Winnipeg

ROUTE 90 IMPROVEMENTS STUDY

EXECUTIVE SUMMARY

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Value Engineering Facilitation	Faithful + Gould
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1 INTRODUCTION

Route 90 is an important transportation corridor through Winnipeg, linking major residential, employment, and commercial areas in the southwest and northwest quadrants. The route needs to be upgraded to address current and future traffic volumes, new development, future redevelopment, and the needs of pedestrians, cyclists, and transit users.

Route 90 from Ness Avenue to Taylor Avenue was included in the City of Winnipeg Transportation Master Plan (2011) as a priority Strategic Road Network improvement. Route 90 is the only continuous north south route connecting PTH 100 to PTH 101 and beyond, in west Winnipeg. It is a critical link for the local, regional, and international movement of goods by truck and provides critical connections to the James Armstrong Richardson International Airport, and Manitoba's tri-modal inland port (CentrePort Canada) and supporting industries.

The goal of this study is to develop a Preliminary Design for improvements to Route 90 between Taylor Avenue and Ness Avenue that allows for the safe, convenient, and efficient movement of people and goods; connects the residential areas on the east and west sides of Route 90; supports for social interaction, healthy lives, economic stability, and growth; and provides accessible, connected transportation options for all ages and abilities. **Table 1.1** provides an overview of the project objectives and guiding principles across various design considerations.

A Transportation Planning Study (TPS) was conducted in 2012 to determine the preferable alignment to accommodate widening of Route 90 to six lanes and providing enhanced active transportation accommodation for the corridor. The current study elaborates on this TPS by examining options for improving the operation of the proposed Route 90 alignment between Taylor Avenue and Ness Avenue, including alterations to the St. James Bridges and Ramp Structures and the Portage Avenue Interchange. The current study also expands on multi-modal transportation options that drive community benefits such as greater health and personal mobility, reduced climatic and environmental impacts, and greater community livability and sociability. This process confirmed assumptions and needs from the corridor and demonstrated the best possible outcome when considering all relevant City policies, stakeholder interests and impacts/opportunities for the adjacent communities. The corridor improvements are intended not only to improve traffic flow, but to help reduce the impacts of realigned Route 90 on the adjacent residential environment. The study scope included:

- Public engagement program.
- Comprehensive review of past studies/reports, current policies, and existing conditions.
- Development of conceptual interchange options.
- Various investigations and analyses to support the development of a functional design of multiple alignment and interchange options for Route 90 and connecting roadways.
- Various investigations and analyses to support the refinement of a preliminary design of two alignment options for Route 90.
- Identification of a preferred preliminary design for Route 90.
- Identification of future considerations for Route 90 (not included in the preliminary design) relating to the Lockston Pedestrian and Cycling overpass, Portage Avenue Interchange, rail bridge over the Assiniboine River, and other considerations for detailed design.

Table 1.1: Project Objectives and Guiding Principles

DESIGN CONSIDERATION	OBJECTIVES AND GUIDING PRINCIPLES
Transportation Design	– Incorporate three through lanes each way on Route 90 with a minimum posted/operating speed limit of 60 km/h within the project limits. – Improve Level of Service (LOS) for all modes. – Reduce congestion, minimize traffic delays, and improve people and goods movement.
Bridge Design	– Design all bridges to meet current geometric design standards for Route 90. – Provide a minimum 75-year service life for new and rehabilitated structures. – Incorporate improved walking and cycling connections on the bridges.
Support the land use vision for the area	– Consider design that supports redevelopment options for and responds to character variation of lands along the corridor to ensure multi-modal accommodation. – Consider design that supports (re)development that is walkable and provides good east west connectivity. – Ensure the design supports the unique land use and transportation needs of Naawi-Oodena. – Implement a public engagement process that will confirm the broad range of issues, concerns, and opportunities raised by residents and stakeholders and evaluate the road design options in a manner that considers and responds to the feedback that is received. – Consider how land use will interface with the public realm component of the design. – Minimize property impacts and acquisitions.
Integrate and support active, accessible, and healthy lifestyle options	– Incorporate facilities that offer choices for different modes of transportation. – Consider the urban context of the study area. Route 90 is a Major Arterial passing through a Mature Community in an Established Neighborhood. – Provide safe and convenient opportunities to cross Route 90 for pedestrian and cyclists. – Respect the existing character of the neighborhood and maintain sightlines and visual permeability. – Maintain flexibility in design with respect to AT, transit requirements, and traffic standards.

DESIGN CONSIDERATION	OBJECTIVES AND GUIDING PRINCIPLES
Integrate and support safe, efficient, and equitable movement of people, goods, and services	– Reduce conflicts at bus stops and intersections between all user types/modes. – Recognize Route 90 as a Transit Quality Corridor as defined in the 2011 Transportation Master Plan (updated to Frequent Transit Corridor in the 2021 Winnipeg Transit Master Plan) and consider infrastructure accessibility enhancements through the design of the corridor. – Provide quality connections to key destinations in the network.
Integrate and support the principles of effective asset management	– Assess the condition of existing facilities. – Achieve improved levels of service for all modes. – Use life cycle cost analysis to design infrastructure that minimizes the total cost of ownership. – Consider effect of construction delays to the public.
Sustainability	– Consider sustainable landscaping and naturalization in the design. – Install new land drainage sewer (LDS) system to separate combined sewers in accordance with the City's Combined Sewer Overflow (CSO) Master Plan. – Consider impacts to water quality, aquatic habitat, and riverbank erosion and stability.

2 PUBLIC ENGAGEMENT

The public engagement program set out to understand the public's needs and priorities and reflect them in the design. The engagement strategy and communications plan set out engagement objectives, risks, stakeholders, engagement techniques, roles of project team members, and a high-level schedule of events for the duration of the study period. Engagement objectives included:

- Maintaining and building on the extensive work that has been done with stakeholders and the public in the 2012 Transportation Planning Study.
- Generating broad public awareness and providing the public, community and elected decision-makers with rationale, benefits, impacts and key information about the study.
- Verifying study goals, objectives and gathering input on evaluation criteria as well as focused project features to help inform the preferred option for the final preliminary design report.

The engagement included three phases, as set out in **Figure 2.1**. An overview of "what was heard" during each phase of engagement is outlined below. The public engagement summary reports are posted on the project webpage and provide a comprehensive summary of what we heard from the public.

PHASE 1 PUBLIC ENGAGEMENT

The first phase of stakeholder and public engagement was conducted between January and May 2018 to gather perspectives and input on priorities for Route 90 improvements early in the project. In this phase, we surveyed a random and representative sampling of 600 Winnipeggers (adults residing in Winnipeg). Of those, 58 were identified as regional residents residing in postal codes R3N, R3J and R3G. In addition to the scientific survey, we also met with the Project Advisory Committee (PAC) and collected feedback through an online survey (1,815 responses).

What we heard in Phase 1 public engagement included:

- An overwhelming majority of Winnipeggers consider Route 90 an important transportation route for the city (94 percent). There has been virtually no change in this sentiment over the last decade.
- Winnipeggers are slightly more likely to consider too many intersections (51 percent), instead of too many trucks (36 percent), as the main cause of traffic jams on Route 90.
- Winnipeggers say reducing traffic congestion (39 percent) and accommodating future growth (33 percent) are top priority for Route 90.

- Winnipeggers mentioned better truck traffic management (34 percent) in their top three priorities. However, among regional residents, building better bike routes (19 percent) was a much higher priority than truck traffic management (5 percent).
- Common themes in the online survey comments include community connectivity, property impacts and acquisition, lane closures during construction, and increasing traffic as a result of road improvements.

These results were integrated into the functional design developed and presented to stakeholders and the public for feedback in Phase 2.

PHASE 2 PUBLIC ENGAGEMENT

The second phase of stakeholder and public engagement was conducted between June 2018 and August 2018 to present the draft functional design and gather feedback to help inform the preliminary design. In this phase, a survey of a random sample of regional residents (335 Winnipeg adults from postal code prefixes R3G (Wolseley and the West End), R3M and R3N (River Heights) and R3P and R3Y (Tuxedo and South Winnipeg)) allowed for comparison of views with Winnipeggers (random sample of 600). In addition to the scientific surveys, we also met with the PAC, held property owner and community meetings, hosted pop-up events, and collected feedback through an online survey (1,205 responses).

What we heard in Phase 2 public engagement included:

- Reducing traffic congestion (82 percent) and ensuring the new design will accommodate population and traffic growth in the future (60 percent) are top priorities for regional residents.
- Higher frequency of buses, followed by bus stop enhancements and diamond lanes/dedicated transit lanes were the most mentioned transit improvements.
- A bridge crossing at Lockston Avenue for pedestrian and cyclists was perceived by regional residents as safe (91 percent) and easy to use (72 percent).
- Regional residents would like the character of Route 90 to feel like a parkway (62 percent) with off-street pedestrian and cycling paths (76 percent).
- The less-preferred option of protected on-street bike lanes would still entice more than two-thirds of regional residents to cycle more often down Route 90.

Feedback on the functional design was considered by the project team and helped inform the preliminary design.

PHASE 3 PUBLIC ENGAGEMENT

The third phase of stakeholder and public engagement was conducted between May and June 2023 to present the proposed preliminary design and gather feedback to help finalize the design. In this phase, the project team held landowner and stakeholder meetings, hosted an open house, and collected feedback through an online survey (3,225 responses).

What we heard in Phase 3 public engagement included:

- Some online survey respondents felt the design does a good job balancing traffic flow and local access (34 percent). Others felt the design favors traffic flow on Route 90 too much and does not provide enough local access (21 percent).
- Respondents thought the proposed design will make walking (50 percent) and biking (62 percent) safer.
- Respondents thought the proposed design will make getting to where they need to go easier (61 percent).
- The majority of respondents thought the proposed design achieves a parkway look and feel (60 percent).
- Top concerns noted by respondents included: (1) the design focuses too much on vehicles (mode shift); (2) the design does not include enough transit improvements, and (3) concerns with the project cost.

Feedback on the proposed preliminary design helped the project team refine the design before recommending a preliminary design to Council.

	KICKOFF NOV – DEC 2017	PHASE 1 JAN – MAY 2018	PHASE 2 JUN – AUG 2018	PHASE 3 MAY - JUN 2023
OBJECTIVES	• Verify draft goal and objectives • Identify key decisions and changes • Establish timeline • Stakeholder and risk identification • Finalize strategy • Re-introduce project	• Establish and engage PAC • Engage key stakeholders • Share information • Collect and share input	• Engage PAC • Share information and updates • Generate broad public awareness • Collect input on key areas • Compile and share input with team	• Share how public and stakeholder input was considered in the design • Create a shared understanding of project complexities and limitations • Build trust in the process and support for the project • Provide rationale, benefits, impacts and key information about the project • Be clear on timeline
ACTIVITIES	• Assessment • Develop public engagement strategy • Stakeholder mapping • Draft communications plan	• Establish PAC • PAC meeting 1 and 2 • Website launch • Statistically significant survey (random sample) • Public survey (self-selected) • Team review and consideration of feedback	• PAC meeting 3 • Webpage Update • Statistically significant survey (random sample) • Public survey (self-selected) • Landowner meetings (2) • Community meetings (5) • Pop-up events (2) • Team review and consideration of feedback	• Website update • Public survey (self- selected) • Stakeholder meetings (4) • Landowner meetings (5) • Group Stakeholder Meetings • Open House (1) • Team review and consideration of feedback
PROJECT OUTCOMES	• Public Engagement Strategy and Communications Plan confirmed	• Functional design drafted with the help of feedback	• Refinements made to the functional design with the help of feedback • Preliminary design drafted	• Refinements made to the preliminary design with the help of feedback • Final report drafted

Figure 2.1: Public Engagement Program Overview

3 EXISTING CONDITIONS

The study area includes Route 90 between Taylor Avenue and Ness Avenue, including the Portage Avenue / Route 90 interchange and the St. James Bridges. The existing conditions review investigated:

- **2012 TPS**: Examined the previous recommended option, public engagement, City approvals and changes to the study area that have occurred since that study was completed.
- **City policies**: Identified pertinent policy extracts from OurWinnipeg 2045 together with the Complete Communities Direction Strategy 2.0 (CCDS 2.0), Transportation Master Plan (2011), Pedestrian and Cycling Strategies (2015), and Universal Design Policy.
- **Land uses:** Identified major developments that may impact the Route 90 corridor and development plans for Naawi-Oodena (the former Kapyong Barracks lands).
- **Street system:** Included a review of the roadway classifications, truck route designation, speed limit, lane configuration, and on-street parking restrictions for the primary roadways within the study area.
- **Transportation studies and road construction projects:** Identified significant transportation studies and road construction projects have been conducted near the study area since the 2012 TPS.
- **Traffic analysis:** Established the traffic forecasts for the study and the existing road network traffic operational conditions at the signalized intersections along Route 90.
- **Neighbourhood traffic impacts:** Identified key neighbourhood traffic impacts that were considered in the 2012 TPS based on stakeholder feedback.
- **Collision analysis:** Involved a review of the collision history through an assessment of multiple years of collision statistics. This review is to establish collision rates and possible relationships between the collisions that have occurred and the geometric features and operational conditions of the facility.
- **Pedestrian and cycling infrastructure:** Examined the existing and proposed infrastructure outlined in the Pedestrian and Cycling Strategies (2015) and identified gaps in the network.
- **Transit service:** Identified the existing transit routes, schedules, and stops servicing the area, as well as passenger activity in the study area.
- **Goods movement:** Identified the existing demand for goods movement along Route 90 and the local, regional, and international importance for accommodating goods movement on Route 90.
- **Road design and construction staging:** The 2012 TPS design was reviewed for conformity to current standards. The construction staging plan and timeline from the 2012 TPS was also reviewed.
- **Signage:** The existing signage within the study area and the proposed signage from the 2012 TPS was reviewed to gain an understanding of the signage that would be required as part of this study.
- **Water mains and utilities:** Included a review of the existing water main condition assessment by the Water and Waste Department's Asset Management Branch. A review was also conducted with utility companies to identify existing infrastructure and any planned improvements.
- **Combined sewers:** A condition assessment of the sewer assets was undertaken to identify the existing conditions and to recommend repairs or rehabilitation where defects were noted.
- **Land drainage:** Existing record information available from the City of Winnipeg and the 2012 TPS was reviewed to gain an understanding of current conditions and identify data gaps that exist.
- **Geotechnical investigation:** Geotechnical investigation was not part of the 2012 TPS, as such, a geotechnical investigation was necessary to determine the soil stratigraphy, monitor groundwater conditions, assess the slope stability, and determine viable foundation types for the proposed bridges.
- **Pavement condition:** A pavement condition assessment of the side streets connected to Route 90 between Taylor Avenue and Ness Avenue was conducted to determine the scope of work required for inclusion in the preliminary design for Route 90.
- **Bridge condition assessment:** The condition of major structural elements (bridges and retaining walls) was assessed to determine if immediate maintenance work is required, and to determine the feasibility of carrying out major modification and rehabilitation of the existing structures.
- **Hydraulics:** Identified the existing hydraulic conditions of the Assiniboine River, including the flood frequency and water levels at the Route 90 bridge site.
- **Environmental considerations:** The review identified changes to Federal Environmental Acts since the 2012 TPS and potential environmental considerations for the project.
- **Noise:** An environmental noise investigation was conducted as part of this study to gain an understanding of the existing noise levels (2017) along Route 90.
- **Landscape design:** Identified the existing character of the Route 90 corridor, which included three zones (Taylor to Carpathia, Carpathia to Academy, and Academy to Ness) with distinct characteristics.

The existing conditions review established baseline information, as well as study area issues, opportunities and constraints that would inform the development of options, functional design, and preliminary design. Key issues and considerations for the study area are identified in **Figure 3.1** which include:

- Future development planned for Naawi-Oodena.
- Need to improve Route 90 to reduce congestion and improve travel times to accommodate current and future traffic volumes.
- Need for separation of combined sewers under Route 90 consistent with the CSO Master Plan;
- Consideration that Route 90 is a designated truck route.
- Need for safe, convenient, and accessible pedestrian and cycling crossings of Route 90.
- No dedicated north-south cycling infrastructure along Route 90.

- Property constraints both residential and institutional in nature.
- Several closely spaced and uncontrolled intersections with local streets are present between Willow Avenue and Academy Road, impacting safety and traffic operations on Route 90.
- Inadequate merge lane geometry for eastbound Portage Avenue to southbound Route 90 (direct ramp) and for westbound Portage Avenue to southbound Route 90 (loop ramp).
- Southbound St. James Bridge is nearing the end of its service life.

Figure 3.1: Study Area Issues and Considerations

4 DESIGN CRITERIA

Design criteria for roadways, pedestrian and cycling facilities, bridge structures, land drainage, and trees and naturalized areas were established at the outset of the project. The design criteria guided the development of options and ensure that the functional and preliminary designs aligned with relevant guides, manuals, specifications, standards, codes, and best practices.

The design criteria were submitted and approved by the City of Winnipeg for the functional and preliminary designs of Route 90 between Taylor Avenue and Ness Avenue. Design Criteria is provided for the roadways, pedestrian and cycling facilities, structures, drainage, and trees and natural areas.

5 DEVELOPMENT OF INTERCHANGE OPTIONS

Various interchange, ramp, bridge structure, and intersection design options were investigated as part of this study with the objective of addressing traffic capacity and operational issues related to the Route 90/Portage Avenue/Academy Road interchange.

Several conceptual options were identified early on in the design process for consideration as part of this study. These initial options were discussed at an Options Charrette involving key members of the Project Steering Committee and WSP technical staff. Following the Options Charrette, a refined set of options were subsequently presented to the Steering Committee and the Steering Committee agreed to a set of options that would go forward for a more detailed assessment in terms of geometric and traffic capacity analysis.

Prior to commencing the functional design, the WSP Team met with the Steering Committee to reach consensus on which options to take forward into the functional design stage. Two interchange alternatives were recommended for further review and assessment during the functional design phase of this study; however, the only significant difference between the two alternatives is the treatment of the southbound Route 90 to eastbound Academy Road manoeuvre.

Alternative 1 repurposes the existing southbound bridge to serve as the ramp from southbound Route 90 to eastbound Academy Road and as the ramp from eastbound Portage Avenue to southbound Route 90 and eastbound Academy Road. A separate three-lane bridge would be constructed between the existing bridges for the southbound Route 90 through traffic. Major advantages of Alternative 1 are that southbound Route 90 to eastbound Academy Road, eastbound Portage Avenue to southbound Route 90 and eastbound Academy Road, and eastbound Portage Avenue to southbound Route 90 through traffic have separate lanes and weaving on the bridge is eliminated. Safety and capacity are significantly enhanced by eliminating the need for traffic to change lanes.

Alternative 2 maintains southbound traffic on a single bridge structure (similar to existing conditions, where the southbound Route 90, eastbound Portage Avenue to southbound Routh 90, and southbound Route 90 exit to eastbound Academy Road manoeuvres are accomplished on a single southbound bridge structure). Alternative 2 requires complete replacement of the existing southbound bridge with a new, wider structure, and the use of a loop ramp on the south side of the Assiniboine River. The traffic analysis undertaken indicates that the level of service for southbound traffic will reach undesirable levels towards the end of the 2041 horizon year.

6 FUNCTIONAL DESIGN

Two interchange options were designed to a functional level. The functional design involved completing a traffic analysis, roadway, structure, and pedestrian / cycling facilities and universal design and drawings, water mains and utilities conflict identification, and Class 4 cost estimate. Following the completion of the functional design of the two options, the following additional investigations and analyses were completed:

- **Independent Road Safety Review** – The City of Winnipeg Public Works Department retained Fireseeds North Infrastructure to prepare an independent road safety review for the functional design. The road safety review identified risks and recommendations which were reviewed by the design team and discussed with the road safety review team and key members of the Steering Committee. Based on direction provided by the City, design modifications were incorporated into the preliminary design.
- **Evaluation of the Interchange Functional Design Options** – Interchange options were evaluated by the Study Team and confirmed by the City. Each option was evaluated against criteria relating to safety, property requirements, pedestrian and cycling facilities, area impacts, environmental impacts, geometric design, traffic operations, utility impacts, extent of staging and detour works, ease of construction and staging, and costs. Each option was then scored on a scale ranging from one to three for each criterion. Based on the evaluation of the functional design interchange alternatives, Alternative 1: “Westbound Portage Southbound Route 90 – northbound Route 90 to eastbound Portage – Construction of New Southbound St James Bridge – Triple Right Turns from Academy Road”, was selected as the recommended alternative for further analysis during the preliminary design.
- **Value Engineering Session** - A Value Engineering (VE) Workshop for the functional design was completed by personnel from Faithful+Gould, the Project Steering Committee, WSP, Fireseeds North Infrastructure and technical experts not involved in the projects from Watt Consulting and WSP. The main objective of the VE Workshop was to present the recommended alternative and brainstorm design options to increase value through improved functionality and/or capital and/or life cycle cost avoidance while maintaining a quality project that meets stakeholder needs and the overall objectives of the project. The result was 46 ideas for the Route 90 Improvements project across the six value target areas relating to access management, active transportation, construction strategy, mainline, Portage Avenue / Route 90 interchange and deep / shallow utilities. The 46 ideas resulted in 10 Quantitative VE Alternatives (avoid cost), four Qualitative VE Alternatives (added value for added cost) and 11 Design Suggestions. Five of the nine recommended Quantitative VE Alternatives were accepted for an estimated total savings of $27,353,000. Two of the four Qualitative VE Alternatives were accepted for an estimated additional capital cost of $1,912,000. The net cost saving of the recommended VE alternatives is $25,441,000.
- **Additional Roadway Alignment Options Between Corydon Avenue and Academy Road** – One of the original constraints in establishing a roadway alignment for the Route 90 Improvements between Taylor Avenue and Ness Avenue from the 2012 TPS was that the roadway alignment between Taylor Avenue and Academy Road could not impact the Manitoba Youth Centre (MYC) property. Because of this constraint, a functional design was developed using the preferred Option 4 from the 2012 TPS. This option avoided the MYC site by shifting the roadway alignment between

Corydon Avenue and Academy Road towards the east. In June 2018, the City held several public engagement events to obtain feedback from study area residents. Based on the feedback received, the City initiated further discussion with the Province regarding the MYC property. During these discussions, the City learned that the Province was open to reviewing a proposed westward realignment of Route 90 that would require property from the MYC. Based on the new information, three alignment revisions were explored between Corydon Avenue and Academy Road that would shift Route 90 westwards and onto the MYC property by varying amounts (known as MYC Options 1, 2 and 3). The goal of this exercise was to identify the potential benefits in terms of reducing the number of residential properties on the east side of Route 90 that would need to be acquired when compared to the original (2012 TPS) alignment that treats the MYC property as a constraint.

The City selected MYC Option 3 as the option having the most benefits in terms of property acquisition reduction and commenced discussions with the Province regarding impacts to two bungalows or acquisition of the full MYC property. At that time, MYC Option 3 to was further developed to a preliminary design level while the City waited for a response from the Province. Following the completion of the preliminary design for MYC Option 3, the City received notification from the Province that the MYC property would not be available for purchase, nor can the Route 90 Improvements impact any part of the MYC property; therefore, the eastern alignment option was selected as the preferred design.

- **Lowering of Wellington Avenue and Wolseley Avenue –** The feasibility of lowering Wellington Crescent (south side of the Assiniboine River) and Wolseley Avenue (north side of the Assiniboine River) to provide sufficient vertical clearance for the passage of fire trucks beneath the existing St. James Bridges was investigated within the context of the Route 90 Improvement Study. The desired (posted) vertical clearance for both Wellington Crescent and Wolseley Avenue is 3.70 m, which means the actual clearance needs to be 3.80 m to provide the City's typical 100 mm margin of safety. This clearance will facilitate the passage of the tallest ladder truck (3.63 m) in the City's fire truck inventory. The feasibility study included a functional design for the lowering of Wellington Avenue and Wolseley Avenue, including drawings and findings related to roadway geometry, constructability, hydraulic, geotechnical, land drainage, utilities, regulatory requirements, and cost.
- **Additional Pedestrian and Cycling Option Utilizing Rail Bridge over the Assiniboine River –** The recommended preliminary design includes a 2.5 m sidewalk on the northbound St. James Bridge. However, an alternative that can be explored further in the detailed design phase is to utilize a former rail bridge is currently privately owned. The existing former railway bridge crosses the Assiniboine River immediately east of the northbound St. James Bridge structure. The bridge has not been used for rail service in over two decades as the rail line was closed, the tracks were removed, and the rail operator sold the property (including the bridge). The bridge is not currently being used and there is a potential opportunity to use the bridge as the east side pedestrian and cycling crossing of the Assiniboine River. By converting the rail bridge to an active transportation crossing there would no longer be a need for a sidewalk on the existing northbound St. James Bridge. This would enable the existing northbound lanes to be realigned by centering the deck on the existing piers, which will minimize the amount of pier widening required. A high-level visual inspection, underwater pier inspection and functional design was undertaken to determine the feasibility of converting the rail bridge to a pedestrian and cycling crossing. The feasibility study found that utilizing the former railway bridge would provide spatial separation from vehicular traffic would enhance the AT user experience by reducing exposure to noise, dust, headlights glare, vehicle emissions, and by eliminating the possibility for conflict between AT users and vehicular traffic. The option was found to be both functionally and technically feasible and aligns with the Pedestrian and Cycling Strategies. Furthermore, there is a strong indication that this option is also fiscally feasible (based on preliminary comparative costing), subject to the purchase price for the privately-owned rail bridge.

7 PRELIMINARY DESIGN

The final preliminary design for Route 90 includes Alternative 1 that was explored during the functional design, as well as the lowering of Wellington Avenue and Wolseley Avenue. The design was refined based on various additional technical analyses that are described in the following sections.

7.1 TRAFFIC OPERATIONS

A traffic operational analysis for the Preliminary Design was undertaken using Synchro / SimTraffic analysis software (version 10.0). The traffic analysis confirmed the lane configuration and turning lane lengths required at each of the Route 90 intersection based on the information available at the time of the analysis. The analysis included a medium density land use scenario for the Naawi-Oodena development; however, due to the uncertainty in future development, a sensitivity analysis was also completed to compare the adjacent street network's intersection operations for three Naawi-Oodena development density scenarios – Low, Medium, and High.

The results of the 2041 weekday peak hour intersection analysis for the Route 90 and Portage Avenue intersections are summarized in Table 7.1. The results show that all intersections operate at a level-of-service (LOS) D or better in the a.m. peak hour. In the p.m. peak hour, most intersections are operating at a level-of-service D or better, with the exception of Grant Avenue and Tuxedo Avenue that are operating at LOS E. In both the a.m. and p.m. peak hour, there are some individual movements that are operating over capacity (v/c ratio is greater than 1).

Table 7.1: Intersection Analysis Results

SCENARIO	OVERALL INTERSECTION		
	LOS (DELAY)	ICU LOS	MAX V/C
AM Peak Hour			
Taylor Avenue	D (43 sec)	E (83%)	1.01 (WB Left)
Grant Avenue	D (51 sec)	F (93%)	1.07 (NB Thru)
Corydon Avenue	C (26 sec)	E (89%)	1.03 (SB Left)
Lockston Avenue	B (14 sec)	B (59%)	0.74 (NB Thru)
Tuxedo Avenue	D (41 sec)	E (86%)	1.08 (NB Thru)
Academy Road	C (30 sec)	G (106%)	1.08 (WB Right)

SCENARIO	OVERALL INTERSECTION		
	LOS (DELAY)	ICU LOS	MAX V/C
Portage Avenue & NB-EB Ramp	B (11 sec)	C (70%)	0.80 (EB Thru)
Portage Avenue & EB-SB Ramp	B (14 sec)	C (72%)	0.87 (EB Thru)
Ness Avenue	D (39 sec)	F (95%)	1.04 (NB Left)
PM Peak Hour			
Taylor Avenue	D (45 sec)	F (94%)	1.25 (WB Left)
Grant Avenue	E (74 sec)	G (108%)	1.26 (NB Left)
Corydon Avenue	D (38 sec)	F (92%)	0.99 (SB Thru)
Lockston Avenue	A (6 sec)	A (53%)	0.67 (NB Thru)
Tuxedo Avenue	E (67 sec)	D (81%)	1.07 (NB Thru)
Academy Road	B (10 sec)	E (84%)	0.87 (NB Thru)
Portage Avenue & NB-EB Ramp	A (7 sec)	B (58%)	0.57 (WB Thru)
Portage Avenue & EB-SB Ramp	A (8 sec)	D (75%)	0.86 (WB Left)
Ness Avenue	D (35 sec)	F (93%)	1.06 (NB Left)

Important Note: As described in Section 7.2, refinements were made to optimize the roadway geometric design and also following discussions regarding the Naawi-Oodena development. These refinements have not been fully incorporated in the traffic analysis. It is recommended that the traffic analysis be updated at the detailed design stage based on the latest Naawi-Oodena development information and considering the re-distribution of traffic that would occur with the latest proposed development accesses.

7.2 ROADWAY DESIGN

Refinements were made to optimize the roadway geometric design and address supplementary project requirements. Key design elements are included in Figure 7.2 to Figure 7.4. Common refinements included:

- Some of the lane widths on Route 90 and connecting collector and arterials roadways were narrowed to 3.5 m.
- Regulatory, warning and guide sign locations were added.
- Sound attenuation measures were added.
- Intersection designs were refined to include separated pedestrian and cycling crossings, smart channels and bus stops that accommodate articulated buses on Route 90.
- Half signals were added at three locations along Route 90 (Carpathia Road, Lockston Avenue, and Willow Avenue) to provide additional crossing opportunities for pedestrians, cyclists, and transit riders.
- Accesses to adjacent properties were added based on requirements identified by Emergency Services.

The following additional changes to the design were made following discussions regarding the Naawi-Oodena development:

- A new signalized intersection was added at Boulton Bay to accommodate access to Naawi-Oodena on the west side of Route 90, as well as the existing housing on the east side of Route 90 (Figure 7.1).
- Transit lay-by lanes were removed on Route 90 at Taylor Avenue (southbound), Grant Avenue (northbound and southbound), Corydon Avenue (northbound and southbound), Tuxedo Avenue (northbound and southbound), and Academy Road (northbound).
- At the Taylor Avenue intersection, the southbound right-turn cut-off and westbound right-turn cut-off lanes were removed, as well as the eastbound right turn storage lane (cut-off lane remains).

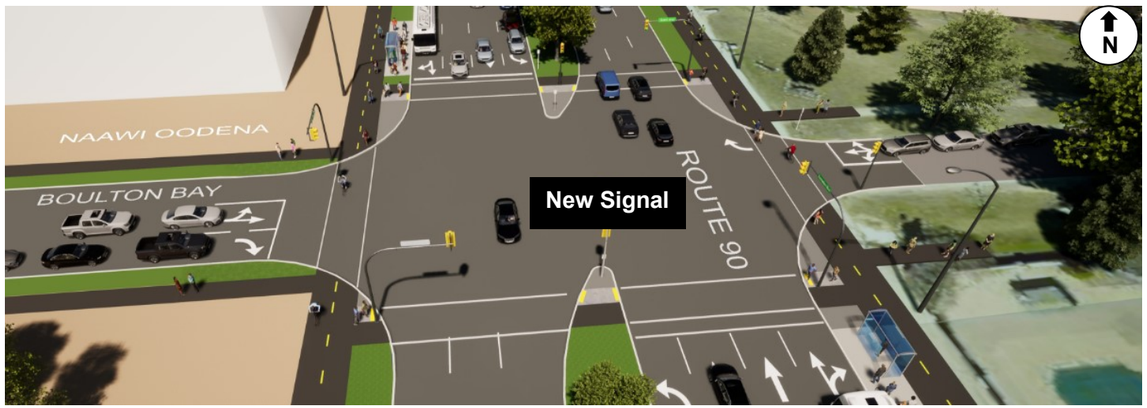


Figure 7.1: New Signalized Intersection at Boulton Bay

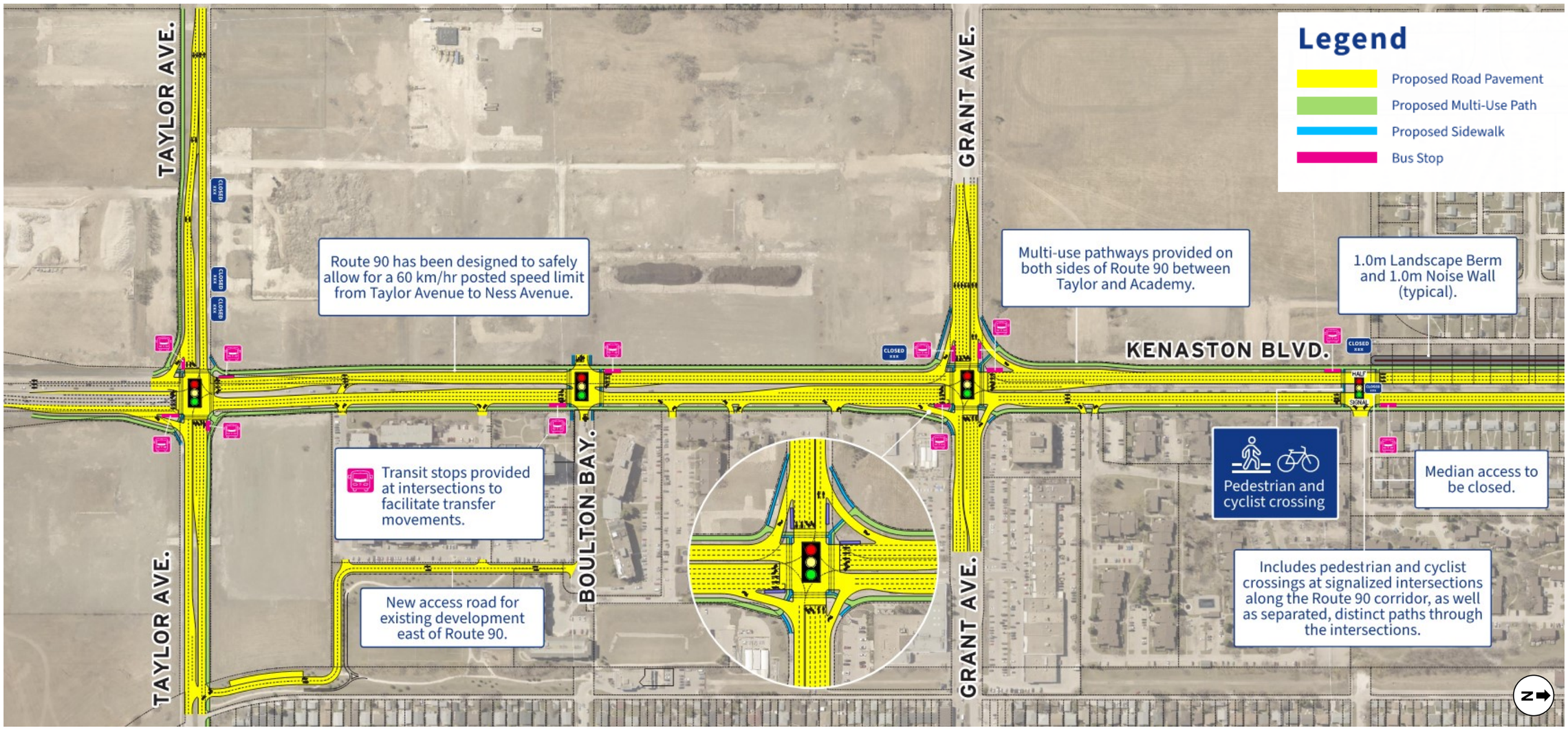


Figure 7.2: Key Design Elements – Taylor Avenue to Carpathia Road

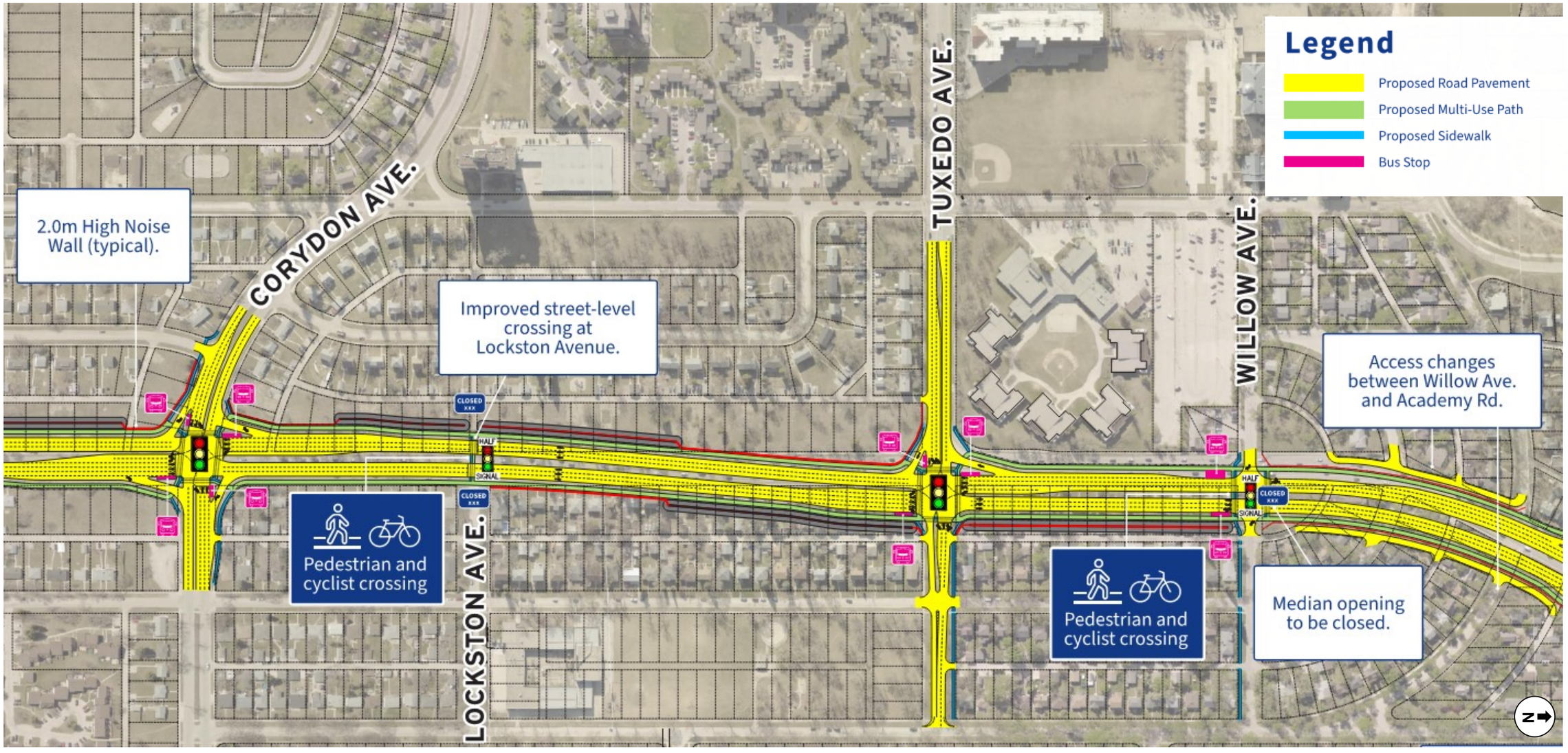


Figure 7.3: Key Design Elements – Corydon Avenue to Willow Avenue

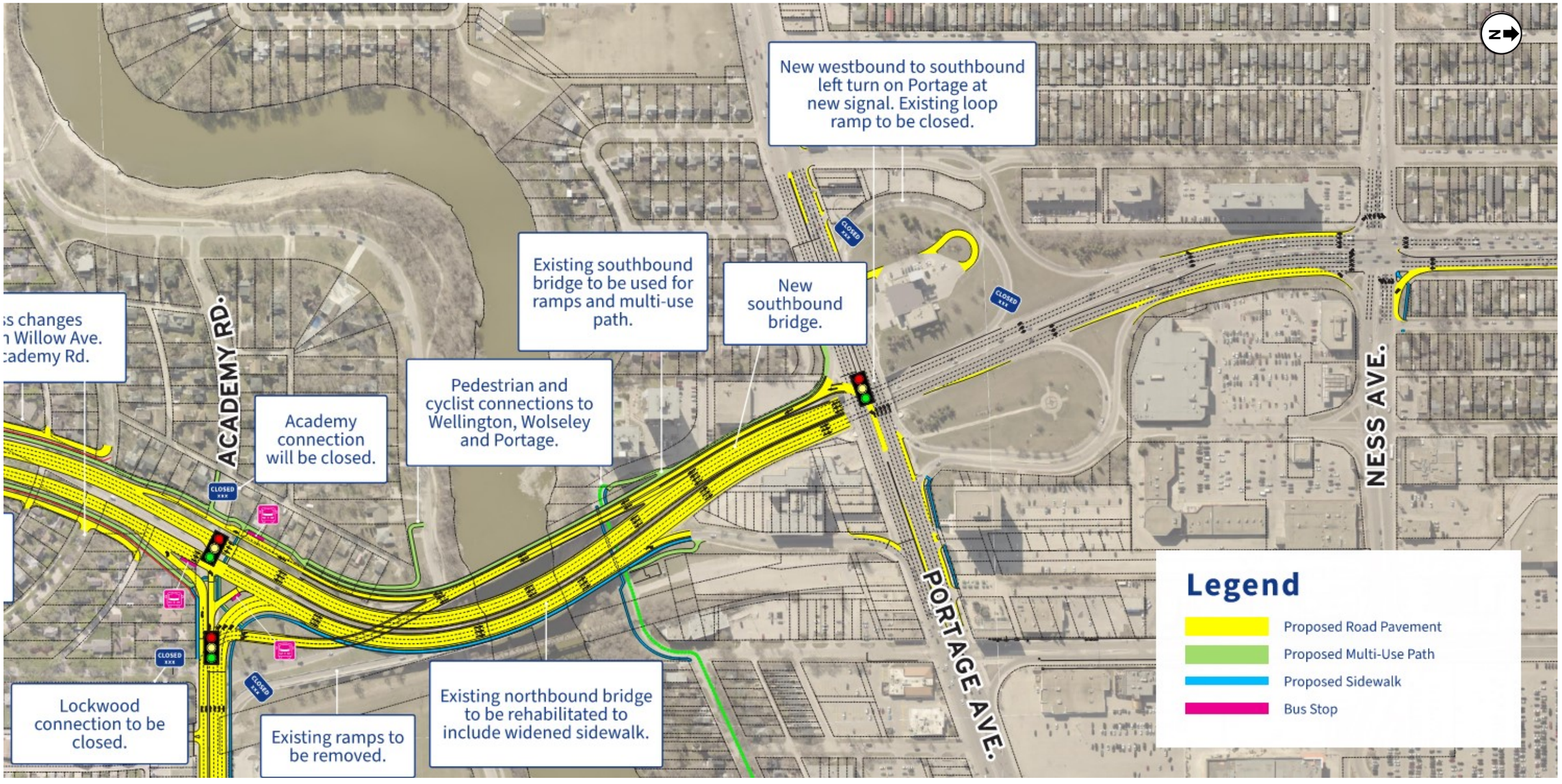


Figure 7.4: Key Design Elements – Academy Road to Ness Avenue

7.3 PEDESTRIAN & CYCLING INFRASTRUCTURE

The preliminary design for Route 90 from Taylor Avenue to Academy Road replaces the existing sidewalks with 3.5 m multi-use paths located near the east and west right-of-way boundaries. The multi-use paths connect to the existing shared pedestrian and cycling paths south of Taylor Avenue and extend north to the pedestrian and cycling network north of Academy Road.

At intersections, pedestrians and cyclists are separated, have distinct paths through the intersection, and are controlled by pedestrian and bicycle signals. The preliminary design also includes half signals at the intersection of Route 90 with Carpathia Road, Lockston Avenue and Willow Crescent to provide additional connectivity between the communities on the east and west sides of Route 90. The half signals also provide safe crossing opportunities for pedestrians wanting to connect to transit at the transit stops located near the half signals (Figure 7.5).

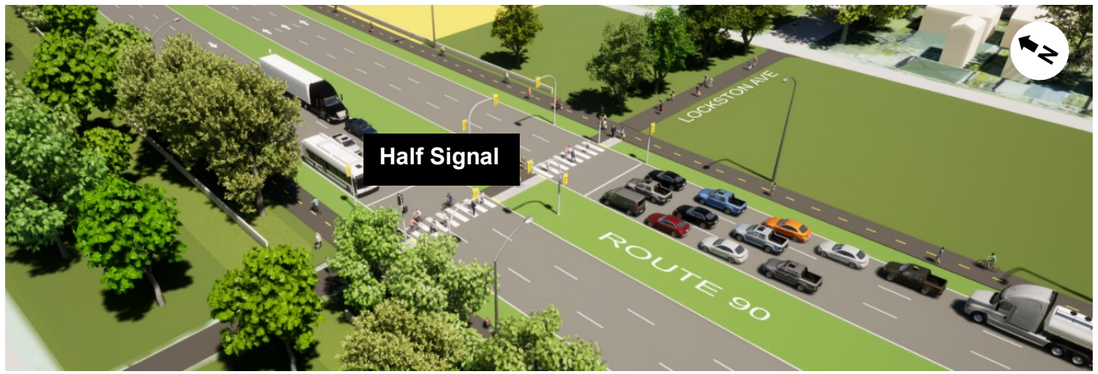


Figure 7.5: Half Signal at Lockston Avenue

North of Academy Road and west of Route 90, pedestrians and cyclists can connect to Wellington Crescent and the St. James Bridge via a new 3.5 m wide multi-use path (Figure 7.6). This 3.5 m wide multi-use path continues on the southbound existing bridge and connects to Portage Avenue at Riverbend Crescent and Wolseley Avenue east of the 1710 Portage Avenue (Kiltarton Towers) property line (Figure 7.7). These connections further the goals of the Pedestrian and Cycling Strategies (PCS), which proposes that Wolseley Avenue and Riverbend Crescent be part of the City's cycling network and designed as neighbourhood greenways.

North of Academy Road and east of Route 90, pedestrians can connect to the northbound St. James Bridge via a 2.5 m wide sidewalk (Figure 7.6 and Figure 7.7). The 2.5 m wide sidewalk continues on the northbound bridge and connects to the existing sidewalk on Kintyre Street and to Wolseley Avenue via a multi-use path west of the proposed Pump Station. A new sidewalk is proposed on the south side of Wolseley Avenue between St. James Street and the access to 1710 Portage Avenue (Kiltarton Towers).

The preliminary design provides connections to the existing pedestrian and cycling network and has been designed to facilitate connections to the proposed network identified in the PCS. The PCS is currently being updated as part of the City's Transportation Master Plan study and the proposed connections to Route 90 should be reviewed and incorporated (as appropriate) at future design stages. The proposed pedestrian and cycling network is shown in Figure 7.8.

Figure 7.6: Pedestrian and Cycling connections to Wellington Crescent on South Side of Assiniboine River (Looking North)

Figure 7.7: Pedestrian and Cycling Connections to Wolseley Avenue on North Side of Assiniboine River (Looking South)

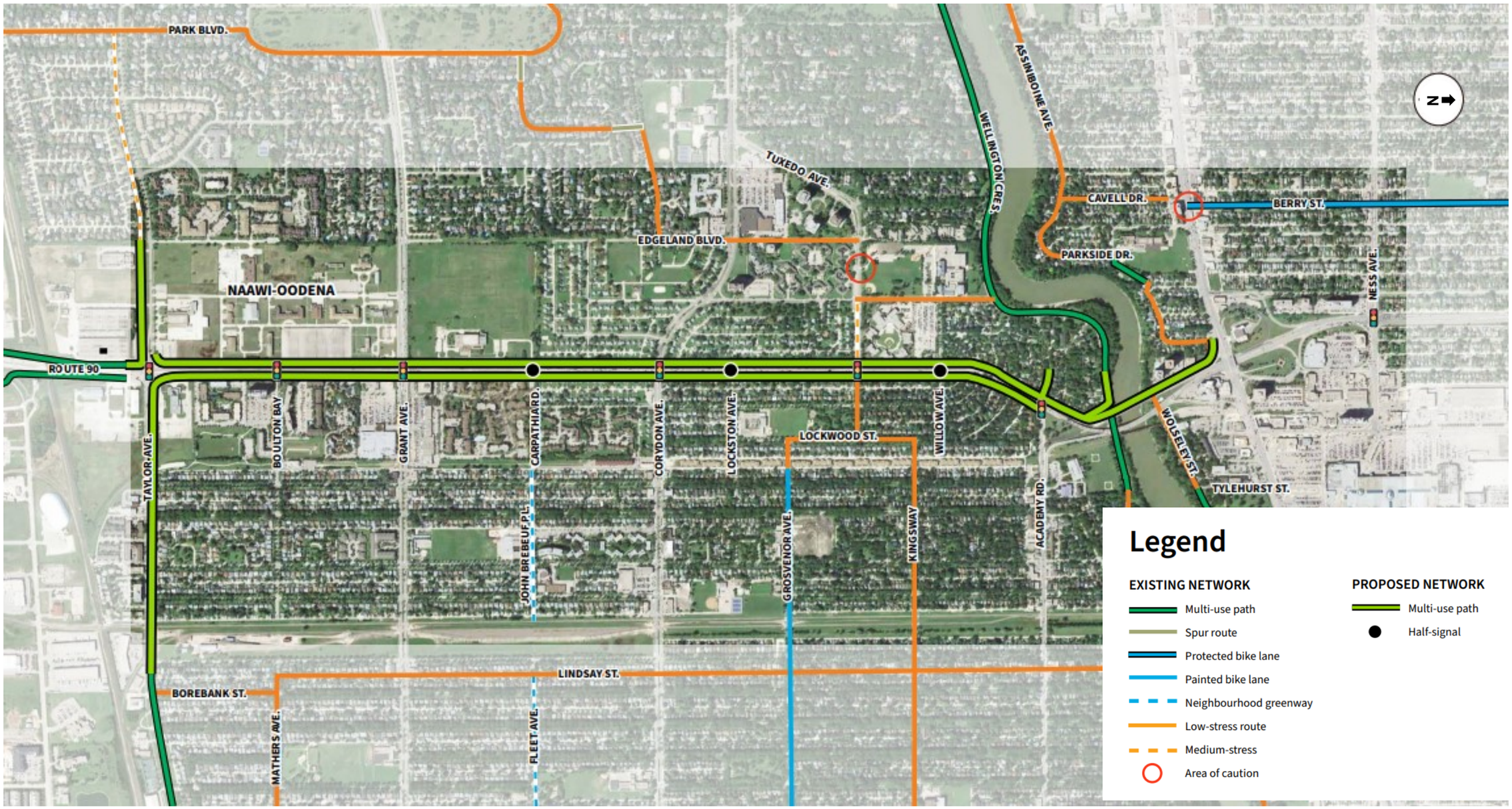


Figure 7.8: Proposed Pedestrian and Cycling Network

7.4 TRANSIT INFRASTRUCTURE

As the Route 90 Study was being completed, the City of Winnipeg was also developed a Transit Master Plan that lays out the 25-year vision for Winnipeg's transit system. The Transit Master Plan intends to give Winnipeggers better transit options that will make it easier for people to choose and access transit and reduce congestion on the existing and future road networks.

The Transit Master Plan identifies Route 90 as a frequent line that connects to other lines or routes at Taylor Avenue, Grant Avenue, Corydon Avenue, Tuxedo Avenue, and Academy Road.

It is anticipated that the Grant Avenue and Kenaston Boulevard intersection will be the most critical Transit Junction along the corridor, as both Kenaston Boulevard and Grant Avenue are identified as important corridors in the Winnipeg Transit Master Plan.

Figure 7.9: Transit Junction at Route 90 and Grant Avenue

To accommodate the proposed transit service for Route 90, the preliminary design includes transit stops at the major intersections along Route 90 to facilitate the connection between lines and / or routes. The transit stops on Route 90 are located on the intersection islands, have been designed to accommodate articulated buses, and are connected to pedestrian and cycling infrastructure. The transit stops on the intersecting streets are also located at intersection islands. The preliminary design also includes transit stops located near half-signals (at Carpathia Road, Lockston Avenue, and Willow Avenue) to provide safe crossing opportunities for pedestrians.

The transit stop at the Route 90 and Academy Road intersection was designed differently than the other stops on Route 90 due to the unique configuration of the intersection (Figure 7.10). All buses travelling westbound on Academy are planned to travel north on Route 90; therefore, the transit stop lane is located in the middle of the island between the westbound left-turn and right-turn lanes on Academy Road and is connected to the pedestrian and cycling infrastructure in the area. A suitable transit stop location for southbound Route 90 to eastbound Academy Road buses will be determined during future design refinement.

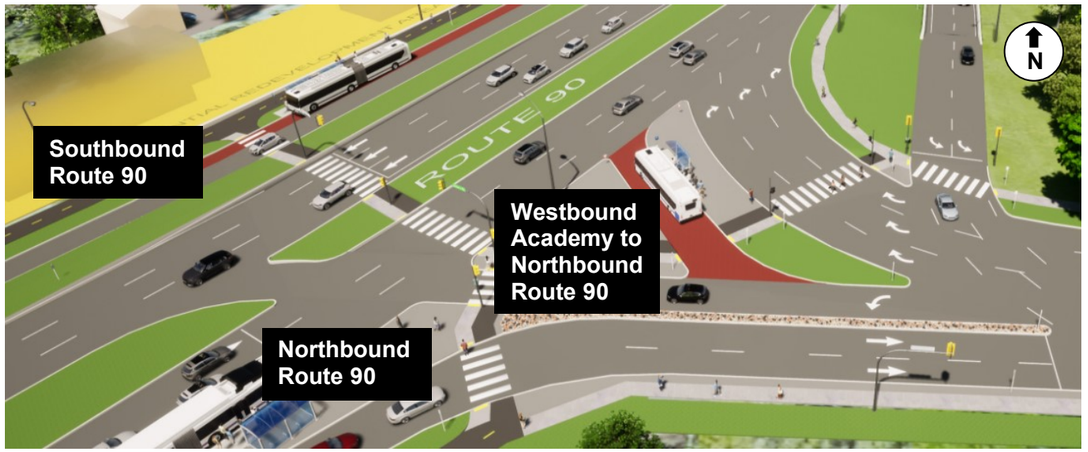


Figure 7.10: Transit Junction at Route 90 and Academy Road

7.5 GOODS MOVEMENT

Route 90 is an important economic transportation route, the northern terminus of the Mid-Continent Trade Corridor, and accommodates significant volumes of local, regional, national, and international truck traffic. Route 90 is also the only contiguous north-south truck route between PTH 100 and 101 in the western portion of the City and has been identified as part of the City's Strategic Goods Movement Network in the 2011 Winnipeg Transportation Master Plan.

The recommended design allows for truck movements on and off Route 90 at intersecting truck routes (Ness Avenue, Portage Avenue, Academy Road - east of Route 90, Tuxedo Avenue - west of Route 90, Corydon Avenue, Grant Avenue, and Taylor Avenue - east of Route 90). The design also allows trucks to pull in and out of adjacent development with direct access to Route 90. On-street loading/deliveries is not accommodated on Route 90 and loading must occur off-street on private property (with some exceptions). Accommodating trucks in an appropriate manner will minimize delays, emissions, and fuel usage, and improve safety of all road users.

There are many areas that will likely influence truck activity along Route 90, including lands outside the study area. Areas that are expected to experience future development that will impact truck activity along Route 90 within the study area include CentrePort Canada, Airport lands, Naawi-Oodena, and Seasons of Tuxedo.

The City provided vehicle counts for the project area, including classification counts. Growth factors from the City's macroscopic travel demand model were used to forecast traffic, with truck percentages from existing counts. Overall, southbound truck traffic is higher than northbound truck traffic and truck traffic is expected to grow between 2017 and 2041. The highest peak hour truck volumes are near Corydon Avenue in the morning peak, and across the Assiniboine River in the afternoon peak.

The Province of Manitoba recently built CentrePort Canada Way located within CentrePort Canada, connecting PTH 101 and Inkster Boulevard west of Route 90. This new road, combined with planned

upgrades to PTH 100, is expected to divert some of the truck traffic away from internal City streets such as Route 90 due to improved travel times.

7.6 SIGNAGE PLAN

The preliminary signage plan developed for Route 90 conforms to the Manual of Uniform Traffic Control Devices for Canada. The plan includes traffic control signage (regulatory and warning signs) and overhead signage (guide signs). It should be noted that the preliminary signage plan does not include supplemental signage installed directly on traffic signals and light standards – such as snow route/no parking signs, transit stop signs, and existing signage not impacted by the proposed works, which will be confirmed during detailed design.

7.7 WATER MAINS & UTILITIES

WATER MAINS CONDITION ASSESSMENT

As part of the preliminary design of Route 90, the condition of water mains within the study area were assessed to determine if various sections of water main renewal or relocation were required. The frequency of water main leaks in the study area was determined, and pertinent existing information reviewed in coordination with the Water & Waste Department ‘s Asset Management Branch. Impacts to the life of existing water mains due to changes in grade that may result in freezing and breaks have also been considered in this condition assessment.

The existing 300 mm water main running along the east side of Route 90 currently meets the City’s level of service. A total of three breaks have occurred on this section of water main each of 2001, 2011 and 2014. However, the section of water main between Taylor Avenue and Carpathia Avenue is a 300mm diameter asbestos cement pipe installed circa 1949. It is therefore approaching the end of its useful life.

Consequently, WSP recommends replacing and relocating the existing asbestos cement water main, along with appropriate lengths of connecting mains along the intersecting streets. The proposed alignment is 5.0m from the proposed east right-of-way limit. This alignment will place the water main in the grassed boulevard areas, minimizing overlap with street pavements, sidewalks, and active transportation paths.

Beyond the asbestos cement water main, the remaining segments of water main are comparatively newer and of PVC material, and it is therefore recommended to leave them in place. Because these segments will be located under the new Route 90 corridor, a pipe loading and thermal analysis of these segments is recommended during detailed design to ensure adequate protection of existing water main in the pavement.

SHALLOW UTILITIES

Other shallow utilities in the study area also require consideration. Coordination occurred with all non-City utilities (e.g., Hydro, BellMTS, Shaw/Rogers, Telus) within the study area to identify their future plans and considerations for the design. The previous 2012 TPS recommendations for utility relocations were verified and expanded upon. This included determining the number of existing utilities which cross through the study area, as well as the depth of utilities and confirming the abilities to handle traffic load. A cost estimate was developed for the relocations and improvements.

Of particular importance are the 350 mm and 50 mm gas mains located on the west side of Route 90. Options will need to be coordinated with Manitoba Hydro, including a possible common utility trench with telecommunication providers, relocation, or protection. While Manitoba Hydro may relocate one or both mains away from the Route 90 corridor, no final determination has been made by Manitoba Hydro.

An enclosed building formerly belonging to the Department of National Defence also exists at the southeast corner of Kenaston and Grant. Available information indicates that this building was used to provide electrical power to the former Kapyong Barracks site. As this structure will be located inside the new Kenaston Boulevard right of way, it will require removal or relocation prior construction.

7.8 LAND DRAINAGE

CURRENT CONFIGURATION

Route 90 (within the study area and south of the Assiniboine River) predominately lies within the Doncaster Combined Sewer District (CSD). Land drainage is therefore currently directed to a combined sewer. The proposed Route 90 Improvements will generate additional surface runoff. Under the City’s Environmental Act Licence, additional flows cannot be added to an existing combined sewer. Thus, the land drainage sewer (LDS) design proposes a new dedicated land drainage Trunk Sewer (the “Route 90 LDS Trunk Sewer”) that follows the Route 90 roadway alignment from Taylor Avenue to Academy Road, ultimately draining into the Assiniboine River through a new outfall and gate chamber, located west of the existing southbound bridge structure. By doing this work the extent of the Route 90 study area will be separated.

PROPOSED DESIGN

A hydrologic/hydraulic model was developed to facilitate the hydraulic design of the Route 90 LDS Trunk Sewer. The model was used to evaluate different design scenarios and to carry out the hydraulic design of the Route 90 LDS Trunk Sewer and the proposed LDS network extending from Taylor Avenue to the proposed outfall location at the Assiniboine River. The proposed Route 90 LDS Trunk Sewer achieves separation of the Doncaster CSD within the project study area, supports complete separation of the Doncaster CSD in the future, and full build-out of Naawi-Oodena. Each of the design considerations incorporated into the Route 90 LDS Trunk Sewer sizing are explained below.

NAAWI-OODENA LAND DRAINAGE CONSIDERATIONS

Future development of Naawi-Oodena was identified as an important land drainage design consideration. The ultimate development plan and associated land drainage servicing needs are not yet confirmed. During the preliminary design phase, it was unknown whether the future development will use the existing Doncaster Combined Trunk Sewer, to what degree the lands will be developed, and whether the development will make use of internal runoff attenuation or storage (e.g., retention ponds). Thus, hydraulic modelling was carried out to determine proposed Route 90 LDS Trunk Sewer sizing required for various development scenarios. Given the uncertainty at this time, the design of the proposed Route 90 LDS Trunk Sewer assumes the following:

- Naawi-Oodena will be fully developed, and the cumulative surface runoff will be serviced by the proposed Route 90 LDS Trunk Sewer.
- Naawi-Oodena will tie into the Route 90 LDS Trunk Sewer at a single point south of Grenadier Drive, via a private land drainage sewer owned and operated by Naawi-Oodena.

It is recommended that further engagement occur with Treaty One Development Corporation (T1DC) and Canada Lands Corporation (CLC) regarding Naawi-Oodena development and site runoff servicing in reference to the Route 90 land drainage design in future design phases.

DONCASTER COMBINED SEWER DISTRICT SEPARATION CONSIDERATIONS

The difference between a Combined Sewer System and a Separate Sewer System is shown in Figure 7.11. The CSO Master Plan recommends that the Doncaster CSD be completely separated in the future. Upon completion of the Route 90 Improvements (including installation of the proposed Route 90 LDS Trunk Sewer), a significant portion of the Doncaster CSD will be separated. A future combined sewer separation project would be required to separate the remaining portion of the Doncaster CSD. However, sizing of the proposed Route 90 LDS Trunk Sewer was based on achieving complete district separation in the future, which would result in flexibility during future detailed design and construction phases.

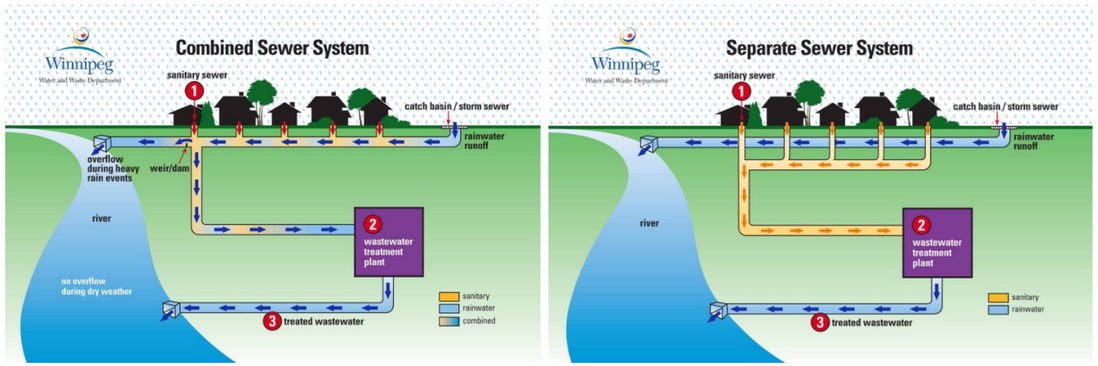


Figure 7.11: Differences between a Combined and Separate Sewer System

WASTEWATER SEWER RECONNECTION WORK ANALYSIS

Given that the proposed land drainage sewer works separate land drainage (runoff) from the existing combined sewer system, it was necessary to review the feasibility of repurposing the existing combined sewers to convey wastewater only.

The potential wastewater flows generated from the full build-out of Naawi-Oodena was estimated, and its impact on existing sewers within the Doncaster CSD was evaluated. Options were also reviewed for diverting wastewater flow from existing developments along Kenaston Boulevard that currently drain into a combined sewer trunk located within Naawi-Oodena. It was assumed that the existing combined sewer trunk will be abandoned or repurposed as part of the future development of the Naawi-Oodena lands and is not desired to be reused as part of complete sewer separation of the Doncaster CSD.

These assumptions will need to be confirmed during future detailed design stages of the project.

LAND DRAINAGE SEWER TRUNK ALIGNMENT

The proposed Route 90 LDS Sewer Trunk alignment and estimated construction access shaft locations were developed with the intent of:

- Maintaining two lanes of traffic in both directions for the duration of construction.
- To avoid impacts to existing and future infrastructure.
- To make use of available space required for the anticipated construction activities (sewer pipe assumed to be installed using trenchless tunneling technologies).

The selected alignment is on the west side of the existing Route 90 roadway between the west curb line and the proposed west right-of-way as shown on the drawings.

DRAINAGE INLET DESIGN

Roadway drainage design was completed based on the proposed roadway design for the Route 90 Improvements. The proposed design for roadway drainage is curb and gutter inlets, catch basins, and leads all draining into the proposed Route 90 LDS Trunk Sewer.

7.9 BRIDGE HYDRAULIC ASSESSMENT

A hydraulic assessment was completed for the proposed St. James Bridges over the Assiniboine River. Based on the results of the hydraulic assessment, the following observations and recommendations were made for the proposed new southbound bridge:

- The bridge meets the maximum velocity requirements for all design conditions.
- The total headloss for the bridges (calculated as the sum of headloss for the group of four bridges) meets the maximum headloss requirements for the flood protection level and average summer conditions. Headloss requirements are exceeded by 1 cm for the average spring condition. This is deemed acceptable because the addition of the new southbound bridge only increases the total headloss by 1 cm.
- The bridge design provides over 8 m of vertical clearance between the average summer water level and the bottom of the girder. This will likely satisfy all navigational requirements for the Assiniboine River. However, these requirements should be confirmed with Transport Canada at the next stage of design.
- With the underside of the girder set to El. 234.055 m, the bridge meets the freeboard criteria.
- A minimum thickness of 0.55 m of Class 350 riprap be placed around the piers and along the channel side slopes for erosion protection.
- Ice protection for all bridge piers should extend from the top of the piers to the ground elevation at the base of the pier.
- All bridge piers should be designed to withstand impact forces from large pieces of debris.
- The additional bridge piers for the new southbound bridge have minimal effect on water velocity and water levels because they are narrow and in line with existing piers. However, the addition of these piers does narrow the effective existing span widths when considering spans through and between the bridges. This may result in an increased impedance of passing of large ice floes or large debris through the area that could result in additional accumulation or jam potential.

7.10 BRIDGE GEOTECHNICAL ASSESSMENT

A bridge geotechnical assessment was completed for the proposed St. James Bridges over the Assiniboine River. Based upon the preliminary assessment, the following recommendations are made:

- All structural loads (both live and dead loads) from the bridges should be carried by foundations system supported by either the underlying till or bedrock.
- Shallow footings founded on competent dense till may be designed based on an unfactored ULS capacity of 600 kPa and SLS capacity of 240 kPa. The recommended SLS value was selected to limit vertical settlement to 25 mm. A geotechnical resistance factor of 0.5 should be applied to the unfactored ULS capacity.
- Cast-in-place end bearing piles on competent till may be designed based on an unfactored ULS end bearing capacity of 1,000 kPa, and SLS capacity of 320 kPa. The recommended SLS value was selected to limit vertical settlement to 25 mm. A geotechnical resistance factor of 0.4 should be applied to the unfactored ULS capacity.
- Cast-in-place rock-socketed caissons can be assigned an unfactored ULS capacity of 3,125 kPa and SLS capacity of 1,000 kPa for skin friction in competent bedrock. The competent bedrock can be assigned an end bearing unfactored ULS capacity of 8,750 kPa and SLS capacity of 2,500 kPa. The recommended SLS value was selected to limit vertical settlement to 25 mm. A geotechnical resistance factor of 0.4 should be applied to the unfactored ULS capacity.
- Steel piles driven to refusal may be designed with an unfactored ULS capacity of 50 percent of the yield stress of the steel and a SLS capacity of 30 percent of the yield stress of the steel multiplied by the cross-sectional area of the steel. The recommended SLS value was selected to limit vertical settlement to 25 mm. A geotechnical resistance factor of 0.4 should be applied to the unfactored ULS capacity.
- Precast concrete piles driven to practical refusal can be assigned unfactored ULS capacities of 1,250 kN, 1,750 kN and 2,200 kN and SLS capacities of 450 kN, 625 kN and 800 kN for pile diameters of 300 mm, 350 mm, and 400 mm, respectively. The recommended SLS value was selected to limit vertical settlement to 25 mm. A geotechnical resistance factor of 0.4 should be applied to the unfactored ULS capacity.
- It is recommended that pile load testing be undertaken. Potential foundation cost savings can result when either dynamic Pile Driving Analysis (PDA) testing or static load testing are completed as the geotechnical resistance factor can be increased to 0.5 or 0.6, respectively.
- Seepage and sloughing may occur at various depths within the underlying soil, therefore full-length steel sleeves should be maintained on site and utilized as required during construction to maintain the pile shaft and base in a clean dry state for cast-in-place piles.
- Full-time inspection by experienced geotechnical personnel during construction of all foundations is recommended.
- Depending on the elevations of the foundations and the season during construction, utilizing a de-watering system to control the possible high groundwater conditions may be required during the excavation.
- All concrete in contact with native soils should utilize sulfate resistant cement CSA Type HS.
- A rockfill toe berm should be installed along the south riverbank over a length of 150 m. The toe berm should have a 5.0 m width at the bottom and should be extended 1.0 m into dense competent silt till.
- A riprap blanket should be installed along the north riverbank over a length of 150 m. The riprap blanket should be 1 m thick, extended to the channel bottom, and be sloped at 5H:1V beyond the upstream and downstream limits to provide a smooth hydraulic transition.
- The construction sequence of the proposed riverbank stabilization work should be consistent with the recommendations made herein. In terms of riverbank stability, the most critical time will be during the actual construction of the works and therefore the works should proceed as recommended to reduce the potential for excessive bank movements during construction.

7.11 BRIDGE STRUCTURES & RETAINING WALLS

NORTHBOUND BRIDGE

The existing northbound St. James Bridge crosses over the Assiniboine River and connects Route 90 to the south with Century Street to the north (Route 90). The bridge was originally constructed in 1962 and designed to carry the AASHTO H20-S16-44 design vehicle. In 1987, the bridge was rehabilitated and strengthened for AASHTO HSS25 design live loading. The existing structure is comprised of three segments:

- **The approach ramp from Route 90:** The approach ramp from Route 90 is a five-span structure that is composed of a 1.14 m thick voided reinforced concrete deck slab supported on reinforced cast-in-place concrete piers and an abutment founded on precast, prestressed concrete hexagonal piles. The first two spans at the south are continuous over the support and are each approximately 17.7 m long. The three remaining spans are also continuous over the supports and are each approximately 20.8 m long. The overall length of the ramp is 97.5 m. In 1987, the deck cantilevers were replaced to widen the roadway from 8.23 m to 9.16 m, maintaining two lanes of traffic.
- **The approach ramp from Academy Road:** The approach ramp from Academy Road is a five-span structure that is composed of a 1.14 m thick voided reinforced concrete deck slab supported on reinforced cast-in-place concrete piers and an abutment founded on precast, prestressed concrete hexagonal piles. All spans are approximately 20.7 m long. The first two spans at the south are continuous over the support, and the three remaining spans are also continuous over the remaining supports. The overall length of the ramp is 103.6 m. In 1987, the deck cantilevers were replaced to strengthen the deck and provide space for a parapet separation between the 1.5 m sidewalk and the 6.1 m wide single-lane roadway.
- **Crossing of the Assiniboine River:** The bridge is an eight-span structure that is composed of a reinforced concrete deck cast compositely with six lines of steel I-girders. The superstructure is supported on reinforced cast-in-place concrete piers and an abutment. Three central piers that support the four spans over the river are founded on hardpan, and the remaining piers and abutment are supported by precast, prestressed concrete hexagonal piles. The two southern spans and the two northern spans are all simple-support with constant depth steel girders, while the four central spans are continuous haunched girders. The span lengths of the river crossing (from south to north) are approximately 25.3 m, 25.3 m, 31.9 m, 35.1 m, 35.1 m, 31.9 m, 24.8 m, and 19.2 m for

a total length of 231.0 m with a travelled road width varying from 11.9 m at the south to 16.5 m at the north. The structure widens from three travelled lanes at the south to four travelled lanes at the north. A 1.5 m sidewalk is located on the east side of the bridge and is separated from traffic by a concrete barrier. The bridge is located adjacent to an abandoned railway bridge to the east. In addition to spanning over the river, the bridge also spans over Wellington Avenue at the south and Wolseley Avenue at the north.

The existing bridge and pier layout is shown below in **Figure 7.12**.

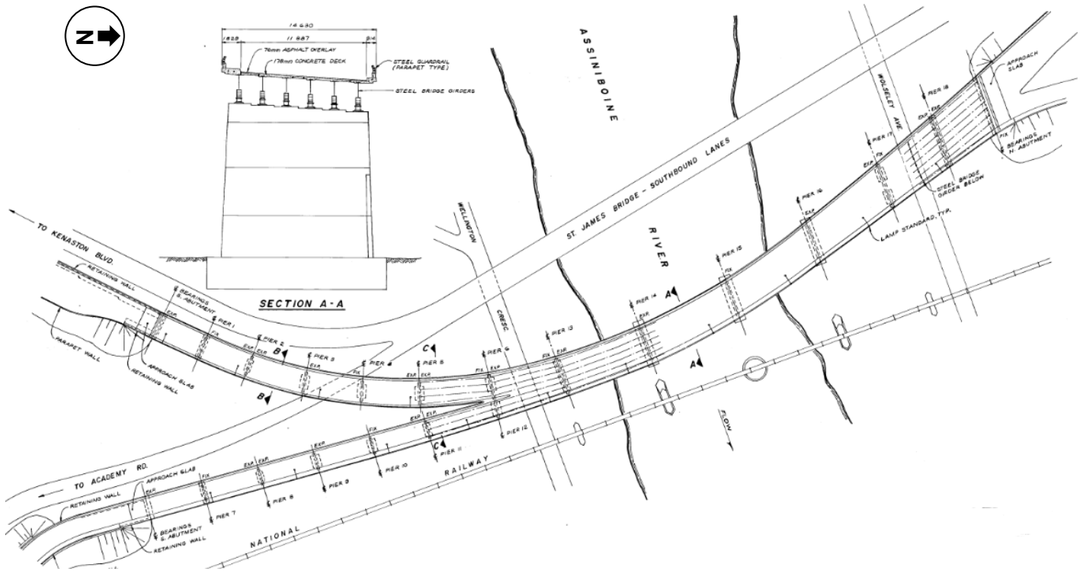


Figure 7.12: Northbound St. James Bridge Layout

Consideration was given to the following factors when determining the recommended scope of rehabilitation:

- The history of maintenance and repairs on the structure.
- The current condition of the bridge based on visual observations and material testing.
- The age of the structure and remaining service life.
- The current load carrying capacity.
- The amount of structure that would have to be rebuilt in a partial reconstruction.

Although there have been several interventions since the bridge was constructed, it remains in relatively good condition, and continues to provide sufficient capacity to support present-day loading. Another intervention in the near future to address the high level of chlorides in the deck would extend its service life and would cost less than replacing the bridge.

Based on these considerations, the following scope of rehabilitation work is recommended for this structure:

- Replace the deck partial depth, except full depth at the overhangs.
- Replace the northbound Route 90 approach ramp voided deck superstructure.
- Partially reconstruct the north abutment to allow deck widening for the Portage Avenue off-ramp.
- Rehabilitate the girders noted in the 2018 bridge inspection and add new girders where required for deck widening.
- Reconstruct the piers and abutments, either fully or partially to allow for the realignment of the existing bridges and deck widening.

SOUTHBOUND BRIDGE – EXISTING

The existing southbound St. James Bridge crosses over the Assiniboine River and connects Route 90 to the south with Century Street to the north (Route 90). The bridge was originally named the St. James Bridge and was constructed in 1936 to carry one 20-ton truck or three 15-ton trucks side by side. In 1982, the bridge was rehabilitated and strengthened for AASHTO HS30-44 design live loading.

The bridge is an eight-span continuous structure that is composed of a reinforced concrete deck cast compositely with four lines of steel "I" girders. The superstructure is supported on cast-in-place reinforced concrete piers and abutments. Except for Piers 2 and 7, which are founded on reinforced concrete piles, the piers are supported on spread footings that sit on hardpan. The three spans over the river are each approximately 30.5 m long. The overall bridge length is 179.1 m, with a travelled road width of 10.67 m that carries three lanes of traffic. A 1.5 m sidewalk that carries three 5" hydro ducts, two 4" BellMTS Lines, a 2" street lighting duct, and a 5" traffic signals duct is located on the west side of the bridge and is separated from traffic by a concrete barrier.

The existing bridge and pier layout is shown below in **Figure 7.13**.

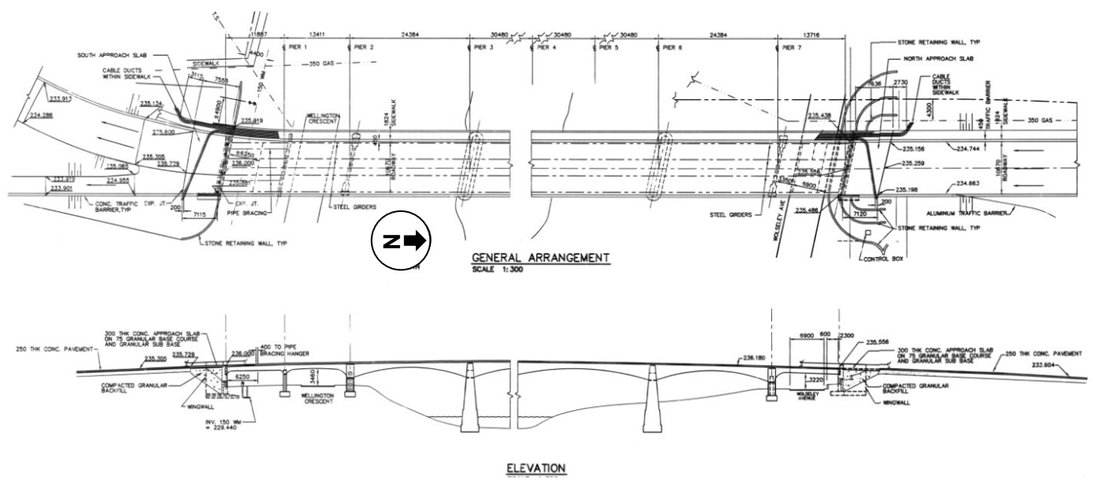


Figure 7.13: Southbound St. James Bridge Layout

In addition to spanning over the river, the bridge spans over Wellington Avenue to the south and Wolseley Avenue to the north.

The number of lanes on the bridge will be reduced from three existing lanes to two 3.5 m lanes, and the existing 1.5 m wide sidewalk will be widened to accommodate a 3.5 m multi-use path. One lane of traffic will come from Route 90 and the other lane will be traffic exiting eastbound Portage Avenue onto a southbound ramp and onto the bridge.

SOUTHBOUND ST. JAMES BRIDGE – NEW

The new southbound bridge structure is proposed between the existing northbound and southbound St. James Bridges and will carry three lanes of traffic from Route 90 north over the river to Route 90.

The width of the deck is constant (14.55 m), and it carries three 3.75 m lanes, a 1.5 m exterior shoulder, a 0.9 m median shoulder, and 0.45 m single slope concrete barriers on both sides of the deck. Three types / sizes of concrete girder are used in the various spans of the bridge, determined by the span length, articulation (continuity), and available vertical clearance beneath the deck. There are no sidewalks or multi-use paths on this bridge.

SOUTHBOUND ON-RAMP AT PORTAGE AVENUE OVERPASS

The left turn from Portage Avenue westbound and the exit ramp from Portage Avenue eastbound onto Route 90 southbound will require partial demolition and reconstruction of parts of the existing retaining wall and replacement of the rest of the wall that runs along the northeast corner of 1700 Portage Avenue (Herzing College), and the construction of a new retaining wall along the edge of Route 90. South of 1700 Portage Avenue, the new retaining wall alignment is nearly the same as that for the existing wall. The stems of the existing retaining wall will be demolished, and the concrete pile cap and hex piles will be reused for the realigned stem.

North of 1700 Portage Avenue, the new wall alignment diverges sufficiently to the west that a new foundation will be required for support. The old retaining wall stem and pilecap will be demolished and the existing piles will be cut to below the new foundation to avoid any conflict. The new cantilever concrete retaining walls will be founded on vertical and battered steel H-piles. While there is sufficient space for these piling operations, a vibration mitigation and control plan will likely be required for piling operations.

The northeast corner of the 1700 Portage Avenue (Herzing College) building is offset approximately 3.0 m from the back-face of the proposed retaining wall, and care must be exercised during construction to minimize impacts to the building structure and its foundation. The need for a temporary sheet pile wall to protect this building during construction should be reviewed during detailed design.

Buried 406 mm diameter concrete piles located 2.87m away from the building face and spaced 3.7 m on centre may still be present on the east side of the building. These piles previously supported an approximately 0.72 m high ornamental brick wall that has since been removed.

A new 1.37 m high barrier will be constructed on top of the retaining wall to provide fall protection for users of the AT path located behind the wall.

The existing east retaining wall that separates the eastbound to southbound merge ramp from southbound Route 90 will be demolished and replaced with a new wall that accommodates the new lane configuration.

The new retaining wall will follow the east edge of the ramp, gradually diminishing in height until the two roads merge together (see **Figure 7.14**). At the north end, the retaining wall will terminate at the southwest corner of the existing Portage Avenue Underpass abutment. The existing southwest wingwall of the Portage Underpass structure will be removed.

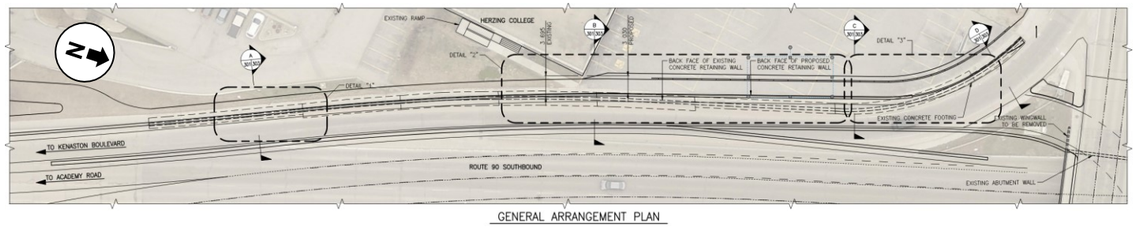


Figure 7.14: Retaining Wall at Portage Avenue Underpass

7.12 ROADWAY GEOTECHNICAL ASSESSMENT

A roadway geotechnical assessment was completed for the proposed Route 90 Improvements. Based upon the assessment, the following conclusions and recommendations are made:

- The stratigraphy along the Route 90 generally consists of pavement materials overlying clay fill underlain by high plasticity clay. Silt or clayey silt layers are occasionally encountered at different depths including underneath the roadway base/subbase course.
- No groundwater was encountered within the depth of the test holes during drilling program.
- The roadway subgrade should be proof-rolled and compacted to 95 percent SPMDD; a non-woven geotextile should be placed on top of the subgrade.
- Areas that exhibit unsuitable deflection or contain unsuitable materials (i.e., organic matter, silt, and concrete waste) should be sub-excavated an additional 600 mm and replaced with compacted granular subbase. A geogrid should be placed in addition to the woven geotextile on top of prepared subgrade prior to placing sub-base course.
- The pavement structure should be designed by a professional pavement engineer.

7.13 PAVEMENT DESIGN

A pavement design was completed for the proposed Route 90 Improvements. Concrete and asphalt pavement structures were considered. A concrete pavement structure is recommended based on the long-term durability, less demanding maintenance schedule, and life-cycle costing. Concrete pavements have better long-term performance, particularly on roads with heavy truck traffic such as Route 90 and its connecting streets. The increased durability results in less damage such as rutting, fatigue cracking, and potholes compared to an asphalt pavement.

7.14 PUMP STATION

The land drainage infrastructure that supports the existing Portage underpass requires relocation to facilitate construction of the new southbound bridge structure. The existing infrastructure that services the underpass was installed in 1963 as part of the St. James Bridge and interchange project. The infrastructure includes inlets along both the north and southbound roadways, gravity collection sewers, a

750 mm trunk sewer extending south towards the existing underpass flood pump station (FPS), the station, and a 900 mm gravity outfall from the station to the Assiniboine River. The FPS and outfall are located between the two existing bridge structures and in the path of the proposed new southbound structure and must therefore be relocated to facilitate the planned Route 90 works.

The decision to relocate the infrastructure was based on an evaluation of options by the design team in conjunction with the Water and Waste Department and the Public Works Department. Three options were evaluated that included keeping the station location and modifying the bridge structure, modifying the FPS, or relocating the station. The recommendation from that evaluation was to relocate the station to the east of the existing northbound structure.

Initial analysis of the existing underpass LDS showed that the infrastructure does not meet the current land drainage standards for an underpass. Further analysis was undertaken to determine what if any upgrades to the existing LDS system and what new infrastructure would be required to support the major and minor storm events. The proposed FPS and outfall relocation include the following:

- New trunk sewer:
  - upsized to 1050 mm.
  - connected to the existing 900 mm trunk sewer north of the northmost pier to the new southbound structure.
  - Extending east across the abutment to the existing northbound bridge structure.
  - Connecting to a new 2400 mm chamber north of the new FPS.
- New flood pump station.
- Access and parking area off Wolseley Avenue.
- New 1050 mm outfall structure extending south to the Assiniboine River.

7.15 LOWERING OF WELLINGTON CRESCENT AND WOLSELEY AVENUE

The feasibility of lowering Wellington Crescent (south side of the Assiniboine River) and Wolseley Avenue (north side of the Assiniboine River) to provide sufficient vertical clearance for the passage of fire trucks beneath the existing St. James Bridges was further investigated within the context of the Route 90 Improvements Study. The desired (posted) vertical clearance for both Wellington Crescent and Wolseley Avenue is 3.70 m, which means the actual clearance needs to be 3.80 m to provide the City's typical 100 mm margin of safety. This clearance will facilitate the passage of the tallest ladder truck (3.63 m) in the City's fire truck inventory.

The feasibility study included a review of the roadways, land impacts, retaining wall requirements, pedestrian and cycling paths, constructability, geotechnical requirements, hydraulics, land drainage, and utilities. A summary is provided below.

WELLINGTON CRESCENT

At the location of the bridges, Wellington Crescent will remain as a 7.60 m wide two-lane urban roadway, centred approximately 15 m from the top of the Assiniboine Riverbank. The roadway will need to be lowered a maximum of 1.0 m in the vicinity of the southbound structure location. Due to the proposed depth of lowering the roadway, the existing pavement structure will require reconstruction, along with adjusting the existing guardrail on the south side, and installation of a retaining wall and railing along the north side of Wellington Crescent between the existing AT path and roadway.

The lowering of Wellington Crescent also affects the first three private property driveways to the west of the existing southbound Route 90 Bridge. These driveways will require minor regrading and resurfacing to tie-in to the new road elevation. Several utilities pass under the road within the limits of the proposed lowering and will need to be further investigated during detailed design and construction.

Offloading of the upper bank will result in an increase to the existing riverbank stability under normal river and groundwater conditions. If the existing ground surface on the river side of the roadway is maintained for flood protection, local ground lowering within the roadway will result in no change to the existing stability.

WOLSELEY AVENUE

At the location of the bridges, Wolseley Avenue will remain a 7.00 m wide, two-lane undivided urban roadway, centred approximately 10.10 m from the top of the Assiniboine Riverbank. The roadway will need to be lowered a maximum of 0.70 m at the southbound structure location. Due to the proposed depth of lowering the roadway, the existing pavement structure will require reconstruction, along with installation of retaining walls on both sides of the roadway in the vicinity of the bridges. A new railing will be installed on the north retaining wall to provide fall protection for pedestrians using the new sidewalk. Shifting Wolseley Avenue to the south also provides greater separation from the north abutment.

The length of the section to be lowered would be approximately 150 m. Since the road right-of way ends immediately west of the Route 90 southbound bridge, the lowering of Wolseley Avenue would need to extend approximately 50 m westwards into the 1710 Portage Avenue (Kiltarton Towers) property. This will impact the southeast corner of the property adjacent to the existing southbound bridge that is currently being used for parking. It is understood there is a lease agreement between the City and Kiltarton Towers regarding the right-of-way in question, and discussions will be required between the two parties. Several utilities pass under the road within the limits of the proposed lowering and conflicts will need to be further investigated during detailed design and construction.

The existing grades meet or are slightly lower than the Flood Protection Level (FPL). Therefore, localized road lowering and regrading of the riverbank would be required ensure the FPL is satisfied. The proposed lowering and regrading works will be confined to the upper riverbank area and are anticipated to have negligible effect to the overall stability of the north riverbank; however, this should be confirmed during detailed design.

7.16 CONSTRUCTION STAGING & TRAFFIC MANAGEMENT PLAN

Preliminary construction detour configurations for the Route 90 Improvements, including the St. James Bridges and Portage Avenue interchange, were completed as part of the Preliminary Design Study to confirm the constructability of the proposed works and identify any potential issues that may need to be addressed before or during construction. All properties are recommended to be acquired prior to commencement of construction to minimize risk to the project. Pedestrians should be accommodated on both sides of Route 90 during construction as best as possible. Construction staging drawings were developed to ensure that two lanes of traffic in both directions, and the accommodation of pedestrians and cyclists, were maintained at all times during construction.

A construction staging and traffic management plan was prepared assuming that the project is undertaken in a conventional or "design-bid-build" manner. The project assumes a five-stage process over an eight-year schedule to completion.

7.17 LAND USE ANALYSIS

Complete Communities Direction Strategy 2.0 (CCDS 2.0) identifies the Route 90 corridor as part of a Mature Community in an Established Neighborhood. The CCDS 2.0 Vision is that *Established Neighbourhoods will continue to evolve as complete communities to increase the diversity of housing choices, improve housing affordability, and more efficiently use land, infrastructure and services*.

Following this vision, existing and remnant parcels along the Route 90 corridor that provide key city building and placemaking opportunities were identified. Some parcels are areas deemed to be of adequate size to support future residential development. Other parcels are areas that may not be developable, but provide opportunities for future public realm enhancements such as landscaping, streetscaping, historic features, and public art.

The report identifies potential future residential sites, noting the current zoning, site area, building area, and proposed number of residential units for each site.

7.18 PROPERTY REQUIREMENTS

Properties required for the proposed design were provided to the City of Winnipeg who determined the acquisition costs of the properties directly impacted by the proposed project right-of-way. A total of 78 private properties, 50 DND-owned properties and 14 City-owned properties were identified for full or partial takings in order to accommodate the project alignment.

All landowners whose properties may be affected by the proposed design were invited to an in-person meeting during Phase 3 public engagement. Property owners were grouped based on location and the project team held separate meetings with representatives from Treaty One Development Corporation and the Department of National Defence. Key themes that arose during these landowner meetings are summarized in **Table 7.2**.

Table 7.2: Key themes from Landowner Meetings

KEY THEME	WHAT WE HEARD FROM LANDOWNERS
Land Acquisition	– Landowners wanted to know more about the City's land acquisition process. – The lack of firm timelines for detailed design and construction is frustrating. – The project has created uncertainty around the future of their properties.
Property Impacts	– Property impacts are perceived to be caused by existing traffic volumes (with a focus on truck traffic) including damage to drywall, foundation issues, frequent vibrations, and noise. – Property impacts could increase with additional traffic lanes. – Property impacts could decrease if the road was in better condition.
Sound Attenuation	– Sound attenuation like berms and walls do not cover the entire project area. – Key areas of concern were along both sides of Route 90 between Carpathia Road and the St. James Bridges.
Local Access	– Closing intersections between Willow Avenue and Academy Road would reduce access to/from Route 90 for residents and business owners.
Project Need	– Route 90 and the St. James Bridges require immediate repair. – The project is needed because of high traffic volumes.

7.19 ENVIRONMENTAL ASSESSMENT

CONTAMINATED SITES OVERVIEW

A Contamination Overview Study (COS) was submitted to the City in October of 2018. The purpose of the COS was to evaluate the current and historical land use within the study area to identify potential or actual environmental contamination that may exist in connection with the study area and surrounding properties. The results of the COS provided an evaluation to address mitigation strategies prior to the construction phase for Route 90 Improvements.

The COS study area consists of a combination of publicly owned (the City of Winnipeg and Government of Canada properties) and privately-owned properties which include residential and commercial land types. The study area encompassed all lands, infrastructure, and watercourses within 0.25 km of the Route 90 centerline from Taylor Avenue northward to Ness Avenue.

The COS consisted of a review of desktop material including aerial photographs, EcoLog ERIS database search results, regulatory documents including the Manitoba Conservation and Climate (formerly Manitoba Sustainable Development) GWDrill groundwater well database and contaminated/impacted sites list. The COS report including a detailed table of areas of potential environmental concern (APECs). The COS:

- Identified 13 APECs associated with commercials properties; the APECs include properties with potential hydrocarbon contamination due to historic rail beds and underground storage tanks primarily associated with historic or active gas stations.
- Of the residential homes within the study area that may require acquisition/demolition to accommodate the Route 90 Improvements, 18 were identified as candidates for a Phase I Environmental Site Assessment (ESA) based on the age and structure of these properties. The COS recommended that Phase I ESAs be conducted:
    - At seven properties on Route 90 and at two properties on Fulham Avenue due to these houses being constructed in the 1920s and 1930s and the higher potential for heating oil or coal use on these properties.
    - At two properties on Carpathia Road, two properties on Fulham Avenue, and five properties on Route 90. These properties were recommended for a Phase I ESA as they provide a

small sample of residential properties within the study area that require acquisition as well as providing a range of years built from 1941 to 1954 and housing styles. This selection of properties is to verify potential or actual environmental concerns associated with site activities and structural building materials including hazardous building materials that may be present in the form of asbestos containing materials (ACMs), polychlorinated biphenyls (PCBs) and lead-based products (LBPs).

- Under Manitoba Workplace Safety and Health Act and Regulation provisions, a designated substance survey for hazardous building materials may be required for each structure that is to be demolished as part of the project.

PHASE I ENVIRONMENTAL SITE ASSESSMENT

The COS identified 18 potential residential properties as candidates for Phase I ESAs. Since the completion of the COS in 2018, four City-owned residential properties, including two identified in the COS (49 Route 90 and 61 Fulham Avenue), have been demolished by the City. Subsequently, in 2019, three City-owned properties not originally identified in the COS for a Phase I ESA were identified as potential candidates to replace three privately owned properties.

To date, no Phase I ESAs have been completed as part of this project. As property acquisitions, demolition of City-owned residential homes and future engineering design is a dynamic process, the properties identified in the COS for Phase I ESAs may change. Once detailed design and a construction start date are identified for the project, selection of properties for Phase I ESAs should be revaluated and completed as applicable. Based on the Phase I ESA observations a Hazardous Materials Investigation may be recommended.

REGULATORY REQUIREMENTS

New legislation and/or amendments to existing federal and provincial legislation, municipal by-laws, regulations, guidelines, and permitting requirements have occurred in the last decade. A copy of all applicable regulatory requirements for the project should be reviewed/referenced at the detailed design and construction stages to ensure project compliance with regulatory requirements.

Requirements may include:

1 **Federal:**

- Fisheries Act and Species at Risk Act, as to the potential for harm to fish, fish habitat, and species at risk within the Assiniboine River during bridge construction. It is expected that a Fisheries Act Authorization will be required for work in the vicinity of the river.
- Canadian Navigable Waters Act, as to maintaining the navigability of watercraft on the Assiniboine River during and after construction of the new and modified bridge structures. It is anticipated that further consultation with Transport Canada will be required to confirm compliance with Act requirements.

2 **Provincial:**

- The Water Protection Act, (and Aquatic Invasive Species Regulation) as to preventing release of aquatic invasive and non-native species into the Assiniboine River during bridge construction.
- Environment Act, as to the potential need for an Environmental Act Licence for the project.
- Environment Act, in relation to the City remaining in compliance with its existing Environment Act License for the operation of combined sewers.
- The Expropriation Act, as to the ability of the City to expropriate property required for the project.
- The Heritage Resources Act, as to the potential presence of heritage resources in the project area. A Heritage Resource Impact Assessment may be required for bridge construction at the Assiniboine River.

3 **Municipal:**

- OurWinnipeg By-Law 120/2020 and Complete Communities Direction Strategies 2.0 By-Law 119/2020, as to how the project supports the urban structure of the City.
- The City of Winnipeg Waterway By-Law 5888/92, the project will require a City of Winnipeg Waterways Permit.
- The Winnipeg Building By-Law No. 4555/87, the project will require an Occupancy Permit for the proposed pump station building.

7.20 NOISE INVESTIGATION NOISE INVESTIGATION & SOUND ATTENUATION

The City intends to keep noise levels below 68 dBA Ldn in the recreational areas within 100 m of the Route 90 corridor. The City of Winnipeg *Motor Vehicle Noise Policies and Guidelines, October 11, 1984*, establishes a noise level limit of 65 dBA Ldn measured at the limits of the outdoor recreational area on a residential property. Ldn is a 24-hour A-weighted equivalent sound level with a 10-decibel penalty to sound levels during nighttime hours (11:00 p.m. to 7:00 a.m.) to recognize that nighttime noise is more intrusive than daytime noise levels. Ldn describes the cumulative noise exposure over a full 24 hours. The City Guideline notes that the traffic noise must exceed the existing sound level by 5 dBA if noise attenuation measures are to be considered. The policy defines the outdoor recreational area as *"a ground level outdoor living area adjacent to residential units accommodating a variety of outdoor activities."* The analysis found that forecast noise levels at the back of residential properties along the proposed Route 90 corridor met the City's requirement exceeded the noise level threshold (65 dBA Ldn) north of Carpathia Road.

When the noise level threshold was exceeded, three types of noise mitigation walls were investigated (hard, highly reflective; absorptive; highly absorptive) at heights of 2 m and 3 m. Based on the results of the analysis and discussions with the City of Winnipeg, it was recommended that the sound attenuation include a 1 m high berm with 1 m high sound wall where feasible, and a 2 m sound wall where a berm was not feasible or desirable (e.g., residual lands that could potentially be redeveloped). The sound attenuation measures were analyzed assuming they would be implemented on both sides of Route 90 between Carpathia Road and Academy Road.

7.21 PUBLIC REALM & STREETSCAPE CHARACTER

STREETSCAPE DESIGN

The streetscape design recognizes that Route 90 is a vital transportation route for users of all ages and abilities, regardless of their mode of transportation, and that this route within the project limits passes through a predominantly residential neighbourhood. The streetscape is designed for people as well as placemaking. People components include safe, accessible, and multi-modal transportation choices, connectivity, and health. Placemaking components include context sensitivity, and sustainability. Design features include:

- A 3.5 m wide bi-directional multi-use path on both sides of the roadway that links to the existing multi-use path south of Taylor Avenue.
- A 3.0 m wide boulevard on both sides of Route 90, and where space allows, a 9.0m wide median with mixed salt-tolerant tree species and low-mow salt tolerant grasses.
- Tree planting behind the multi-use path with mixed salt-tolerant tree species where space allows.
- A naturalized landscape buffer on City-owned land not suitable for redevelopment including a berm, noise wall, tree planting, and naturalized low-maintenance groundcover.
- AT location maps and route markers at key locations indicating connectivity to other AT routes and networks.
- Heritage interpretation panels at locations along the route celebrating local history.
- Rest areas at strategic locations that include benches, waste receptacles, route markers, AT location maps and nearby points of local history and interest.
- Upgraded and re-located transit stops.
- Places for public art.

NEIGHBOURHOOD INTEGRATION

The following are suggested design measures to help integrate the new facilities into the surrounding context:

- The creation of a healthy, uniform urban forest to establish scale, provide shade for sidewalks and the multi-use path and maintain ‘curb appeal’ of residential properties lining the roadway.
- Salt tolerant and mixed species trees will be planted in medians, behind multi-use paths and on naturalized City-owned land in accordance with the latest Forestry Guidelines for Regional Streets to ensure good survival rate and reduced maintenance.
- The use of low-mow salt tolerant grasses will reduce the long-term maintenance along the corridor.
- Maintain a continuity of materials in recently upgraded areas adjacent to the study area including multi-use paths, intersections, and plant species similar to the surrounding residential neighbourhood.
- Tie into existing pedestrian and AT routes that connect to or cross Route 90 including: Route 90 South & Taylor multi-use path, Tuxedo low stress route, Wellington medium stress route, and Wolseley low stress route.
- Place AT wayfinding signs and route markers in decision points to help users move through the new system, applying the graphic design vocabulary developed by the City.
- Ensure comfort (shade, wind protection, gentle grades) and year-round usability to keep the facilities active and well supervised.
- Use cultural and heritage interpretation as a means of communicating local history and sense of place. This is particularly important as a means of integrating with the Kapyong Barracks redevelopment once that master plan is complete.
- Ongoing dialogue with residents, workers and user groups on the design evolution, construction progress, access restrictions and other changes related to the extension. This can be done through continuing public engagement during detailed design, and website updates during construction.
- The incorporation of public art into the streetscape to celebrate local culture. This is also an opportunity to collaborate with the Treaty One Development Corporation and other corporate landowners along the corridor. The process should aim for clear and open communication regarding the public art, and public events at the unveiling of each piece.

ACCESSIBILITY AND SAFETY

The new multi-use pathways are designed to comply with the City of Winnipeg Universal Design Policy and meet the needs of users of all ages and abilities, through gentle grades, good sight lines, appropriate furnishings at reasonable intervals, (e.g., benches with arm rests and backs for people who need more support while sitting), shade and shelter from the elements, indicator strips in paved expanses like intersection islands, safe crossings at intersections including detectable tiles, appropriate lighting, and high contrast legible information systems for wayfinding and interpretive elements.

REST AREAS

Rest areas are located approximately 700 m apart at Taylor Avenue, Grant Avenue, Corydon Avenue, Tuxedo Avenue and Academy Road. Rest areas will consist of furnishings set back from the multi-use path to ensure safe clearance from snow removal equipment and walkers with low vision and located between the property line and path. Rest areas will typically consist of benches, waste receptacles, AT location maps, route markers, and heritage interpretation panels.

HERITAGE RESOURCES

Over the past 140 years, The Manitoba Historical Society has documented historic sites throughout the Province. Their online resources identify buildings, cemeteries, locations, monuments, museums, and other features of note. The Route 90 study area and the surrounding neighbourhoods offer an extensive local history that can enrich the streetscape design. Pre-contact and pioneer activity is not included in this inventory but is likely to have occurred on the banks of the Assiniboine River, which was a historic trade route.

In response to a screening request, the Archaeological Assessment Services Unit (AASU) indicated that within the project limits, archaeological sites and historic parish buildings have been reported along both riverbanks, as well as evidence of historic burial sites approximately 100 m inland from the Assiniboine River.

To better determine the extent, location and type of heritage resources that may be present, the AASU recommends that during detailed design and construction phases of work, a qualified archaeologist be retained to assess the riverbanks within the project area for intact heritage resources, the presence of which will be dependent on the previous degree of modification of the banks. AASU further recommends that the archaeologist monitor any geotechnical drilling within the bridge construction limits to identify the presence or absence of heritage resources in the soil cores. This monitoring process will also assess the degree of intact soil sediment, which is indicative of the potential for intact heritage resources.

The findings of these investigations will determine if future heritage monitoring or mitigation work would be required for the project.

The Consultants responsible for detailed design will review the inventory from the Manitoba Historical Society and the archaeologist's findings to determine if any significant heritage storylines emerge. If those stories are compelling, unique, and well distributed throughout the corridor, a comprehensive heritage interpretive system may become a key part of the placemaking palette, influencing the forms and materials of streetscape elements, and providing content for a series of interpretive installations running the length of the project area. If the stories are more localized, custom commemorative markers may be more appropriate.

Another heritage interpretation opportunity is a walking tour that connects to more than 30 points of historic interest beyond the corridor, all located within a three-minute bike ride or a ten-minute walk. These circuits can be identified on local wayfinding signs associated with the active transportation network.

Heritage themes could also be incorporated into a public art program for the corridor, offering additional ways for Winnipeggers to connect with past and present culture of the area.

7.22 PUBLIC ART

Public engagement revealed a desire for Route 90 to feel like a parkway with plenty of greenspace and off-street pedestrian and cycling paths, and public art integration. In collaboration with the Winnipeg Arts Council (WAC), a preliminary framework for public art within the corridor was developed, with the understanding that these opportunities will be refined as the project moves to detailed design and implementation.

Keeping historical, contemporary, and future events and users of the region in mind, Route 90 should integrate multiple distinct artworks that collectively combine to form a narrative running the length of the corridor. The goal of the public art program for Route 90 is to encourage contemporary expressions that respond to context, reflecting neighbourhood identity and a unique sense of place. The program should be framed around the following considerations:

- Responsiveness to, and reflection of, the complexities of the area's neighbourhoods and communities.
- Consideration of equity, inclusion and representation of Winnipeg's diverse communities, not only colonial histories.
- Relationship with nearby Treaty 1 development. Themes could also involve the evolution of the land, from its formation through climate change.
- Recognition of the many ways, speed, and distances that people move through the space.
- Integration of sustainable practices, where the medium reflects the message.
- Varied scale and functional integration. Stand-alone installations are preferred over integrating art within the bridge structure.
- Safety of location for motorists, cyclists, and pedestrians.
- Maintaining adequate intersection line of sight and roadside safety, and ensuring the artworks are not visually distracting to motorists, particularly near intersections.

Implementation of public art will take place during the detailed design phase of the project and a Public Art Master Plan for Route 90 will be developed by WAC, which will include:

- Working with the design team to identify locations for public art.
- Researching locations to identify themes for public art.
- Determining the variety of scale and expression, e.g., large-scale work integrated into infrastructure, stand-alone artworks, functional elements designed by artists and community-based projects.
- Developing a plan and process for integration of public art.
- Finalizing budgets and specific public art opportunities based on location, themes, and possible materials.

Once the master plan is in place, WAC will manage the artist and artwork selection process in accordance with the City of Winnipeg Public Art Policy.

Public art will be site-sensitive and integrated into Route 90 in a meaningful way and at strategic points of interest, to contribute to the identity of the corridor, reduce monotony, and act as wayfinding landmarks. Public art will be located where there is adequate space, good visibility, and in some cases, an opportunity to pause and contemplate the work. Preliminary locations include nearby active transportation infrastructure, transit stops, rest area furnishings, community collaborative sites along the route or nearby park space, and stand-alone locations throughout the corridor.

7.23 FOREST COMPENSATION

Using air photos, Google street view, the City of Winnipeg online tree inventory map, and site visits, the location, species, condition, and caliper size of all the trees within the limits of construction were documented. The forest canopy is composed of boulevard trees along Route 90, park specimen trees within City-owned greenspaces, and residential trees. The residential trees included in the inventory are currently on private property but will become part of the Forestry's inventory once the land becomes City property.

The Route 90 preliminary design impacts approximately 830 trees. The canopy loss and compensation value will be offset by the planting of new nursery stock trees within the Route 90 right-of-way and City-owned greenspace.

7.24 TRANSPORTATION DEMAND MANAGEMENT STRATEGY

Transportation Demand Management (TDM) is the application of programs, policies, and services to influence how, why, when and where people travel. TDM programs and services are designed to encourage the long-term use of sustainable travel options, such as transit, walking, cycling, working from home, and other wheeling options (e.g., personal mobility devices, e-scooters, etc.), and carpooling.

Successful TDM strategies can lead to a reduction in the number of single occupancy vehicle (SOV) trips to improve the efficient use of transportation infrastructure and to create an environment that is more supportive of the health and wellbeing of people. TDM focuses on reducing the number of cars on the road and the amount of time spent in SOV. TDM measures therefore benefits all users of the corridor, including people in the local area and those travelling through the corridor, including residents, businesses, and visitors, regardless of preferred mode of travel.

A TDM toolkit of measures was designed to mitigate the potential traffic impacts of population and employment growth along the corridor by increasing the probability of success in shifting travel from SOV trips to sustainable modes. The TDM Toolkit provides an overview of each measure, including a definition of the measure, where it can be applied, how it will be delivered, why it is needed and the benefits to be derived from its implementation. The timing for delivery, evaluation and monitoring was also established and resulted in an TDM implementation program over several years, which included “quick win” actions in the first two years, followed by medium-term actions (years three through five) and long-term actions (years six to 10). Recommendations are made on monitoring the program’s delivery and impacts, and ultimately measuring its success in shifting travel behaviours over time.

7.25 CONSTRUCTABILITY, INSPECTABILITY, MAINTENANCE AND FUTURE EXPANDABILITY

The constructability, inspectability, maintenance and future expandability for the preliminary design of the St. James Bridges was assessed through workshops with two local contracting firms familiar with the work activities contained in the planned scope of the project to explore some of the perceived issues.

CONSTRUCTABILITY

Adequate laydown and staging areas will be required on both sides of the river and should be confirmed during detailed design. Possible locations include various privately owned parking lots on the north side and the proposed property acquisition area on the south side (east of Route 90 and south of Wellington). It is also noted that the size of the area already identified on the south side for property acquisition should be increased, if possible (e.g., acquisition / easement of rail property), and that such acquisition / easement should be completed before contractor mobilization.

The Wolseley Avenue access to 1710 Portage Avenue (Kiltarton Towers) will need to be shut down for all but emergency vehicles because Wolseley Avenue (vicinity bridge structures) will be a major construction area with many activities that will be dangerous to the general public. Access to 1710 Portage Avenue will be provided via 1700 Portage Avenue (Herzing College) via Riverbend Crescent and should be confirmed during detailed design.

Given the limited access off Wolseley Avenue and Portage Avenue, and the limited space available in the 1700 Portage Avenue (Herzing College) parking lot, detailed design should consider alternative retaining wall designs and installation methods to reduce the schedule risk associated with this element of work.

Piling operations associated with widening of the northbound structure will need to take place in advance or at the same time as the piling operations for construction of the new southbound structure.

River access will be critical and 12-month access is preferred; however, will depend on recommendations/mitigation measures required by regulatory authorities. Building a rock road out of the armouring material that will eventually be used on the riverbank armouring on both sides of the river and using a short Bailey-type bridge would improve access for construction of the river piers and installation of the girders and would be beneficial to the schedule. This should be confirmed during detailed design.

Detailed design should also consider multiple methods for bridge pier modifications and include constructability and schedule risk in the evaluation and selection of a preferred design.

It is recommended that additional investigation of the deck be carried out during the next stage of detailed design. Depending on the condition of the concrete bridge deck at the time of construction, it may be more economical and lower risk to replace the entire bridge deck, as opposed to partial depth rehabilitation of the existing deck.

INSPECTIBILITY

The minimum separation between the existing/realigned NB structure and the new SB bridge is 3.0 m, which has been agreed by the City provides adequate space for the City’s underbridge inspection unit to be used for inspection activities from either structure.

The surfaces of the concrete NU girders and steel “I” girders are accessible for inspection without the need for confined space entry, using either the underbridge inspection unit from above or ground-based equipment from below.

MAINTENANCE

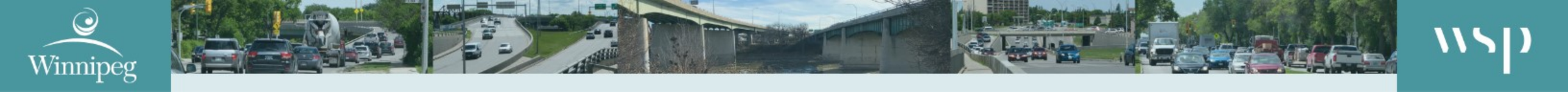
The materials and products that will be incorporated into the permanent structural work will meet the City’s specifications for quality and will be consistent with those generally used throughout the City’s bridge inventory. The City’s usual ways of carrying out routine maintenance activities will be applicable to the completed work.

FUTURE EXPANDIBILITY

The constrained nature of the site means there is no practical method for increasing the width of the bridges in the future. Future widening of the bridge structures was not considered in this study.

7.26 CLASS 3 COST ESTIMATE

A Class 3 cost estimate (accuracy of +/- 20% to 30%), as well as a Basis of Estimate and Class of Estimate (using the City of Winnipeg’s Asset Management template) was prepared for the preliminary design of Route 90. The total cost for the project is estimated to be **$736.7 million**. This assumes an in-service year of 2031 and includes construction costs, as well as inflationary costs relating to construction, engineering,



utilities, land acquisition, administrative and other contingencies. It assumes the City will solely fund the project and utilize 100% debt financing.

The total cost distribution between construction / equipment costs, consultant costs, utility costs, other costs, contingency costs, and administrative costs are included in Figure 7.15.

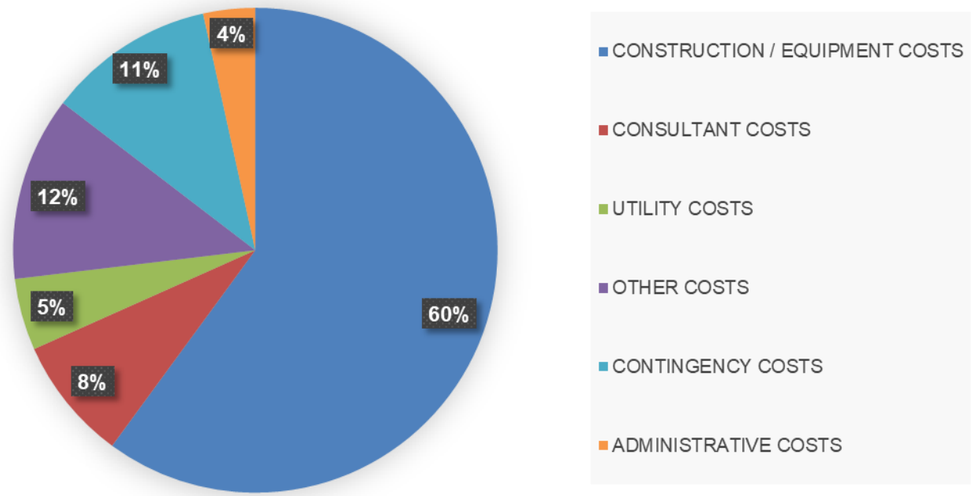


Figure 7.15: Project Cost Distribution

7.27 VALUE ENGINEERING SESSION 2

A second Value Engineering (VE) Workshop was conducted for the preliminary design of the Route 90 Improvements. The main objectives of the VE Workshop were to:

- Review the Preliminary Design with respect to cost-effectiveness, risk, function, schedule, and ability to meet the project objectives.
- Provide recommended VE Alternatives and Design Suggestions to increase project value through improved functionality and/or capital and/or life cycle cost avoidance, while maintaining a quality project that meets stakeholder needs and overall project objectives.
- Compare VE Team alternatives based on capital cost and, where applicable, maintenance and life cycle costs over a 20-year life cycle to meet the ongoing and long-term requirements of the project and the overall community.
- At this early stage, ensure the preliminary design is the “the right project”, i.e., a project that meets the functional and performance requirements.
- Provide the City of Winnipeg with the best value for the money spent.

A risk analysis was also completed for the preliminary design. Risk mitigation recommendations related to schedule and cost included:

- There are early work activities that could be commenced in advance (funding dependent) to remove them from the critical path, and therefore mitigate schedule risk.
- A comprehensive construction schedule should be prepared during detailed design to verify assumed sequencing and duration of work items.
- The cost estimate is currently a Class 3 (expected accuracy of -20% to +30%). Increasing the accuracy of the cost estimate would require additional project design work to improve the level of project definition above a preliminary design stage, at additional cost. The accuracy of property acquisition costs may be improved by formal appraisals.
- Constructability can have a significant impact on cost; a constructability review can mitigate this risk and should occur during detailed design.

7.28 INDEPENDENT ROAD SAFETY AUDIT

The City of Winnipeg Public Works Department retained Fireseeds North Infrastructure to conduct an independent road safety audit of the preliminary design. The road safety audit identified risks and recommendations which were reviewed by the design team and discussed with the road safety audit team and key members of the Steering Committee. Based on direction provided by the City, design modifications were incorporated into the preliminary design.

8 CONCLUSIONS AND RECOMMENDATIONS

The goal of this study was to develop a Preliminary Design for Route 90 Improvements between Taylor Avenue and Ness Avenue that are safe, convenient, and provide for the efficient movement of people and goods; including facilities that connects the residential areas on the east and west sides, support social interaction, healthy lives, economic stability, and growth, and offer accessible connected transportation option for all ages and abilities.

The Route 90 Improvements study included option development, evaluation, and a refinement process (including value engineering sessions), as well as various technical analyses and phases of public and stakeholder engagement to determine a recommended design for Route 90 Improvements between Taylor Avenue and Ness Avenue. Through this process, a preliminary design for Route 90 was established that achieves the objectives of this study.

The preliminary design for Route 90 includes:

- Three travel lanes in both directions between Taylor Avenue and Ness Avenue with additional turning lanes and geometric improvements at all existing intersections to improve operations and safety.
- 3.5 m wide off-street multi-use paths on both sides of Route 90 for pedestrians and cyclists that connect to existing and future planned pedestrian and cycling infrastructure along Route 90.
- Dedicated pedestrian and cyclist crossings at all signalized intersections, including two new half-signal crossings at Carpathia Road and Willow Avenue.

- Maintaining access to properties based on requirements identified by Emergency Services.
- A new signalized intersection at Boulton Bay to accommodate access to future Naawi-Oodena development on the west side of Route 90, and to existing residences on the east side of Route 90.
- Where space allows, a 3.0m wide boulevard on both sides and a 9.0m wide median that allow for tree plantings.
- A naturalized landscape buffer on City-owned land not suitable for redevelopment including tree planting, naturalized low-maintenance groundcover and granular path.
- Sound attenuation measures on both sides of Route 90 between Carpathia Road and Academy Road. Some sections will include a one-meter-high berm with one-meter-high sound wall, while other sections will include a two-meter-high sound wall where a berm cannot be accommodated.
- AT wayfinding aids, rest areas, and heritage interpretation panels at several locations throughout the project area.
- The incorporation of public art into the streetscape design to promote usability, beauty, pride, belonging, local neighbourhood complexity, equity, and sense of place.
- Transit stops that accommodate longer articulated buses and consider the future transit needs based on the Winnipeg Transit Master Plan. Near side bus stops are provided at most intersections to allow for easy transfers between routes. The design also includes transit stops located near half-signals to provide safe crossing opportunities for pedestrians.
- Roadway geometry continues to accommodate trucking operations (goods movement) through the area.
- A preliminary signage plan that includes traffic control (regulatory and warning signs) and overhead signage (guide signs).
- Identification of existing and potential conflicts with city-owned and third-party utilities.
- Assessment of existing water mains to determine if various sections of water main require renewal or relocation during construction.
- A land drainage trunk sewer that follows the Route 90 roadway alignment from Taylor Avenue to Academy Road and will drain to the Assiniboine River through a new outfall and gate chamber located to the west of the existing southbound bridge structure. The trunk sewer was designed to facilitate the (future) complete separation of the Doncaster CSD and full build out of the Naawi-Oodena lands. This system will accommodate rainfall and snowmelt for the entire project area and will decrease combined sewer overflows into the river, in accordance with the City's CSO Master Plan.
- Erosion protection of riverbanks in the vicinity of bridge structures and bridge piers that will resist forces from ice and debris.
- Geotechnical design requirements for the roadway, as well as the bridge structures, shallow footings, cast-in-place end bearing piles, cast-in-place rock-socketed caissons, steel piles, pre-cast concrete piles.
- A pavement design that recommends cross sections for concrete pavement and asphalt pavement, as well as the life cycle costing for the concrete and asphalt pavement options.
- New and modified bridge structures across the Assiniboine River:
    - A new southbound bridge between the existing northbound and southbound St. James Bridges to accommodate forecast traffic volumes. The width of the deck is constant (14.55 m), and it carries three 3.75 m lanes, a 1.5 m exterior shoulder, a 0.9 m median shoulder, and 0.45 m single slope concrete barriers on both sides of the deck. Precast concrete NU girders are used for bridge spans. There are no sidewalks or multi-use paths on this bridge as pedestrians and cyclists are accommodated on the existing bridges.
    - Rehabilitation and reconfiguration of the existing northbound Route 90 bridge which includes partial depth replacement and widening of the concrete deck, replacement of the northbound Route 90 approach ramp, partial reconstruction of the north abutment to allow deck widening for the Portage Avenue off-ramp, rehabilitation the existing girders, new girders where required for deck widening, and modification of the piers and abutments to accommodate deck widening.
    - Rehabilitation of the existing southbound Route 90 bridge. The number of lanes on the bridge will be reduced from three lanes to two, and the existing sidewalk will be widened to provide a 3.5 m multi-use path. The bridge will provide one lane of traffic from southbound Route 90 (exiting to eastbound Academy Road) and one lane of traffic coming from Portage Avenue (continuing southbound on Route 90).
- A new traffic signal on Portage Avenue west of Route 90 will provide access for westbound Portage Avenue to southbound Route 90 traffic via a new southbound ramp. The new ramp requires the partial demolition and reconstruction of parts of the existing retaining wall that runs along the northeast corner of 1700 Portage Avenue, and the construction of two new retaining walls.
- Relocation of the existing pump station to the east side of the northbound structure to facilitate pier and abutment construction. Relocation is required due to the construction of the new southbound bridge which impacts land drainage sewer infrastructure along the north shore of the Assiniboine River.
- Lowering of Wellington Crescent and Wolseley Avenue to provide sufficient vertical clearance for the passage of fire trucks beneath the existing St. James Bridges
- Preliminary construction detour configurations for Route 90 Improvements, including the St. James Bridges and Portage Avenue interchange. Construction staging drawings were developed to ensure that two lanes of traffic in both directions, and the accommodation of pedestrians and cyclists, were maintained at all times during construction. The plan was developed assuming all properties are acquired prior to commencement of construction. The plan assumes an eight-year schedule to completion of the project.
- Property value assessments of the properties directly impacted by the proposed project right-of-way. A total of 78 private properties, 50 DND-owned properties and 14 City-owned properties were identified for full or partial takings in order to accommodate the proposed works. The estimated cost (2023 dollars) for property acquisition is $52,764,575 with $1,700,000 of residual land that could be

sold by the City following completion of the project. A Title Plot was also created based on the proposed design and under the supervision of a Manitoba Land Surveyor.

- A land use analysis to help guide future development along the Route 90 corridor based on policy direction from CCDS 2.0 and the Transit Oriented Development (TOD) Handbook, as well as input from the Steering Committee, and the Project Advisory Committee and other project stakeholders. The analysis resulted in a plan that illustrates existing and remnant parcels along the Route 90 corridor that provide city-building and placemaking opportunities. The plan included parcels that are deemed to be of adequate size to support future residential development, and parcels that may not be developable but provide opportunities for public realm enhancements such as landscaping, streetscaping, historic features, and public art. Any future development of these sites is subject to review under the current development application process.
- A TDM Strategy to address traffic issues, population growth, new commercial development, and to accommodate all modes of travel. TDM measures have been incorporated into a TDM Toolkit for Route 90. The toolkit is a compendium of measures designed to mitigate the potential traffic impacts of population and employment growth along the corridor. The timing for delivery, evaluation and monitoring was also established and resulted in an TDM implementation program over several years, which included “quick win” actions in the first two years, followed by medium-term actions (years three through five) and long-term actions (years six to 10). Recommendations are made on monitoring the program’s delivery and impacts, and ultimately measuring its success in shifting travel behaviours over time.
- An environmental assessment that included a included a review and identification of legislation and/or amendments to existing federal, provincial, and municipal Acts, Regulations, guidelines and permitting requirements that may impact this project, as well as a Contamination Overview Study (COS) to evaluate the current and historical land use within the study area to identify potential or actual environmental contamination that may exist within the study area and surrounding properties.
- Constructability, inspectability, maintenance and future expandability considerations for the preliminary design of the St. James Bridges that were identified through workshops with two local contracting firms familiar with the work activities contained in the planned scope of the project to explore some of the perceived issues.
- A Class 3 cost estimate, Basis of Estimate and Class of Estimate using the City of Winnipeg’s Asset Management template. The total cost for the project is estimated to be **$736.7 million**. This assumed assumes an in-service year of 2031 and includes construction costs, as well as inflationary costs relating to construction, engineering, utilities, land acquisition, administrative and other contingencies. It assumes the City will solely fund the project and utilize 100% debt financing.
- Value engineering session to increase project value and a risk analysis to identify risks associated with the project and mitigation recommendations.
- Independent road safety audit to identified risks and recommendations. Agreed upon design modifications were incorporated into the preliminary design.

RECOMMENDATIONS FOR DETAILED DESIGN AND CONSTRUCTION

The following is recommended to be investigated by the City, design team, or construction team during future detailed design and construction:

General Recommendations:

- Consider the TDM initiatives identified for this study.
- The PCS is currently being updated as part of the City’s Transportation Master Plan study and the proposed connections to Route 90 should be reviewed and incorporated (as appropriate).
- It is recommended that the traffic analysis be updated at the detailed design stage to confirm the findings of this study. In particular:
    - Review impacts of the proposed Naawi-Oodena development at the Grant Avenue, Taylor Avenue and Boulton Bay intersections). The traffic analysis should be based on the latest development information and consider the re-distribution of traffic that would occur with the full signal at Boulton Bay and the other proposed Naawi-Oodena development accesses. It should confirm that adequate turning lane storage lengths are provided.
    - Review the potential traffic impacts of the proposed Polo Park Redevelopment.

Safety:

- Review the findings of the Independent Road Safety Audit to identify opportunities to enhance safety for all users.

Water mains / Utilities:

- The segments of existing PVC water main are recommended to remain in place. Because these segments will be located under the new Route 90 corridor, a pipe loading and thermal analysis of these segments is recommended to ensure adequate protection of the existing water main.
- Existing segments of asbestos concrete water main are at end-of-life and should be replaced as part of the Route 90 Improvement works.
- Existing gas mains along the west side of Route 90 will require additional coordination with Manitoba Hydro, including a possible common utility trench with telecommunication providers, relocation, or protection. Manitoba Hydro may relocate one or both mains away from the Route 90 corridor, however this should be confirmed during detailed design.

Land Drainage:

- It is recommended that a new Route 90 Land Drainage Sewer (LDS) Trunk Sewer system be constructed as part of this project, to follow the Route 90 roadway alignment from Taylor Avenue to Academy Road and drain to the Assiniboine River through a proposed new outfall and gate chamber located to the west of the existing southbound bridge structure.
- The Route 90 LDS Trunk Sewer is to be sized for full build-out of the Naawi-Oodena lands, in combination with accommodating separation of the remainder of the Doncaster CSD to align with the City’s CSO Master Plan. This will result in the most conservative LDS Trunk Sewer design

allowing for flexibility during the future detailed design and construction phases until the Naawi-Oodena development unknowns are better understood.

- Further engagement is recommended with Treaty One Development Corporation (T1DC) and Canada Lands Corporation (CLC) regarding the Naawi-Oodena development and site runoff servicing in reference to the land drainage design in future design phases.
- Additional work to divert wastewater from existing properties along Route 90 to neighboring sewers should be included as part of the Route 90 Improvements project.
- Portions of the land drainage trunk sewer alignment light outside of land identified to be within the Route 90 road ROW. When the final alignments of the proposed land drainage trunk sewer are established, the City should begin permanent easement applications for the proposed trunk sewer. Modifications to the alignment to provide further spacing from the existing structures can also be undertaken as part of detailed design.
- The location of the manholes along the alignment should also be optimized during detailed design with consideration of the construction access shafts and long-term operational needs.
- Some utility conflicts exist with the proposed construction access shafts and trunk sewer alignment that will need to be addressed during detailed design. These conflicts are primarily associated with the existing 50mm and 350mm gas lines that run parallel with the existing Route 90 roadway. Specifically, conflicts are noted from 207 Kenaston Boulevard to 127 Carpathia Road and in the vicinity of the outfall and gate chamber, however, all shaft locations should be analysed for conflicts during detailed design.
- Coordination with Manitoba Hydro during detailed design will be required be develop relocation plans for these or the support of these utilities during construction. Vertical crossing conflicts were also considered in the design. The vertical alignment is generally dictated by the hydraulic modelling at the preliminary design stage and then refined during detailed design once the utility crossings have been verified and final grades are set. However, a review of potential conflicts with existing gravity sewers running perpendicular to the proposed trunk sewer was undertaken. Conflicts were found to exist at a few locations. Crossing solutions for these conflicts, including siphons or pass-through flumes will need to be considered at the detailed design stage.

Geotechnical:

- It is recommended that pile load testing be undertaken; full-length steel sleeves should be maintained on site and utilized as required during construction to maintain the pile shaft and base in a clean dry state for cast-in-place piles; and full-time inspection by experienced geotechnical personnel during construction of all foundations; depending on the elevations of the foundations and the season during construction, utilizing a de-watering system to control the possible high groundwater conditions may be required during the excavation; all concrete in contact with native soils should utilize sulfate resistant cement CSA Type HS; a rockfill toe berm should be installed along the south riverbank over a length of 150 m; a riprap blanket should be installed along the north riverbank over a length of 150 m. In terms of riverbank stability, the most critical time will be during the actual construction of the works and therefore the works should proceed as recommended to reduce the potential for excessive bank movements during construction.

Structures:

- The northbound bridge girder geometry and straddle bent configuration should be confirmed and further refined during detailed design.
- The new southbound bridge girder geometry and straddle bent configuration should be confirmed and further refined during detailed design.
- Given the history of the girder arrangement of the existing southbound bridge (originally only two lines and later increased by inserting two additional lines), it is recommended that an assessment of cumulative fatigue damage of the exterior girders be carried out if the bridge is to be retained and rehabilitated to achieve the service life objective of 75 years.

Public Realm / Streetscaping:

- Review and explore the Archaeological Assessment Services findings and the Manitoba Historical Society online inventory and develop a comprehensive heritage interpretive system for the corridor.
- Develop a process for integrating public art that identifies themes, locations, variety of scale and expression, establishes a budget, and a process for hiring public artists.
- Design pedestrian scale lighting on sidewalks and pathways to Public Works illumination requirements and City of Winnipeg Accessible Design Standards.
- Confirm the layout and changes to park amenities within Joe Malone Park, including service road alignment, parking, soccer field location, and fencing and gates.

Environment:

- The results of the COS provided an evaluation to address mitigation strategies prior to the construction phase for Route 90 Improvements, including potential residential properties as candidates for Phase I ESAs. To date, no Phase I ESAs have been completed as part of this project. Once detailed design and a fixed construction start date are identified for the project, selection of properties for Phase I ESAs should be revaluated and completed as applicable. Based on the Phase I ESA observations a Hazardous Materials Investigation may be recommended.
- Existing federal and provincial legislation, municipal by-laws, regulations, guidelines, and permitting requirements that may impact this project should be reviewed/referenced at the detailed design and construction stages to ensure project compliance with regulatory requirements.

Constructability:

- Adequate laydown and staging areas will be required on both sides of the river and should be identified during detailed design. Possible locations include various privately owned parking lots on the north side and the proposed property acquisition area on the south side (east of Route 90 and south of Wellington). It is also noted that the size of the area already identified on the south side for property acquisition should be increased, if possible (e.g., acquisition / easement of rail property), and that such acquisition / easement should be completed before contractor mobilization.
- The Wolseley Avenue access to 1710 Portage Avenue (Kiltarton Towers) will need to be shut down for all but emergency vehicles because Wolseley Avenue (vicinity bridge structures) will be a major construction area with many activities that will be dangerous to the general public. Access to 1710

Portage Avenue will be provided via 1700 Portage Avenue (Herzing College) via Riverbend Crescent and should be confirmed during detailed design.

- Given the limited access off Wolseley Avenue and Portage Avenue, and the limited space available in the 1700 Portage Avenue (Herzing College) parking lot, detailed design should consider alternative retaining wall designs and installation methods to reduce the schedule risk associated with this element of work.
- Piling operations associated with widening of the northbound structure will need to take place in advance of or at the same time as the piling operations for construction of the new southbound structure.
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- Detailed design should consider multiple methods for bridge pier modifications and include constructability and schedule risk in the evaluation and selection of a preferred design.
- It is recommended that additional investigation of the deck be carried out during detailed design. Depending on the condition of the concrete bridge deck at the time of construction, it may be more economical and lower risk to replace the entire bridge deck, as opposed to partial depth rehabilitation of the existing deck.

This concludes the Executive Summary for the Route 90 Improvements Study.