

**City of Winnipeg
Southwest Rapid Transit Corridor– Stage 2
Environmental Review and Assessment**

Report – April 2014

Submitted by:
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba R3T 0Y4



(In reply, please refer to)

Our File: 13-8439



April 17, 2014

Ms. Tracey Braun, Director
Environmental Approvals Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
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Re: Submission of Environment Act Proposal, Environmental Impact Statement and Class 2 Development Fees for the City of Winnipeg Southwest Rapid Transit Corridor – Stage 2 Project

Dear Ms. Braun,

The City of Winnipeg is seeking approval and licensing under the Manitoba Environment Act for the proposed development of the City of Winnipeg's Stage 2 of the Southwest Rapid Transit Corridor (the Project). Stage 1 of the Southwest Transitway was opened in April 2012 and is currently in operation from Queen Elizabeth Way in the downtown area of the City of Winnipeg to Pembina Highway and Jubilee Avenue. Stage 2 of the Project extends the Southwest Rapid Transit Corridor from Pembina Highway and Jubilee Avenue south to the University of Manitoba.

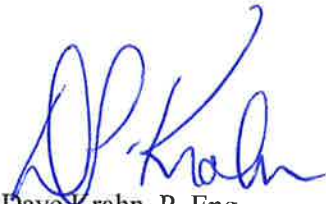
Dillon Consulting Limited and their sub-consultant, M. Forster Enterprises, met with Manitoba Conservation and Water Stewardship Environmental Approvals Branch officers on November 18, 2013 to discuss the proposed Project and determine the environmental licensing and regulatory requirements for the proposed Project. During the meeting, it was determined that the proposed Project would be considered as a Class 2 Development under the Manitoba Environment Act and will require an Environment Act License from the Province of Manitoba. A review of current Canadian Environmental Assessment Act and other federal regulations and guidelines (e.g., Transport Canada, Fisheries and Oceans Canada, federal P3 funding under PPP Canada) found that there are no federal review, approval or licensing requirements for the Project.

Further to the November 18, 2013 meeting, we are pleased to provide a completed Environment Act Proposal form, Environmental Impact Statement Report and the required \$7,500 fee for a Class 2 Development. Attached find four (4) hard copies and one (1) electronic copy of this report.

We trust that our submission is complete and meets current regulatory requirements. We look forward to working further with your Department on this important Project. Please contact the undersigned if you require any other information or clarification.

Best regards,

DILLON CONSULTING LIMITED



Dave Krahn, P. Eng.
Project Manager



Dennis Heinrichs, M-Sc P. Eng
Senior Environmental Lead

DPK/jar

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Environment Act Proposal Form



Name of the development: City of Winnipeg Southwest Rapid Transit Corridor – Stage 2	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 2	
Legal name of the applicant: City of Winnipeg	
Mailing address of the applicant: 421 Osborne Street, Winnipeg, Manitoba R3L 2A2	
Contact Person: Mr. Bjorn Radstrom, Project Manager, Winnipeg Transit	
City: Winnipeg	Province: Manitoba Postal Code: R3L 2A2
Phone Number: 204-986-5743	Fax: 204-986-6863 email: bradstrom@winnipeg.ca
Location of the development: City of Wpg., Pembina Hwy & Jubilee to Bison Drive/U of M	
Contact Person: Mr. Bjorn Radstrom, Project Manager, Winnipeg Transit	
Street Address:	
Legal Description:	
City/Town: Winnipeg	Province: Manitoba Postal Code: R3L 2A2
Phone Number: 204-986-5743	Fax: 204-986-6863 email: bradstrom@winnipeg.ca
Name of proponent contact person for purposes of the environmental assessment: Mr. Dave Krahn, P.Eng.	
Phone: 204-453-2301, ext 4046 Fax: 204.452.4412	Mailing address: Dillon Consulting Limited 1558 Willson Place Winnipeg, Manitoba R3T 0Y4
Email address: dkrahn@dillon.ca	
Webpage address: www.dillon.ca	
Date: APRIL 17/14	Signature of proponent, or corporate principal of corporate proponent:  Printed name: DAVE KRAHN

A complete **Environment Act Proposal (EAP)** consists of the following components:

- **Cover letter**
- **Environment Act Proposal Form**
- **Reports/plans supporting the EAP** (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information and number of copies)
- **Application fee** (Cheque, payable to Minister of Finance, for the appropriate fee)

Per Environment Act Fees Regulation (Manitoba Regulation 168/96):	
Class 1 Developments	\$1,000
Class 2 Developments	\$7,500
Class 3 Developments:	
Transportation and Transmission Lines ..	\$10,000
Water Developments	\$60,000
Energy and Mining.....	\$120,000

Submit the complete EAP to:

Director
Environmental Approvals Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5

For more information:

Phone: (204) 945-8321

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<http://www.gov.mb.ca/conservation/eal>

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1 INTRODUCTION

The City of Winnipeg (the City) is proposing to develop Stage 2 of the Southwest Transitway (the Project). Stage 1 of the Southwest Transitway was opened in April 2012 and is currently in operation from Queen Elizabeth Way in the downtown area of the City of Winnipeg to Pembina Highway and Jubilee Avenue. Stage 2 of the project looks at extending the Southwest Transitway from Pembina Highway and Jubilee Avenue south to the University of Manitoba. An extension of Stage 2 from Jubilee Avenue to Bison Drive would complete the link between downtown Winnipeg to the University of Manitoba (U of M), Investors Group Field and southwest suburbs, providing a one-seat trip for passengers (Dillon Consulting Limited 2013a).

The City of Winnipeg Transit Department retained Dillon Consulting Limited. (Dillon) and their sub-consultants to conduct the Functional Design Study for Stage 2 of the Southwest Transitway. The Functional Design study is composed of several components, including an Environmental Assessment (EA) of the proposed Project.

Based on discussion with Manitoba Conservation and Water Stewardship (MCWS), the Project will be considered as a Class 2 Development under the requirements of the Manitoba Environment Act, and therefore requires submission of an Environmental Impact Statement (EIS), and approval by MCWS to obtain an Environment Act License (EAL) (B. Webb, pers. comm. 2013). This document provides the EA of the proposed Project and serves as the EIS for submission to MCWS.

2 PROJECT LOCATION

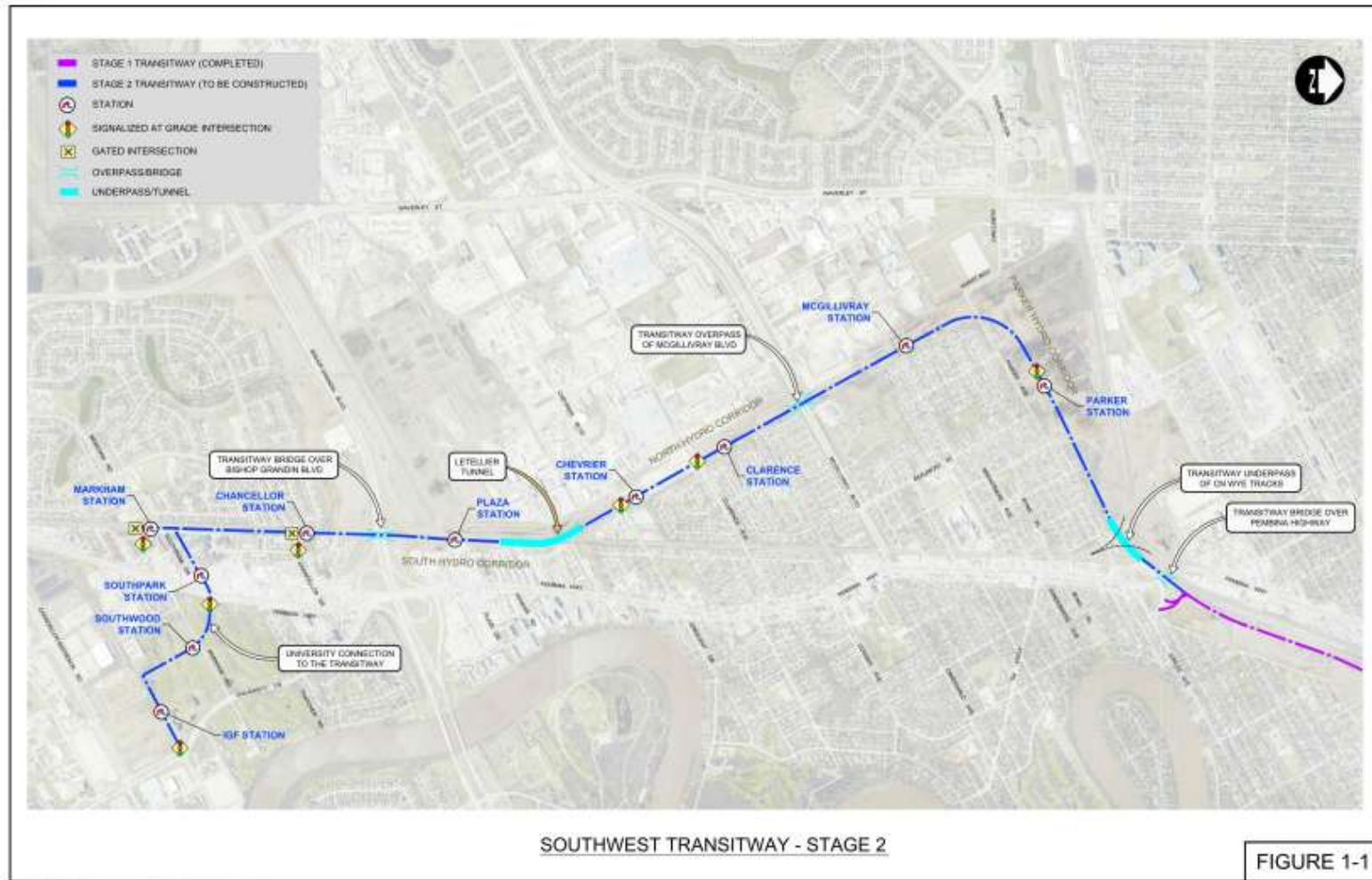
The Project is located within the City of Winnipeg between the Pembina Highway and Jubilee Avenue overpass and Bison Road (Figure 1-1).

3 PROJECT FUNDING

The City of Winnipeg will be seeking project funding under the Government of Canada's Public-Private Partnerships (P3) program. The Stage 2 Transitway project from Pembina/Jubilee to the University of Manitoba is expected to be delivered as a P3 project in conjunction with the widening of Pembina Highway at the Jubilee underpass and the associated railway works.

The City has outlined a capital funding commitment of 37.5% of the Project Costs, which will be matched by the Province of Manitoba. PPP Canada's commitment will be 25% of the costs related to the Design Build Finance Maintain contract and will be subject to the approval by the Federal Government. Specific terms, conditions and timing of the contributions from the Province and PPP Canada are expected to be finalized in the spring/early summer of 2014.

Figure 1-1: Project Location



4 PROJECT BACKGROUND AND NEED

The population of Winnipeg is expected to grow by approximately 200,000 over the 2006 - 2031 time period, resulting in a population of approximately one million people in the City and surrounding area by 2031. This growth is expected to occur most extensively in the southwest part of Winnipeg, which has a current population of 75,000 and is expected to grow by over 40% over the next 20 years. There are three major industrial areas and several commercial areas in the southwest part of the City that are experiencing even higher growth. In addition, the province's two largest universities (the University of Manitoba - 30,000 students/staff, and the University of Winnipeg - 10,000 students/staff) are located within the service area of the Southwest Transitway and are expanding their campuses and educational offerings.

The growth in this area of the City is placing tremendous strain on the existing transportation infrastructure. The major arterial street in the area, Pembina Highway, is already highly congested with average traffic volumes of approximately 60,000 vehicles each weekday. This volume is expected to increase as development continues in the City's southwest quadrant. To accommodate the growth in development and population, there are only limited opportunities to expand the road infrastructure. Although a high level of transit service operates on Pembina Highway, it is subject to significant delays and slow speeds caused by the traffic congestion. The increasing travel times along Pembina Highway, coupled with the resulting decrease in transit schedule reliability, threatens Winnipeg's ability to provide a high quality transit service to its citizens.

In 2011, Winnipeg's City Council approved "Our Winnipeg", the City's long-term development plan (City of Winnipeg 2011a). "Our Winnipeg" outlines a 25-year vision for the physical, social, environmental and economic development to position the City for sustainable growth and ensure Winnipeg's future competitiveness. The vision outlined in "Our Winnipeg" is brought into action through supporting Direction Strategies, including the Sustainable Transportation Strategy and the City's Transportation Master Plan (TMP). The TMP approved by City Council includes the development of an initial network of four rapid transit corridors:

- Southwest Corridor (parallel to Pembina Highway using existing Canadian National (CN) Rail and Manitoba Hydro Right-of-Ways [RoWs]);
- Eastern Corridor (parallel to Nairn and Regent Avenues);
- Western Corridor (within or parallel to Portage Avenue); and
- Northern Corridor (within or parallel to Main Street).

The City's highest priority is the Southwest Corridor (named the Southwest Transitway) that connects downtown with Winnipeg's rapidly growing southwest sector and the University of Manitoba.

Stage 1 of the Southwest Transitway, the initial phase of Winnipeg's rapid transit network, was constructed during 2009-2011. The Stage 1 transitway (3.6 kilometres [km] in length, located between downtown and Pembina Highway and Jubilee Avenue, with three highly developed stations) opened for service in April 2012 and is used by a Bus Rapid Transit (BRT) network of 13 routes, providing fast,

frequent, reliable service throughout the day on all days of the week. Rapid transit routes access the transitway at four locations to provide trips without transfer for passengers travelling between the southwest part of the City and downtown.

The City's next rapid transit project is Stage 2 of the Southwest Transitway. As shown in Figure 1-1, this project will extend the transitway southerly from Pembina Highway and Jubilee Avenue to the University of Manitoba using land within Manitoba Hydro and CN Rail RoWs for most of its alignment. This alignment, recommended by a study completed and subsequently approved by City Council in 2013, provides an opportunity to deliver rapid transit service directly to the University of Manitoba, downtown, and several neighbourhoods in the southwestern and western parts of the city. The project also includes a widening of Pembina Highway as it underpasses the CN mainline near Jubilee Avenue at the northern limit of the Stage 2 transitway project.

This project is consistent with the strategic direction identified in the City's TMP and will provide essential transportation infrastructure required to accommodate the new growth in the southwest part of the City.

5 PROJECT OBJECTIVES

The objectives of Stage 2 of the Southwest Transitway are to create benefits that meet the key strategic goals outlined in the City's Sustainable Transportation Strategy and TMP. These benefits include:

- **Improved Transit Service and Increased Ridership** - The transitway will allow rapid transit vehicles to operate at high speed in a dedicated runningway free of interference from other traffic. This ability will result in faster travel times and high schedule reliability and, in combination with frequent service, attractive and comfortable stations, state-of-the-art buses, and real-time passenger information, significant benefits will be realized by existing transit users and an increase in corridor ridership of 12% to 15% is expected to be generated.
- **Reduction in Traffic Congestion** - Pembina Highway, the major arterial roadway in the corridor, is highly congested due to the significant population growth in the southwest quadrant of the City. The implementation of the transitway to achieve an increase in the transit mode split, in combination with the widening of Pembina Highway by an additional northbound lane at the Jubilee underpass, is expected to improve travel times and reduce congestion for both transit users and motorists.
- **Improved Access to Investors Group Field** - Based on experience during the 2013 CFL season, approximately 13,000 people use transit (40% transit mode split) for events at Investors Group Field located at the southern end of Stage 2 of the transitway. With a fully built-out transitway, significant improvements in travel time, reliability, and comfort will accrue for spectators attending events at the stadium.
- **Transit Oriented Development (TOD)** - The TMP identifies four designated TOD sites along the Southwest Transitway corridor, including the Fort Rouge Yards; the Southwood Golf Course lands; the former Sugar Beet lands near Pembina Highway and Bishop Grandin Boulevard; and the Parker lands west of Pembina Highway and south of the CN main line. Recent development

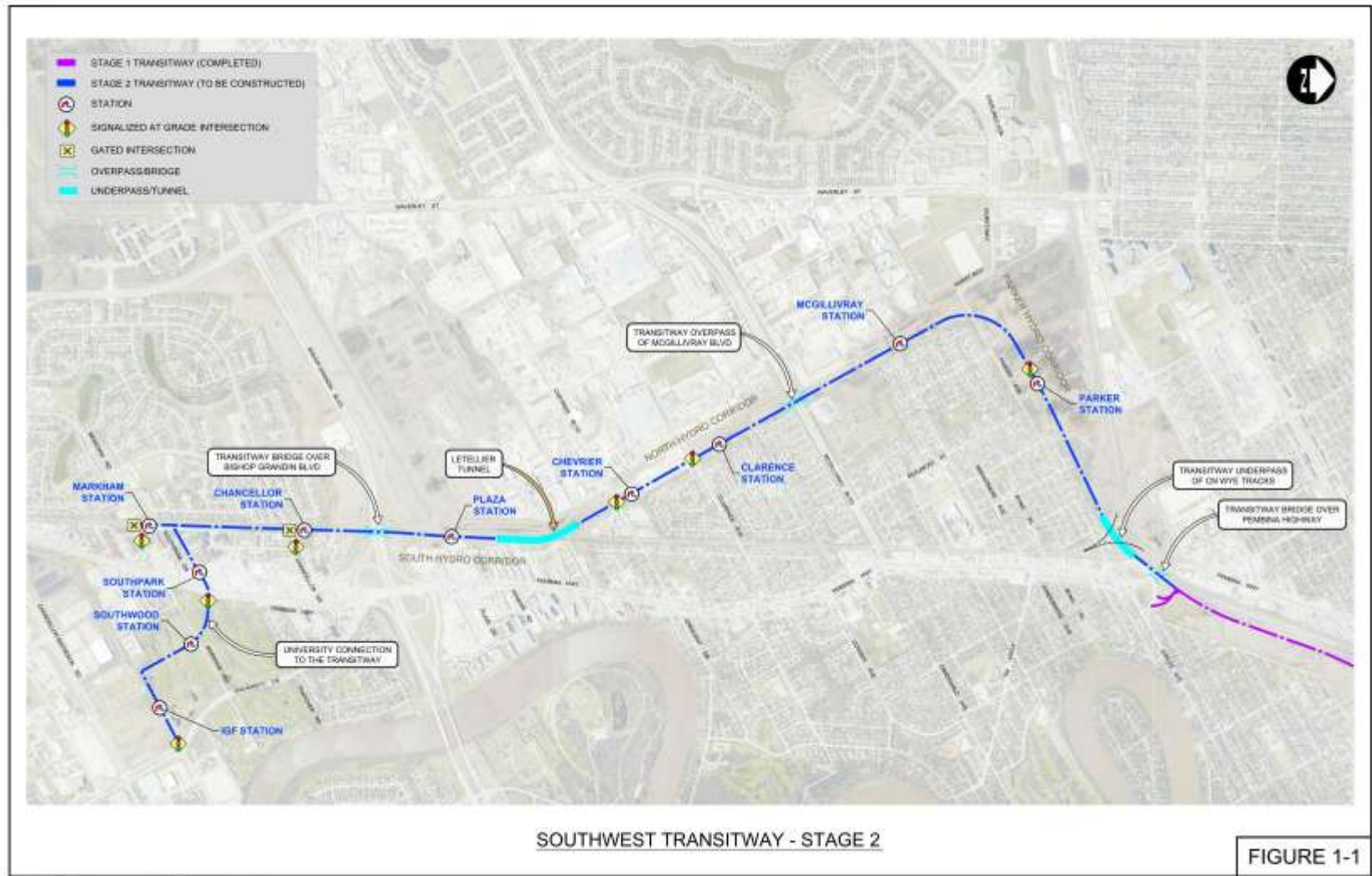
announcements since the opening of the Stage 1 corridor, and in anticipation of completion of Stage 2, have indicated a strong interest by developers in promoting TOD along the transitway, including ones adjacent to Harkness Station (19-storey high rise building), Osborne Station (5-storey mixed use commercial and office building) and Fort Rouge Station (Fort Rouge Yards development - 1,000 dwellings – project underway).

- **Revitalization of Downtown** - Winnipeg’s downtown has experienced significant revitalization in recent years including such developments as the Graham Transit Mall, MTS Centre, Manitoba Hydro Place, and Centrepoint. In addition, existing surface parking lots are being converted into higher-value uses, such as the “Sports, Hospitality and Entertainment District” (SHED), SoPo Square, SkyCity Centre, Creswin’s planned development of the empty parking lot at 416 Main Street, and the expansion of the RBC Convention Centre. In revitalizing the downtown landscape, these developments reduce the availability of parking spaces in the area. A reliable rapid transit service operating via the Graham Transit Mall into the heart of Winnipeg’s downtown area will provide a viable and less expensive alternative to commuters while enhancing citizens’ access to the revitalized downtown area.
- **Reduction in Greenhouse Gas Emissions** - The implementation of the transitway will reduce greenhouse gas emissions (GHGs) as a result of a mode shift from high-consumption private automobiles to public transit and active transportation. Operating efficiencies resulting from higher speeds and new vehicles are expected to reduce emissions from the bus fleet that operates on the transitway.
- **Support the Local Economy** – The design, construction, and implementation of the transitway will have numerous positive impacts on the local Winnipeg economy. Direct benefits will accrue to local design and engineering companies and to local construction contractors. Spin-off benefits will be realized from local bus purchases, from the TOD developments, from improvements to downtown revitalization and accessibility, and from an improved urban transportation system in the southwest sector of the city.

6 PROJECT DESCRIPTION

Figure 6-1 provides an illustration of the recommended alignment for the Project. Additional details are provided on Figures 1 to 4 in Appendix A, which depict the recommended alignment from south to north. The transitway will operate on an exclusive RoW from the intersection of Jubilee Avenue and Pembina Highway to Bison Drive at the CN rail RoW. The corridor alignment extends from Stage 1 of the Southwest Transitway from Jubilee Avenue over Pembina Highway on a structure just north of the Jubilee Avenue Overpass. West of Pembina Highway, the transitway alignment passes under two CN rail tracks (Letellier Subdivision and switching track), and continues west paralleling Parker Avenue. At the westerly end of the Parker Lands the alignment turns in a south-easterly direction, crosses the existing Parker Avenue and then is located within the Manitoba Hydro RoW until it intersects the CN Letellier rail line, north of Bishop Grandin Boulevard. Just south of Manahan Avenue, this alignment crosses over two railway service tracks and the CN Letellier subdivision on an overpass structure, touching down on the east side of the Letellier Subdivision just north of Plaza Drive.

Figure 6-1: Recommended Alignment for Stage 2 of the Southwest Transitway



From this point, the alignment continues south along the east side of the CN rail line, crosses Bishop Grandin Boulevard on an overpass, and terminates at Bison Drive.

Stage 2 of the Southwest Transitway will involve the construction of the following infrastructure:

- Approximately 7.6 km of runningway roadwork to extend the transitway from Pembina Highway and Jubilee Avenue to Markham Road and to the University of Manitoba;
- Widening of Pembina Highway by one lane through the Jubilee Underpass;
- Construction of a new CN Rail Bridge over Pembina Highway and demolition of the existing CN Rail Bridge structure;
- Construction of a new Transitway Bridge over Pembina Highway;
- Construction of new Transitway Underpasses of CN Wye Tracks at the CN Portage Junction;
- Construction of a Transitway Overpass of McGillivray Boulevard;
- Construction of a Transitway Tunnel beneath the CN Letellier rail line (Letellier Tunnel);
- Construction of a new CN Letellier Rail Bridge over Bishop Grandin Boulevard;
- Construction of a new Transitway Bridge over Bishop Grandin Boulevard;
- Construction of roadway connections between the transitway and the street system;
- Seven modern transit stations along the Stage 2 transitway;
- Construction of new Park and Ride facilities at two of the transitway stations;
- Two new stations on the transitway connection to the University of Manitoba, a new transit station at Investors Group Field, and upgrades to existing stations on the Fort Garry campus of the University of Manitoba;
- New signalized intersections with transit priority signals; and
- A new Active Transportation Path (AT pathway) along the transitway with direct connections to existing paths and to the stations, and bicycle storage facilities at the stations.

Following the construction of Stage 2, the completed Southwest Transitway will encompass 11.2 kilometres of bus-only transitway, 11 rapid transit stations, a comprehensive network of rapid transit routes that provide one-seat trips for most travel to/from/within the service area, and a continuous AT pathway between the southwest part of the city and the downtown.

7 PROJECT COMPONENTS

7.1 Transitway Right-of-Way

The RoW for Stage 2 of the Southwest Transitway will be located in lands currently owned by the City of Winnipeg, CN Rail, Manitoba Hydro, the University of Manitoba, and some private interests. Of the 7.6 kms of the Stage 2 transitway:

- 0.5 kms are on City of Winnipeg land;
- 2.6 kms are within the CN Letellier RoW;
- 3.2 kms are within the Manitoba Hydro RoW;

- 0.3 kms are on undeveloped privately-owned land; and,
- 1.0 kms are on University of Manitoba land.

The status for use of the required lands not currently owned by the City can be summarized as follows:

Land Owner	Status
CN Rail	Under a 1994 agreement between the City of Winnipeg and CN, the City already has in place a lease for the CN lands required for Stage 2 of the transitway.
Manitoba Hydro	Under a 2014 Memorandum of Agreement between the City and Manitoba Hydro, the City will acquire those lands in the Manitoba Hydro RoW required for the transitway project on mutually agreed terms.
University of Manitoba	During 2014-15, the City and the University will negotiate an agreement for the use of a portion of the former golf course lands required for the transitway project on mutually agreed terms.
Private Lands	Minor portions of a few private properties are required for the project. The City will undertake negotiations with the owners for the acquisition of these lands.

The City’s land acquisition strategy will be completed by the time the project is forecasted to begin construction in early 2016 and will not impact the commencement of “on ground construction”.

7.2 Pembina Highway Widening at Jubilee Underpass, CN Rail Bridge over Pembina Highway

At the north limit of the Project, Pembina Highway passes under a roadway that connects Jubilee Avenue with Pembina Highway. This underpass has two northbound lanes and three southbound lanes. Due to the very high traffic volumes through the underpass (60,000 vehicles per day; 6,000 vehicles during the peak hour), the underpass currently functions at an unacceptable level of service in the northbound direction. To improve traffic operations at this location, the Project includes a widening of the northbound roadway through the underpass from two lanes to three lanes.

Two existing structures and one planned structure are located in the vicinity of the underpass. The existing structures include the Jubilee overpass roadway and, to the north of the overpass, a CN Rail Bridge over Pembina Highway that accommodates three tracks of CN’s main line and a service road. The planned structure is a new Transitway Bridge over Pembina Highway to be constructed as part of the southerly extension of the Southwest Transitway. The new transitway bridge is required to be constructed between the Jubilee overpass and the CN Rail Bridge.

To accommodate the additional northbound lane on Pembina Highway and the new transitway bridge, the existing CN Bridge over Pembina Highway will need to be replaced by a new and longer rail bridge at a location north of the existing rail bridge. These works were investigated in detail in a study conducted for the Public Works Department of the City of Winnipeg (Dillon Consulting Limited 2013b). During the study, extensive consultation was undertaken with the City’s Public Works, Water and Waste, and Transit departments, with CN, and with all affected utility companies to ensure the recommended design met all requirements. All parties have approved the recommended design. The works to widen Pembina Highway and to replace the CN Bridge over Pembina Highway will include the following:

- **Railway Works**
 - The construction of the new CN Rail Bridge over Pembina Highway that accommodates four tracks and an improved service road;
 - The relocation of existing tracks within the CN Rivers subdivision to align with the new rail bridge;
 - The relocation of two existing wye tracks at Portage Junction to align with the relocated CN Rivers tracks; and
 - The demolition of the existing CN Bridge over Pembina Highway.
- **Roadway Works**
 - The reconstruction of Pembina Highway to provide for three lanes in each direction through the Jubilee Underpass; and
 - The construction of AT pathways, 4.5 metres in width, on each side of Pembina Highway, including connections to the planned active transportation path along the Southwest Transitway.
- **Utility Works**
 - The relocation of an existing combined sewer outfall to accommodate the lowering of the Pembina roadway through the underpass; and
 - The construction of a land drainage sewer system, including a retention pond, to accommodate run-off during major rainfall events.

7.3 Transitway Bridge over Pembina Highway

This transitway bridge will be constructed between the Jubilee overpass and the new CN Rail Bridge over Pembina Highway. This bridge will accommodate one transitway lane in each direction and a two-way AT pathway adjacent to the northbound transitway lane (separated from the lane by a physical barrier).

7.4 New Transitway Underpass of CN Wye Tracks (CN Letellier and WC02 Spur) at the CN Portage Junction

In the Portage Junction rail lands (defined by the triangular area bounded by the CN Rivers subdivision on the north, the Jubilee roadway overpass on the east, Parker Avenue on the south, and the eastern edge of undeveloped land on the west) are located two wye tracks (the CN Letellier rail line and the WC02 spur line) and some maintenance buildings. As described above, the two existing wye tracks at Portage Junction will be required to be re-aligned with the relocated CN Rivers tracks. A new transitway underpass of each of the CN wye tracks will be constructed to provide a grade-separation between the transitway and the wye tracks. Because the wye tracks will be relocated to new alignments, the underpass structures can be initially constructed at grade without disrupting existing rail operations. Following construction, the wye tracks will be relocated on the new structures and the old tracks abandoned, the excavations beneath the structures will be undertaken, and the transitway through the underpasses will be constructed.

7.5 Transitway Overpass of McGillivray Boulevard

A new transitway structure will be constructed over McGillivray Boulevard, a high-speed urban arterial thoroughfare with two through lanes in each direction and a wide boulevard between the eastbound and westbound roadways. On either side of McGillivray Boulevard, the transitway is oriented north-south within the Manitoba Hydro RoW. Within this RoW are located four existing and two planned hydro transmission lines, a City of Winnipeg aqueduct, and a major water feeder main. In consultation with Manitoba Hydro and the City, the transitway alignment and the new overpass have been designed to minimize impacts on these utilities. The overpass design includes the use of vertical walls (Mechanically Stabilized Earth – MSE) to minimize impacts on hydro and underground infrastructure. The new overpass will accommodate one transitway lane in each direction and a two-way AT pathway adjacent to the northbound transitway lane (separated from the lane by a physical barrier).

7.6 Letellier Tunnel

At approximately Chevrier Boulevard, a new transitway tunnel (Letellier Tunnel) will be constructed to transition the transitway from the Manitoba Hydro RoW on the west side of the CN Letellier tracks to the east side of the tracks. The transitway needs to be aligned on the east side of the CN Letellier subdivision to provide rapid transit access to existing high-density development between Chevrier and Markham Road, and to provide efficient transitway access to Investors Group Field and the University of Manitoba. The Letellier Tunnel will be constructed beneath the CN Fort Garry Industrial Leads (tracks WC07 and WC21) and the CN Letellier track. The north end of the tunnel structure will be on the west side of the Letellier subdivision immediately south of Chevrier Boulevard. The other end of the tunnel structure will be approximately 621 metres further south on the east side of the Letellier subdivision. The tunnel structure includes a covered tunnel approximately 200 metres in length with retaining walls approximately 200 metres in length approaching the north tunnel entrance and 225 metres in length approaching the south tunnel entrance. During construction, a temporary shoofly of the CN Letellier track and a temporary relocation of the CN Fort Garry Industrial Leads will be required.

7.7 Relocation of CN Letellier Track, CN Letellier Rail Bridge over Bishop Grandin Boulevard, Transitway Bridge over Bishop Grandin Boulevard

Between the south end of the Letellier Tunnel and a point south of Markham Road, segments of the existing track, signals and switches will be relocated westerly within the CN Letellier RoW to accommodate the transitway alignment. This work will include the construction of a new CN Letellier Rail Bridge over Bishop Grandin Boulevard parallel to and immediately west of the existing rail bridge over Bishop Grandin Boulevard. After construction of the new rail bridge is completed and the CN Letellier track is relocated, the old rail infrastructure will be removed, CN operations will be shifted to the relocated line, and a new Transitway Bridge over Bishop Grandin Boulevard will be constructed in the current location of the existing rail bridge. The Transitway Bridge will accommodate one transitway lane in each direction and a two-way AT pathway adjacent to the northbound transitway lane (separated from the lane by a physical barrier).

7.8 Stations

Stage 2 of the Southwest Transitway will include the construction of seven new stations along the transitway, two new stations on the transitway connection to the University of Manitoba, a new station at Investors Group Field and upgrades of existing stops on the University of Manitoba campus. The new transitway stations will include:

- Parker Station (between Georgina Street and Beaumont Street, north of Parker Avenue);
- McGillivray Station (north of McGillivray Boulevard, near Seel Avenue);
- Clarence Station (between Clarence Avenue and Waller Avenue);
- Chevrier Station (north of Chevrier Boulevard);
- Plaza Station (east side of CN Letellier track at west limit of the Public Road referred to as Plaza Drive);
- Chancellor Station (a “split” station on east side of CN Letellier track; northbound platform north of Chancellor Drive; southbound platform south of Chancellor Drive); and
- Markham Station (east side of the CN Letellier track, north of Markham Road).

Major features of these stations include large heated shelters, canopies over the platforms, station identification and wayfinding signage, information kiosks, electronic signs that display real-time bus departures, benches, waste receptacles, and bicycle storage facilities.

Two new stations will be built on the transitway connection to the University of Manitoba at:

- Southpark Drive near Pembina Highway; and
- On the University’s Southwood lands near the Transitway and Markham Road intersection.

These two stations will include such amenities as heated shelters, a sign structure, electronic signs, information kiosks, benches, and waste receptacles.

Existing stops to be upgraded on the University of Manitoba campus include:

- University of Manitoba Station on Dafoe Road;
- School of Music Stop;
- Northbound University Crescent at Matheson Road; and
- Northbound University Crescent at Dafoe Road.

These stops will include such amenities as heated shelters, a sign structure, electronic signs, information kiosks, benches, and waste receptacles.

A special purpose station will be construction at Investors Group Field (IGF) to accommodate buses serving major events at the stadium. Up to 200 buses are used to transport spectators to and from events. IGF Station will be located adjacent to the stadium. An overhead pedestrian walkway will be built between a stadium entrance and the station’s large central loading platform to segregate pedestrian movements from bus operations.

7.9 Park and Ride

Large park and ride facilities will be constructed at McGillivray Station and at Clarence Station. At McGillivray Station, an existing parking lot on the west side of the Manitoba Hydro RoW (currently leased by the Church of the Rock) will be extended further north to the station. Street connections will be provided between the parking lot and Buffalo Place and Seel Avenue. At Clarence Station, a new parking lot will be built on the west side of the Manitoba Hydro RoW adjacent to the station. Street connections will be provided between the parking lot and Clarence and Waller Avenues.

7.10 Transitway Runningway, Connections between the Transitway and Street System, At-Grade Intersections

Between stations, the transitway runningway will include a 3.5 metre lane and a shoulder allowance in each direction. Within each station, two lanes will be constructed in each direction to allow express buses to overtake other buses that may be boarding passengers and to provide for bus turning movements between the runningway and the street system. Roadway connections between the transitway and the street system will be constructed at the following locations to permit transit routes operating on the transitway to be “through-routed” to their various destinations in southwest Winnipeg:

- From Parker Station to Hurst Way/Wilkes Avenue/Sterling Lyon Parkway;
- From Parker Station to Beaumont Street;
- From McGillivray Station to Seel Avenue;
- From Clarence Station to Clarence Avenue;
- From Chevrier Station to Chevrier Boulevard;
- From Chancellor Station to Chancellor Drive;
- From Markham Station to Markham Drive;
- From the transitway to Southpark Drive; and
- From IGF Station to University Crescent.

The transitway will have at-grade crossings with the street system at the following five locations:

- Georgina Street (near Parker Station);
- Clarence Avenue (near Clarence Station);
- Chevrier Boulevard (near Chevrier Station);
- Southpark Drive and Pembina Highway; and
- University Crescent (near IGF Station).

These intersections will be controlled by new traffic signals. Where possible, transit signal priority technology will be used to enable buses to communicate with the traffic signal controllers to provide priority to rapid transit service. In addition, the transitway will have at-grade crossings with the street system in close proximity to the CN Letellier track at the following two locations:

- Chancellor Boulevard (near Chancellor Station); and
- Markham Boulevard (near Markham Station).

Flashing warning signals currently operate at these rail crossings to stop on-street eastbound and westbound traffic and pedestrians while a train passes. These flashing warning signals will be repositioned to stop on-street eastbound/westbound traffic, pedestrians, and southbound transitway buses intending to turn right from the transitway onto either Chancellor or Markham when a train is passing. In addition, traffic signals will be installed to permit transitway buses to cross the streets and make turns from or to the transitway at these locations. The CN flashing warning signals and the traffic signals will be integrated to ensure safe operations. Transit signal priority technology will be used to enable rapid transit buses to communicate with the traffic signal controllers to provide priority to buses over other on-street traffic.

7.11 Active Transportation

The Project includes an extension of the existing AT pathway adjacent to the Stage 1 transitway along the Stage 2 transitway to the University of Manitoba. The path will be sufficiently wide to accommodate cyclists and pedestrians and will be connected to existing paths in the active transportation network at several locations along the transitway. The path will be included in transitway underpass, overpass, and bridge structures, adjacent to the northbound transitway lane (separated from the lane by a physical barrier). Due to safety reasons, the path will not be included in the Letellier Tunnel. Instead, the path will be routed at grade from Chevrier Station on the west side of the tracks to Plaza Station on the east side of the CN Letellier tracks via Chevrier Boulevard and Hudson Street. The AT pathway will be directly connected to all stations. Bicycle storage facilities will be provided at each station.

7.12 Railway Works Considerations

For the following railway works described above, i.e., CN Rail Bridge over Pembina Highway, Transitway Underpass of CN Wye Tracks at Portage Junction, Letellier Tunnel, Relocation of CN Letellier Track and CN Letellier Rail Bridge over Bishop Grandin Boulevard, the following guidelines were used in the development of the functional plans:

- Existing operating train speeds of 30 to 40 km/hr in the CN Letellier subdivision will be maintained following completion of the project;
- Proposed temporary and permanent track alignments and turnout configurations are based on approved CN engineering standards;
- To minimize train noise, continuous welded rail (CWR) with premium ties and fasteners will be used for the relocated CN Letellier track (based on CN engineering track standards);
- A noise attenuation wall is proposed on the west side of the relocated CN Letellier track between Bishop Grandin Boulevard and Markham Road; and
- During project construction, CN service on the CN Rivers tracks and on the CN Letellier track and spur tracks will be maintained.

7.13 Drainage Works

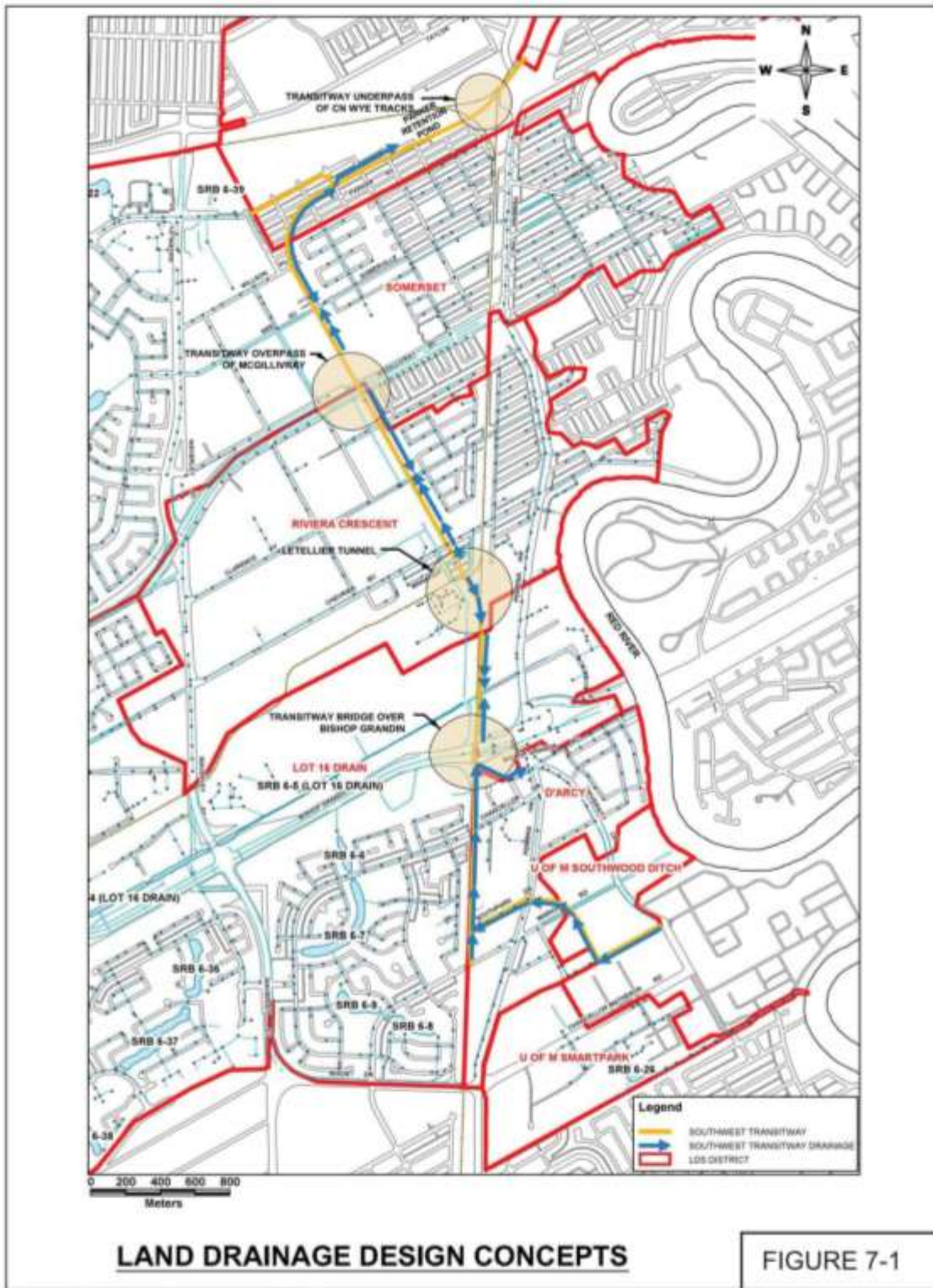
The land drainage functional design concept for the Project has been prepared based on discussions with the Water and Waste Department of the City of Winnipeg and will be finalized at the Detailed Design stage as carried out by the contractor, Project Co¹ (Dillon Consulting Limited 2013a). Figure 7-1 illustrates the proposed design and includes consideration of the drainage requirements for the Cockburn and Calrossie Combined Sewer Relief Works, the Pembina Highway Underpass, as well as Stage 2 of the Southwest Transitway Project. Drainage concepts that consider all three components were reviewed to determine the best overall recommendation. For example, based on a review of the pumping station concepts servicing the Pembina Highway Underpass and the proposed Transitway Underpass of the CN Wye Tracks, it was recommended that two separate pumping stations be built.

The drainage concept for the transitway considers restrictions from Manitoba Hydro transmission lines, the CN Railway, the Branch II Aqueduct and Fort Garry Feedermain, and was developed based on various features of the proposed transitway structures (i.e. Transitway Underpass of CN Wye Tracks, Transitway Overpass of McGillivray, Letellier Tunnel) as well as several stations and street connections. The stations and connections are important to consider as the impervious area increases considerably and therefore generate more overland runoff. In some cases, it also limited the drainage options as there was no longer enough space for ditching.

The concept consists of a combination of new land drainage sewers (LDS) and ditches along the transitway that would drain into existing adjacent land drainage systems. This approach is standard design practice provided that an analysis has been carried out to show that there is no increase in the peak flow rate. The adjacent systems include the Parker Retention Pond, Somerset Avenue, Riviera Crescent, Lot 16 Drain, D'Arcy Drive and the University of Manitoba Southwood Lands. As part of the Cockburn and Calrossie Combined Sewer Relief Works, the current design concept for separation involves the construction of the Parker Retention Pond. The design and construction of the Parker Retention Pond is being carried out by the City of Winnipeg Water and Waste Department and is not part of Stage 2 of the Southwest Transitway project. The recommended alignment and drainage design for the Project takes this pond into consideration, but the Parker Retention Pond is not part of the Project.

¹ *Project Co represents the joint-venture that will be created by financiers, engineering, construction and maintenance partners to undertake the project following a Design-Build-Finance-Maintain Public Private Partnership structure*

Figure 7-1: Land Drainage Design Concepts



The Parker Retention Pond has been included in the list of adjacent systems as drainage along Parker Avenue will be routed east toward the pond via ditches. It is also proposed that runoff at the Transitway Underpass of CN Wye tracks be pumped into the Parker Retention Pond.

The conceptual design for the Parker Retention Pond includes incorporation of natural features and native plants, such as those used by Native Plant Solutions (a division of Ducks Unlimited Canada), a group currently developing methods and plans for the construction of stormwater ponds that incorporate upland, wet meadow, and wetland plants and features for constructed ponds (Ross 2013). The pond will provide water retention to address current inadequacies in the existing sewer systems, prevention of overland flooding in the area, and replace the function of the wet meadow and cattails stands as wet areas and habitat for the existing vegetation and wildlife in the PSA that require these seasonally wet conditions.

Models of the adjacent systems were created using the software InfoWorks CS to assess the existing hydraulic conditions and determine the impact of additional flows. Transitway flows into the adjacent systems were restricted via a small pipe inlet (250 mm diameter) to maintain the existing peak discharge. Because of the flow restriction, the new LDS and ditches for the transitway were upsized to provide the necessary storage capacity to handle a 100-year MacLaren rainfall. The results of the hydraulic assessment show that there is no effect on the peak flow rate in the adjacent systems.

With the exception of a few sections near stations (400 to 600 mm diameter LDS), ditching is proposed along the transitway between Parker Avenue and Chevrier Boulevard. The ditch configuration consists of 6H:1V side slopes and a bottom width of 1.5 metres, with depths ranging from 0.80 to 1.05 metres. Drainage near the proposed Letellier Tunnel is restricted because of numerous conflicts and consists of LDS (ranging from 375 to 1050 mm diameter). South of Bishop Grandin Boulevard to Markham Road, a new LDS system is also proposed with diameters ranging from 750 mm near the IGF Station to 900 mm along the Transitway North-South segment and 1050 mm downstream.

The ditch drainage design is based on a 5-year MacLaren storm based on City of Winnipeg design standards. The design standard for underpasses is more stringent as water accumulation could render the underpass impassable. For this reason, the drainage design for the underpasses was based on a target 50-year MacLaren rainfall total capacity, which is a higher level of service than for the design used for the pumping station for the Stage 1 transitway tunnel. Two pumping stations are included as part of the land drainage concept at the Transitway Underpass of CN Wye and the Letellier Tunnel.

7.14 Termination of Parker Avenue/Extension of Beaumont Street

As this transitway alignment requires the termination of Parker Avenue at Hurst Way and the transitway, an extension of Georgina Street from Parker Avenue to Hurst Way is planned as a replacement road to accommodate travel between the residential areas west of Pembina Highway and the Sterling Lyon/Linden Woods area.

7.15 Utilities

The following utility work will need to be undertaken to accommodate the Project:

- **Manitoba Hydro Transmission, Distribution, and Communication Lines** – The Project requires removal/relocation of hydro infrastructure (including transmission, communication, and distribution lines) along the transitway alignment. Extensive consultation with Manitoba Hydro was undertaken to develop a plan of hydro-related work that accommodates the Project and the safety, maintenance, and long range planning needs of Manitoba Hydro. To accommodate the start of project construction in 2016, Manitoba Hydro has committed to the removal and/or relocation of the lines prior to December 31, 2015. As a result, the City will arrange for this work prior to executing its contract with Project Co. The removal/relocation works, including all design, construction, and construction management, will be undertaken by Manitoba Hydro at its cost. However, incremental costs for these works that would not otherwise be incurred in the absence of the transitway project have been included in the Project’s cost estimates. These incremental costs are related to:
 - The use of tubular towers, rather than lattice towers, for the new transmission lines. Although more expensive and accommodating shorter line spans than lattice towers, the smaller footprint of the tubular towers is required to fit the relocated lines within the reconfigured RoW.
 - An increase in tower heights for certain lines in certain locations to ensure sufficient clearance of transitway lighting standards, stations, parking lots, and the transitway overpass of McGillivray Boulevard.
 - Other requirements to meet safety regulations and to accommodate construction of the hydro works in the vicinity of the City of Winnipeg aqueduct and water mains located within the hydro RoW.

On the west side of the CN Letellier RoW between Bishop Grandin Boulevard and the southern project limit, an overhead distribution line will be required to be relocated underground to accommodate a planned noise attenuation wall. Throughout the transitway alignment, there are locations where the project will cross Manitoba Hydro communication cables. One overhead communication line will be relocated. Some underground communication cables will be required to be lowered to accommodate project construction. In addition, there are overhead distribution lines and customer service feeds that cross the transitway alignment. These structures will need to also be redistributed, buried, or reassigned to existing infrastructure to maintain service to hydro customers. In summary, the required Manitoba Hydro work will be carried out under two distinct work areas:

- Work to be carried out by Manitoba Hydro forces prior to the 2016 construction period to ensure that the existing transmission, distribution, and communication lines that impact the construction of the Transitway will be relocated prior to construction. The City of Winnipeg will arrange for this work to be carried out by Manitoba Hydro prior to executing its contract with Project Co.
- Work to be carried out by the Project Co. that will be undertaken throughout the construction period that will not negatively impact the Project Co. schedule and construction procedures.

- **Street Lighting** – New street lighting and cabling is required throughout the entire length of the transit corridor, in all adjacent parking lots, and along new transitway connections to the street system. In addition, existing street lighting where the transitway intersects the street system will be reconfigured.
- **Natural Gas Distribution** – The transitway alignment crosses three existing natural gas distribution lines: a 200 mm line along Chevrier Boulevard, a 50 mm line along Chancellor Drive, and a 50 mm line along Markham Road. These lines will be required to be lowered where the transitway crosses them.
- **Manitoba Telecom Services Communication Lines** – Existing lines cross the transitway alignment at Seel Avenue, Chevrier Boulevard, Manahan Avenue, Chancellor Drive, and Markham Road. Some lines that are underground will be required to be lowered where they cross the transitway. In some instances, it may be possible to relocate some of these lines on overhead pole lines shared with Manitoba Hydro. While some underground lines are at a depth that will not be affected by project construction, adjustments to their underground cabinets and manholes will be required. The project includes two new pump stations to service the underpasses. These facilities require MTS connections for telephone service.
- **Other Communications Companies’ Lines** – For lines owned by Shaw, Telus, and TeraSpan, there are some underground and overhead lines that will require relocation. Some are shallowly buried along streets that cross the transitway and will be required to be lowered. Other lines that are currently located on Manitoba Hydro poles that will be relocated will need to be re-routed. The Pembina Trails School Division has an existing underground fibre optic line that crosses the transitway alignment at Seel Avenue. This line will be required to be lowered.

7.16 Services Required of City of Winnipeg Departments

The Project will require the following services from the City of Winnipeg:

- The Traffic Services Branch of the Public Works Department will be required to provide permanent roadway signage on the transitway, at transitway connections with streets, at bus access/egress locations on the transitway, and for closures/realignments of existing streets. During construction, directional and wayfinding signage will be required for temporary traffic detours.
- The Traffic Signals Branch of the Public Works Department will be required to upgrade existing traffic signals at the intersection of Markham Road and Pembina Highway, and to design and install new traffic signals at transitway intersections with the following streets: Georgina Street, Clarence Avenue, Chevrier Boulevard, Chancellor Drive, Markham Road, Southpark Drive at Pembina Highway, Markham Road on the University of Manitoba lands, and University Crescent.
- The Forestry Branch and Naturalist Services Branch of the Public Works Department will be required to assess trees and other vegetation removed from the Project limits and to inspect newly installed trees, landscaping and plantings, in keeping with the City’s Natural Area Appraisal and Tree Removal Guidelines.

- The Transit Department will be required to arrange for any special operational signage on the transitway and for the integration of the transitway’s electronic variable message signs and Closed Circuit Televisions (CCTV) infrastructure with existing systems.
- The Geomatics Branch of the Planning, Property and Development Department will be required to install monuments and property pins at various locations within the Project limits.

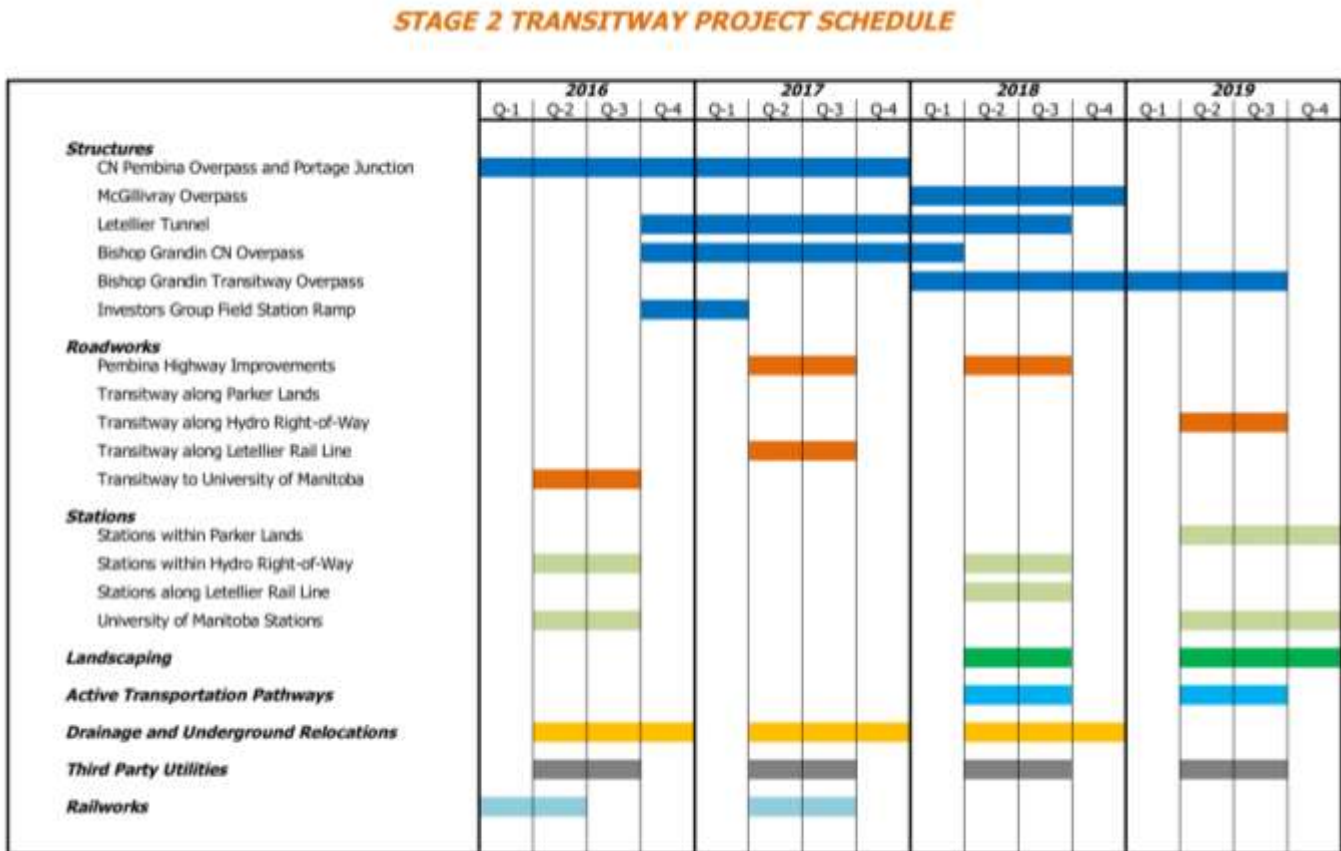
7.17 Landscaping

Landscape treatment will be a unifying element of the Southwest Transitway and will be used to enhance the aesthetic quality of the transitway, while improving micro-climate conditions such as environmental relief from the effect of sun and wind. The use of low maintenance, hardy, xeriscape plant material will ensure the highest level of survivability with the lowest level of supplementary watering, pruning and weeding. The selection of plant material will complement station design, have seasonal variation and provide functional characteristics for shade, security, winter protection and colour. Plant species native to the area will be used where possible. The City of Winnipeg Naturalist Services Branch will consult with Native Plant Solutions to determine appropriate plant species for the Project landscaping requirements, including the Parker Retention Pond.

8 PROJECT SCHEDULE

Based on the required Project components described above, a construction schedule for the Project was developed to take place over the 2016 to 2019 time period. This schedule considers the requirements of the City, Winnipeg Transit, Manitoba Hydro, CN, and the University of Manitoba. The construction schedule for the Project components is shown in Figure 8-1.

Figure 8-1: Proposed Project Construction Schedule



9 PROJECT CONSTRUCTION ACTIVITIES

The Project construction activities will include construction of the following components:

- Structures, which will include the CN Pembina Overpass and Portage Junction, McGillivray Overpass, Letellier Tunnel, Bishop Grandin CN Overpass, Bishop Grandin Transitway Overpass and Investors Group Field Station Ramp;
- Roadworks, which will include the Pembina Highway Improvements, the Transitway along the Parker Lands, Manitoba Hydro RoW, Letellier Rail Line and to the University of Manitoba, and the termination of Parker Avenue and extension of Georgina Drive to Hurst Way;
- Stations within the Parker Lands, Hydro RoW, Letellier Rail Line and at the University of Manitoba;
- Landscaping;
- Active Transportation Pathways;
- Drainage and Underground Relocations;
- Third Party Utilities; and
- Railworks.

The construction activities will be carried out in accordance with current Best Management Practices (BMPs), regulations, specifications and standards for the transportation and rail industries. Equipment and methods to be employed will be typical of other urban transportation and rail projects previously undertaken in the City, e.g. use of heavy construction equipment such as asphalt pavers, backhoes, bulldozers, cement trucks, concrete mixers, cranes, drills, dump trucks, excavators, graders, heavy and light trucks, pavers, pile drivers, scrapers, packers, and assorted hand tools. The construction of the transitway and associated structures and works will require large amounts of gravel, sand and fill, as well as asphalt, cement, geotextiles and other building materials. Landscaping and the construction of the AT pathways and ditches will also require the use of native soils and plants to establish stable vegetated areas that are functional, low maintenance and aesthetically pleasing. A number of staging areas, shooflies, construction access points and traffic management plans will also be required for the Project construction activities. Additional information on the construction activities, equipment, methods and approach will be developed for the Detailed Design phase of the Project.

10 PROJECT OPERATIONS AND MAINTENANCE ACTIVITIES

The Project will enter the operations and maintenance (O&M) phase on completion of the construction activities. As this project is expected to be undertaken as a P3 Project, the project will require that the Project Co. (referred to as Contractor through the remainder of the document) carry out all maintenance of the facility for a 30 year time frame. After this time frame the City will take on the facility and the maintenance. The following information provides a brief description of activities during the Project O&M phase.

10.1 Structures

O&M of the structures associated with the Southwest Transitway will be carried out by the Contractor selected by the City of Winnipeg. O&M activities will be consistent with the activities undertaken for similar City of Winnipeg structures, e.g., free of debris, snow or ice and safe for travel expansion joint repair, curb replacement etc..

10.2 Transitway

Once in operation, scheduled transit service will operate on the transitway 24 hours a day. During peak periods (between 7:00 a.m. and 9:00 a.m. and 3:30 p.m. and 5:30 p.m.), 30 buses per hour will operate on the transitway in each direction (for a total of approximately 60 buses per hour). During off-peak periods, an average of 15 buses per hour per direction (a total of 30 buses per hour) will operate on the transitway. One to two buses per hour will use the transitway between 1:00 am and 5:00 am.

Buses utilizing the transitway will consist of a mix of current City of Winnipeg buses and new Rapid Transit articulated vehicles – modern, state-of-the-art rubber-tired vehicles that provide high-level comfort and passenger amenities. Emergency vehicles will also have access to the transitway, when required. Buses will travel along the transitway at speeds of up to 80 kilometres per hour. Entering and exiting stations, bus speeds will be restricted to between 35 and 50 kilometres per hour.

Runningway maintenance activities throughout the transitway corridor will be consistent with those undertaken for all City of Winnipeg streets. Maintenance work will consist of joint and curb repairs, joint sealing, diamond grinding etc. During the winter months, snow clearing will take place on a regular basis and snow will be hauled to registered snow dump areas.

10.3 Stations

Stations along the transitway will operate during the same hours as the transitway. The buses traveling the transitway will stop at each of the proposed stations. Ongoing maintenance at the stations will be consistent with the maintenance activities currently in place for Winnipeg Transit stations.

10.4 Park and Ride

The new Park and Ride stations along the transitway will operate during the same hours as the City's existing Park and Ride stations and bus operations. The buses traveling the transitway will stop at all stations that have Park and Ride facilities. Ongoing maintenance at the Park and Ride stations will be consistent with the maintenance activities currently in place for Winnipeg Transit Park and Ride stations.

10.5 Active Transportation Pathways

The new AT pathways will be operated and maintained in the same manner as the existing City of Winnipeg AT pathways, i.e., open for multiple uses (cycling, rollerblading, walking) with the trails kept free of debris and safe for the intended uses.

10.6 Railworks

The railworks located within CN property will be operated and maintained by CN. Any areas, facilities or structures associated with the railworks that are located within City of Winnipeg property will be operated and maintained by the Contractor selected by City. Ongoing maintenance will be consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries.

10.7 Land Drainage System

The City of Winnipeg Water and Waste Department will be responsible for maintaining Parker Retention Pond, while the Contractor will be responsible for maintaining the ditches, LDS, pumping stations for the first 30 years. Consistent with current department practices, regular inspections of the facilities will be conducted to ensure that they are functioning as designed. The City of Winnipeg Water and Waste Department currently has a person assigned for the O&M of retention basins to conduct annual to semi-annual maintenance including the removal of rubbish, rodents, etc.

10.8 Landscaping

The Contractor selected by the City will be responsible for maintaining the landscaped areas alongside the Transit Corridor, while the will be responsible for maintaining the landscape areas at the Parker Retention Pond. Maintenance activities will include planting, mowing, mulching, pruning, watering and weeding, as well as regular inspections to ensure that the vegetation is healthy, functioning as designed and aesthetically pleasing.

11 PROJECT DECOMMISSIONING

The transitway and associated infrastructure have been designed as permanent features in the City of Winnipeg and decommissioning is not anticipated. However, should the City of Winnipeg decide at some point in the future to decommission the transitway, decommissioning will be done in a manner consistent with up-to-date construction/demolition and environmental standards.

12 PROJECT ALTERNATIVES

12.1 Alternative Modes

The Rapid Transit Task Force’s “Made in Winnipeg” report evaluates the options of Bus Rapid Transit (BRT) and Light Rail Transit (LRT). The study involved a review of twenty LRT systems in the United States and three in Canada, as well as over thirty-five BRT systems in Canada, the United States, South America, Australia and England. The studies focused on the structures, capital and operating costs, passenger capacities, and key features of the systems various implemented in the focus jurisdictions, and relates these factors to the implementation of a BRT system or to various alternative LRT systems (traditional LRT, electric LRT, and diesel). In addition, the study compared BRT and LRT systems with respect to functional requirements, design features, schedule adherence, and the ability for existing infrastructure to be used to support rapid transit development. The study also involved consultation with technical experts and the general public.

The report’s evaluation reveals the following²:

- Both BRT and LRT can fulfill the functional requirements of a rapid transit system providing high capacity, high performance, urban transit routes and services.
- BRT and LRT share the same key features including runningways, transit priority measures, real-time passenger information systems, centralized stations with passenger amenities, brand identify, presence and sense of permanence.
- The key features of a rapid transit system have a greater effect on system performance (speed, frequency, reliability) than the choice of vehicle (bus or train).
- Rapid transit systems with more exclusive runningways (separated from other vehicles) have the most reliability and schedule adherence.
- BRT systems with exclusive roadways operate at travel times comparable to LRT.
- The differences between LRT and BRT are primarily public perception and cost.
- BRT has lower capital costs, lower operating costs for passenger demands predicted for Winnipeg and lower equivalent annualized costs (annualized capital costs combined with annual operations and maintenance costs) than LRT.

² "Made in Winnipeg: Rapid Transit Solution." Rapid Transit Task Force, Sept. 2005. Web. 3 Dec. 2013.

For the Southwest Transit Corridor in particular, the complexity created by the proximity of major utilities (CN mainline and branch lines, Manitoba Hydro transmission lines and sub-stations, aqueduct, major water and sewer mains, intersecting arterial roadways) and the pattern of available capital funding require that the corridor be constructed in stages. The BRT approach (where transit vehicles can operate both on the transitway and on regular streets) enables each stage to be put into service immediately after construction. In comparison, LRT requires the complete line to be constructed before any service can be operated and any benefits realized. The BRT approach permits an earlier return on rapid transit investment than would otherwise be possible for the Southwest Corridor.

12.2 Alternative Routing

The following four options for the routing of Stage 2 of the Southwest Transitway were identified and assessed in the Southwest Rapid Transit Corridor Stage 2 Alignment Study (Dillon 2013a):

- Concept 1A – Parker/Manitoba Hydro Lands Paralleling CN West Rail Line;
- Concept 1B – Parker/Manitoba Hydro Lands Paralleling Parker Avenue;
- Concept 2 – CN Letellier Subdivision; and,
- Concept 3 – Pembina Highway Center Median.

Concept 1A extends from Stage 1 of the Southwest Rapid Transit Corridor from Jubilee Avenue over Pembina Highway on a structure just north of the Jubilee Avenue Overpass. West of Pembina Highway, the transitway alignment passes under two CN rail tracks (Letellier Subdivision and switching track), at which point Concept 1A continues west alongside CN’s main line. At the westerly end of the Parker Lands, the alignment turns in a southeasterly direction, crosses Parker Avenue, and then is located within the Manitoba Hydro RoW until it intersects the CN Letellier rail line just north of Bishop Grandin Boulevard. This alignment provides an opportunity to use a pedestrian connection under or over the existing CN rail line to link with the developable Shindico lands on the north side of the tracks, one of the 11 Major Redevelopment Sites designated in “Our Winnipeg” (City of Winnipeg 2011a) and “Complete Communities” (City of Winnipeg 2011b). However, this alignment would significantly impact the current developable GEM Equities Inc. lands north of Parker Avenue, also a Major Redevelopment Site.

Concept 1B extends from Stage 1 of the Southwest Rapid Transit Corridor from Jubilee Avenue over Pembina Highway on a structure just north of the Jubilee Avenue Overpass. West of Pembina Highway, the transitway alignment passes under two CN rail tracks (Letellier Subdivision and switching track), at which point Concept 1B continues west paralleling Parker Avenue. At the westerly end of the Parker Lands the alignment turns in a southeasterly direction, crosses the existing Parker Avenue and then is located within the Manitoba Hydro RoW until it intersects the CN Letellier rail line, north of Bishop Grandin Boulevard. The Concept 1A and 1B alignments are identical south of Parker Avenue within the Manitoba Hydro RoW and the CN Letellier Row.

Concept 2 extends Stage 1 of the Southwest Transitway from Jubilee Avenue over Pembina Highway on a structure just north of the Jubilee Avenue Overpass. West of Pembina Highway, the alignment follows the east side of CN’s Letellier sub-division continuing south and crossing Byng Place, Windermere

Avenue, Somerset Avenue, Waterford Avenue, Southwood Avenue, McGillivray Boulevard, Waller Avenue, Clarence Avenue, Chevrier Boulevard, Bishop Grandin Boulevard, Chancellor Drive, Markham Road, terminating at Bison Drive. All street crossings within this section would be at grade and controlled by signalized gates to accommodate both transit and CN train traffic, with the exception of Bishop Grandin Boulevard, which will be a new overpass structure.

Concept 3 extends Stage 1 of the Southwest Transitway from Jubilee Avenue along the center median of Pembina Highway to Bison Drive. This option would require extensive property, dislocate many commercial properties, require extensive reconstruction of Pembina Highway for the entire length south of Jubilee Avenue, create significant safety concerns at all 48 median openings along Pembina Highway, and would be unable to cross Bishop Grandin Boulevard. For these reasons, the Pembina Highway median alignment option was considered to be not viable.

An extensive review and evaluation of Concepts 1A, 1B, 2 and 3 was conducted that considered the engineering, socio-economic and environmental issues; property impacts; Transit Orientated Development (TOD); tax incentives; ridership; active transportation; future build-out opportunities; public feedback; and expected construction costs. Based on the review and evaluation, Concept 1B was selected as the preferred alignment for Stage 2 of the Southwest Transitway. This alignment completes the link between downtown Winnipeg and southwest Winnipeg, and provides for access to/from the U of M, Investors Group Field, and new neighbourhoods. Additional information on the alternative routing options, evaluation process and public consultation program are provided in the “Southwest Rapid Transit Corridor Stage 2 Alignment Study – Final Report” (Dillon 2013a).

13 REGULATORY FRAMEWORK

As noted in Section 1, the Project will be considered as a Class 2 Development under the requirements of the Manitoba Environment Act, and therefore requires submission of an Environmental Impact Statement (EIS) and approval by MCWS to obtain an Environment Act License (EAL) (B. Webb, pers.comm. 2013). Under the Canadian Environmental Assessment Act (CEAA) 2012, the Project does not require review or approval by the Canadian Environmental Assessment Agency. The federal and provincial environmental legislation applicable to the proposed Project at the time of writing included the following:

- Canada
 - Canadian Environmental Protection Act
 - Fisheries Act and Regulations
 - Migratory Birds Convention Act
 - Species at Risk Act
 - Transport Canada
 - Wildlife Act
- Manitoba
 - Climate Change and Emissions Reductions Act
 - Dangerous Goods Handling and Transportation Act
 - Endangered Species Act

- Environment Act
- Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat;
- Noxious Weeds Act and Regulation
- Sustainable Development Act
- Waste Reduction and Prevention Act and Regulations
- Wildlife Act

14 ENVIRONMENTAL ASSESSMENT METHODS

The Project is considered to be a Class 2 Development under the Manitoba Environment Act and therefore requires an Environmental Assessment (EA) of the proposed Project activities to obtain an Environment Act License from the Province of Manitoba.

The methods and analysis used to identify and determine potential environmental effects within the Project area consisted of the following:

- Review of engineering, consultation and environmental information from previous studies;
- Information on land use, topography and location of commercial areas, industrial areas, recreational areas, residential areas, parks, protected areas, watercourses, waterbodies, forests, wetlands, roadways, trails and other infrastructure was determined by a desk-top review and examination of topographic maps, drainage maps, aerial imagery and published information for the area.
- The above-noted features were further examined and ground-truthed by a field survey of the Project study area. The field survey provided on-site observations and documentation of the presence and location of the proposed BRT route; Manitoba Hydro transmission lines and transmission line RoW, CN yards and CN RoW; vegetated areas; mowed or cultivated areas; residences, parking lots, businesses and other infrastructure; potential fish and wildlife habitat; protected areas; roads and other human made structures or land use practices. The field survey was conducted on October 01, 2013, by a two person crew consisting of a qualified botanist and a qualified fisheries and wildlife biologist.
- Provincial (Manitoba Conservation Data Centre [MCDC]) and federal (Committee on the Status of Endangered Wildlife in Canada [COSEWIC], Species At Risk Act [SARA]) databases and registries were reviewed and cross-referenced to species distribution maps, habitat preferences, breeding periods and migration times to determine the potential for the presence of any species listed as endangered, threatened or of special concern within the Project area.
- Review of information provided in the Manitoba Breeding Bird Atlas, Manitoba Herps Atlas, annual publications released by MCDC on MCDC Rare Plant Surveys and Stewardship Activities and recent Environmental Impact Statements (EIS) completed for projects located within the region.
- Review of the City of Winnipeg Naturalist reports for the Project area, including the Parker Lands.
- Contact with the Invasive Species Council of Manitoba (ISCM) to obtain a current list of invasive species for the Project area.
- Review of the City of Winnipeg’s “Ecologically Significant Natural Lands Strategy and Policy” (December 2007) and current City of Winnipeg Tree Removal Guidelines.

- A request was submitted to the MCDC for information on the presence of any rare or endangered species in the Project area.
- A request was submitted to the Manitoba Historic Resources Branch (MHRB) for information on the presence of any heritage resources in the Project area.
- A review of current First Nations Treaty Lands, Reserves, and/or Community Interest Zones in the Project Area.
- A meeting on November 18, 2013, with Manitoba Conservation and Water Stewardship (MCWS) regulatory staff to review the project and determine the requirements for the EIS.
- Review and incorporation of the stakeholder information provided in the Public Consultation program.
- Review of applicable municipal, provincial, and federal environmental regulations, guidelines, and/or policies.
- Potential effects were identified based on knowledge of the Project area, previous experience with similar projects, professional experience in conducting environmental assessments, and knowledge of applicable municipal, provincial, and federal environmental regulations, guidelines, and/or policies.
- Canadian Environmental Assessment Act (CEAA) criteria were used to determine the potential environmental effects, the presence of residual effects once mitigation measures have been considered, if the remaining residual effects will have an environmental consequence, and the need for any follow-up or monitoring activities. Information on the criteria used to assess the residual effects and environmental consequence of the residual effects is provided in Section 20.

15 STUDY AREA

15.1 Project Study Area

The Project Study Area (PSA) is defined as the area that will be physically altered and/or directly affected by the Project construction activities and/or Project O&M (O&M) activities. The Project activities will take place within the existing CN Rail, Manitoba Hydro RoW corridor, and City of Winnipeg-owned land; therefore, the PSA was designated as the area located within the existing CN Rail and Manitoba Hydro RoW where Project activities will occur.

15.2 Local Study Area

A Local Study Area (LSA) is selected to include the spatial area in which direct effects from the Project are anticipated to occur. To examine the potential environmental effects of the Project in the local area, the LSA was designated as the lands, watercourses/waterbodies, residences, businesses, facilities and infrastructure located within 0.5 kilometres (km) of either side of the existing CN Rail and Manitoba Hydro RoW.

15.3 Regional Study Area

A Regional Study Area (RSA) is selected to include the spatial area in which direct and indirect effects from the Project are anticipated to occur. To examine the potential environmental effects of the Project in the region, the RSA was designated as the City of Winnipeg. This area was selected to:

- Encompass wildlife movements and activities in the area, including Species At Risk;
- Include any affected watercourses, waterbodies or wetlands that extend outside of the PSA and LSA;
- Examine potential effects on land use, recreation, development and/or other stakeholder interests in the region.

16 EXISTING ENVIRONMENT

16.1 Overview of Project Area

The Project is located within the City of Winnipeg between the Pembina Highway and Jubilee Avenue overpass and Bison Road (Figure 1-1; Figure 6-1; Appendix A). The majority of the PSA is contained within the CN RoW and/or Manitoba Hydro RoW. These RoW areas are routinely mowed and maintained as per CN and Manitoba Hydro operational and safety standards.

The PSA consists of vacant land south of the CN tracks near the Pembina Highway and Jubilee Avenue junction bounded to the south by Parker Avenue (known as the Parker Lands) and the Manitoba Hydro transmission line RoW leading south from the western edge of this property to Bison Drive. The proposed route follows the Manitoba Hydro transmission line RoW to a point south of Clarence Avenue, where it then joins the CN RoW and travels south to Bison Drive.

The Parker Lands include a City of Winnipeg off-leash dog park, paths used for walking and cycling, and plots for gardening. During the field survey, dumping of refuse was evident as well as dumping of garden waste. Some non-native “garden escapes” such as ground-ivy (*Glechoma hederacea*), Tartarian honeysuckle (*Lonicera tatarica*) and wild asparagus (*Asparagus officinalis*) have colonized some of the patches of woodlands. The corridor for the CN rail and RoW has trails used for walking and cycling, garden plots, and provides east/west access across the railroad tracks. More dumping of household items was evident in this section of the PSA.

16.2 Field Survey

The entire PSA was surveyed on foot. Information on the habitat conditions, disturbed areas and species present was recorded on field data sheets and photographed using the camera option on an Oregon 550 hand-held GPS and/or a Garmin Map 60CSx hand-held GPS. The start and end point of each surveyed area and any other areas of interest (e.g., plant species location) were marked as a waypoint on the GPS.

Additional time was spent surveying the Parker Lands area, which is vacant land south of the CN railroad tracks near the Pembina Junction, bounded to the south by Parker Avenue. This land is a focal point for a local community group that is concerned the Project will affect a wetland area that provides habitat for

Northern leopard frog (*Lithobates pipiens*), a species of Special Concern under the federal SARA, and also affect areas of deciduous forest, wet meadow and grassland that occurs in the Parker Lands. Special attention was paid to surveying the Parker Lands and the search for species of conservation concern.

The field survey was conducted on October 01, 2013; therefore, the majority of migratory wildlife species would have already left the area; the wet meadow and/or wetland areas were dry; and plants that grow and flower in spring or early summer were not present or were in senescence. However, the timing of the survey provided a good indication of the size and permanence of the wet areas, the plant species within and adjacent to the wet areas, and aided in the classification of these areas as potential Northern leopard frog habitat. A late spring survey would be required to provide a better understanding of the amount and duration of water present in the stand and its wetland classification, as well as additional information on the presence/absence of spring blooming plants and wildlife in the area, e.g., Northern leopard frog, migratory birds.

16.3 Biophysical Environment

16.3.1 Climate

Climate can be defined as the generally prevailing weather conditions of a region throughout the year, and is typically described by variables such as air pressure, cloud cover, humidity, precipitation, hours of sunshine, temperature, wind speed and wind direction. The PSA is located in the prairie region of Canada. Climate within the prairies ranges from semiarid to humid continental and is typified by long, cold winters and short, warm summers with little precipitation. The region experiences variable winds, an abundance of sunshine, and occurrences of severe weather incidences in all seasons.

Environment Canada has collected climate data for several areas within Canada, from which 30-year climate normals and averages can be calculated for particular locations. The most recent 30-year climate normals provided by Environment Canada are for the period of 1971 to 2000. The Environment Canada weather reporting station considered to be closest to the PSA is located at Winnipeg Richardson International Airport. This station is located at 49°55' N and 97°14' W at an elevation of 238.7 m above sea level. Table 16-1 summarizes the Canadian climate normals data from 1971 to 2000 for Winnipeg Richardson International Airport (Environment Canada 2013a).

Table 16-1: Climate Normals Summary for Winnipeg, Manitoba (1971-2000)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature													
Daily Average (°C)	-17.8	-13.6	-6.1	4	12	17	19.5	18.5	12.3	5.3	-5.3	-14.4	2.6
Daily Maximum (°C)	-12.7	-8.5	-1.1	10.3	19.2	23.3	25.8	25	18.6	10.8	-0.9	-9.7	8.3
Daily Minimum (°C)	-22.8	-18.7	-11	-2.4	4.8	10.7	13.3	11.9	6	-0.3	-9.6	-19.1	-3.1
Precipitation													
Rainfall (mm)	0.2	2.5	7.5	21.5	58	89.5	70.6	75.1	51.9	31	6.1	1.6	415.6
Snowfall (cm)	23.1	14.2	15.8	10.1	0.8	0	0	0	0.4	5	21.4	19.8	110.6
Total (mm)	19.7	14.9	21.5	31.9	58.8	89.5	70.6	75.1	52.3	36	25	18.5	513.7
Wind													
Windspeed (km/h)	17.1	16.7	17.7	18.4	17.9	16.4	14.6	14.9	17.1	18	17.4	17.1	16.9
Most Frequent Direction	S	S	S	S	S	S	S	S	S	S	S	S	S

Source: Environment Canada's National Climate Archive (Environment Canada 2013a).

The annual mean daily temperature in Winnipeg for the period of 1971-2000 was 2.6°C. The mean daily temperatures in January and July were -17.8°C and 19.5°C, respectively. The mean annual total precipitation during this period was 513.7 mm, the majority of which fell as rain. The average annual wind speed was 16.9 km/h and most frequently blew from the south (Environment Canada 2013a).

16.3.2 Air Quality and Greenhouse Gas Emissions

Air quality and greenhouse gas (GHG) emissions within the PSA are affected by the commercial, industrial, recreational, transportation and urban activities that occur in the region. The Province of Manitoba and Environment Canada operate air quality monitoring stations in the cities of Brandon, Flin Flon, Thompson, and Winnipeg, Manitoba. The air quality monitoring stations closest to the Project area are located in the City of Winnipeg at 65 Ellen Street and at 299 Scotia Street. Air quality parameters that are monitored include: carbon monoxide (CO), particulate matter ≤ 10 microns (PM10t), particulate matter ≤ 2.5 microns (PM2.5), nitric oxide (NO), nitrogen dioxide (NO2), nitrogen oxides (NOx), ground level ozone (O₃), sulphur dioxide (SO₂), wind direction, and wind speed (Government of Manitoba 2013a). Recent and historical data for the measured parameters can be obtained online at the Government of Manitoba air quality website.

Guidelines for ambient air quality have been compiled for many parameters in the Manitoba Air Quality Criteria (July 2005) (Government of Manitoba 2013b). These guidelines come primarily from the Canadian Council of Ministers of the Environment's (CCME) (1999) national ambient air quality objectives. For this assessment, these guidelines were supplemented with criteria from CCME's (2000) standards for particulate matter and ozone and Ontario Ministry of Environment's (2012) objectives for PM₁₀.

Data from the downtown station at Ellen Street, which is the monitoring station closest to the Project Area, are provided in Table 15-2. The only parameter that regularly exceeded guideline levels was ground level ozone (O₃), a product primarily of vehicle emissions.

Table 16-2: Ambient Air Quality Data - Continuous Monitoring: Downtown Monitoring Station (65 Ellen Street) from 2007 to 2012

Pollutant (unit)	Year	Annual Mean ¹	Maximum Data Value ¹		# Samples Above MDL ^{1,2}		# Samples Above MAL ^{1,3}		# Samples Above MTL ^{1,4}	
			1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (CO) (ppm)	Guideline ⁵				15 ppm	--	35 ppm	--	--	--
	2007	0.4	3.7	1	0	--	0	--	--	--
	2008	0.4	2.3	1	0	--	0	--	--	--
	2009	0.4	5.8	1.1	0	--	0	--	--	--
	2010	0.2	2.3	0.6	0	--	0	--	--	--
	2011	0.1	1.5	0.4	0	--	0	--	--	--
	2012	0.2	1.6	0.5	0	--	0	--	--	--
Nitrogen Dioxide (NO ₂) (ppb)	Guideline ⁵				--	--	400 ppm	200 ppm	1000 ppm	--
	2007	--	--	--	--	--	--	--	--	--
	2008	11.6	91	31	--	--	0	0	0	--
	2009	11.6	88	37.8	--	--	0	0	0	--
	2010	9.2	77	30.7	--	--	0	0	0	--
	2011	11.5	70	36.8	--	--	0	0	0	--
	2012	9.9	49.7	28.9	--	--	0	0	0	--
Nitric Oxide (NO) (ppb)	Guideline				--	--	--	--	--	--
	2007	7.4	446	50.2	--	--	--	--	--	--
	2008	7.1	151	38.6	--	--	--	--	--	--
	2009	7.3	281	69.6	--	--	--	--	--	--
	2010	4.6	191	39.6	--	--	--	--	--	--
	2011	5.3	175.7	40.4	--	--	--	--	--	--
	2012	5	226.8	59.9	--	--	--	--	--	--
Nitrogen Oxides (NO _x) (ppb)	Guideline				--	--	--	--	--	--
	2007	--	--	--	--	--	--	--	--	--
	2008	18.6	209	68.8	--	--	--	--	--	--
	2009	17.8	353	89.5	--	--	--	--	--	--
	2010	14.6	217	66.5	--	--	--	--	--	--
	2011	17	239.4	77.3	--	--	--	--	--	--
	2012	15	262.1	85.3	--	--	--	--	--	--
Sulphur Dioxide (SO ₂) (ppb)	Guideline				450 ppm	150 ppm	900 ppm	300 ppm	--	800 ppm
	2007	--	--	--	--	--	--	--	--	--
	2008	0	35	3	0	0	0	0	--	0
	2009	0	14	2	0	0	0	0	--	0
	2010	0	13	3	0	0	0	0	--	0
	2011	0	11	2	0	0	0	0	--	0
	2012	0	17	1	0	0	0	0	--	0

Pollutant (unit)	Year	Annual Mean ¹	Maximum Data Value ¹		# Samples Above MDL ^{1,2}		# Samples Above MAL ^{1,3}		# Samples Above MTL ^{1,4}	
			1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Ground Level Ozone (O ₃) (ppb)	Guideline ⁵				100 ppb	30 ppb	160 ppb	50 ppb	400 ppb	--
	2007	20.7	62	40.6	0	2	0	0	0	--
	2008	20.7	56	41	0	54	0	0	0	--
	2009	19.1	56	40.4	0	41	0	0	0	--
	2010	23.3	72	52.6	0	70	0	2	0	--
	2011	23.6	64.3	45.4	0	73	0	0	0	--
	2012	23.4	65.3	44	0	77	0	0	0	--
PM ₁₀ (inhalable particulate) (µg/m ³)	Guideline ⁶⁽⁵⁾				--	--	--	50 (25) ⁷	--	--
	2007	13	154.3	61.9	--	--	--	2 (30)	--	--
	2008	10.8	208.4	73.7	--	--	--	1 (13)	--	--
	2009	9.3	85.4	29.6	--	--	--	0 (3)	--	--
	2010	7.7	64.3	41.3	--	--	--	0 (2)	--	--
	2011	6.5	80.2	23.8	--	--	--	0 (0)	--	--
	2012	5.5	142.5	41.4	--	--	--	0 (2)	--	--
PM _{2.5} (inhalable particulate) (µg/m ³)	Guideline ⁸⁽⁵⁾				--	--	--	30 (15) ⁷	--	--
	2007	--	--	--	--	--	--	--	--	--
	2008	4.4	46.8	21.6	--	--	--	0 (5)	--	--
	2009	--	--	--	--	--	--	--	--	--
	2010	--	---	--	--	--	--	--	--	--
	2011	5.2	84.8	30.2	--	--	--	1 (5)	--	--
	2012	6.5	535.4	50.1	--	--	--	2 (16)	--	--

Source: Data from Government of Manitoba 2013a

1. Indicates that there are no data and/or no guidelines or objectives for this parameter
2. MDL is Maximum Desirable Level. This level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for the pristine areas of Manitoba and for the continuing development of control technology.
3. MAL is the Maximum Acceptable Level. This level is deemed essential to provide adequate protection for soils, water, vegetation, materials, animals, visibility, personal comfort, and well-being.
4. MTL is Maximum Tolerable Level. This level denotes a time-based concentration of air contaminant beyond which, due to a diminishing margin of safety, appropriate action is required to protect the health of the general population.
5. CO, NO₂, and O₃ guidelines, along with PM₁₀ and PM_{2.5} reference levels, are from CCME 1999 and 2000.
6. PM₁₀ MAL from Ontario Ministry of Environment 2012.
7. MAL (Reference Level). Reference level is defined by CCME (1999) as the level above which there are demonstrated effects on human health or the environment.
8. PM_{2.5} MAL from CCME 2000.

Environment Canada has also developed the “Air Quality Health Index” (AQHI), an index that is based on the relative risk to human health that can be caused by a combination of common air pollutants (Environment Canada 2013b). These pollutants include ground-level ozone (O₃), particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂). The AQHI is measured on a colour-coded scale from 1 to 10+ and the values are also grouped into risk categories (low, moderate, high, very high) to identify the level of risk. The higher the number, the greater the health risk associated with local air quality (Environment Canada 2013b). The Province of Manitoba states that “recent monitoring has shown that the health risks associated with air quality for the cities of Brandon and Winnipeg are generally low, with an average AQHI rating of around three or lower in both locations” (Government of Manitoba 2013c).

Environment Canada currently tracks six GHG substances as part of Canada’s efforts to identify, quantify and reduce sources of GHGs. The six substances are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs) (Environment Canada 2013c). Environment Canada produces an annual “National Inventory Report on Greenhouse Gas Sources and Sinks in Canada” for submission to the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations 2013). The report includes a summary of GHG emissions for each province. Table 16-3 provides a summary of Manitoba’s GHG emissions from 1990 to 2011, which is from the most recent National Inventory Report.

Table 16-3: Summary of Manitoba’s GHG Emissions from 1990 to 2011

Year	1990	2000	2005	2007	2008	2009	2010	2011
CO ₂ Equivalent	18,300	21,000	20,500	21,300	21,200	19,800	19,700	19,500

Source: United Nations 2013.

Of the provinces and territories, Manitoba had the 7th highest GHG emissions in Canada in 1990, 2009, 2010, and 2011. Additional information on the relative amounts of each tracked substance for different GHG categories (i.e., energy, industrial processes, solvent and other product use, agriculture and waste) can be found in the annual National Inventory Reports.

It is expected that the existing air quality and GHG emissions within the PSA are affected by the following local activities:

- Vehicle exhaust and road dust from traffic on the paved and dirt roads and trails within and adjacent to the PSA;
- Emissions from CN rail traffic within and adjacent to the PSA;
- Emissions from residential, commercial and industrial activities and equipment use within and adjacent to the PSA, including vehicle and air traffic;
- Emissions from commercial and industrial wastes, wastewater plants and lagoons within and adjacent to the PSA; and
- Generation and transportation of airborne pollutants from the surrounding commercial, industrial, recreational and urban activities in the LSA and RSA, i.e., the City of Winnipeg.

16.3.3 Noise and Vibration

Existing noise and vibration levels in the PSA are expected to be typical of an urban area located within an active freight rail mainline, residential areas and the presence of commercial, industrial, recreational and transportation activities. The east side of the PSA consists of residential areas and areas located behind the parking lots, businesses and shopping areas located along Pembina Highway and other roadways. The west side of the PSA between Hurst Way and Bishop Grandin Boulevard consists of commercial and industrial businesses and facilities, as well as the Wilkes Reservoir and Hurst Pumping Station.

It is expected that the majority of existing noise and vibration in the PSA and LSA are due to CN rail traffic, vehicle traffic, air traffic and industrial activities. Sources of noise and vibration identified for the PSA, LSA and RSA include:

- Rail traffic on the CN line;
- Light, medium and heavy vehicle traffic on Hurst Way, the Pembina Highway and Jubilee Avenue overpass, McGillivray Avenue, Clarence Avenue, Chevrier Boulevard, Bishop Grandin Boulevard Chancellor Drive, Markham Road, and other roads within and surrounding the PSA;
- Commercial and industrial activities;
- CN rail, Manitoba Hydro transmission line and RoW operation and maintenance activities;
- City of Winnipeg road O&M activities, including collection of garbage and recycling, snow clearing, construction, and road repairs;
- Air traffic; and
- Human activities in urban and recreational areas.

Common noise levels and typical human reactions are summarized in Table 16.4. As shown in Table 16.4, average background noise levels from road and rail traffic in the PSA likely range from about 60 to 70 dBA, although actual noise levels would be dependent on the volume of traffic, speed of the traffic and distance from the road or railway. The areas surrounding the PSA consist of both residential and light industrial uses and typical noise levels in the PSA from these sources likely range from about 50 to 55 dBA. Road construction equipment noise ranges between about 76 dB and 89 dB at 15 m from the equipment.

Table 16-4: Common Noise Levels and Typical Human Reactions

Source	Decibels (dB)	Effect
Car horn/propeller aircraft/air raid siren	120	Threshold of pain
Amplified rock band	110	Maximum vocal effort
Running train	100	Discomfort
Heavy truck at 15 m/Busy city street	90	Very annoying - Hearing damage (8 hr)
Paver at 15 m	89	-
Jackhammer at 15 m	88	-
Concrete mixer at 15 m	85	-
Bulldozer, Grader or Loader at 15 m	85	-
Pneumatic tool at 15 m	85	-
Generator at 15 m	81	-
Backhoe at 15 m	80	-
Factory floor	80	Annoying
Freight train at 15 meters	80	-
Concrete vibrator at 15 m	76	-
Pump at 15 m	76	-
Passenger car at 65 mph at 8 m	70	Telephone use difficult
Radio or TV-audio, vacuum cleaner	70	-
Normal piano practice	60-70	-
Normal conversation	60	Intrusive
Noisy office	50	Speech interference
Light automobile traffic at 30 m	50	-
Public library	40	Quiet
Soft whisper at 5 m	30	Very quiet
Rustle of leaves	10	Just audible
Threshold of hearing	0	-

Sources: Beranek 1988; Canadian Mortgage and Housing Corporation (CMHC) 1981; City of Los Angeles 1970; Harris, Miller, Miller and Hanson (HMMH) 2014.

D. J. Martin (1977) conducted a study on ground vibrations due to construction noise generated by different types of equipment on different types of soils and surfaces. Martin (1977) classified the construction equipment as follows:

- Tracked plant, such as dozers and tractor shovels;
- Rubber-tired plant, such as motorised scrapers and dump trucks; and
- Continuous or intermittent impacting plant, such as pile drivers and vibratory rollers.

The following information is excerpted from Martin's 1977 study. The study found that vibration levels at 10 m from equipment such as an earth moving plant and sheet-piling rig were above the threshold of human perception and could cause disturbance to people. However, the levels were much lower than the levels that could likely cause architectural damage to buildings. The results showed that the major sources of vibration in road construction were the tracked earthmoving plant, compaction plant and intermittent impacting plant. Rubber-tired equipment did not generate ground surface vibration levels

high enough to be detected by human subjects. At distances greater than 10 m, ground attenuation effects may reduce the vibration levels to values below human sensitivity. The measurements obtained in this investigation showed that ground vibration levels are unlikely to be high enough to cause any disturbance to people situated at distances greater than 20 m from the source of vibration due to attenuation in the soil.

Table 16-5 provides an example of human/structural responses to a variety of vibration sources and levels, including trains, rapid transit and buses.

Table 16-5: Examples Of Human/Structural Responses to Various Vibration Sources and Levels

Human/Structural Response	Vibration Levels (Vdb)	Typical Sources (15 m from source)
Threshold, minor cosmetic damage to sensitive buildings	100	Blasting from construction projects
Difficulty with tasks such as reading a Video Display Terminal (VDT) screen	90 to 95	Bulldozers and other heavy tracked construction equipment
Residential annoyance, infrequent events (e.g., commuter rail)	80 to 90	Locomotive at 80 km/hr
Residential annoyance, frequent events (e.g., rapid transit)	70 to 75	Light rail vehicle at 80 km/hr
Limit for vibration sensitive equipment; approximate threshold for human perception of vibration	60 to 65	Bus or truck, typical
-	50 to 55	Typical background vibration

Source: Harris, Miller, Miller and Hanson (HMMH) 2006; Vdb = vibration velocity in decibels relative to a level of 1×10^{-6} inches per second

The rapid transit buses for the Project will be rubber-tired vehicles that will travel at a speed of about 80 km/hr in the transitway corridor. The information in Table 16-5 provides the expected Vdb from rapid transit using a light rail vehicle and the expected Vdb from a typical bus or truck. Based on the information in Table 16-5, it is expected that vibration levels in the existing CN rail corridor in the PSA may range from 80 to 90 Vdb at 15 m from the rail line, the vibration levels from rapid transit buses may range from 60 to 75 Vdb at 15 m from the BRT line, and vibration levels from construction equipment may range from 90 to 95 Vdb at 15 m from the operating equipment (i.e. immediately within the project area).

16.3.4 Terrain and Soils

The City of Winnipeg is located at the convergence of the Red and Assiniboine rivers in the broad plain of the Red River Valley, in the Winnipeg Ecodistrict of the Lake Manitoba Plain Ecoregion. The area covers the Lake Agassiz clay plain that represents the offshore lake bottom deposits of glacial Lake Agassiz (Matile et al. 1998). Surface topography is relatively flat with elevations rising gently eastward and westward from the Red River. The regional stratigraphy of the Winnipeg area consists of clay and silt overlaying glacial till and resting on carbonate bedrock.

Soils in the Winnipeg Ecodistrict are predominantly imperfectly drained Gleyed Humic Vertisols and Gleyed Vertic black Chernozems, and poorly drained Gleysolic Humic Vertisols and humic Vertisols, which have developed on calcareous, clayey glaciolacustrine sediments (Smith et al. 1998). These sediments range in thickness from more than 60 m near the United States border to less than 1 m locally in the northern part of the basin. Gleyed Rego Black Chernozemic and Gleysolic soils also occur on shallow, extremely to very strongly calcareous, loamy to silty sediments, some of which occur in the form of intersecting bars and spits and were formed during the latter stages of Lake Agassiz (Smith et al. 1998). Soil conditions at the proposed site are expected to be a thin organic layer overlying clay soils.

In January 2014, AECOM completed the geotechnical investigation program for the Project, which consisted of four deep test holes and two intermediate test holes. Drilling of test holes at McGillivray Boulevard and at Bishop Grandin Boulevard was advanced 6 m into bedrock. Drilling of test holes at the area of the proposed tunnel near Manahan Avenue was terminated at auger refusal at 5.8 m and 2.3 m into till, respectively. Test holes south of McGillivray Boulevard, and north of Bishop Grandin Boulevard were drilled to 6 m below existing grade and terminated in the clay unit. Although the project extends over 7 km, the encountered soil stratigraphy in the test holes were practically uniform and are typical to areas within the limits of City of Winnipeg (AECOM 2014). In descending order the soil profile consisted of:

- Glacio-lacustrine clay;
- Glacial till; and
- Limestone bedrock.

Glacio-lacustrine silty clay up to 12 m thick was encountered in all test holes. Thin topsoil about 150 mm thick overlays the clay in most test holes. Silt layers about 1.0 m thick were observed in the top two metres of the clay unit. Typically, the clay is brown changing to grey with depth, firm to stiff becoming soft with increasing depth, moist and of high plasticity. The clay is underlain by glacial till that typically contains variable amounts of clay, sand and gravel. Boulders and cobbles are known to be present within the till unit and were encountered during the drilling. Where the drilling advanced into bedrock below the till unit at McGillivray Boulevard and Bishop Grandin Boulevard, the thickness of the till layer varies from 4 m to 6 m. In vicinity of Manahan Avenue, auger refusal was encountered about 6 m into till, therefore till thickness may be greater than 6 m. The till is brown to light grey, soft/loose in the upper zone and become dense to very dense with increasing depth. Coring was necessary to advance the drilling through very dense and boulders/cobbles dominated lower zone of the till. The till is underlain by limestone bedrock, which forms an artesian aquifer. The bedrock surface was encountered at elevations between 214.0 m and 215.0 m in both the McGillivray Boulevard and at Bishop Grandin Boulevard test hole locations.

16.3.4.1 Potentially Impacted or Contaminated Sites

The Manitoba Contaminated Sites List (MCWS 2014a) was reviewed to identify potentially impacted or contaminated sites within or adjacent to the PSA. The online list is maintained by Manitoba Conservation and was last updated September 16, 2013 (checked as of March 24, 2014). The list includes impacted or

contaminated sites in Manitoba, but may not include all sites for which the Department currently maintains files. An updated file search will be completed prior to Detailed Design of the Project to confirm all the information Manitoba Conservation maintains on a site.

All neighbouring street names listed on the provided drawings and maps were searched in the list. All street names with listed properties were mapped using their addresses. Property locations that were not adjacent to or near the proposed BRT corridor are not included in this screening list. A total of nine potentially impacted or contaminated sites (CS) were found to be near or adjacent to the proposed BRT corridor:

- 960 Pembina Highway, Goodyear Canada Inc., CS, File No. 20295
- 1761 Pembina Highway, Minute Muffler, CS, File No. 44069
- 1855 Pembina Highway, Mr. Grease (Former), CS, File No. 20628
- 2535 Pembina Highway, Shell Canada Self-Serve (Former), CS, File No. 20623
- 555 Hervo Street, Rogers Sugar (Former), File No. 20623
- 77 Irene Street, Indal Wall Systems, CS, File No. 20729
- 10 Irene Street, Simmons Equipment Rentals, CS, File No. 20726
- 1397 Buffalo Place, Superior Cable Corp, CS, File Nos. 19561, 19565
- 1455 Buffalo Place, Powell Equipment Ltd (Former), CS, File No. 19566

All of the known impacted sites are outside of the actual transitway alignment properties and Manitoba Conservation indicated that all impacts are contained within the impacted properties, as identified on the Manitoba Conservation Contaminated Sites List (MCWS 2014a).

16.3.5 Groundwater

The following information on groundwater in the City of Winnipeg was obtained from Render 1970. There are three regional aquifers beneath the City of Winnipeg: the Upper Carbonate aquifer, Lower Carbonate aquifer and the Sandstone Aquifer. The Upper Carbonate aquifer is the major aquifer underlying the Winnipeg area and occurs in the top 15 m to 30 m of the Paleozoic bedrock limestones and dolomites. The Upper Carbonate aquifer is partially confined above by the glacial drift and below by the slightly pervious underlying carbonate rock. A relatively minor aquifer, called the Lower Carbonate aquifer, occurs in the bottom 7.5 m to 15 m of the Red River formation, along the contact with the upper shale unit of the Winnipeg Formation. The Winnipeg Formation contains an Upper Sandstone aquifer that is 6 m to 12 m thick, and a Lower Sandstone aquifer that is 3 m thick. Both of these Sandstone aquifers contain saline water. Recharge of the Upper Carbonate aquifer occurs through the glacial till and glaciofluvial deposits located in the uplands along the borders of the Red River Basin and in Birds Hill.

The original settlers of the City of Winnipeg initially used river water to supply commercial, industrial and residential water needs. In 1900, the City converted from river water to using groundwater from the Upper Carbonate aquifer (Render 1970). From 1890 to 1914, the City examined the Red, Assiniboine and Winnipeg Rivers, the Upper Carbonate aquifer, and the Lake of the Woods as alternate water sources,

ultimately choosing Shoal Lake in Lake of the Woods as the supply for the Aqueduct system. The City continued to use groundwater sources for commercial and industrial applications (e.g., air conditioning, cold storage), but all residential potable water needs were met by the City of Winnipeg's piped water distribution system from the Aqueduct. Today a number of commercial, industrial and provincial monitoring wells remain in operation in the City and all residential potable water needs are provided via the Aqueduct. As such, there are no residential potable water wells in the PSA, LSA or RSA.

Excessive discharge from the Upper Carbonate aquifer has frequently interfered with deep excavations in the Winnipeg area (Render 1970). This interference occurred during the construction of the Greater Winnipeg Aqueduct Branch 2 Tunnel in 1959 when groundwater flows of about 500 gallons/minute (2,275 litres/minute) were intercepted in the carbonate rock (Render 1970). Groundwater flows have also interfered in the construction of bridge and building foundations in the City (Render 1970). In recognition of these potential groundwater incursions, the Project construction plans will include methods to depressurize the aquifer and remove any groundwater from the excavation sites, if required.

Groundwater in this area of the Upper Carbonate aquifer can be saline due to the presence of chlorides and other dissolved solids such as calcium, magnesium, potassium, sodium and sulfate (Betcher 1986; Render 1970). Groundwater chloride concentrations can range from 500 to 1000 mg/l in this area of Winnipeg (Render 1970). The current Canadian Council of Ministers of the Environment (CCME) guideline for chloride concentrations for the protection of aquatic life is 640 mg/l in the short-term, and 120 mg/l in the long term (CCME 2014). As such, groundwater may be removed from the excavation sites by installing temporary wells. This groundwater will be analyzed to confirm/approve suitability for discharge to the land drainage network or for discharge to the existing City of Winnipeg sewer system for treatment at the South End Water Pollution Control Centre (SEWPCC). Pumped groundwater will not be directly released to the Red River or any other watercourse in the RSA.

The LSA contains part of Winnipeg's Aqueduct system, including the enclosed Wilkes Reservoir and accompanying Hurst Pumping Station on the west side of Hurst Way near Parker Avenue. This reservoir can supply up to 500 million litres of water per day to southwest Winnipeg (City of Winnipeg 2002). The Project construction plans will include measures to isolate and remove any groundwater encountered during the excavation activities; therefore, there will be no interactions between groundwater and the Aqueduct system due to the Project activities.

16.3.6 Surface Water

Areas of surface water in the PSA are limited to the ditches that parallel the CN RoW and Manitoba Hydro RoW on the west side of the PSA and low-lying areas and wet meadows in the Parker Lands, CN RoW and Manitoba Hydro RoW. During the field survey, these areas were dry and the only indication of the presence of water was small isolated stands of cattails (*Typha* spp.) found in the ditches and at three locations in the PSA (see Section 16.3.9). The presence of cattails and other water tolerant plant species such as willows (*Salix* spp.) indicated that these areas may contain water during periods of spring melt,

peak runoff or high levels of precipitation. There were no creeks, streams, ponds or other watercourses or waterbodies found to be present in the PSA.

The LSA includes or is adjacent to the Red River in two places: at the northern extent of the PSA and approximately mid-way in the PSA where the corridor turns south to parallel the CN rail line (Figure 6-1). The Red River is approximately 150 m wide near these locations. The river channel has uniformly sloping banks (where erosion and undercutting has not occurred) and a wide central thalweg. River levels vary seasonally, typically between 3.5 m and 6 m in depth (Dillon Consulting Limited 2009).

The RSA includes the Red River, Assiniboine River, Seine River and number of creeks (e.g. Sturgeon Creek, Omands Creek). With the exception of the Red River, these watercourses are located outside of the Project construction areas and proposed Project land drainage system (Section 10.7), and there are no anticipated effects from the Project on these watercourses.

The functional design concept for the Project land drainage system was prepared based on discussions with the Water and Waste Department of the City of Winnipeg and will be finalized at the Detailed Design stage (Section 10.7). Figure 7-1 illustrates the proposed drainage design for the Transitway Project and takes into consideration the Cockburn and Calrossie Retention Pond, the Pembina Highway Underpass, and the Southwest Transitway components of the project. The concept consists of a combination of new land drainage sewers and ditches along the transitway that would drain into existing adjacent land drainage systems and the retention pond. This approach is standard design practice provided that an analysis has been carried out to show that there is no increase in the peak flow rate. The adjacent systems include the Parker Retention Pond, Somerset Avenue, Riviera Crescent, Lot 16 Drain, D'Arcy Drive and the University of Manitoba Southwood Lands. As part of the Cockburn and Calrossie Combined Sewer Relief Works, the current design concept for separation involves the construction of the Parker Retention Pond. The pond has been included in the list of adjacent systems as drainage along Parker Avenue will be routed east toward the pond via ditches. It is also proposed that runoff at the Transitway Underpass of CN Wye tracks be pumped into the pond. The design and construction of the Parker Retention Pond is being carried out by the City of Winnipeg Water and Waste Department and is not part of Stage 2 of the Southwest Transitway project.

With the exception of a few sections near stations (400 to 600 mm diameter LDS), ditching is proposed along the transitway between Parker Avenue and Chevrier Boulevard. Drainage near the proposed Letellier Tunnel is restricted because of numerous conflicts and consists of LDS (ranging from 375 to 1050 mm diameter). South of Bishop Grandin Boulevard to Markham Road, a new LDS system is also proposed with diameters ranging from 750 mm near the IGF Station to 900 mm along the Transitway North-South segment and 1050 mm downstream.

The ditch drainage design is based on a 5-year MacLaren storm based on City of Winnipeg design standards. The design standard for underpasses is more stringent as water accumulation could render the underpass impassable. For this reason, the drainage design for the underpasses was based on a target

50-year MacLaren rainfall total capacity, which is a higher level of service than for the design used for the pumping station for the Stage 1 transitway tunnel. Two pumping stations are included as part of the land drainage concept at the Transitway Underpass of CN Wye and the Letellier Tunnel.

The land drainage system for the Project has been designed to utilize existing drainage pathways and the Parker Retention Pond to move water off of the land surface and retain the flows prior to discharge to existing combined sewer and stormwater drainage systems. The results of the hydraulic assessment conducted for the Project land drainage system showed that there is no effect on the peak flow rate in the adjacent systems, including the City's planned Parker Retention Pond.

16.3.7 Fish and Fish Habitat

There is no fish or fish habitat in the PSA. The LSA includes or is adjacent to the Red River in two places: at the northern extent of the PSA and approximately mid-way in the PSA where the corridor turns south to parallel the CN rail line (Figure 6-1). The RSA includes the Red River, Assiniboine River, Seine River and number of creeks (e.g. Sturgeon Creek, Omands Creek). With the exception of the Red River, these watercourses are located outside of the Project construction areas and proposed Project land drainage system (Section 10.7), and there are no anticipated effects from the Project on these watercourses.

The Red River supports one of the most diverse aquatic communities in Canada, and many species are part of or support commercial, recreational or Aboriginal fisheries. As such, the fish and fish habitat in the Red River are subject to the prohibition against serious harm to fish under the Fisheries Protection Provisions of the Fisheries Act (Fisheries and Oceans Canada [DFO] 2014a). The Red River within the City limits supports a variety of species, including channel catfish (*Ictalurus punctatus*), northern pike (*Esox lucius*), walleye (*Sander vitreus*) and yellow perch (*Perca flavescens*). Spring and early summer months are sensitive periods for many Red River fish species due to migration, spawning, egg development and rearing activities. Several Species At Risk reside in the Red River, including Bigmouth buffalo (*Ictiobus cyprinellus*) and lake sturgeon (*Acipenser fluvescens*) (DFO 2013). These species are protected under federal and/or provincial Species At Risk Acts and legislation (MCWS 2013; Government of Canada 2013).

The existing system of combined sewers and/or stormwater drains in the PSA and LSA eventually drain to outfalls located along the Red River. The land drainage system developed for the Project will use this existing system of combined sewers and/or stormwater drains. The City is currently developing a Combined Sewer Overflow Master Plan to replace or improve the combined sewer systems in Winnipeg and reduce wet weather overflows of combined sewage and stormwater into the Red and Assiniboine rivers.

16.3.8 Vegetation

16.3.8.1 Overview

Vegetation within the PSA consists mainly of mowed and disturbed areas of grasses and forbs, with small patches of deciduous forest, wet meadow and cattail stands. Contact with Manitoba Hydro Line Maintenance indicated that the area had been mowed in the spring when the grass had reached a height of 15 to 20 cm, and a second mow was done on or near August 08, 2013 (Bob Lapka, pers.comm.). Patches of trees and shrubs were present in the Parker Lands area, along the ditches on the west side of the CN and Manitoba Hydro RoWs, and on either side of the CN rail line and RoW from Bishop Grandin Boulevard to Bison Drive. There was a total of three areas found that were made up of mainly cattails and grasses that likely hold water during periods of high runoff and/or precipitation. All three of these areas were dry with no standing water at the time of the survey. **Photograph 1** provides an example of the ground conditions in the cattail stands. Cattails were also noted to be present in some of the ditches along the west side of the RoW throughout the proposed Project route. Additional information on the cattail stands and wetlands in the PSA is provided in Section 16.3.9 below.

The Parker Lands area is a mix of open grassland with small patches of oak (*Quercus macrocarpa*) - aspen (*Populus tremuloides*) woods and moist depressions of cattails, dogwood (*Cornus* spp.) and willows (**Photograph 2 and Photograph 3**). The north/south corridor is maintained as a mowed RoW with some drainage ditches and scrubby woodland patches along the edges. A number of non-native and/or invasive plant species were present in the PSA as multiple uses over time have disturbed the original natural habitat. Additional information on non-native and/or invasive plant species in the PSA is provided in Section 16.3.8.4 below.

The Parker Lands area in the PSA includes two sites designated as Natural Areas by the City of Winnipeg Naturalist Services: Site 201, named as Parker 2, which is located north of Heatherdale Avenue, east of Daniel Street and south of the CN tracks (City of Winnipeg 2013a); and Site 550, named Parker 3, which is located north of Parker Avenue in between Lottie Street and Daniel Street just east of the corner of Wilkes Avenue and Waverly Street (City of Winnipeg 2013b). Figure 16-1 shows the location, size, layout and habitat quality (as determined by the City) of these two Natural Areas. Site 201 is classified as Grade B aspen forest and described as follows: “This small site is classified as aspen forest habitat. The site is quite disturbed and has a large number of weed species.” (City of Winnipeg 2013a). Site 550 is classified as Grade B prairie and aspen forest and described as “disturbed grassland surrounds higher quality habitat” (City of Winnipeg 2013b). A plant species list for each Natural Area is provided in the City of Winnipeg site reports (City of Winnipeg 2013a; 2013b).

A list of the plant species found in the PSA during the October 01, 2013 field survey is provided in Appendix B. In addition to the family, genus, species and common name for the plant, the list indicates the MCDC conservation status; whether the species is native/non-native/invasive; the location of the plant in the PSA (Parker Lands or RoW corridor) and whether the species has been previously reported in the area.



Photograph 1: View showing ground surface conditions in a cattail stand located on the west side of the Manitoba Hydro transmission line RoW between Mercury Bay and Willson Place, October 01, 2013.



Photograph 2: View facing northwest of a mowed area and patch of aspen, cattails and willows in the Parker Lands area, October 01, 2013.



Photograph 3: View facing southeast in the Parker Lands of an aspen woodland patch located adjacent to Parker Avenue, October 01, 2013.

Figure 16-1: City of Winnipeg Natural Areas and Habitat Quality in the Parker Lands



16.3.8.2 Species at Risk and Rare Plants

The MCDC ranks the conservation status of plants according to their scarcity using existing records of their occurrence (Table 16-6). Species are evaluated and ranked by the MCDC on the basis of their range-wide (global - G) status, and their province-wide (subnational - S) status according to a standardized procedure used by all Conservation Data Centres and Natural Heritage Programs. These ranks are used to determine protection and data collection priorities, and are revised as new information becomes available (MCDC 2013).

Table 16-6: Province of Manitoba Conservation Ranking System for Species

Rank	Definition
1	Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.
2	Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.
3	Uncommon throughout its range or in the province (21 to 100 occurrences).
4	Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).
5	Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.
U	Possibly in peril, but status uncertain; more information needed.
H	Historically known; may be rediscovered.
X	Believed to be extinct; historical records only, continue search.
SNR	A species not ranked. A rank has not yet assigned or the species has not been evaluated.
SNA	A conservation status rank is not applicable to the element.

Source: Manitoba Conservation Data Centre 2013

A request was submitted to the MCDC to confirm the presence or absence of any provincially or federally listed species. The reply confirmed that a search of the Manitoba Conservation Data Centre's rare species database had been completed and there were no occurrences found within the Project area (C. Friesen, Biodiversity Information Manager, Manitoba Conservation, pers.comm.). A copy of the response is provided as Appendix C.

There were no plant species of special concern, i.e., ranked as S1 - very rare, S2 - rare, or S3 – uncommon, found during the field survey or listed on the City of Winnipeg Natural Area site reports for the Parker Lands (City of Winnipeg 2013a, 2013b). There were no plant species listed under the Manitoba Endangered Species Act (MESA), SARA, or that have a special designation by COSEWIC observed to be present in the PSA (Government of Canada 2013; MCWS 2013). Additional information on Species at Risk is found below in Section 16.3.11.

16.3.8.3 Plants of Interest

Although there were no species of conservation concern found within the PSA, there were some plants that are of special interest due to their history in the area or role as habitat for wildlife species. Plant species of interest that were observed in the PSA during the field survey included:

- Several showy milkweed plants (*Asclepias speciosa*) were found in two locations (14U 632162m E, 5521797m N; 14U 631435m E, 5522934m N) along the west side of the Manitoba Hydro RoW (**Photograph 4 and Photograph 5**). Milkweed is important to the survival of Monarch butterflies (*Danaus plexippus*), which is currently listed as a Species of Special Concern under SARA (Government of Canada 2013).
- In the oak-aspen woods, some fairly large specimens of bur-oak trees (*Quercus macrocarpa*) were observed (14U 632191m E, 5523589m N) (**Photograph 6**).
- Some large specimens of peachleaf willow (*Salix amygdaloides*) were found in one of the wetter areas in the Parker Lands (**Photograph 7**). These willows are the only species of willows in southern Manitoba that reach tree-size and are most often relegated to stream and riverbanks.
- There appears to be a former homestead site in the wooded area adjacent to Heatherdale Avenue in the Parker Lands as indicated by a row of large cottonwood (*Populus deltoides*) trees and the remnants of what appeared to be a driveway. A large cottonwood tree was also present in the Manitoba Hydro RoW at the same location as the third stand of cattails (**Photograph 12** in Section 16.3.9).

There may be some remnant tall grass prairie plant species surviving in the area, but due to the late season sampling and the late summer mowing it was not possible to identify all of the grass species. Prairie cordgrass (*Spartina pectinata*), a native grass found in wet areas and moist prairie, was common in the unmowed areas. The plant species list for the Parker 3 Site #550 includes big bluestem (*Andropogon gerardii*), a grass found in native tall-grass prairies, which was reported to be present in a 1995 survey (City of Winnipeg 2013b). As noted above, the timing of the survey was not optimal for the identification of plant species that emerge and flower earlier in the growing season.



Photograph 4: View facing west of the milkweed seed pods found on the west side of the Manitoba Hydro transmission line RoW between Mercury Bay and Willson Place, October 01, 2013.



Photograph 5: Close-up view of the milkweed seed pods found on the west side of the Manitoba Hydro transmission line Right-of Way between Mercury Bay and Willson Place, October 01, 2013.



Photograph 6: View of the large bur oak in the aspen/oak woodland of the Parker Lands, October 01, 2013.



Photograph 7: View of the large peachleaf willow in the aspen/oak woodland of the Parker Lands, October 01, 2013.

16.3.8.4 Invasive Plants

Disturbance of natural habitats often introduces plants that are not native to the area. Some non-native plants are able to out-compete native species and degrade natural areas. These aggressive non-native plants can become invasive. According to the Invasive Species Council of Manitoba (ISCM) several of the plant species found in the survey are of concern as they are listed as Category 2 (Localized Presence) Invasive Species (C. Heming, pers.comm.; ISCM 2013). The ISCM identifies the following listing and management criteria for Category 2 species:

- Criteria for listing:
 - These invasive plants are present in Manitoba and
 - are capable of further spread;
 - pathways for spread are present; and,
 - are easily identifiable with available resources.
- Minimum Management Criteria (MMC):
 - eradication is first option, when feasible;
 - containment and control programs are second option;
 - education and awareness programs to foster prevention; and,
 - a response plan is available or under development.

Plants found during the survey or previously recorded in the area that are listed at Category 2 species are:

- common tansy (*Tanacetum vulgare*);
- common reed (invasive phragmites) (*Phragmites australis*) (found in previous City of Winnipeg [2013b] survey);
- European (common) buckthorn (*Rhamnus cathartica*);
- ox-eye daisy (*Leucanthemum vulgare*); and
 - purple loosestrife (*Lythrum salicaria*).

Additional plants found during the survey that are listed as invasive by ISCM are:

- Canada thistle (*Cirsium arvense*);
- creeping bluebell (creeping bellflower) (*Campanula rapunculoides*);
- dame's violet (dame's rocket) (*Hesperis matronalis*);
- field sow thistle (perennial sow thistle) (*Sonchus arvensis*);
- lesser burdock (*Arctium minus*);
- narrow-leaved cattail (*Typha angustifolia*);
- reed canary grass (*Phalaris arundinacea*);
- tufted vetch (bird vetch) (*Vicia cracca*); and
- wormwood (absinthe) (*Artemisia absinthium*).

Purple loosestrife and reed canary grass are listed as Principal Invasive Aliens (Wetlands) and European (common) buckthorn is listed as a Principal Invasive Alien (Uplands) by Environment Canada (White et al. 1993). Principal invasives are those species believed to pose the greatest threat to natural areas. The dumping of garden waste adds to the potential for further spread of non-native plants. Some “garden escapes”, including ground-ivy, Tartarian honeysuckle and wild asparagus (**Photograph 8**), have colonized some of the patches of woodlands in the Parker Lands. The non-native and invasive plant species found in the PSA during the October 01, 2013 field survey are listed and classified in Appendix B.



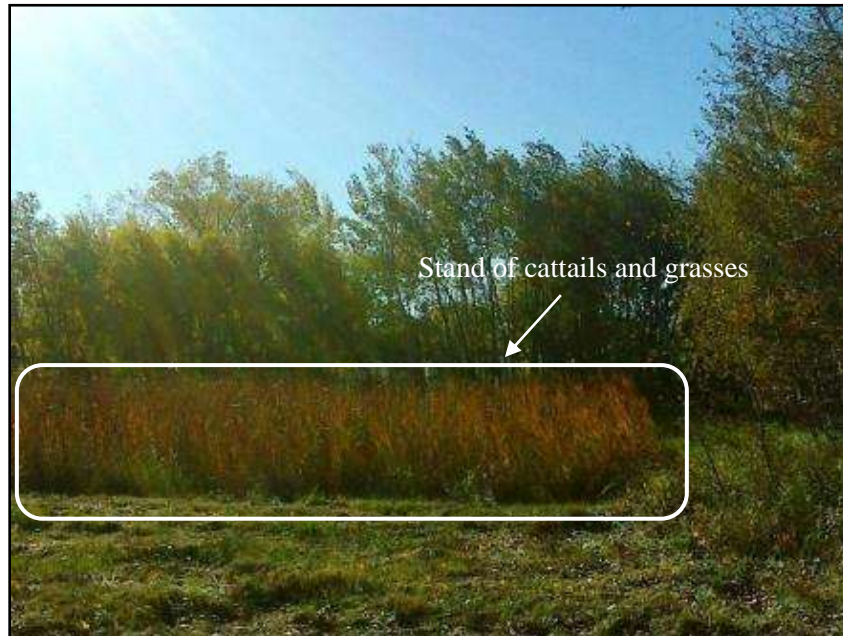
Photograph 8: Wild asparagus plant in the wooded area behind Heatherdale Avenue in the Parker Lands, October 01, 2013.

16.3.9 Wetlands

There was a total of three areas observed that consisted of mainly cattails and grasses and that likely hold water during periods of high runoff and/or precipitation. All three of these areas were dry with no standing water at the time of the survey (**Photograph 1**). Cattails were also present in some of the ditches along the west side of the RoW throughout the proposed Project route.

The first of the three areas was located in the Parker Lands on the north side of Heatherdale Avenue (**Photograph 9 and Photograph 10**). This area contained a stand of cattails and grasses about 5 m wide and 12 m in length. The area surrounding the cattail stand had been recently mowed.

Based on the Stewart and Kantrud (1971) system of wetland classification, the presence of cattails would indicate that the area would be considered a Class III – Seasonal wetland or a Class IV- Semi-permanent wetland. This area is classified as a Class B wetland by the City Naturalist Department (City of Winnipeg 2013a; Figure 16-5).



Photograph 9: View facing east of the stand of cattails and grasses located on the north side of Heatherdale Avenue in the Parker Lands, October 01, 2013.



Photograph 10: View facing southeast of the stand of cattails and grasses located on the north side of Heatherdale Avenue in the Parker Lands, October 01, 2013.

The second area was located on the west side of the Manitoba Hydro transmission line RoW between Mercury Bay and Willson Place (**Photograph 11**). In this area was a stand of cattails and grasses about 8 m wide and 15 m in length. The area around the cattail stand had been mowed on or near August 08, 2013 (Bob Lapka, pers.comm.).



Photograph 11: View facing south of the stand of cattails and grasses located on the west side of the Manitoba Hydro transmission line RoW between Mercury Bay and Willson Place, October 01, 2013.

Based on the Stewart and Kantrud (1971) system of wetland classification, the presence of cattails would indicate that the area would be considered a Class III – Seasonal wetland or a Class IV- Semi-permanent wetland.

The third area was located in the center of the Manitoba Hydro transmission line and CN RoW about 120 m south of Manahan Avenue at the Hervo Street CN sidetrack (**Photograph 12**). This area contained a stand of cattails and grasses about 30 m wide and 30 m in length. The area around the cattail stand had been mowed on or near August 08, 2013 (Bob Lapka, pers.comm.).



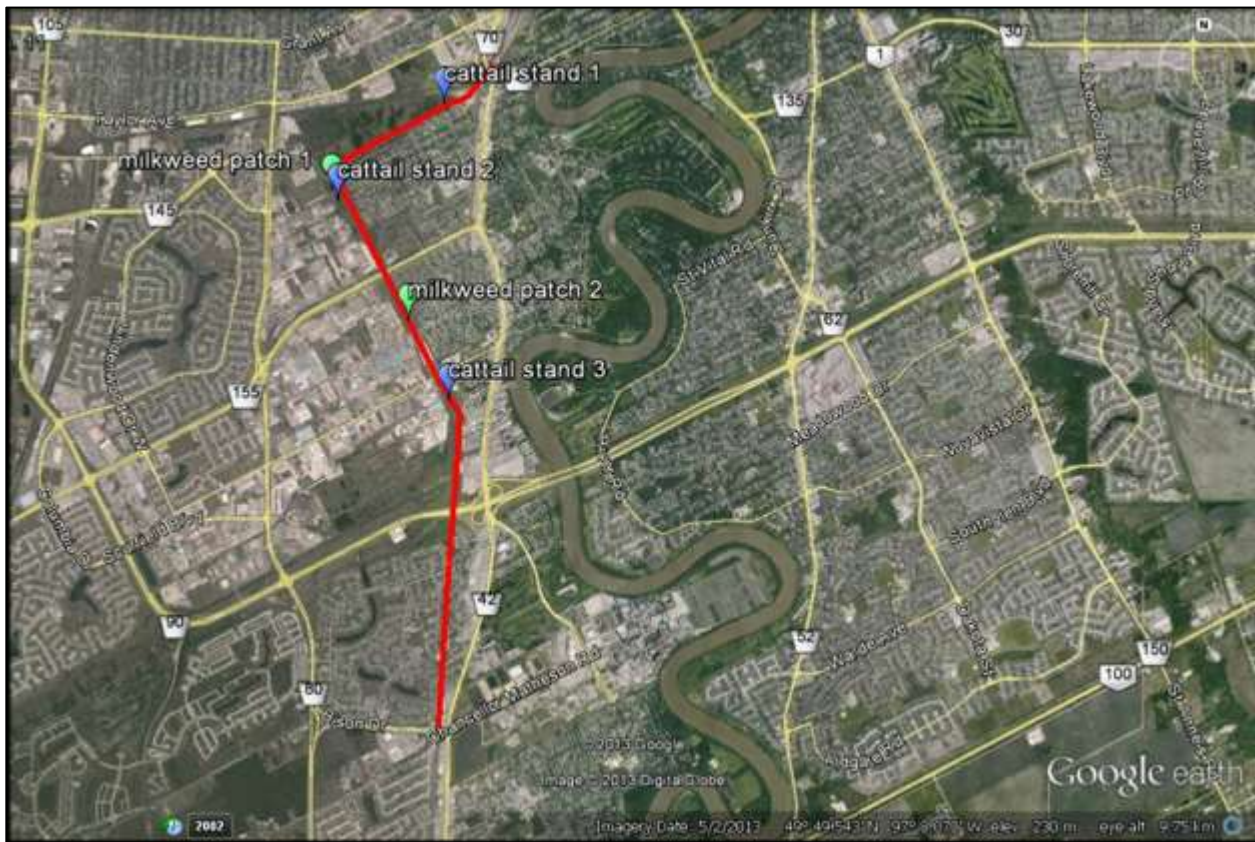
Photograph 12: View facing southeast of the stand of cattails and grasses located in the center of the Manitoba Hydro transmission line and CN RoW about 120 m south of Manahan Avenue at the Hervo Street CN sidetrack, October 01, 2013. A portion of the large cottonwood tree also located at this site appears at the top left of the photograph.

Based on the Stewart and Kantrud (1971) system of wetland classification, the presence of cattails would indicate that the area would be considered a Class III – Seasonal wetland or a Class IV- Semi-permanent wetland.

In addition to these three areas, wet areas with cattails, willow and grass species were also present in the wooded area of the Parker Lands on the north side of Heatherdale Avenue and in a patch of vegetation north of Parker Avenue to the east of Hurst Way (**Photograph 2**). It is expected that the ground surface and near-surface soils would be saturated and potentially hold water in these areas during periods of high runoff and/or precipitation.

Figure 16-2 shows the location of the three cattail stands and milkweed plants in the PSA.

Figure 16-2: Location of Cattail Stands and Milkweed Plants in the Recommended Alignment for the Southwest Transitway Stage 2 Route



Source: Google Earth™ 2014

16.3.10 Wildlife and Wildlife Habitat

As noted in Section 16.3.8 above, the Parker Lands area is a mix of open grassland with small patches of oak-aspen woods and moister depressions of cattails, dogwood and willows. The north/south corridor is maintained as a mowed RoW with some drainage ditches and scrubby woodland patches along the edges. The following wildlife species were observed during the field survey: American crow (*Corvus brachyrhynchos*), Canada goose (*Branta canadensis*) (**Photograph 13**), common grackle (*Quiscalus quiscula*), downy woodpecker (*Picoides pubescens*), house sparrow (*Passer domesticus*), Northern flicker (*Colaptes auratus*), and red squirrel (*Tamiasciurus hudsonicus*). There was also an incidental observation of muskrat (*Ondatra zibethicus*) by Project staff adjacent to the PSA.



Photograph 13: View facing east of Canada geese foraging in the Manitoba Hydro RoW near Manahan Avenue, October 01, 2013.

Although not observed at the time of the field survey in October, other wildlife likely reside in or use habitat within the PSA. It is expected that other urban wildlife such as chipmunks (*Tamias* spp.), eastern cottontail rabbit (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), ground squirrels (*Spermophilus* spp.), meadow voles (*Microtus pennsylvanicus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus virginianus*) are present in the PSA and use the available habitat for some or all of their lifecycle requirements (i.e., breeding, nesting, rearing of young, feeding, migration). The PSA may also provide habitat for bat species such as the big brown bat (*Eptesicus fuscus*), as well as a number of resident and migratory bird species. The survey was conducted in the fall after the migratory period for many bat and bird species; therefore, it could not be determined if any of these species are present in the PSA. The wooded area adjacent to Heatherdale Avenue included a number of tangles of shrubs (dogwood, willow), tree snags, tall trees (aspen, cottonwood, oak, peachleaf willow) and grassy areas that could provide habitat for a number of species (**Photograph 14**). **Photograph 15** shows the only nest activity observed in the PSA. The two patches of milkweed that were not mowed could provide essential habitat for Monarch butterflies (**Photograph 4 and Photograph 5**).

Although the wetland areas observed were dry at the time of the field survey, it is expected that these areas and the other wet areas within the PSA could provide summer habitat for the Northern leopard frog, and potentially year-round habitat for the wood frog (*Lithobates sylvaticus*). Additional discussion of the available Northern leopard frog habitat is provided in Section 16.3.11 below.



Photograph 14: Grasses, shrubs and trees in the wooded area adjacent to Heatherdale Avenue in the Parker Lands, October 01, 2013.



Photograph 15: Nest in the wooded area adjacent to Heatherdale Avenue in the Parker Lands, October 01, 2013.

16.3.11 Species at Risk

The MCDC, MESA, SARA and COSEWIC databases were reviewed prior to the field surveys and cross referenced to species distribution maps to identify potential species listed as endangered, threatened or of special concern that may be present in the RSA (i.e., the City of Winnipeg). Table 16-7 provides a summary of the species listed as endangered, threatened or of special concern potentially found within the PSA.

Table 16-7: Endangered, Threatened or Species of Special Concern Potentially Found in the PSA

Common Name	Scientific Name	MESA Status	COSEWIC Status	SARA Status
Amphibians and Reptiles				
Northern Leopard Frog	<i>Lithobates pipiens</i>	Not Listed	Special Concern	Special Concern
Arthropods				
Monarch Butterfly	<i>Danaus plexippus</i>	Not Listed	Special Concern	Special Concern
Birds				
Bank Swallow	<i>Riparia riparia</i>	Not Listed	Threatened	Not Listed
Barn Swallow	<i>Hirundo rustica</i>	Not Listed	Threatened	Not Listed
Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	Not Listed
Eastern Wood-Pewee	<i>Contopus virens</i>	Not Listed	Special Concern	Not Listed
Peregrine Falcon	<i>Falco peregrinus anatum/tundrius</i>	Endangered	Special Concern	Special Concern
Short-Eared Owl	<i>Asio flammeus</i>	Threatened	Special Concern	Special Concern
Yellow Rail	<i>Coturnicops noveboracensis</i>	Not Listed	Special Concern	Special Concern
Mammals				
Little Brown Myotis	<i>Myotis lucifugus</i>	Not Listed	Endangered	Not Listed
Northern Myotis	<i>Myotis septentrionalis</i>	Not Listed	Endangered	Not Listed

Source: Government of Canada 2013; Manitoba Breeding Bird Atlas 2013; MCWS 2013.

None of the species in Table 16-7 were observed to be present in the PSA during the October 01, 2013 survey; all of the species listed in Table 16-7 migrate to overwintering areas outside of the PSA and it is expected that any individuals that could potentially have been present in the PSA were likely to have already migrated by the time of the survey. However, other migratory bird species (Canada geese, common grackle, Northern flicker) were observed in the PSA during the October 01, 2013 field survey. Based on the existing habitat, level of habitat disturbance and ongoing human, commercial, industrial and transportation activities in the PSA, it is expected that the PSA would only provide temporary feeding or resting areas for the bird and mammal species in Table 16-7 during their migratory movements to more optimal breeding and nesting habitats outside of the PSA. The presence of milkweed in the PSA indicates that these areas of the PSA could be used by the Monarch butterfly if this species is present in the area. The wet areas located in the PSA could provide spring and summer habitat for Northern leopard frog. As such, it is expected that the Monarch butterfly and Northern leopard frog could be present in the PSA.

Additional information on these species and their habitat requirements is provided below. There were no other species listed under MESA, SARA or COSEWIC observed to be present in the PSA (Government of Canada 2013; Manitoba Conservation and Water Stewardship 2013).

16.3.11.1 Monarch Butterfly

The Monarch requires milkweed plants to lay their eggs, grow their larvae (caterpillars), form a chrysalis, complete metamorphosis, and emerge as an adult (Government of Canada 2013). Milkweed is the only plant species used by Monarch butterflies to complete their life-cycle requirements for reproduction; as such, the survival of this species is dependent upon the availability of milkweed plants. Adult Monarchs also use nectar-producing wildflowers such as asters (*Asteraceae*), goldenrod (*Solidago* spp.) and purple loosestrife for feeding requirements (Government of Canada 2013).

The field survey was conducted after the migratory period for the Monarch butterfly; therefore, it could not be determined if this species is present in the PSA and/or using the milkweed plants that are available in the PSA (**Photos 4 and 5**).

16.3.11.2 Northern Leopard Frog

Northern leopard frogs are semi-aquatic and require three seasonal habitat types for breeding, foraging, and overwintering (Environment Canada 2013d). Due to the limited dispersion of this species, these three habitat types must be connected and present in close proximity.

- Spring breeding habitat is characterized by warm, shallow waters with some degree of permanence and containing no predatory fish, and may include, for example, marshes, flooded ditches, beaver ponds, dugouts, margins of lakes, and other slow-moving water (Environment Canada 2013d).
- Summer foraging habitat may be up to 8 km from breeding areas, and consists of moist riparian or upland areas that are neither heavily wooded nor sparsely vegetated (Environment Canada 2013d).
- Winter habitat is typically within about 1.6 km of breeding habitat (Environment Canada 2013d). This species spends its winters hibernating in water bodies that are cold but do not freeze solid and are well oxygenated. This habitat is found in water bodies deeper than water bodies used for breeding habitat.

The available habitat in the PSA could provide foraging habitat for Northern leopard frog, but there were no areas observed that could provide the depth of water that is required for their breeding needs or the permanent depth they require for overwintering. It is expected that this species migrates to and from the Red River or other permanent waterbodies within the area for its breeding and overwintering habitat requirements.

16.4 Socio-Economic Environment

As a linear infrastructure project, Stage Two of the Southwest Transitway passes through (or adjacent to) several communities. Many of them are residential neighbourhoods, including Beaumont, Maybank, and Waverley Heights; others are industrial parks, including Buffalo and Chevrier; and finally, some are mixed-use neighbourhoods, including the Pembina Strip and Montcalm. The following sections outline the socio-economic, demographic, and land use characteristics of these adjacent communities.

16.4.1 Community Demographics

Table 16-8 provides a summary of the demographics for the neighbourhoods located in the PSA. The 2011 Census Community Profiles were not yet available for individual Winnipeg neighbourhoods, nor were 2011 statistics yet available for several demographic categories. Therefore, the information provided herein is based on the 2006 Census Community Profiles (City of Winnipeg 2013c). The population of the neighbourhoods adjacent to the transit corridor is nearly 20,000 people, with tens of thousands more living within the southwest quadrant that the transitway will serve. The neighbourhood populations are relatively stable (due to their built-out nature), while their densities tend to be moderately higher than the city average. Average household and family sizes tend to mirror the city averages (of 2.4 and 2.9 respectively), except in the Pembina Strip and Montcalm neighbourhoods, where both are significantly lower. Ethnic diversity appears to be more prominent along the southern portion of the route, where between approximately one quarter and one third of the population are visible minorities; the numbers are closer to one tenth in the Beaumont and Maybank neighbourhoods.

Education levels are generally consistent with those of the city at-large, although Waverley Heights and Montcalm have higher proportions of those with university education. Unemployment rates vary across neighbourhoods, from a low of 3.7% in Beaumont to a high of 10.7% in Montcalm. Median household incomes vary significantly amongst neighbourhoods, ranging from \$31,565 in Montcalm to \$66,384 in Waverley Heights, which in part can be attributed to household size and makeup.

In terms of commuter transportation modes, most neighbourhoods were near the city average (14.2%) for transit use. However, the Pembina Strip neighbourhood (proximate to several major routes) had a much higher percentage of transit ridership, at 24.3%. That neighbourhood also had lowest percentage of those who drove single-occupant vehicles (55.8%, approximately 12% lower than the city average), while Montcalm had the highest percentage of those walking or biking (14.0%).

Finally, the residential neighbourhoods along the transitway are home to a variety of housing types and tenures. Over 90% of Beaumont's housing stock is made up of single family homes, while Maybank and Waverley heights (61% and 65% respectively) are much closer to the city average of 59%. Homeownership is high within Beaumont, Maybank and Waverley Heights (ranging between 77.2% and 87.1%), while Pembina Strip and Montcalm have the highest percentage of renters (76.5% and 92.8% respectively). The housing stock is generally older the further north one travels – 87.8% of the dwellings in Beaumont were built before 1971, while that number in Waverley Heights was only 5.4.

Table 16-8: Demographics of Neighbourhoods Located in the PSA Based on the City of Winnipeg 2006 Census Community Profiles

Category and Data		Census Neighbourhood					
		Beaumont	Maybank	Waverley Heights	Pembina Strip	Montcalm	Winnipeg
Population	Population	2,360	2,335	5,195	2,815	4,620	633,451
	Population Change ('01 - '06)	-1.3%	1.3%	-4.3%	2.9%	3.1%	2.2%
	Land Area (in km ²)	1.2	0.9	2	0.7	1.1	475.2
	Population Density (per km ²)	1957.5	2628.0	2537.9	3940.4	4084.6	1333.0
	Average Household Size	2.5	2.3	2.8	1.6	1.9	2.4
	Average Family Size	2.9	2.9	3.1	2.3	2.5	2.9
Ethnicity/ Citizenship	Aboriginal Identity	5.3%	9.4%	4.7%	4.8%	6.6%	10.2%
	Visible Minority	12.5%	7.9%	25.6%	24.9%	37.3%	16.3%
	Canadian Citizenship	97.5%	94.6%	93.3%	85.1%	73.8%	94.2%
Education (Highest Level Achieved)	High School	29.7%	29.8%	24.3%	33.0%	33.3%	28.2%
	College	18.1%	17.2%	18.7%	16.9%	11.0%	15.8%
	University	22.2%	17.7%	35.4%	25.5%	32.8%	23.7%
Employment/ Income	Unemployment Rate (15 and over)	3.7%	7.8%	5.5%	6.0%	10.7%	5.2%
	Average Household Income	\$63,073	\$52,648	\$75,671	\$39,787	\$35,426	\$63,023
	Median Household Income	\$56,324	\$45,852	\$66,384	\$36,564	\$31,565	\$49,790
Transportation	Vehicle, driver	67.6%	64.8%	73.4%	55.8%	57.2%	68.0%
	Transit	15.2%	13.9%	11.2%	24.3%	19.4%	14.2%
	Walk or Bike	7.8%	11.1%	6.2%	12.0%	14.0%	8.0%
Housing	% of dwellings single detached	90.9%	61.2%	65.0%	0.0%	1.4%	59.4%
	Owned	87.1%	77.2%	83.9%	23.5%	7.2%	65.1%
	Rented	12.9%	22.8%	16.1%	76.5%	92.8%	34.9%
	Constructed before 1971	87.8%	84.5%	5.4%	24.0%	30.8%	56.6%
	Average value of dwelling	\$134,942	\$125,471	\$167,921	\$119,936	\$160,234	\$161,999

16.4.2 Land Use and Zoning Bylaw Designations

16.4.2.1 Our Winnipeg

The City of Winnipeg’s Development Plan, “Our Winnipeg” (City of Winnipeg 2011a), is a high level policy framework to guide development and growth within the city. The plan includes land use designation maps that provide a general outline of where certain types of growth are most appropriate. The transit corridor passes through three major land use designations:

- **Mature Communities**, which include the Beaumont Street and Maybank Drive neighbourhoods, are generally communities developed before the 1950s. They feature grid-like street patterns, accommodate varied housing densities, and contain several commercial and community nodes.
- **Recent Communities**, which includes Waverley Heights, are areas planned after the 1950s. They are primarily residential neighbourhoods featuring a mix of low and medium density housing. These areas are intended to accommodate some infill development, better transit connections, and increased housing options.
- **Major Redevelopment Sites**, which include the Parker Lands, Sugar Beet Lands, and Southwood Golf Course, present major opportunities for infill development and intensification. Generally brownfield sites, these underutilized or obsolete parcels are designated to transition into mixed-use, transit-oriented development communities.

“Complete Communities” (City of Winnipeg 2011b), which is one of four “Our Winnipeg” direction strategies, further breaks down the high level land use designations. Employment Lands, which include the Buffalo and Chevrier industrial parks to the west of the transit corridor, are the economic engines of the City. These industrial parks consist in general of manufacturing, warehousing and office developments.

16.4.2.2 Zoning By-law

The Winnipeg Zoning By-law 200/2006 regulates land use in the City of Winnipeg (outside of the downtown) by applying zoning districts to parcels of land within City boundaries. Due to the long, linear nature of the transitway, it inevitably passes through a wide variety of zoning districts.

The residential neighbourhoods to the east of the corridor (Beaumont and Maybank) are primarily zoned R1 – Residential Single Family, which accommodates single family development in lower density neighbourhoods. The Maybank neighbourhood also has pockets of RMF – Residential Multi-Family, which accommodates townhouse and low-rise apartment development.

To the west of the corridor (north of Bishop Grandin Boulevard) lie the Chevrier and Buffalo industrial parks. They are almost exclusively zoned for M1 – Manufacturing Light and M2 – Manufacturing General, which both accommodate varying intensities of manufacturing, processing, distribution, storage and warehousing operations.

The Pembina Strip community, centred around Plaza Drive, is one of the truly mixed-use neighbourhoods along the line. It features a wide range of residential and commercial zoning districts. On the commercial

side, C1 – Commercial Neighbourhood, C2 – Commercial Community, and C3 –Commercial Corridor are all present; fronting primarily along Pembina Highway, they feature varying intensities of retail, restaurant, hotel, and service uses. Much of the residential is zoned RMF – Residential Multi-Family, which accommodates the diverse developments of low and mid-rise apartments and condominiums.

In Waverley Heights, much of the land is zoned as R1. However, particularly near the transitway, there are pockets of R2 – Residential Two-Family that accommodate duplexes. There are also a few areas zoned RMF, which accommodate primarily townhouses in this case. In the Montcalm Neighbourhood there exists a mix of C2, C3 and RMF. While the U of M’s Southwood Lands are zoned as PR2 – Parks and Recreation (Community), they are designated as a Major Redevelopment Site. Once the U of M finalizes their plans for the area, it is anticipated that the area will be rezoned for residential and commercial uses in the future. Finally, the transitway’s terminus (University of Manitoba campus) is zoned as EI – Educational and Institutional.

16.4.3 Stakeholders

Over the course of the project, the public consultation team met with a wide variety of stakeholders, including government departments, utilities, schools, adjacent landowners, property managers, community groups, leaseholders, residents and the general public. Approximately 60 meetings were hosted over the two rounds of engagement. The following list outlines a representative sample of these various stakeholder groups:

- Government, Schools and Utilities
 - Canadian National Railways
 - City of Winnipeg - Planning, Property and Development
 - City of Winnipeg - City Naturalist
 - City of Winnipeg - City Forester
 - City of Winnipeg – (regarding Parks)
 - City of Winnipeg - (regarding Dog Parks)
 - University of Manitoba
 - City of Winnipeg - Public Works
 - City of Winnipeg - Active Transportation
 - City of Winnipeg - Water and Waste
 - City of Winnipeg - Real Estate Division
 - City of Winnipeg - (regarding Lot 16 Drain)
 - City of Winnipeg – Councillors
 - Manitoba Hydro
 - General Byng School
 - Ralph Maybank School

- Adjacent Landowners
 - Hopewell
 - Gem Equities
 - Resident at 1500 Parker Avenue (potential acquisition)
 - Winnipeg Blue Bombers
 - Victoria Hospital
 - Winnipeg Humane Society
 - Thompson in the Park (Funeral Home)
- Community Groups
 - Parker Wetlands Conservation Committee
 - Bike Winnipeg
 - Winnipeg Rapid Transit Coalition
 - Bishop Grandin Greenway

16.4.4 Aboriginal Interests

Winnipeg is located in Treaty No.1, which was signed in 1871 between the Government of Canada and the Chippewa and Swampy Cree Indian Tribes (Aboriginal Affairs and Northern Development Canada [AANDC] 2013). The First Nations lands found located within or adjacent to the RSA are summarized in Table 16-9. The Long Plain Madison Indian Reserve #1 has three parcels of land located within the City of Winnipeg on Madison Street between St. Matthews Avenue and Silver Avenue near Route 90. The other FN lands are located outside of the City of Winnipeg perimeter. There were no FN lands or interests found to be located in the PSA or LSA.

Table 16-9: First Nations Reserves Located Within or Adjacent to the RSA

First Nation Reserve Lands	Location
Brokenhead Ojibway Nation, Na-Sha-Ke-Penais Reserve Lot 1	Adjacent to PTH59 near Pritchard Farm Road about 1 km north of the perimeter (PTH101)
Long Plain Madison Indian Reserve #1, Parcels A, E and F	Madison Street between St. Matthews Avenue and Silver Avenue near Route 90
Roseau River Anishinabe First Nation, Parcel 95309	About 0.8 km northwest of PTH101 at PR236 and PTH6
Swan River 8A, convenience store, VLTs and gas station	About 3.5 km west of PTH101 on PTH1

Source: AANDC 2013

In 2008, L. J. Barkwell published a document titled “Rooster Town: A Métis Road Allowance Community”, which described the last known road allowance community in Winnipeg. The following information was obtained from Barkwell (2008): This road allowance community was situated at Grant Avenue and Waverley Street and was known as Rooster Town. During the Great Depression of the

1930's, a number of homeless families, many of whom were destitute Métis, built small shacks illegally on the CN railway property adjacent to City owned land just off Grant Boulevard. The area, now roughly between Weatherdon Avenue and the tracks from Cambridge to Rockwood Streets, became known as Rooster Town. Over the next quarter century the number of squatters varied with economic conditions. By the 1950's, at least 30 to 50 people clustered there in more than a dozen shacks. Alternate housing was found for six or seven families in 1952, but many preferred to stay where they were. In the summer of 1959, the city offered the last families cash payments of \$50 to \$75 to move or face eviction proceedings.

The Parker Wetlands Conservation Committee (2013) indicated that the Parker Lands were a part of Rooster Town and therefore part of Métis history. However, the land area described in Barkwell (2008) does not include the Parker Lands area. There were no other publications or information found describing Métis activities or interests in the PSA.

The Manitoba Métis Federation (MMF) has a regional office in Winnipeg, the Winnipeg Metis Association Inc., located on McGregor Avenue. There are no Métis organizations located within the PSA or LSA.

16.4.5 Land Use

Land use within the PSA and LSA consists of the CN rail line and RoW; the Manitoba Hydro transmission lines, structures and RoW; commercial (e.g., shopping and other services along Pembina Highway and other streets), industrial (e.g., Chevrier and Buffalo industrial parks), recreational (Brenda Leipsic dog park, community gardens, walking and cycling trails) and residential areas (e.g., neighbourhoods of Beaumont, Maybank, Montcalm Pembina Strip and Waverley Heights). The RoW areas are routinely mowed and maintained as per CN and Manitoba Hydro operational and safety standards.

The Parker Lands include a City of Winnipeg off-leash dog park, paths used for walking and cycling, and plots for gardening. During the field survey, dumping of refuse was evident as well as dumping of garden waste. The corridor for the CN rail and RoW has trails used for walking and cycling, garden plots, and provides east/west access across the railroad tracks (Photograph 16). More dumping of household items was evident in this section of the PSA. Photograph 17 shows a view of a garden plot located in the Manitoba Hydro RoW on the south side of Clarence Avenue and Photograph 18 shows the view of the parking lot located on the north side of Clarence Avenue in the Manitoba Hydro RoW.



Photograph 16: View facing northwest of the CN rail line and RoW south of Bison Drive, October 01, 2013.



Photograph 17: View facing north of a garden plot in the Manitoba Hydro RoW on the south side of Clarence Avenue, October 01, 2013.



Photograph 18: View facing south of the parking lot located on the north side of Clarence Avenue in the Manitoba Hydro RoW, October 01, 2013.

The City of Winnipeg Brenda Leipsic dog park is located at intersection of Hurst Way and Parker Avenue in the PSA. There are two community gardens located in the PSA, the Parker Block located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard (City of Winnipeg 2014a).

16.4.6 Resource Use

Resource use in the PSA includes use of the lands for: the CN rail line and RoW; Manitoba Hydro transmission lines, distribution lines, towers and RoW; commercial, industrial, recreational and residential land use; cycling, dog walking, gardening and walking areas; roadways and transportation uses; feeding and resting areas for urban wildlife; and runoff and stormwater drainage.

16.4.7 Protected Areas

There are no protected areas located in the PSA or LSA. There are several City of Winnipeg parks and fields, dog parks and community gardens located in the RSA. There are no parks and fields located in the PSA. There are two community gardens and a dog park located in the PSA (Section 16.4.5). These parks, fields and the dog park are operated and maintained by the City.

16.4.8 Heritage Resources

A request was submitted to MHRB on October 24, 2013 to determine the presence of Heritage Resources in the PSA, particularly in the Parker Lands area. The response received on February 05, 2014 indicated that there were no archaeological sites recorded for the area (P. Blomquist, pers.comm.). A copy of the request and response are provided in Appendix D.

The Manitoba Heritage Resources Branch (MHRB), Manitoba Historical Society (MHS) and City of Winnipeg Heritage Conservation websites were reviewed to determine the presence of any Heritage Resources or historical sites within the PSA (MHRB 2014; MHS 2014; City of Winnipeg 2014b). The Joseph P. Borowski Memorial, located at 1639 Pembina Highway near Manahan Avenue in the Maybank neighbourhood, was the only historic site found in the LSA. The search of the MHS site found that Parker Avenue was named in 1882 for journalist Elizabeth Fulton Parker, who assisted in founding of the YWCA in Winnipeg, the Women’s Canadian Club, and the Alpine Club of Canada (MHS 2014). There were no Heritage Resources or historic sites found to be located in the PSA.

17 PUBLIC AND STAKEHOLDER CONSULTATION

Public and stakeholder consultation was undertaken during the Alignment Study component of the Project in 2011 and 2012, and during the Functional Design component of the Study in 2013 and 2014.

For the Alignment Study, Dillon created and implemented an open public consultation program as part of the Project. The purpose of the consultation program was to engage the public and stakeholders in the study so they had the opportunity to understand the facts about the alignment options for the Project and the opportunity to provide input, opinion and feedback about the alignment options for the Project.

Dillon used a variety of consultation tools to communicate information about the Project and solicit feedback from the public:

- **Letters/Information Brochure:** Canada Post distributed one letter/information brochure to 8,097 mailboxes in the neighbourhoods of Parker, Beaumont, Buffalo, Maybank, Chevrier, Pembina Strip, Waverley Heights and Montcalm, during the week of September 5, 2012. The brochure provided information on the Project, contact information, and served as the primary invitation to the Open Houses.
- **Advertisements:** Dillon prepared an advertisement for the City of Winnipeg to place in the Winnipeg Free Press on September 8 and 15, 2012. The City of Winnipeg also issued a public media release prior to the public Open House, which generated interest from local print and radio media, including CBC and Winnipeg Free Press.
- **Internet:** Dillon prepared an informative “fact sheet”, which the City of Winnipeg used as a basis for the information posted to the Transit webpage outlining the Project (winnipegtransit.com). The website included information on how the public could get involved and participate by means of the two open houses or online through the survey link. Dillon made the survey available at each Open House, as well as an online Open House. Transit posted the online Open House on winnipegtransit.com to give the opportunity to those who could not attend the open house a chance to participate and provide their feedback.

- **Opinion and Feedback Survey:** Dillon developed one public survey for the purpose of collecting feedback about the three alignment options reviewed in the 2012 alignment study. The survey allowed the public to identify their preferred alternative (Concept 1A, 1B, and 2), as well as provide feedback on specific criteria relating to community linkages, property, neighbourhood, business, environmental, operations, and construction, in addition to general comments/opinions. Dillon distributed the survey at each Open House. The survey was also posted online as part of the online Open House at winnipegtransit.com.
- **Open House:** Transit and Dillon hosted two public open houses for the 2013 alignment study, the first on Wednesday evening of September 19 and the second on a Saturday during the day September 22, 2012. Both Open Houses were held at the Holiday Inn Winnipeg South at 1330 Pembina Highway, near the communities and possible Southwest Transitway alignment. Information was shared about the two alignment options as well as the overall Project. Over 375 people attended the Open House (331 completed the survey, either in person or online). An online Open House was subsequently posted online through the survey link for study by other interested individuals. The discussions were informed and contributed to the final recommended option.

Additional information on the Public Consultation program carried out by Dillon for the Alignment Study is provided in Dillon’s “Southwest Rapid Transit Corridor Stage 2 Alignment Study – Final Report” (Dillon 2013a).

For the Functional Design component, Dillon and their sub-consultant, Landmark Planning and Design Inc., carried out the public consultation program associated with the Project in two ‘rounds’. Round 1 occurred between October 2013 and December 2013. Round 2 occurred between January 2014 and March 2014.

The purpose of Round 1 consultation was two-fold:

- Provide basic, early project information (i.e. scope, timing, design, etc.); and
- Identify issues and ideas that the design team should consider during the preparation of the functional design.

The purpose of Round 2 consultation was two-fold:

- Provide detailed information relating to the draft functional design, including responses to the issues, concerns and ideas presented by participants in Round 1 consultation; and
- Identify opportunities to adjust the draft Functional Design and/or provide further information based on participant feedback.

The consultation approach included the following components during each of the two rounds of consultation:

- Meeting with approximately 25 internal and external stakeholder groups or individuals (e.g. City departments, utilities, nearby institutions, advocacy groups, etc.);
- Meetings with individuals (i.e. residents, landowners, renters, etc.);
- Small Group Meetings with residents or businesses with property directly adjacent to the proposed transitway corridor;
- Information sessions for the general public;

- Information provided via a project website; and
- “Full-time” direct access by phone or email to the public consultation team.

Participants represented a range of perspectives including residents living directly adjacent to the planned corridor, those living nearby, and other Winnipeg citizens living more distant from the proposed corridor. Businesses, organized interest groups, land leaseholders and transit users also participated. About half of the respondents that participated in Round 1 of the consultation process also participated in Round 2 of the consultation process, indicating good continuity as well as good on-going participation opportunities. The vast majority of participants in each round of the consultation process indicated that the team members working with participants were helpful, and that the information provided was helpful. During Round 1 of the consultation process, stakeholders provided a mix of opinions concerning the Project:

- Adjacent commercial and multi-family property owners (owners of vacant land) see the benefits of this project with respect to the potential for the transitway to increase value for transit-oriented development (TOD) on these sites, which, in turn, will increase the City’s property tax base and contribute to “Our Winnipeg’s” infill development goals along rapid transit corridors. Owners would also like to ensure residents have access to active transportation (AT) pathways along the route;
- Existing and future transit users expressed a range of opinions regarding the Stage 2 Project; many were supportive of the new service and the overall rapid transit plan for Winnipeg; others were not supportive for various reasons as outlined below;
- A significant number of individuals that participated in the consultation expressed a concern regarding the loss of “perceived public space”. The “Parker Lands” are privately held lands mistakenly seen to be public lands due to the frequent use by local residents for strolling, dog walking, etc. The desire is to “preserve” all or part of these lands.
- There is concern regarding the potential impact to the existing City of Winnipeg dog park; it is apparent that many dog park users think the dog park area is much larger than it is (i.e. the entirety of the “Parker Lands” versus an area about 1/6th the size); users are concerned about loss of the dog park;
- Individuals living in homes directly adjacent to the proposed corridor expressed concerns regarding the potential for disruptive effects such as noise, vibration, transitway lighting and odour;
- Individuals living directly adjacent and to the west of Letellier rail line expressed concerns about the potential for increased noise, vibration and risk associated with the potential relocation of the rail line closer to their residences;
- A number of individuals expressed concern regarding potential decreases in transit service on Pembina Highway;
- Many participants provided commentary considered to be outside the scope of this Functional Design project; the commentary can be generally summarized as advocating for: elimination of rapid transit as an option altogether; relocation of the selected rapid transit route to another route (e.g. Pembina Highway, Letellier rail corridor); or concern regarding project cost.

During Round 2 of the consultation process, stakeholders had a variety of comments concerning the draft functional design:

- Many respondents indicated that initial concerns had been addressed through the draft Functional Design. Some respondents continued to suggest an alternative routing for the transitway beyond the scope of the draft Functional Design study.
- There was substantial support for the Active Transportation (AT) component of the draft Functional Design. A number of participants provided specific suggestion for improvement of the proposed AT components.
- A number of participants provided suggestions for bus routing, particularly concerning the frequency of Pembina Highway routes.
- A number of participants indicated an on-going concern about the potential for noise and dust from busses would negatively impact the enjoyment of their properties.
- A number of participants provided suggestions for the placement and design of the stations (i.e. station amenities), including consideration for vision impaired individuals.
- A number of participants provided suggestions for modifying the road system in and around the proposed transitway.
- Commentary concerning the existing dog park generally indicated that the provision of an alternative dog park nearby was a reasonable solution.
- Commentary concerning the University of Manitoba access point was generally favourable towards using the Southpark Drive alignment rather than the Markham Avenue alignment.
- A small number of participants provided both negative and positive commentary concerning proposed Park and Ride locations. Concerns focused on the potential for transit riders to park on nearby residential streets rather than in designated park and ride spaces.
- A small number of participants re-iterated a wish to designate areas in the “Parker Lands” for use as a public park.
- A small number of participants expressed concern regarding the potential project cost.

Additional information on the Public Consultation program carried out by Landmark Planning and Design Inc. for the Functional Design study is provided in “Southwest Transitway (Stage 2) Public Engagement Report” (Landmark Planning and Design Inc. 2014). An Issue-Response table is provided in Appendix A of the full report. The table summarizes primary concerns or questions raised during both rounds of the consultation process and the response of the study team to each of these matters.

18 POTENTIAL ENVIRONMENTAL EFFECTS

18.1 Bio-physical Environment

18.1.1 Climate

The Project construction activities are not expected to have an effect on the local climate (i.e., no effect on air pressure, cloud cover, humidity, precipitation, hours of sunshine, temperature, wind speed and wind direction).

As noted in Section 5, one of the objectives of the Project is a reduction in GHG emissions. The implementation of the transitway will reduce GHG emissions as a result of a mode shift from

high-consumption private automobiles to public transit and active transportation. Operating efficiencies resulting from higher speeds and new vehicles are expected to reduce emissions from the bus fleet that operates on the transitway. A reduction in GHG emissions during the O&M phase of the Project is considered to be a positive effect of the Project.

18.1.2 Air Quality and Greenhouse Gas Emissions

During the Project construction activities, there will be air and GHG emissions due to exhaust and/or dust from the use of stationary and mobile project equipment (e.g., asphalt pavers, backhoes, bulldozers, dump trucks, excavators, scrapers, packers, etc.). These emissions may have a temporary, localized effect on air quality and GHG emissions in the PSA during the Project construction phase. As noted in Section 18.1.1 above, these emissions are not expected to have a significant effect on climate in the PSA, LSA or RSA.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the Contractor and City will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. The PSA is located in a mixed urban area with existing commercial, industrial, residential and transportation activities. As such, the O&M activities are not expected to have a significant effect on air quality and GHG emissions in the PSA. As noted in Section 18.1.1 above, one of the objectives of the Project is a reduction in GHG emissions, and a reduction in GHG emissions during the O&M phase of the Project is considered to be a positive effect of the Project.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.3 Noise and Vibration

During the Project construction activities, there will be noise and vibration due to the use of stationary and mobile project equipment (e.g., asphalt pavers, backhoes, bulldozers, dump trucks, excavators, scrapers, packers, etc.). This noise and vibration may have a temporary, localized effect on noise and vibration in the PSA during the Project construction phase. As shown in Table 16.4 in Section 16.3.3, average background noise levels from road and rail traffic in the PSA likely range from about 60 to 70 dBA, although actual noise levels would be dependent on the volume of traffic, speed of the traffic and distance from the road or railway. The areas surrounding the PSA consist of both residential and light industrial uses, and typical noise levels in the PSA from these sources likely range from about 50 to 55 dBA. Road construction equipment noise ranges between about 76 dB and 89 dB at 15 m from the equipment.

Sound levels drop by 6 dB for every doubling of the distance from the source of the noise of emission (Engineering Page 2014; Sengpiel Audio 2014). Table 18.1 provides a summary of the expected decibel levels with distance from the construction equipment.

Table 18.1: Attenuation of Construction Equipment Noise with Distance

Equipment	dB at 15 m	dB at 30 m	dB at 60 m	dB at 120 m	dB at 240 m
Paver	89	83	77	71	65
Bulldozer, Grader, Loader	85	79	73	67	61
Pump	76	70	64	58	52

Source: Engineering Page 2014; Sengpiel Audio 2014

The noise levels from the construction activities will decrease over distance. It is expected that the construction noise levels will be in the “very annoying” to “annoying” range for receptors located within 15 m to 30 m of the works, decrease to the “annoying” to “intrusive” range for receptors located within 60 m to 120 m of the works, and be within existing ambient noise levels for receptors located within 240 m of the works (Table 16-4).

Martin (1977) found that ground vibration levels are unlikely to be high enough to cause any disturbance to people situated at distances greater than 20 m from the source of vibration. As such, the vibration produced during the construction activities is not expected to have a significant effect on people or residences located greater than 20 m from the construction sites within the PSA.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. The Project design includes features to reduce noise and vibration in the PSA and mitigate any additional noise and vibration that may occur in the PSA as a result of the Project O&M. These features include:

- Existing operating train speeds of 30 to 40 km/hr in the CN Letellier subdivision will be maintained following completion of the Project;
- To minimize train noise, continuous welded rail (CWR) with premium ties and fasteners will be used for the relocated CN Letellier track (based on CN engineering track standards);
- A noise attenuation wall is proposed on the west side of the relocated CN Letellier track between Bishop Grandin Boulevard and Markham Road; and
- During Project construction, CN service on the CN Rivers tracks and on the CN Letellier track and spur tracks will be maintained.

In addition to the above, the City has committed to baseline noise monitoring and noise attenuation barrier design within the Project Detailed Design process. The City manages the issue of noise-related traffic through the City of Winnipeg Motor Vehicle Noise Policies and Guidelines, dated October 11, 1984. While dated, the policy provides overall guidance and direction for roadway planning and related noise attenuation, i.e., if the intruding noise level exceeds the existing sound levels by 5 dBA, noise attenuation measures are to be considered. In order to arrive at the sound levels produced by the transitway, the City will require the collection of baseline field measurements along areas of concern, followed by the use noise prediction models of the operational transitway to determine the nature and extent of any attenuation. When outdoor sound levels are 55 dBA or less for daytime and 50 dBA or less for nighttime, no noise control measures are contemplated. Proposed follow-up involves monitoring and periodic inspection of the site for noise/vibration levels, monitoring complaints and ensuring adherence to design specifications.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.4 Terrain and Soils

The construction of the Project will require the permanent alteration of portions of terrain and soils in the PSA, and temporary disturbance to terrain and soils in other areas of the PSA. A section of the terrain and soils located in the Manitoba Hydro RoW between the Parker Lands and Clarence Avenue (Figure 6-1; Appendix A, figures 2, 3 and 4) will be converted from grassy, treed or wet meadow areas to be used as the dedicated transitway, stations and AT pathways, and the section of the Parker Lands located in the Manitoba Hydro RoW between the CN wye tracks and Heatherdale Avenue will be converted to the Parker Retention Pond (Figure 7-1; Appendix A, blue area outlined on Figure 4). Other smaller areas in this section of the PSA will be converted to ditches as part of the Project drainage system requirements (Figure 7-1; Section 7.13). South of Clarence Avenue to Markham Avenue, the existing parking lot, roadways and grass or dirt areas will also be converted for use as the dedicated transitway, stations, AT pathways and drainage system requirements (Figure 1-1; Appendix A, Figures 1 and 2). The alteration or disturbance of terrain and soils due to the Project construction activities will be limited to areas located within the existing Manitoba Hydro or CN RoWs.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities do not involve any soil removal and as such are not expected to have a significant effect on terrain and soils in the PSA.

The Manitoba Contaminated Sites List (MCWS 2014a) was reviewed to identify potentially impacted or contaminated sites within or adjacent to the PSA (Section 16.3.4.1). All of the known impacted sites are

outside of the actual BRT alignment properties and Manitoba Conservation indicated that all impacts are contained within the impacted properties, as identified on the Manitoba Conservation Contaminated Sites List (MCWS 2014a). As such, there are no expected effects on terrain and soils in the PSA as a result of contaminated sites or the need for site remediation.

There is the potential for the release of hazardous materials as a result of accidents and malfunctions that may occur during the Project construction and/or O&M activities. These potential effects can be mitigated by the implementation of appropriate equipment usage, equipment fuelling and equipment maintenance techniques.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.5 Groundwater

Potential effects to groundwater due to the Project construction and O&M activities include the accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances during the Project construction activities to groundwater sources in the PSA.

The geotechnical investigations for the PSA (AECOM 2014) showed that the soil profile in the PSA generally consists of a thin layer of topsoil, followed by a layer of glacio-lacustrine clay up to 12 m thick, a layer of glacial till from 4 to 6 m thick and a layer of limestone bedrock. This limestone bedrock contains the Upper Carbonate aquifer, which is the major aquifer underlying the Winnipeg area and occurs in the top 15 m to 30 m of the Paleozoic bedrock limestones and dolomites (Section 16.3.5). The Upper Carbonate aquifer is partially confined above by the glacial drift and below by the slightly pervious underlying carbonate rock. The water quality in the Upper Carbonate aquifer can be saline in this area of Winnipeg, with groundwater chloride concentrations from 500 to 1000 mg/l (Render 1970). As such, all residential potable water in the PSA is provided by the Aqueduct; there are no residential potable water wells in the PSA, LSA or RSA.

Given that the depth to the aquifer is about 16 to 18 m below ground and lies beneath a layer of clay, it is expected that, along with appropriate mitigation measures (e.g., appropriate equipment usage, fuelling and maintenance techniques), the potential effect of an accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances during the Project construction activities to groundwater sources in the PSA is not significant.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities do not involve any soil removal or excavations. With appropriate mitigation

measures (e.g., appropriate equipment usage, fuelling and maintenance techniques), it is expected that the potential effect of an accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances during the Project O&M activities to groundwater sources in the PSA is not significant.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.6 Surface Water

The potential effects to surface water in the PSA and LSA include:

- Alteration of the existing drainage regime, flows and/or amount of surface water;
- Changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization; and
- Accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances to PSA or LSA watercourses, ditches or drains.

The Project construction and O&M activities include the development, operation and maintenance of a land drainage system that would drain into existing adjacent land drainage systems, including the City's planned Parker Retention Pond. The land drainage system for the Project has been designed to utilize existing drainage pathways and the City's planned Parker Retention Pond to move water off of the land surface and retain the flows, prior to discharge to existing combined sewer and stormwater drainage systems. The results of the hydraulic assessment conducted for the Project land drainage system showed that there is no effect on the peak flow rate in the adjacent systems. As such, the Project construction and O&M activities are not expected to have a significant effect on the existing drainage regime or flows in the PSA.

The development of the Parker Retention Pond as carried out by the City Water and Waste Department will create a catchment area in areas that currently consist of treed areas, grassy areas, wet meadow and cattail stands. It is expected that these areas are periodically inundated during spring melt and peak runoff periods, and may be inaccessible by pedestrians and/or cyclists during these periods. The development of the Parker Retention Pond will partially capture the runoff and drainage that typically spreads over the area to create a delineated area of about 6.7 ha (Figure 7-2; Appendix A, blue area outlined in Figure 4) that will serve as a pond and wetland area in the PSA. It is the City of Winnipeg Water and Waste Department's intention to carry out the conceptual and final design for the Parker Retention Pond to incorporate natural features and native plants, such as those used by Native Plant Solutions (a division of Ducks Unlimited Canada), a group currently developing methods and plans for the construction of stormwater ponds that incorporate upland, wet meadow, and wetland plants and features for constructed ponds (Ross 2013). As such, the amount of surface water in the PSA will not be altered, but the manner in which it is collected, stored and drained in the PSA will be changed from the existing conditions. Although not part of the Project scope, the City's planned Parker Retention Pond is linked to the Project as the pond will provide water retention as part of the prevention of overland flooding in the area, and replace the function of the wet meadow and cattails stands as wet areas and habitat for the existing vegetation and wildlife in the PSA that require these seasonally wet conditions.

During the Project construction activities there will be areas within the PSA where deep excavations are required, i.e., the road tunnel crossing under the CN rail tracks. Excessive discharge from the Upper Carbonate aquifer and groundwater flows have interfered in the construction of bridge and building foundations in the City in previous projects (Render 1970). In recognition of these potential groundwater incursions, the Project construction plans will include methods to depressurize the aquifer and remove any groundwater from the excavation sites. Groundwater will possibly need to be removed from the tunnel excavation and the rail bridge construction sites by installing temporary wells and pumping the groundwater to the existing City of Winnipeg sewer system for treatment at the South End Water Pollution Control Centre (SEWPCC). Groundwater will be analyzed to determine its suitability/approval for sanitary sewer or land drainage system discharge. As such, the potential effect of changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization is expected to be not significant.

With appropriate mitigation measures (e.g., appropriate equipment usage, fuelling and maintenance techniques), it is expected that the potential effect of an accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances during the Project construction and/or O&M activities to surface water in the PSA is not significant.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.7 Fish and Fish Habitat

There is no fish or fish habitat located in the PSA. However, the LSA includes portions of the Red River and therefore the potential effects of the Project construction and O&M activities include:

- Changes to the water chemistry of surface waters due to changes to the existing land drainage system in the PSA;
- Changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization; and
- Accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances to PSA or LSA watercourses, ditches or drains.

The existing system of combined sewers and/or stormwater drains in the PSA and LSA eventually drain to outfalls located along the Red River. The land drainage system developed for the Project will use this existing system of combined sewers and/or stormwater drains. There will be no additional drainage inputs or amounts in the PSA. As such, the potential effects on fish or fish habitat in the LSA due to changes to the water chemistry of surface waters as a result of changes to the existing land drainage system in the PSA is expected to be not significant.

As noted in Section 18.1.6, groundwater may need to be removed from the tunnel and rail bridge excavation sites by installing temporary wells and pumping the groundwater to the existing City of Winnipeg sewer system for treatment at the South End Water Pollution Control Centre (SEWPCC). Groundwater will be analyzed to determine its suitability/approval for sanitary sewer or land drainage

system discharge. As such, the potential effect of changes to the water chemistry of fish or fish habitat in the LSA by brackish/saline groundwater released during aquifer depressurization is expected to be not significant.

With appropriate mitigation measures (e.g., appropriate equipment usage, fuelling and maintenance techniques), it is expected that the potential effect of an accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances during the Project construction and/or O&M activities to fish or fish habitat in the LSA is not significant.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.8 Vegetation

The potential effects on vegetation due to the Project construction activities include:

- Permanent alteration of treed, grassy, wet meadow and cattail stand areas in portions of the PSA;
- Temporary disturbance to grassy areas in portions of the PSA; and
- Introduction of new or additional non-native or invasive plant species.

The construction of the Project will require the permanent alteration of portions of vegetation in the PSA, and temporary disturbance to vegetation in other areas of the PSA. A section of the vegetation located in the Manitoba Hydro RoW between the Parker Lands and Clarence Avenue (Figure 6-1; Appendix A, Figures 2, 3 and 4) will be converted from grassy, treed or wet meadow areas to be used as the dedicated transitway, stations and AT pathways, and the section of the Parker Lands located in the Manitoba Hydro RoW between the CN wye tracks and Heatherdale Avenue will be converted to the Parker Retention Pond (Figure 7-1; Appendix A, blue area outlined on Figure 4). Other smaller areas in this section of the PSA will be converted to ditches as part of the Project drainage system requirements (Figure 7-1; Section 7.13). South of Clarence Avenue to Bison Drive, the existing parking lot, roadways and grass or dirt areas will also be converted for use as the dedicated transitway, stations, AT pathways and drainage system requirements (Figure 6-1; Appendix A, Figures 1 and 2). The alteration or disturbance of vegetation due to the Project construction activities will be limited to areas located within the existing Manitoba Hydro or CN RoWs.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities do not involve any vegetation removal and as such are not expected to have a significant effect on vegetation in the PSA.

Manitoba Hydro also conducts regular mowing of the grassy areas in the transmission line RoW areas located in the PSA. This existing O&M activity will be continued as part of the Project O&M activities and will not result in any additional environmental effects.

Both the construction and the O&M activities can lead to the introduction of non-native or invasive plants as seeds of these plants may be brought in to an area by equipment or footwear used in other areas. Mitigation measures to help prevent the introduction or expansion of non-native and invasive plants in the PSA include cleaning of equipment and footwear prior to entering the Project area. The planting of native species can also help prevent colonization of newly exposed areas by non-native or invasive species.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.9 Wetlands

The Project construction activities will result in the permanent change of the majority of the wet meadow and cattail stand areas in the PSA due to the construction of the transitway, AT pathways and stations; development of the drainage system for the Project; and development of the Parker Retention Pond by the City of Winnipeg Water & Waste Department. The City of Winnipeg conceptual and final design for the Parker Retention Pond is anticipating to incorporate natural features and native plants, such as those used by Native Plant Solutions (a division of Ducks Unlimited Canada), a group currently developing methods and plans for the construction of stormwater ponds that incorporate upland, wet meadow, and wetland plants and features for constructed ponds (Ross 2013). The primary function of the Parker Retention Pond is to provide stormwater retention as part of the Cockburn and Calrossie Combined Sewer Relief Works; the current design concept for separation involves the construction of the Parker Retention Pond. The Pond, while a project of City of Winnipeg Water & Waste, has been identified in the list of adjacent systems as drainage along Parker Avenue will be routed east toward the pond via ditches. The City's development of the Parker Retention Pond is anticipated to include the incorporation of natural vegetation and shoreline features that could also provide habitat for the existing vegetation and wildlife in the PSA that require these seasonally wet conditions. The development of the Parker Retention Pond as wetland habitat would provide compensation for the Project effects on the wet meadow and cattails stands in the PSA, provide potential amphibian and other wildlife habitat, meet regulatory requirements, and address stakeholder concerns.

Native Plant Solutions have conducted studies that show how the stormwater ponds that contain wetland plants and features outperform the stormwater ponds designed only with upland plants in terms of:

- Improved water quality and clarity;
- Reduced growth of nuisance algae;
- Decrease in grazing geese;
- Reduced growth of invasive plant species as native plants outcompete the invasive species;
- Reduced sediments and higher absorption of nutrients;
- Reduction of pathogens and degradation of pesticides;

- Lower construction and long-term management costs; and,
- Creation of natural areas in the urban environment.

Additional advantages of designing and constructing a stormwater pond that incorporates natural features and native plants include:

- Demonstration of environmental awareness and stewardship, due diligence and corporate responsibility by striving to meet Province of Manitoba water quality and wetland protection objectives.
- If the correct plants and features are used and implemented, the stormwater pond could help replace the summer habitat for Northern leopard frog that may be present in the PSA, and potentially increase the quantity and quality of habitat for Northern leopard frog in the area by providing the depth and cover needed for spring breeding activities.
- The stormwater pond and areas around it could be used to provide habitat and propagation of upland, wet meadow and wetland plant Species At Risk and other native prairie plant species.
- The existing milkweed plants in the PSA, additional milkweed plants and other native plants such as goldenrod, black-eyed Susan (*Rudbeckia hirta*) and wild bergamot (*Monarda fistulosa*) could be planted as part of the Parker Retention Pond and other Project landscaping activities to provide habitat in the PSA for Monarch butterflies, as well as for birds, bees, dragonflies and other beneficial insects.
- It is expected that the areas of shallow standing water created in the existing wet meadow, grassy areas and stands of cattails in the PSA during the spring and summer provide habitat for mosquitoes. The development of the Parker Retention Pond and land drainage system for the Project will remove some of these standing water areas and potentially reduce mosquito habitat areas. Development of a stormwater pond in the PSA will also create areas of standing water for the growth of mosquitoes; however, the use of native plants to create habitat for birds, bees, dragonflies and other beneficial insects would also encourage the presence of these and other wildlife (e.g., bats) that feed on mosquitoes and mosquito larvae.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities are not expected to have a significant effect on any remaining areas of wet meadow or cattails stands in the PSA, or to any wetland areas created by the development of the City's Parker Retention Pond in the PSA.

Manitoba Hydro also conducts regular mowing of the grassy areas in the transmission line RoW areas located in the PSA. This existing O&M activity will be continued as part of the Project O&M activities and will not result in any additional environmental effects. It is expected that mowing could be ceased or altered in the areas in and around the City's Parker Retention Pond if mowing affects any efforts to propagate specific plant species.

Both the construction and the O&M activities can lead to the introduction of non-native or invasive plants as seeds of these plants may be brought in to an area by equipment or footwear used in other areas. Mitigation measures to help prevent the introduction or expansion of non-native and invasive plants in the PSA include cleaning of equipment and footwear prior to entering the Project area. The planting of native species can also help prevent colonization of newly exposed areas by non-native or invasive species.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.10 Wildlife and Wildlife Habitat

The potential effects on wildlife and wildlife habitat due to the Project construction and O&M activities include:

- Temporary disturbance in the PSA during construction and O&M activities; and
- Permanent alteration of treed, grassy, wet meadow and cattail stand areas in the PSA that may provide habitat.

The treed, grassy, wet meadow and cattail stand areas in the PSA provide small areas of habitat that may provide feeding, foraging, nesting, breeding and/or overwintering habitat for some wildlife species that are adapted to urban living and are able to use these small pockets of habitat areas, and also provide feeding and resting areas for other wildlife species passing through the area on their way to breeding, nesting and/or overwintering areas outside of the PSA. It is expected that the majority of wildlife species present in the PSA are habituated to the noise and activity in the PSA. As such, the potential effect of temporary disturbance during construction and O&M activities is not expected to have a significant effect on wildlife and wildlife habitat in the PSA.

Some of the treed, grassy, wet meadow and cattail stand areas in the PSA will be replaced by the landscaping and plantings associated with the development of the AT pathways and the adjacent Parker Retention Pond. It is expected that the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA will displace some of the wildlife species that may be present in the existing PSA, while other species will remain or return after the completion of the Project construction activities. As such, the potential effect of the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA that may provide wildlife habitat is expected to have a minimal effect on wildlife and wildlife habitat in the PSA.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.1.11 Species at Risk

The potential effects on Species at Risk due to the Project construction and O&M activities include:

- Temporary disturbance in the PSA during construction and O&M activities;
- Injury or mortalities to Northern leopard frogs or Monarch butterfly larvae present in the construction and/or O&M areas;

- Permanent alteration of grassy, wet meadow and cattail stand areas in the PSA that may provide habitat for Northern leopard frogs; and
- Loss of milkweed plants in the PSA that may provide Monarch butterfly habitat.

Table 16-7 in Section 16.3.11 outlines the Species At Risk that may be present in the PSA. All of these species are migratory and/or have specific breeding and/or overwintering habitat requirements that are not present in the PSA. As such, disturbance of these species would only occur during the spring or summer periods when these species would be able to use the habitat available in the PSA. It is expected that the bird and bat species in Table 16-7 would only be present in the PSA for feeding or temporary resting needs, and would avoid the noise and disturbance in the PSA during Project construction and O&M activities.

Although not observed during the field survey, Northern leopard frog and Monarch butterfly may be present in the PSA based on the assessment of available habitat (wet meadow, ditches, cattail stands for Northern leopard frog; milkweed for the Monarch butterfly). Northern leopard frogs present in the PSA during Project construction and O&M activities would be at risk of being injured or killed by various types of equipment, including mowers used by Manitoba Hydro for existing O&M activities. Monarch butterfly larvae would also be at risk of injury or mortality if adult Monarchs are able to access the milkweeds plants prior to construction activities, and the milkweed plants are subsequently destroyed.

Mitigation measures that may be used to prevent injury or mortality of Northern leopard frog and/or Monarch butterfly include: conducting a pre-construction survey in the spring to determine the presence and location of any Species At Risk in the PSA; relocating the milkweed plants present in the PSA prior to the construction and O&M activities; capturing and relocating any Northern leopard frogs found within the PSA prior to the construction and O&M activities; and/or scheduling construction and O&M activities to take place in the late summer, fall or winter when these species would not be present in the PSA.

During periods of inundation, the grassy, wet meadow and cattail stand areas in the PSA may provide summer foraging habitat for Northern leopard frog. Some of the treed, grassy, wet meadow and cattail stand areas in the PSA will be replaced by the landscaping and plantings associated with the development of the AT pathways and the Parker Retention Pond. It is expected that the permanent alteration of the grassy, wet meadow and cattail stand areas in the PSA will displace some of the Northern leopard frogs that may have returned to these areas of the PSA in the spring, while other individuals may adapt to the new conditions and return after the completion of the Project construction activities. As such, the potential effect of the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA that may provide areas of seasonal habitat for Northern leopard frog is expected to have a minimal effect on Northern leopard frog in the PSA.

The potential loss of milkweed plants in the PSA that may provide Monarch butterfly habitat can be mitigated by: relocating the existing plants in the PSA prior to the Project construction activities; and/or replacing the existing plants with new plantings of milkweed in the landscaped areas for the Project and/or Parker Retention Pond. As such, the overall effect of the potential loss of milkweed plants in the PSA was considered to be not significant.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.2 Socio-Economic Environment

18.2.1 Stakeholders

Potential effects of the Project construction activities on stakeholders include:

- Temporary disturbance due to noise, dust, equipment and crews working in the PSA;
- Temporary disturbance to traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA;
- Permanent alteration of the treed, grassy, wet meadow and cattail stand areas in sections of the PSA;
- Permanent alteration of sections of the dog park and community gardens located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard;
- Creation of AT pathways in the PSA; and
- The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions.

The Project construction activities will cause a temporary disturbance to stakeholders due to noise, dust, equipment and crews working in the PSA. The measures that will be employed during construction activities to mitigate these effects are summarized in Table 19.1.

The Project construction activities will cause a temporary disturbance to stakeholders due to disruptions in traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA. The measures that will be employed during construction activities to mitigate these effects are summarized in Table 19.1.

The construction of the Project will require the permanent alteration of land areas in the PSA, and temporary disturbance to lands in other areas of the PSA. A section of the lands located in the Manitoba Hydro RoW between the Parker Lands and Clarence Avenue (Figure 6-1; Appendix A, Figures 2, 3 and 4) will be converted from grassy, treed or wet meadow areas to be used as the dedicated transitway, stations and AT pathways, and the section of the Parker Lands located in the Manitoba Hydro RoW between the CN wye tracks and Heatherdale Avenue will be converted to the Parker Retention Pond (Figure 7-1; Appendix A, blue area outlined on Figure 4). Other smaller areas in this section of the PSA will be converted to ditches as part of the Project drainage system requirements (Figure 7-1; Section 7.13). South of Clarence Avenue to Bison Drive, the existing parking lot, roadways and grass or dirt areas will also be converted for use as the dedicated transitway, stations, AT pathways and drainage system requirements (Figure 6-1; Appendix A, Figures 1 and 2). This alteration was perceived as a positive effect by some stakeholders, and as a negative effect by others (Section 17).

During the Public Consultation activities, stakeholders indicated that the provision of an alternative dog park nearby was a reasonable solution to the alteration of the existing dog park (Section 17). Stakeholders also indicated support and a positive reaction to the creation of AT pathways in the PSA (Section 17).

The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions, are considered to be positive effects of the Project.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities are temporary in duration, localized in area and similar to the O&M activities that currently occur in the PSA. As such, these O&M activities are not expected to have a significant effect on stakeholders in the PSA.

Table 19.1 in Section 19 provides a summary of the mitigation measures that will be implemented to minimize the potential effects of the Project construction and O&M activities.

18.2.2 Aboriginal Interests

There are no First Nations reserve lands, Treaty Land Entitlements or Community Interest Zones located within the PSA (Section 16.4.4). As such, the Project construction and O&M activities are not expected to affect First Nations lands or First Nations traditional land use activities in the RSA. There are no Métis organizations or known Métis interests located within the PSA or LSA (Section 16.4.4). As such, the Project construction and O&M activities are not expected to affect Métis interests or activities in the PSA or LSA.

18.2.3 Land Use

Potential effects of the Project construction activities on land use include:

- Temporary disturbance due to equipment and crews working in the PSA;
- Temporary disturbance to traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA;
- Permanent alteration of the treed, grassy, wet meadow and cattail stand areas in sections of the PSA;
- Permanent alteration of sections of the dog park and community gardens located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard; and
- Creation of AT pathways in the PSA.

The Project construction activities will cause a temporary disturbance to existing land use in the PSA due to equipment and crews working in the PSA. The measures that will be employed during construction activities to mitigate these effects are summarized in Table 19.1.

The Project construction activities will cause a temporary disturbance to existing land use due to disruptions in traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA. The measures that will be employed during construction activities to mitigate these effects are summarized in Table 19.1.

The construction of the Project will require the permanent alteration of land areas in the PSA, and temporary disturbance to lands in other areas of the PSA. A section of the lands located in the Manitoba Hydro RoW between the Parker Lands and Clarence Avenue (Figure 6-1; Appendix A, Figures 2, 3 and 4) will be converted from grassy, treed or wet meadow areas to be used as the dedicated transitway, stations and AT pathways, and the section of the Parker Lands located in the Manitoba Hydro RoW between the CN wye tracks and Heatherdale Avenue will be converted to the Parker Retention Pond (Figure 7-1; Appendix A, blue area outlined on Figure 4). Other smaller areas in this section of the PSA will be converted to ditches as part of the Project drainage system requirements (Figure 7-1; Section 7.13). South of Clarence Avenue to Bison Drive, the existing parking lot, roadways and grass or dirt areas will also be converted for use as the dedicated transitway, stations, AT pathways and drainage system requirements (Figure 6-1; Appendix A, Figures 1 and 2). These changes to the land base will alter the use of some areas of the PSA, particularly the areas of the Manitoba Hydro RoW used for walking, cycling, dog walking and gardening. With the exception of gardening, the development of the Project's AT pathways will provide alternate areas for these land use activities in the PSA. It is expected that the City will reallocate or replace the community garden area located adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard.

During the Public Consultation activities, stakeholders indicated that the provision of an alternative dog park nearby was a reasonable solution to the alteration of the existing dog park (Section 17). Stakeholders also indicated support and a positive reaction to the creation of AT pathways in the PSA (Section 17).

As such, the potential effects on land use in the PSA due to the Project construction activities are expected to be not significant.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities are temporary in duration, localized in area and similar to the O&M activities that currently occur in the PSA. As such, the O&M activities are not expected to have a significant effect on land use in the PSA.

18.2.4 Resource Use

The existing resource use in the PSA includes use of the lands for: the CN rail line and RoW; Manitoba Hydro transmission lines, distribution lines, towers and RoW; commercial, industrial, recreational and residential land use; cycling, dog walking, gardening and walking areas; roadways and transportation uses; feeding and resting areas for urban wildlife; and runoff and stormwater drainage. There are no hunting, trapping, fishing or gathering of medicinal or sacred plants activities in the PSA.

The Project construction activities are not expected to result in any losses to the existing resource use in the PSA. Some of the land areas will be altered and there will be the additional use of a BRT system, but overall, the resource use will remain the same and the Project construction activities are not expected to have a significant effect on resource use in the PSA.

During the O&M phase of the Project (Section 10), in addition to the operation of the transitway, the City (or its Contractor) will need to perform O&M activities such as transitway and road maintenance (concrete repairs as required, snow clearing in winter, line painting); and maintenance of stations, Park and Ride areas, AT pathways, landscaping and drainage systems. CN will need to conduct O&M activities consistent with the maintenance activities currently in place for existing rail lines and in keeping with current BMPs, regulations, specifications and standards for the transportation and rail industries. These O&M activities are temporary in duration, localized in area and similar to the O&M activities that currently occur in the PSA. As such, the O&M activities are not expected to have a significant effect on resource use in the PSA.

18.2.5 Protected Areas

There are no protected areas located in the PSA or LSA. As such, there were no potential effects to protected areas identified due to the Project construction or O&M activities.

18.2.6 Heritage Resources

The MHRB indicated that there were no records of archaeological findings in the PSA (Section 16.4.8; Appendix D). There were no other Heritage Resources or historic sites found to be present within the PSA (Section 16.4.8). As such, there were no potential effects to Heritage Resources identified due to the Project construction or O&M activities.

In the event that archaeological and/or historical artifacts are discovered during construction, work at the location will cease immediately, and the discovery will be reported to the Project Construction Field Supervisor. The Project Construction Field Supervisor or their designate will contact the MHRB for further information and instruction on an acceptable heritage resource management strategy.

19 PROPOSED MITIGATION

The City of Winnipeg is committed to conducting all of their construction projects in a manner that will reduce potential effects on the environment wherever possible. As part of this commitment, the City of Winnipeg through its Contractor will develop a project specific Environmental Management Plan (EMP)

for the Project. The EMP will outline the environmental protection procedures and mitigation measures to be implemented before, during and after construction to prevent or minimize any adverse effects on the environment. The construction and O&M activities will be carried out in accordance with all applicable City of Winnipeg by-laws and guidelines (e.g., tree removal guidelines, tree protection guidelines) as well as all applicable provincial and federal laws, acts and regulations.

The potential environmental effects identified in Section 18 will be mitigated using the measures outlined in the EMP and in accordance with the following federal and provincial Acts, policies and regulatory guidance documents:

- Canada
 - Environmental Protection Act
 - Wildlife Act
 - Fisheries Act and Regulations
 - Migratory Birds Convention Act
 - Species at Risk Act
- Manitoba
 - Climate Change and Emissions Reductions Act
 - Dangerous Goods Handling and Transportation Act
 - Endangered Species Act
 - Environment Act
 - Noxious Weeds Act and Regulation
 - Stream Crossing Guidelines for the Protection of Fish and Fish Habitat
 - Sustainable Development Act
 - Transportation of Dangerous Goods Act
 - Waste Reduction and Prevention Act and Regulations
 - Wildlife Act

The current Project construction schedule (Figure 8-1) shows the works required in the PSA (new structures, roadworks for the new transitway, new stations, drainage works, landscaping) occurring at various times of the year from the first quarter of 2016 to the fourth quarter of 2019. The majority of the PSA is located within previously disturbed lands and/or vacant lands that are virtually devoid of wildlife habitat; as such, scheduling construction activities outside of wildlife breeding, nesting or migratory periods is not considered to be required in these areas. However, there are cattails stands and wet meadow areas in the Parker Lands and Manitoba Hydro RoW that may provide habitat for Northern leopard frog (Species At Risk), as well as milkweed patches that may provide habitat for Monarch butterflies (Species At Risk). There are a number of measures that can be taken to mitigate potential effects on these species:

- Conduct a pre-construction survey in the late spring before the start of Project construction activities to confirm the presence/absence of these species in the Parker Lands area.
- Relocate any Northern leopard frogs, if found in the area, to another location of appropriate habitat (e.g., near the Red River).

- Relocate the milkweed plants in the PSA to another suitable area.
- Mark the cattails stands/wet meadow/milkweed plant areas as sensitive sites and indicate in the Project EMP that construction activities for these areas will be scheduled to take place outside of the breeding or migratory periods for these two species (i.e., conduct works in the late fall or winter).
- Replacement of the lost or altered cattail stands/wet meadow areas in the Parker Lands with new areas of semi-aquatic vegetation, aquatic vegetation and a pond habitat through development of the City's planned Parker Retention Pond.
- Replacement of the lost or altered milkweed stands with plantings of additional milkweed plants as part of Project landscaping and the development of the City's planned Parker Retention Pond.

The appropriate measures to be used to mitigate potential effects to Northern leopard frogs and/or Monarch butterflies will be determined in consultation with MCWS.

Table 19-1 provides a summary of the measures proposed to mitigate the potential environmental effects of the proposed Project that were identified in Section 18.

Table 19-1: Summary of Proposed Mitigation Measures

Project Component	Environmental Issue	Mitigation Plans
General Project Mitigation	<ul style="list-style-type: none"> Site management, overall environmental management. 	<ul style="list-style-type: none"> Implementation of BMPs and measures outlined in the Contractor’s EMP as directed by the City of Winnipeg for the Project including water/drainage management and erosion and sediment control measures. Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. Isolation of the work areas as needed to prevent the release or transport of deleterious substances (e.g., fuel, grease, mud) or debris within the Project area. Safety signage and safe work practices will be used at all work areas for the Project as part of site management practices. Performance of environmental inspections and monitoring before, during and after construction activities.
Climate	<ul style="list-style-type: none"> No effects identified; the potential effects of GHG emissions are provided in the Air Quality and GHG section below 	<ul style="list-style-type: none"> None required; mitigation measures for the potential effects of GHG emissions are provided in the Air Quality and GHG section below.
Air Quality and GHG Emissions	<ul style="list-style-type: none"> During the Project construction and O&M activities, there will be temporary air emissions due to exhaust and/or dust from the use of stationary and mobile equipment. The expansion and use of Stage 2 of the Southwest Transitway is expected to have an overall effect of reducing GHG emissions in the City of Winnipeg. 	<ul style="list-style-type: none"> Implementation of BMPs and measures outlined in the EMP for the Project. Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. Mobile and stationary construction equipment will be required to meet appropriate federal emission standards. Equipment and vehicles will not be left idling whenever possible. Dust control measures such as spraying access roads/areas with water will be implemented as needed. The overall effect of reduction of GHG emissions has a positive effect and direction.
Noise and Vibration	<ul style="list-style-type: none"> During the Project construction activities, there will be noise and vibration due to the use of stationary and mobile project equipment (e.g., asphalt pavers, backhoes, bulldozers, dump trucks, excavators, scrapers, packers, etc.). During the Project O&M activities, there will be noise and vibration due to the operation of the BRT line and O&M activities. 	<ul style="list-style-type: none"> Implementation of BMPs and measures outlined in the EMP for the Project. Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. Project construction and O&M activities will occur during daytime hours to minimize the effects of noise on stakeholders and local wildlife. The Project contractors will follow all applicable noise bylaws. All equipment used on site will be fitted with appropriate mufflers and be well maintained to minimize noise levels off the site. Existing operating train speeds of 30 to 40 km/hr in the CN Letellier subdivision will be maintained following completion of the Project.

Project Component	Environmental Issue	Mitigation Plans
		<ul style="list-style-type: none"> • To minimize train noise, continuous welded rail (CWR) with premium ties and fasteners will be used for the relocated CN Letellier track (based on CN engineering track standards). • A noise attenuation wall is proposed on the west side of the relocated CN Letellier track between Bishop Grandin and Markham Road. • The City has committed baseline monitoring and noise attenuation barrier design within the Project Detailed Design process. Proposed follow-up involves monitoring and periodic inspection of the site for noise/vibration levels, monitoring complaints and ensuring adherence to design specifications.
Terrain and Soils	<ul style="list-style-type: none"> • The construction of the Project will require the permanent alteration of portions of soil and terrain in the PSA, and temporary disturbance to soils and terrain in other areas of the PSA. • The Project O&M activities do not involve any soil removal and therefore not expected to have a significant effect on terrain and soils in the PSA. • Potential for the release of hazardous materials as a result of accidents and malfunctions that may occur during the Project construction or O&M activities. • There were no contaminated sites found within the PSA and therefore no expected effects on terrain and soils in the PSA as a result of contaminated sites or the need for site remediation. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project, including erosion and sediment control measures. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • The area of terrain and soils that will be permanently altered is required for the transitway expansion. • The amount of area affected will be minimized as much as possible by having the areas required to be cleared, surveyed and accurately marked prior to construction. • In areas where terrain and soils can be reclaimed after construction, care will be taken during clearing to keep topsoil layers separate from lower layers so that the original soils can be restored after construction. • Storage and disposal of dangerous goods will occur according to Workplace Safety and Health Act and its regulations and the Dangerous Goods Handling and Transportation Act and its regulations including the Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001. • Storage and disposal of all waste generated at the site will adhere to municipal by-laws and applicable provincial regulations. • All spills will be reported to the appropriate authority and remediation will be in accordance with applicable regulations. • All Project material used at the site will be removed and the area will be restored to the pre-existing appearance.

Project Component	Environmental Issue	Mitigation Plans
Groundwater	<ul style="list-style-type: none"> • Accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances to the PSA during the Project construction or O&M activities. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project, including water/drainage management and erosion and sediment control measures. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • Oil changes, refuelling and lubricating of mobile construction equipment will be conducted a minimum of 100 m from any watercourse, wetland or drainage areas. • Storage and disposal of dangerous goods will occur according to Dangerous Goods Handling and Transportation Act and the Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001. • Storage and disposal of all waste generated at the site will adhere to municipal by-laws and applicable provincial regulations. • All spills will be reported to the appropriate authority and remediation will be in accordance with applicable regulations.
Surface Water	<ul style="list-style-type: none"> • Alteration of the existing drainage regime, flows and/or amount of surface water. • Changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization. • Accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances to PSA or LSA watercourses, ditches or drains during the Project construction or O&M activities. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project, including water/drainage management and erosion and sediment control measures. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • The results of the hydraulic assessment conducted for the Project land drainage system showed that there is no effect on the peak flow rate in the adjacent systems. As such, the Project construction and O&M activities are not expected to have a significant effect on the existing drainage regime or flows in the PSA. • Groundwater may be removed from the excavation sites by installing temporary wells and pumping the groundwater to the existing City of Winnipeg sewer system for treatment at the South End Water Pollution Control Centre (SEWPCC). Groundwater will be analyzed to determine its suitability/approval for sanitary sewer or land drainage system discharge. As such, the potential effect of changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization is expected to be not significant. • Oil changes, refuelling and lubricating of mobile construction equipment will be conducted a minimum of 100 m from any watercourse, ditches or drainage areas. • Storage and disposal of dangerous goods will occur according to Dangerous

Project Component	Environmental Issue	Mitigation Plans
		<p>Goods Handling and Transportation Act and the Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001.</p> <ul style="list-style-type: none"> • Storage and disposal of all waste generated at the site will adhere to municipal by-laws and applicable provincial regulations. • All spills will be reported to the appropriate authority and remediation will be in accordance with applicable regulations.
Fish and Fish Habitat	<ul style="list-style-type: none"> • Changes to the water chemistry of surface waters due to changes to the existing land drainage system in the PSA; • Changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization; and • Accidental release and/or transport of fuel, grease, mud, soil or other deleterious substances to PSA or LSA watercourses, ditches or drains. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project, including water/drainage management and erosion and sediment control measures. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • The existing system of combined sewers and/or stormwater drains in the PSA and LSA eventually drain to outfalls located along the Red River. The land drainage system developed for the Project will use this existing system of combined sewers and/or stormwater drains. There will be no additional drainage inputs or amounts in the PSA. As such, the potential effects on fish or fish habitat in the LSA due to changes to the water chemistry of fish or fish habitat as a result of changes to the existing land drainage system in the PSA is expected to be not significant. • Groundwater will be removed from the excavation sites by installing temporary wells and pumping the groundwater to the existing City of Winnipeg sewer system for treatment at the South End Water Pollution Control Centre (SEWPCC). Groundwater will be analyzed to determine its suitability/approval for sanitary sewer or land drainage system discharge. As such, the potential effect of changes to the water chemistry of surface waters by brackish/saline groundwater released during aquifer depressurization is expected to be not significant. • Oil changes, refuelling and lubricating of mobile construction equipment will be conducted a minimum of 100 m from any watercourse, ditches or drainage areas. • Storage and disposal of dangerous goods will occur according to Dangerous Goods Handling and Transportation Act and the Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001. • Storage and disposal of all waste generated at the site will adhere to municipal by-laws and applicable provincial regulations. • All spills will be reported to the appropriate authority and remediation will be in

Project Component	Environmental Issue	Mitigation Plans
Vegetation	<ul style="list-style-type: none"> • Permanent alteration of treed, grassy, wet meadow and cattail stand areas in portions of the PSA. • Temporary disturbance to grassy areas in portions of the PSA. • Manitoba Hydro’s existing O&M activity of mowing in the RoW will be continued as part of the Project O&M activities and will not result in any additional environmental effects. • The other Project O&M activities are not expected to have a significant effect on vegetation in the PSA. • Introduction of new or additional non-native or invasive plant species from equipment and vehicles during construction or O&M activities. 	<p>accordance with applicable regulations.</p> <ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • The area of vegetation that will be permanently altered during construction is required for the transitway expansion. • The amount of vegetation affected by construction activities will be minimized as much as possible by having the areas required to be cleared, surveyed and accurately marked prior to construction. • Any areas of exposed soils will be stabilized and revegetated with an approved seed or plant mix. • Replacement of the lost or altered vegetation with new areas of upland vegetation, semi-aquatic vegetation, aquatic vegetation and a pond habitat through Project landscaping, development of the AT pathways and the City’s adjacent development of the Parker Retention Pond. • All construction equipment and footwear mobilized from outside the construction area shall arrive on the RoW or construction site in clean condition to minimize the risk of weed or pest introduction. The planting of native species can also help prevent colonization of newly exposed areas by non-native or invasive species. • The City of Winnipeg guidelines for tree protection, tree removal and tree replacement will be followed. • To maintain compliance with the Manitoba Noxious Weed Act, the locations of the existing invasive plants will be marked and the plants removed prior to construction to prevent the proliferation and expansion of these invasive species in the PSA. • Vehicle and equipment access will be limited to the RoW and existing roads and paths wherever possible. • Work will be halted under very wet or muddy conditions. • All Project material used at the site will be removed and the area will be restored to the pre-existing appearance.
Wetlands	<ul style="list-style-type: none"> • The Project construction activities will result in the permanent change of the majority of the wet meadow and cattail stand areas in the PSA due to the construction of the transitway, AT pathways and stations; 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • The areas of wet meadow and cattail stands that will be permanently altered during construction are required for the transitway expansion.

Project Component	Environmental Issue	Mitigation Plans
	<p>development of the drainage system for the Project; and development of the adjacent Parker Retention Pond by the City.</p> <ul style="list-style-type: none"> • Manitoba Hydro’s existing O&M activity of mowing in the RoW will be continued as part of the Project O&M activities and will not result in any additional environmental effects. • The other Project O&M activities are not expected to have a significant effect on any remaining areas of wet meadow or cattails stands in the PSA, or to any wetland areas created by the development of the City’s Parker Retention Pond in the PSA. • Introduction of new or additional non-native or invasive plant species from equipment and vehicles during construction or O&M activities. 	<ul style="list-style-type: none"> • The amount of wet meadow and cattail stands affected by construction activities will be minimized as much as possible by having the areas required to be cleared, surveyed and accurately marked prior to construction. • Replacement of the lost or altered wet meadow and cattail stands with new areas of semi-aquatic vegetation, aquatic vegetation and a pond habitat through Project landscaping, development of the AT pathways and the City’s adjacent development of the Parker Retention Pond. • All construction equipment and footwear mobilized from outside the construction area shall arrive on the RoW or construction site in clean condition to minimize the risk of weed or pest introduction. The planting of native species can also help prevent colonization of newly exposed areas by non-native or invasive species. • Vehicle and equipment access will be limited to the RoW and existing roads and paths wherever possible. • Work will be halted under very wet or muddy conditions. • All Project material used at the site will be removed and the area will be restored to the pre-existing appearance.
Wildlife and Wildlife Habitat	<ul style="list-style-type: none"> • Temporary disturbance in the PSA during construction and O&M activities. • Permanent alteration of treed, grassy, wet meadow and cattail stand areas in the PSA that may provide habitat. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines, including restricted activity periods. • It is expected that the majority of wildlife species present in the PSA are habituated to the noise and activity in the PSA. As such, the potential effect of temporary disturbance during construction and O&M activities is not expected to have a significant effect on wildlife and wildlife habitat in the PSA. • Project construction and O&M activities will occur during daytime hours to minimize the effects of noise on stakeholders and local wildlife. The Project contractors will follow all applicable noise bylaws. • All equipment used on site will be fitted with appropriate mufflers and be well maintained to minimize noise levels off the site. • The noise levels generated during the Project O&M activities are not expected to exceed noise levels generated by typical activities (including traffic) that occur in the area. • The area of potential wildlife habitat that will be permanently altered is required for the transitway expansion. • Some of the treed, grassy, wet meadow and cattail stand areas in the PSA will be replaced by the landscaping and plantings associated with the development of

Project Component	Environmental Issue	Mitigation Plans
		<p>the AT pathways and the City’s Parker Retention Pond. It is expected that the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA will displace some of the wildlife species that may be present in the existing PSA, while other species will remain or return after the completion of the Project construction activities. As such, the potential effect of the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA that may provide wildlife habitat is expected to have a minimal effect on wildlife and wildlife habitat in the PSA.</p>
Species At Risk	<ul style="list-style-type: none"> • Temporary disturbance in the PSA during construction and O&M activities. • Injury or mortalities to Northern leopard frogs or Monarch butterfly larvae present in the construction and/or O&M areas. • Permanent alteration of grassy, wet meadow and cattail stand areas in the PSA that may provide habitat for Northern leopard frogs. • Loss of milkweed plants in the PSA that may provide Monarch butterfly habitat. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • Project construction and O&M activities will occur during daytime hours to minimize the effects of noise on stakeholders and local wildlife. The Project contractors will follow all applicable noise bylaws. • All equipment used on site will be fitted with appropriate mufflers and be well maintained to minimize noise levels off the site. • The noise levels generated during the Project O&M activities are not expected to exceed noise levels generated by typical activities (including traffic) that occur in the area. • The areas of potential Species At Risk habitat (wet meadows, cattail stands, milkweed plants) that will be permanently altered are required for the transitway expansion. • It is expected that the bird and bat species in Table 16-7 would only be present in the PSA for feeding or temporary resting needs, and would avoid the noise and disturbance in the PSA during Project construction and O&M activities. However, if nests, roosts, burrows or breeding areas for the bird or bat Species At Risk identified in Table 16-7 are discovered during construction or O&M activities, the activities will be halted and appropriate set back distances will be implemented. • Mitigation measures that may be used to prevent injury or mortality of Northern leopard frog and/or Monarch butterfly include: conducting a pre-construction survey in the spring to determine the presence and location of any Species At Risk in the PSA; relocating the milkweed plants present in the PSA prior to the construction and O&M activities; capturing and relocating any Northern leopard frogs found within the PSA prior to the construction and O&M activities; and/or scheduling construction and O&M activities to take place in the late summer, fall or winter when these species would not be present in the PSA.

Project Component	Environmental Issue	Mitigation Plans
		<ul style="list-style-type: none"> • Some of the treed, grassy, wet meadow and cattail stand areas in the PSA will be replaced by the landscaping and plantings associated with the development of the AT pathways and the Parker Retention Pond. It is expected that the permanent alteration of the grassy, wet meadow and cattail stand areas in the PSA will displace some of the Northern leopard frogs that may have returned to these areas of the PSA in the spring, while other individuals may adapt to the new conditions and return after the completion of the Project construction activities. As such, the potential effect of the permanent alteration of the treed, grassy, wet meadow and cattail stand areas in the PSA that may provide areas of seasonal habitat for Northern leopard frog is expected to have a minimal effect on Northern leopard frog in the PSA. • The potential loss of milkweed plants in the PSA that may provide Monarch butterfly habitat may be mitigated by: relocating the existing plants in the PSA prior to the Project construction activities; and/or replacing the existing plants with new plantings of milkweed in the landscaped areas for the Project and/or Parker Retention Pond.
Stakeholders	<ul style="list-style-type: none"> • Temporary disturbance due to noise, dust, equipment and crews working in the PSA. • Temporary disturbance to traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA. • Permanent alteration of the treed, grassy, wet meadow and cattail stand areas in sections of the PSA. • Permanent alteration of sections of the dog park and community gardens located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard. • Creation of AT pathways in the PSA. • The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • Stakeholders will be notified in advance of the commencement of Project start-up activities. • Safety signage and safe work practices will be used at all work areas for the Project as part of site management practices. • Project construction and O&M activities will occur during daytime hours to minimize the effects of noise on stakeholders and local wildlife. The Project contractors will follow all applicable noise bylaws. • All equipment used on site will be fitted with appropriate mufflers and be well maintained to minimize noise levels off the site. • Mobile and stationary construction equipment will be required to meet appropriate federal emission standards. • Equipment and vehicles will not be left idling whenever possible. • Dust control measures such as spraying access roads/areas with water will be implemented as needed. • All Project material used at the site will be removed and the area will be restored. • The alteration of land areas in the PSA due to the Project was perceived as a positive effect by some stakeholders, and as a negative effect by others.

Project Component	Environmental Issue	Mitigation Plans
	and reduction in GHG emissions.	<ul style="list-style-type: none"> • During the Public Consultation activities, stakeholders indicated that the provision of an alternative dog park nearby was a reasonable solution to the alteration of the existing dog park. • Stakeholders indicated support and a positive reaction to the creation of AT pathways in the PSA. • The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions, are considered to be positive effects of the Project.
Aboriginal Interests	<ul style="list-style-type: none"> • There are no First Nations reserve lands, Treaty Land Entitlements or Community Interest Zones located within the PSA. • There are no Métis organizations or known Métis interests located within the PSA or LSA. 	<ul style="list-style-type: none"> • The Project construction and O&M activities are not expected to affect First Nations lands or traditional land use activities. • The Parker Wetlands Conservation Committee suggested that the Parker Lands are part of Rooster Town and Métis history; however, published information for Rooster Town indicates that the Parker Lands were not part of Rooster Town. As such, the Project construction and O&M activities are not expected to affect Métis interests or activities in the PSA or LSA.
Land Use	<ul style="list-style-type: none"> • Temporary disturbance due to equipment and crews working in the PSA. • Temporary disturbance to traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA. • Permanent alteration of the treed, grassy, wet meadow and cattail stand areas in sections of the PSA. • Permanent alteration of sections of the dog park and community gardens located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard. • Creation of AT pathways in the PSA. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • Stakeholders will be notified in advance of the commencement of Project start-up activities. • Safety signage and safe work practices will be used at all work areas for the Project as part of site management practices. • Project construction and O&M activities will occur during daytime hours to minimize the effects of noise on stakeholders and local wildlife. The Project contractors will follow all applicable noise bylaws. • All equipment used on site will be fitted with appropriate mufflers and be well maintained to minimize noise levels off the site. • Mobile and stationary construction equipment will be required to meet appropriate federal emission standards. • Equipment and vehicles will not be left idling whenever possible. • Dust control measures such as spraying access roads/areas with water will be implemented as needed. • All Project material used at the site will be removed and the area will be restored. • The alteration of land areas in the PSA due to the Project was perceived as a

Project Component	Environmental Issue	Mitigation Plans
		<p>positive effect by some stakeholders, and as a negative effect by others.</p> <ul style="list-style-type: none"> • With the exception of gardening, the development of the Project’s AT pathways will provide alternate areas for these land use activities in the PSA. It is expected that the City will reallocate or replace the community garden area located adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard. • During the Public Consultation activities, stakeholders indicated that the provision of an alternative dog park nearby was a reasonable solution to the alteration of the existing dog park. • Stakeholders indicated support and a positive reaction to the creation of AT pathways in the PSA. • The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions, are considered to be positive effects of the Project.
Resource Use	<ul style="list-style-type: none"> • The Project construction activities are not expected to result in any losses to the existing resource use in the PSA. Some of the land areas will be altered and there will be the additional use of a BRT system, but overall, the resource use will remain the same and the Project construction or O&M activities are not expected to have a significant effect on resource use in the PSA. 	<ul style="list-style-type: none"> • None required
Protected Areas	<ul style="list-style-type: none"> • No effects identified 	<ul style="list-style-type: none"> • None required
Heritage Resources	<ul style="list-style-type: none"> • The MHRB indicated that there were no records of archaeological findings in the PSA (Section 16.4.8; Appendix D). • There were no other Heritage Resources or historic sites found to be present within the PSA (Section 16.4.8). As such, there were no potential effects to Heritage Resources identified due to the Project construction or O&M activities. 	<ul style="list-style-type: none"> • Implementation of BMPs and measures outlined in the EMP for the Project. • Compliance with all applicable federal, provincial and municipal legislation, codes and guidelines. • If archaeological and/or historical artifacts are discovered during construction, work at the location will cease immediately, and the discovery will be reported to the Project Construction Field Supervisor. The Project Construction Field Supervisor or their designate will contact the MHRB for further information and instruction on an acceptable heritage resource management strategy.

20 RESIDUAL EFFECTS

20.1 Residual Effects Assessment Criteria

Residual effects are the anticipated effects that are remaining after consideration of the application of all mitigation measures. Residual effects of the proposed Project were defined by the following criteria:

Direction – the direction of the effect may be positive, neutral, or negative with respect to beneficial or adverse effects from the Project on the existing environment.

Magnitude – a measure of the degree or intensity of change that can occur as the Project proceeds, which can be low (above background conditions, but within established criteria or scientific threshold and the range of natural variability), medium (substantially above background conditions, but within established criteria or scientific threshold and the range of natural variability), or high (predicted to exceed established criteria or scientific threshold and will likely cause detectable change beyond the range of natural variability).

Geographic extent – refers to the area potentially affected by the effect, whether it is the site (i.e. work areas within the PSA), locally (i.e., LSA), the region (i.e., RSA/City of Winnipeg), or beyond regional.

Duration – refers to the length of time that the environmental effect occurs and whether the effect is reversible once the disturbance has been completed (i.e., reclamation of disturbed areas). Duration can be short-term, medium-term or long-term. Short-term effects occur only during the construction time period, medium-term effects occur over the entire construction period and extend to the time required for site reclamation, and a long-term effect implies that the disturbance occurs beyond the time required for completion of construction and site reclamation.

Frequency - refers to the frequency at which the effect occurs over the specified duration and is described as: infrequent (occurs once over the duration of the disturbance), frequent (occurs periodically over the duration of disturbance), or continuous (occurs continuously over the duration of disturbance).

Likelihood – refers to the probability of occurrence (i.e., the risk of an event occurring) and is described as very unlikely, unlikely, likely and very likely.

The activities associated with the proposed Project were first assessed according to the above criteria, and then evaluated together to predict the overall environmental consequence. Environmental consequence was determined as:

- **Minimal** - effects with a low magnitude, short- to medium-term duration, infrequent to continuous occurrence, and are restricted to the proposed Project area in geographic extent. The potential effect may result in a slight decline in the resource in the study area during construction phase, but the resource should return to pre-construction levels.
- **Low** - effects with a low magnitude, short- to long-term duration, infrequent to continuous occurrence, and are restricted to the proposed Project area in geographic extent. The potential effect may result in a slight decline in the resource in the study area during the life of the Project. Research, monitoring, and/or recovery initiatives would not normally be required.

- **Moderate** - effects with a medium magnitude, short- to long-term duration, frequent to continuous occurrence, and extend outside the proposed Project area to adjacent areas. Potential effect could result in a decline in resource to lower-than-baseline but stable levels in the Project area after Project closure and into the foreseeable future. Regional management actions such as research, monitoring, and/or recovery initiatives may be required.
- **High** - refers to major effects that are long-term in duration, continuous in occurrence, and extend outside the proposed Project area to adjacent areas. Potential effect could threaten sustainability of the resource and should be considered a management concern. Research, monitoring, and/or recover initiatives should be considered.

The effect is considered to be significant if the environmental consequence is determined to be moderate or high, and is considered to be not significant if the environmental consequence is determined to be minimal or low.

20.2 Summary of Residual Effects

Residual effects, i.e., the effects that remain after application of mitigation measures, are expected to occur for the following environmental components: air quality and GHGs; noise and vibration; terrain and soils; vegetation; wetlands; wildlife and wildlife habitat; Species at Risk; stakeholders and land use. The residual effects were assessed in terms of their direction, magnitude, geographic extent, duration, frequency and likelihood as described in Section 20.1. Table 20-1 provides a summary of the residual effects and the assessed environmental consequence of the residual effect for each of the environmental components examined in the environmental assessment for the proposed Project.

20.3 Environmental Effects Summary

Based on the assessment of the environmental effects that will remain after implementation of the mitigation measures described in Section 19, the residual effects associated with the proposed Project for air quality and GHGs, noise and vibration, terrain and soils, vegetation, wetlands, wildlife and wildlife habitat, Species at Risk, stakeholders and land use were found to be minimal or low. As such, the environmental effects of the proposed Project on these components are expected to be not significant.

The Project effects of reduced GHG emissions, creation of AT pathways and the Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions, were found to be positive effects of the Project.

Table 20-1: Residual Effects and Assessed Environmental Consequence of Residual Effects

Project Component	Predicted Residual Effect	Direction	Magnitude	Geographic Extent	Duration	Frequency	Likelihood	Environmental Consequence
Air Quality and Greenhouse Gas Emissions	<ul style="list-style-type: none"> During the Project construction and O&M activities, there will be temporary air emissions due to exhaust and/or dust from the use of stationary and mobile equipment. 	Negative	Low	Project area	Short-term	Frequent	Likely	Minimal
	<ul style="list-style-type: none"> The expansion and use of Stage 2 of the Southwest Transitway is expected to have an overall effect of reducing GHG emissions in the City of Winnipeg. 	Positive	Low	Region	Long-term	Continuous	Likely	Low
Noise and Vibration	<ul style="list-style-type: none"> During the Project construction activities, there will be noise and vibration due to the use of stationary and mobile project equipment (e.g., asphalt pavers, backhoes, bulldozers, dump trucks, excavators, scrapers, packers, etc.). 	Negative	Low	Project area	Short-term	Frequent	Likely	Minimal
	<ul style="list-style-type: none"> During the Project O&M activities, there will be noise and vibration due to the operation of the transitway. 	Negative	Low	Project area	Long-term	Frequent	Likely	Low
	<ul style="list-style-type: none"> During the Project O&M activities, there will be noise and vibration due to the O&M activities. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal
Terrain and Soils	<ul style="list-style-type: none"> The construction of the Project will require the permanent alteration of portions of terrain and soils in the PSA. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low
	<ul style="list-style-type: none"> The construction of the Project will require the temporary disturbance of terrain and soils in other areas of the PSA. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal

Project Component	Predicted Residual Effect	Direction	Magnitude	Geographic Extent	Duration	Frequency	Likelihood	Environmental Consequence
Vegetation	<ul style="list-style-type: none"> Permanent alteration of treed, grassy, wet meadow and cattail stand areas in portions of the PSA. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low
	<ul style="list-style-type: none"> Introduction of new or additional non-native or invasive plant species from equipment and vehicles during construction and site reclamation activities. 	Negative	Low	Project area	Medium-term	Frequent	Likely to Unlikely	Minimal
	<ul style="list-style-type: none"> Introduction of new or additional non-native or invasive plant species from equipment and vehicles during O&M activities. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal
Wetlands	<ul style="list-style-type: none"> The Project construction activities will result in the permanent change of the majority of the wet meadow and cattail stand areas in the PSA due to the construction of the transitway, AT pathways and stations; development of the drainage system for the Project; and development of the Parker Retention Pond by the City. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low
	<ul style="list-style-type: none"> Introduction of new or additional non-native or invasive plant species from equipment and vehicles during construction and site reclamation activities. 	Negative	Low	Project area	Medium-term	Frequent	Likely to Unlikely	Minimal
	<ul style="list-style-type: none"> Introduction of new or additional non-native or invasive plant species from equipment and vehicles during O&M activities. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal
Wildlife and Wildlife	<ul style="list-style-type: none"> Temporary disturbance in the PSA during construction and O&M activities. 	Negative	Low	Project area	Short-term	Frequent	Likely to Unlikely	Minimal

Project Component	Predicted Residual Effect	Direction	Magnitude	Geographic Extent	Duration	Frequency	Likelihood	Environmental Consequence
Habitat	<ul style="list-style-type: none"> Permanent alteration of treed, grassy, wet meadow and cattail stand areas in the PSA that may provide habitat. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low
Species at Risk	<ul style="list-style-type: none"> Temporary disturbance in the PSA during construction and O&M activities. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal
	<ul style="list-style-type: none"> Injury or mortalities to Northern leopard frogs or Monarch butterfly larvae present in the construction and/or O&M areas. 	Negative	Low	Project area	Short-term	Infrequent to Frequent	Likely to Unlikely	Minimal
	<ul style="list-style-type: none"> Permanent alteration of grassy, wet meadow and cattail stand areas in the PSA that may provide habitat for Northern leopard frogs. 	Negative	Low	Project area	Long-term	Infrequent to Frequent	Likely to Unlikely	Low
	<ul style="list-style-type: none"> Loss of milkweed plants in the PSA that may provide Monarch butterfly habitat. 	Negative	Low	Project area	Long-term	Infrequent to Frequent	Likely to Unlikely	Low
Stakeholders and Land Use	<ul style="list-style-type: none"> Temporary disturbance due to noise, dust, equipment and crews working in the PSA. 	Negative	Low	Project area	Short-term	Frequent	Likely	Minimal
	<ul style="list-style-type: none"> Temporary disturbance to traffic patterns, road use and recreational use (walking, cycling, dog walking and gardening) in the PSA. 	Negative	Low	Project area	Short-term	Frequent	Likely	Minimal
	<ul style="list-style-type: none"> Permanent alteration of the treed, grassy, wet meadow and cattail stand areas in sections of the PSA. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low

Project Component	Predicted Residual Effect	Direction	Magnitude	Geographic Extent	Duration	Frequency	Likelihood	Environmental Consequence
	<ul style="list-style-type: none"> Permanent alteration of sections of the dog park and community gardens located on City owned lands adjacent to Parker Avenue and Heatherdale Avenue, and the Clarence Avenue garden located on Manitoba Hydro owned lands adjacent to Vincent Street south of McGillivray Boulevard. 	Negative	Low	Project area	Long-term	Continuous	Likely	Low
	<ul style="list-style-type: none"> Creation of AT pathways in the PSA. 	Positive	Low	Project area	Long-term	Continuous	Likely	Low
	<ul style="list-style-type: none"> The Project benefits outlined in Section 5, e.g., improved transit service and increased ridership, reduction in traffic congestion, improved access to Investors Group Field and reduction in GHG emissions. 	Positive	Low	Project area	Long-term	Continuous	Likely	Low

21 FOLLOW-UP AND MONITORING ACTIVITIES

21.1 Pre-Construction Monitoring

The City has committed to include both baseline noise monitoring and noise attenuation barrier design within the Project Detailed Design process. The City manages the issue of noise-related traffic through the City of Winnipeg Motor Vehicle Noise Policies and Guidelines, dated October 11, 1984. While dated, the policy provides overall guidance and direction for roadway planning and related noise attenuation, i.e., if the intruding noise level exceeds the existing sound levels by 5 dBA, noise attenuation measures are to be considered. In order to arrive at the sound levels produced by the transitway, the City will require the collection of baseline field measurements along areas of concern, followed by the use noise prediction models of the operational transitway to determine the nature and extent of any attenuation. When outdoor sound levels are 55 dBA or less for daytime and 50 dBA or less for nighttime, no noise control measures are contemplated. Proposed follow-up involves monitoring and periodic inspection of the site for noise/vibration levels, monitoring complaints and ensuring adherence to design specifications.

A pre-construction survey for Species At Risk is one of the measures recommended in Section 19 to mitigate potential effects of the Project on Species At Risk that may be present in the PSA. The survey could be conducted prior to the construction activities to avoid Project delays, protect any Species At Risk that may be present in the PSA, and maintain compliance with regulatory requirements. The appropriate measures to be used to mitigate potential effects to Northern leopard frogs, Monarch butterflies and/or other Species At Risk will be determined in consultation with MCWS.

21.2 Construction Monitoring

The City of Winnipeg will ensure through its procurement process that the contractors' EMP for this Project will include field inspections during construction, adherence to all applicable federal, provincial and municipal acts and regulations, and adherence to the environmental protection provisions outlined in the Project EMP. The City of Winnipeg will assign an Environmental Inspector for the Project. The Environmental Inspector will be responsible for performing inspections of the work site and documenting any deficiencies noted in the environmental protection measures in the inspection reports. The Environmental Inspector will inspect the Project site routinely to ensure that the site is managed in accordance with the construction documentation and the Project EMP.

21.3 Post Construction Monitoring

An Environmental Inspector will examine the work areas for the Project after completion of the Project activities to ensure that the measures outlined in the Project EMP were followed and any areas disturbed by the Project were appropriately restored. Post-construction monitoring may also include monitoring and periodic inspection of the PSA for noise/vibration levels, monitoring complaints and ensuring adherence to design specifications.

22 ACCIDENTS AND MALFUNCTIONS

Potential accidents and malfunctions that may occur during the construction and O&M stages of the Project include fires and explosions, transportation accidents, pedestrian accidents, fuel or other petroleum product spills, hazardous material releases, and blowing and falling debris. The potential effects of these accidents and malfunctions, and the proposed mitigation measures and follow-up, are discussed below.

22.1 Fires and Explosions

Fires and explosions during construction and O&M activities may result from propane heaters, welding/cutting, equipment malfunctions and improper storage of hazardous materials. Fires and explosions can cause serious harm to employees, construction workers, the public and the environment. Project delays and increased costs are also possible. Mitigation measures proposed for fires and explosions include: compliance with applicable provincial legislation, codes and guidelines; provision of fire suppression equipment on-site; preparation and implementation of an emergency response plan that includes fire and explosion prevention, notification and response; and immediate notification of the nearest Fire Department if a fire or explosion occurs. Follow-up may include regular inspections by the Fire Commissioner, routine examination of on-site fire suppression equipment, and periodic testing and evaluation of the emergency response plan.

22.2 Transportation Accidents

There is a risk of transportation accidents during Project construction and O&M activities involving equipment, materials, vehicles and pedestrians accessing the PSA. Mitigation proposed includes safe transportation routes; speed restrictions and signage; alternate pedestrian walkways; compliance with applicable provincial legislation and municipal bylaws; an emergency spill response plan that includes transportation accident prevention on-site and response; and immediate notification to MCWS if a reportable accident occurs. Proposed follow-up includes periodic testing and evaluation of the emergency response plan, ensuring that dangerous goods carriers are licensed and ensuring all shipments are in compliance with regulatory requirements.

22.3 Hazardous Substances Releases

There is potential for a hazardous substances release during construction and O&M activities as a result of improper storage, negligent use or collision by a vehicle. Mitigation measures include: compliance with applicable provincial and municipal legislation and guidelines; preparation and implementation of an emergency spill response plan that includes petroleum spill prevention, notification and response; maintenance of an appropriate number and type of spill kits on-site; and immediate notification to Manitoba Conservation if a reportable accident occurs. Contractors and employees on-site will be required to have appropriate spill response equipment during construction and O&M activities. Proposed follow-up includes: requiring contractors to submit an environmental protection plan that addresses spills; establishing protocols for periodic testing and evaluation of the emergency response plan; inspecting fuel storage tanks for compliance with regulatory requirements; and maintaining records of fuel volumes

delivered and used. In the event of a spill, remedial action such as the removal of contaminated soils may be undertaken within a reasonable timeframe.

22.4 Wind-Blown Debris

There is potential for wind-blown debris during construction. Wind-blown debris can be unsightly and present a nuisance, inconvenience or possible danger to vehicles and residents. Mitigation measures include securing construction and demolition materials; ensuring a high standard of cleanliness during construction; covering waste receptacles and trucks; and fencing the Project site during construction. Follow-up measures include regular inspection of the Project site for wind-blown debris and taking appropriate action when construction or demolition-related debris is encountered.

23 EFFECT OF THE ENVIRONMENT ON THE PROJECT

The effects of the environment on the Project were identified as;

- The potential presence of wildlife and wildlife habitat, wet meadow and cattail stands, and wildlife Species At Risk required consideration during mitigation;
- Existing hydrological and hydraulic conditions on the land base, i.e., seasonal changes in water flow levels and area of inundation, groundwater incursions, drainage requirements;
- Existing condition and use of the landbase in the PSA, which consists of the CN rail line and RoW; the Manitoba Hydro transmission lines, structures and RoW; commercial (e.g., shopping and other services along Pembina Highway and other streets), industrial (e.g., Chevrier and Buffalo industrial parks), recreational (Brenda Leipsic dog park, community gardens, walking and cycling trails) and residential areas (e.g., neighbourhoods of Beaumont, Maybank, Montcalm Pembina Strip and Waverley Heights). The RoW areas are routinely mowed and maintained as per CN and Manitoba Hydro operational and safety standards; and
- Seasonal changes in climate that may affect access to and development of the landbase.

These effects have been addressed by:

- Identifying potential species in the PSA, their habitat requirements and measures to mitigate effects on these species;
- Planning and design of the Project to incorporate existing hydrologic and hydraulic conditions;
- Consideration of the condition and use of the landbase in the Project planning and design; and
- Incorporation of the necessary environmental protection measures into Project planning and design, including erosion and sediment control planning, salvage of soils and vegetation and water management.

24 SIGNIFICANCE OF EFFECTS AND CONCLUSION

The Project was determined to not likely result in significant adverse environmental effects based on the:

- Available information on the proposed Project and the existing local environment;
- Assessment of effects outlined in this Environmental Review and Assessment report; and
- Application of proposed mitigation measures and follow-up.

25 CLOSURE

We trust that the above information meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Sincerely,

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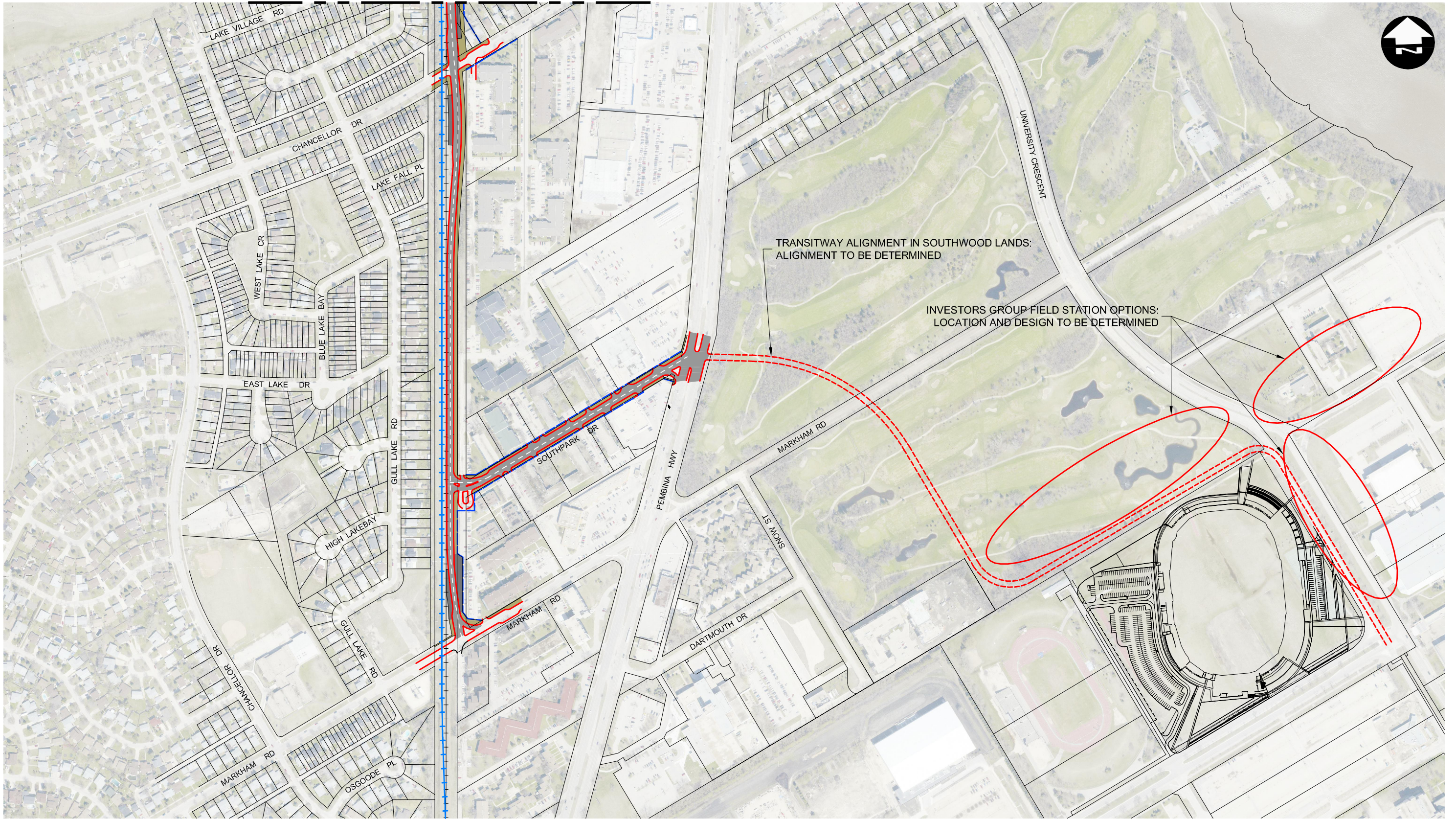
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Appendix A:
Project Area Figures

MATCHLINE: SEE SHEET 2



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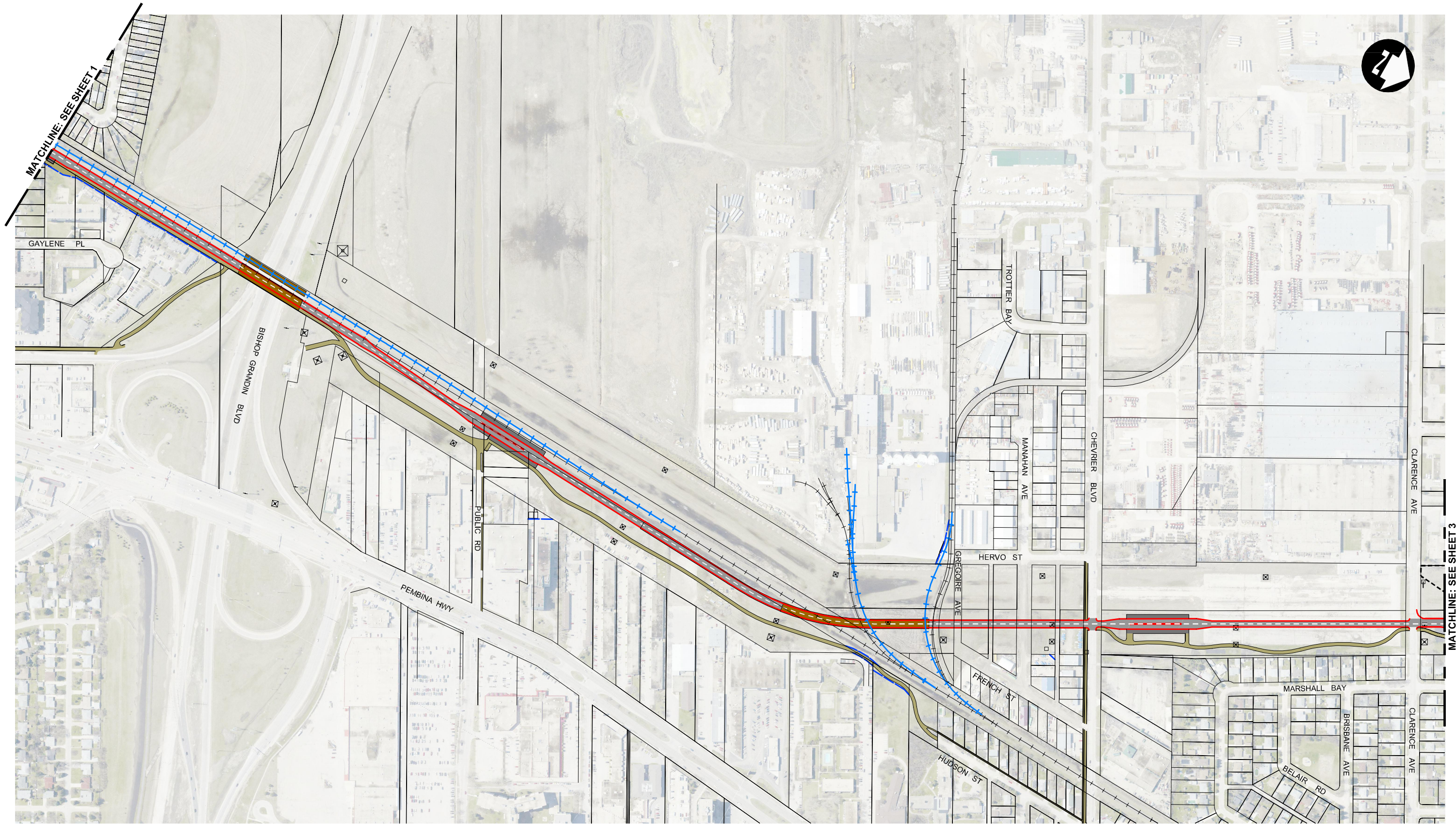
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**SOUTHWEST TRANSITWAY - STAGE 2
P3 CANADA SUBMISSION**

SHEET 1 OF 4

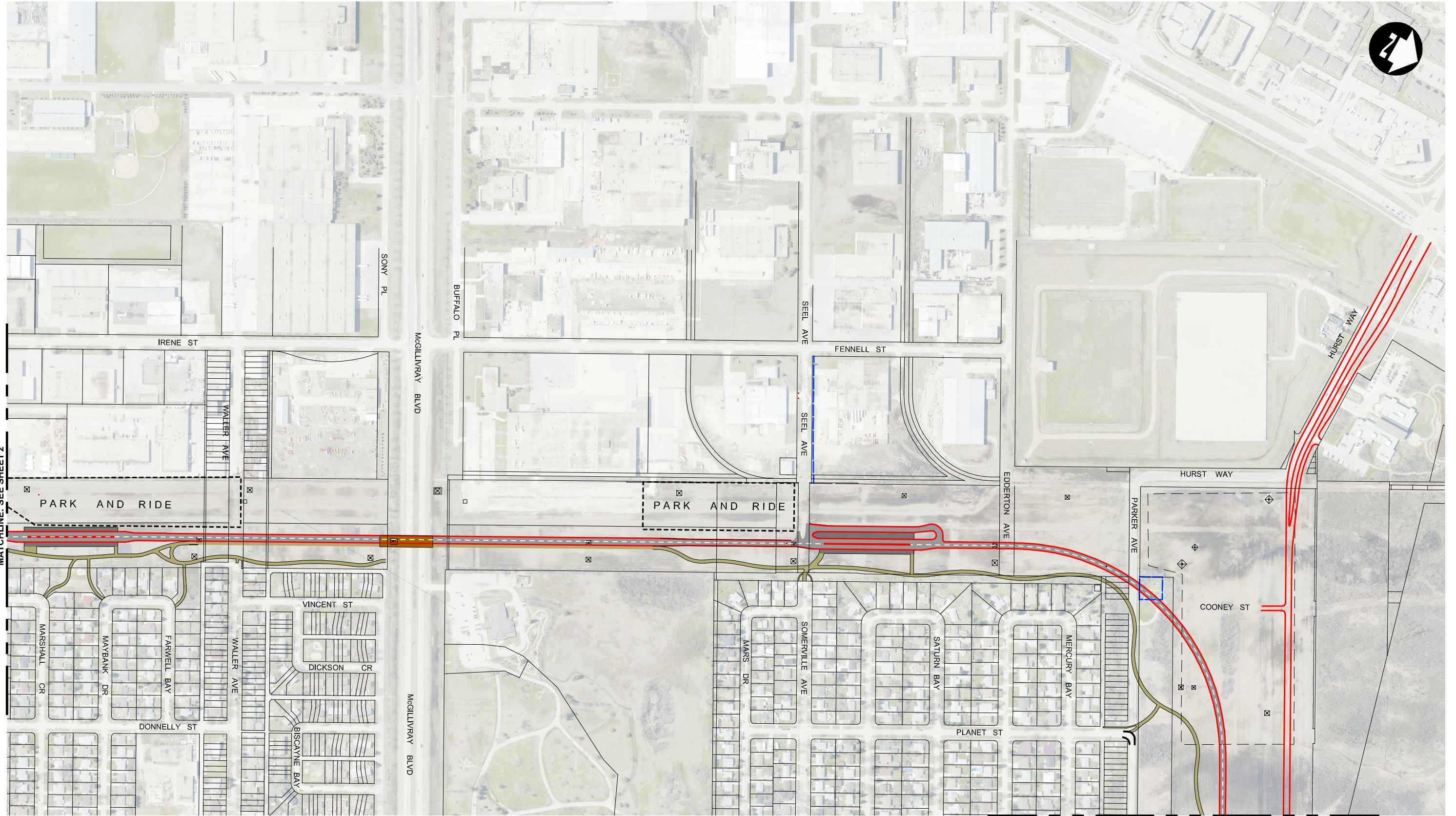
FIGURE 1



SOUTHWEST TRANSITWAY - STAGE 2
P3 CANADA SUBMISSION

SHEET 2 OF 4

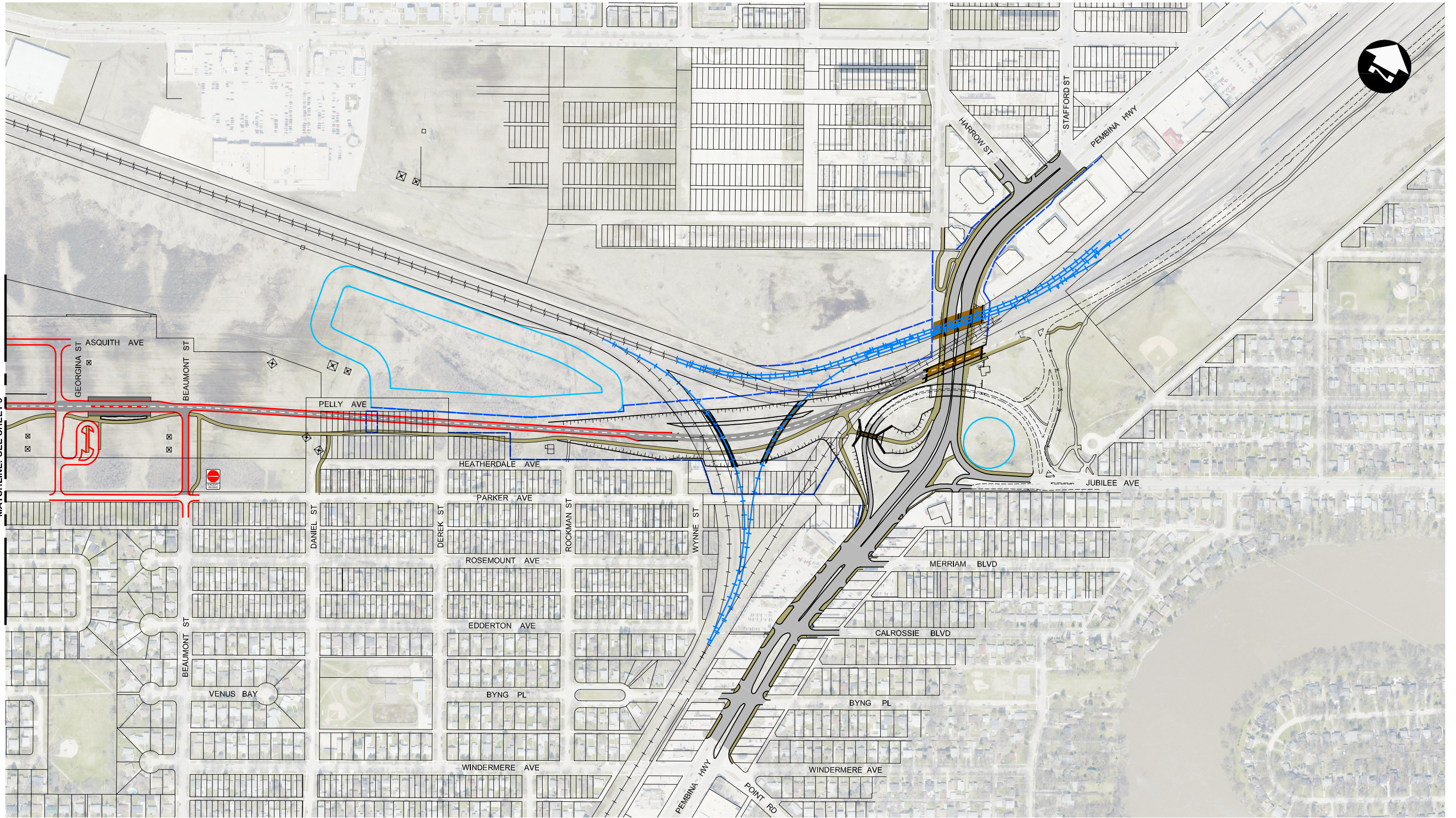
FIGURE 2



MATCHLINE: SEE SHEET 2

MATCHLINE: SEE SHEET 4





SOUTHWEST TRANSITWAY - STAGE 2
P3 CANADA SUBMISSION

SHEET 4 OF 4

FIGURE 4

Appendix B:
List of Plant Species Present in the PSA

**Flora observed in the Stage 2 Southwest Transitway Project Study Area, October 01, 2013
 (Scientific Name Alphabetical by Family)**

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
				Parker Lands ¹	RoW ²	
VASCULAR SPECIES						Parker Lands
ACERACEAE	MAPLE FAMILY					
Acer negundo	Manitoba Maple	S5		x		x
Acer ginnala	Amur Maple	SNA	NON_NATI VE	x		x
ANACARDIACEAE	SUMAC FAMILY					
Toxicodendron rydbergii	Poison Ivy	S5		x		x
APIACEAE	CARROT FAMILY					
Sanicula marilandica	Seneca Snakeroot	S5		x		x
Zizia aptera	Heart-leaved Alexander	S5				x
Zizia aurea	Golden Alexanders	S5		x		
APOCYNACEAE	DOGBANE FAMILY					
Apocynum androsaemifolium	Spreading Dogbane	S5			x	x
ARALIACEAE						
Aralia nudicaulis	Wild Sarsaparilla	S5		x		x
ASCLEPIADACEAE						
Asclepias speciosa	Showy Milkweed	S4			x	
ASTERACEAE	ASTER FAMILY					
Achillea millefolium	Yarrow	S5		x	x	x
Ambrosia psilostachya	Perennial Ragweed	S5		x		x
Antennaria parvifolia	Small-leaved Pussytoes	S4				x
Antennaria spp.	Pussytoes					x
Arctium minus	Lesser Burdock	SNA	INVASIVE			x
Arctium sp.	Burdock			x		
Artemisia absinthium	Wormwood	SNA	INVASIVE			x
Artemisia ludoviciana	Prairie Sage	S5				x
Artemisia sp.	Sage			x		x
Cirsium arvense	Canada Thistle	SNA	INVASIVE	x	x	x
Cirsium flodmanii	Flodman's Thistle	S4			x	x
Conyza canadensis	Canada fleabane	S5				
Erigeron philadelphicus	Philadelphia Fleabane	S5				x

¹ Area north of Parker Avenue and south of CN tracks

² Corridor of existing MB Hydro Right-of-way

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
Grindelia squarrosa	Gumweed	S5		x		x
Lactuca serriola	Prickly Lettuce	SNA	NON_NATI VE			
Lappula squarrosa	Bluebur	SNA	NON_NATI VE			x
Leucanthemum vulgare	Oxeye Daisy	SNA	Cat 2 INVASIVE			x
Packera pauperula	Balsam Groundsel	S5				
Solidago canadensis	Canada Goldenrod	S5		x		
Solidago sp.	Goldenrod					
Sonchus arvensis	Field Sow-thistle	SNA	INVASIVE			
Symphyotrichum ericoides	Many-flowered Aster	S4		x	x	x
Symphyotrichum laeve	Smooth Aster	S5		x		
Symphyotrichum lateriflorum	Calico Aster	S4		x		
Tanacetum vulgare	Common Tansy	SNA	Cat 2 INVASIVE			
Taraxacum officinale	Common Dandelion	SNA	NON_NATI VE			
Tragopogon dubius	Goat's-beard	SNA	NON_NATI VE		x	
BETULACEAE	BIRCH FAMILY					
Corylus americana	American Hazelnut	S4				
BORAGINACEAE	BORAGE FAMILY					
Lappula echinata	Bluebur	SNA	NON_NATI VE			x
BRASSICACEAE	MUSTARD FAMILY					
Armoracia rusticana	Horseradish	SNA	NON_NATI VE	x	x	
Hesperis matronalis	Dame's-violet	SNA	INVASIVE			
Lepidium densiflorum	Pepperwort	S5				
Thlapsi arvense	Field Pennycress	SNA	NON_NATI VE			x
CAMPANULACEAE	BLUEBELL FAMILY					
Campanula rapunculoides	Creeping Bluebell	SNA	INVASIVE	x		x
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY					
Diervilla lonicera	Bush-Honeysuckle	S5		x		
Lonicera dioica	Twining Honeysuckle	S5				x
Lonicera tatarica	Tartarian Honeysuckle	SNA	NON_NATI VE	x	x	x
Symphoricarpos albus	Snowberry	S5		x		
Symphoricarpos occidentalis	Western Snowberry	S5		x		x

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
Viburnum lentago	Nannyberry	S4		x		x
Viburnum opulus	High-bush Cranberry	S5				x
Viburnum rafinesquianum	Downy Arrowwood	S4				x
CARYOPHYLLACEAE	FAMILY					
Moerhingia lateriflora	Grove Sandwort	S5				x
CHENOPODIACEAE	GOOSEFOOT FAMILY					
Salsola tragus	Russian Thistle	SNA	NON_NATI VE		x	
CORNACEAE	DOGWOOD FAMILY					
Cornus sericea	Red-osier Dogwood	S5		x	x	x
CUCURBITACEAE	GOURD FAMILY					
Echinocystis lobata	Wild Cucumber	S5			x	
CYPERACEAE	SEDGE FAMILY					
Carex sp.	Sedge					
Carex tenera	Slender Sedge	S4				x
EQUISETACEAE	HORSETAIL FAMILY					
Equisetum arvense	Common Horsetail	S5		x		x
ELAEAGNACEAE	OLEASTER FAMILY					
Elaeagnus commutata	Wolf-willow	S4				x
Elaeagnus angustifolia	Russian Olive	SNA	NON_NATI VE	x	x	
FABACEAE	PEA FAMILY					
Astragalus agrestis	Purple Milk-vetch	S5				
Caragana arborescens	Common Caragana	SNA	NON_NATI VE	x	x	
Glycyrrhiza lepidota	Wild Licorice	S5		x	x	x
Lathyrus ochroleucus	Cream-coloured Vetchling	S4S5				x
Lathyrus palustris	Marsh Vetchling	S5				x
Lotus corniculatus	Bird's-foot Trefoil	SNA	NON_NATI VE		x	
Medicago lupulina	Black Medic	SNA	NON_NATI VE			x
Medicago sativa	Alfalfa	SNA	NON_NATI VE			x
Melilotus alba	White Sweetclover	SNA	NON_NATI VE	x	x	

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
Melilotus officinalis	Yellow Sweetclover	SNA	NON_NATI VE	x	x	
Trifolium hybridum	Alsike Clover	SNA	NON_NATI VE			x
Trifolium pratense	Red Clover	SNA	NON_NATI VE			
Trifolium repens	White Clover	SNA	NON_NATI VE			
Trifolium sp.	Clover					x
Vicia americana	American Vetch	S5		x		
Vicia cracca	Tufted Vetch	SNA	INVASIVE	x	x	x
FAGACEAE	BEECH FAMILY					
Quercus macrocarpa	Bur Oak	S5		x		x
GROSSULARIACEAE	CURRENT FAMILY					
Ribes americanum	Wild Black Currant	S5				x
Ribes oxycanthoides	Northern Gooseberry	S5				x
Ribes triste	Swamp Red Currant	S5		x		
Ribes sp.	Currant					x
IRIDACEAE	IRIS FAMILY					
Sisyrinchium montanum	Blue-eyed Grass	S5				x
JUNCACEAE	RUSH FAMILY					
Juncus arcticus	Arctic Rush	S5		x	x	x
Juncus sp.	Rush					x
Juncus tenuis	Path Rush	S5		x	x	
LAMIACEAE	MINT FAMILY					
Glechoma hederacea	Ground Ivy	SNA	NON_NATI VE	x		
Lycopus americana	Water Hore-hound	S5			x	
Lycopus asper	Western Water- horehound	S4			x	
Mentha arvensis	Mint	S5		x		
Stachys palustris	Marsh Hedge-nettle	S5		x	x	x
LILIACEAE	LILY FAMILY					
Asparagus officinalis	Garden asparagus	SNA	NON_NATI VE	x	x	x
Maianthemum canadense	Canada May Flower	S5				x
Maianthemum stellatum	Solomon's Seal	S5		x		x
Smilax lasioneura	Carrion Vine	S4		x		x
LYTHRACEAE	LOOSESTRIFE FAMILY					
Lythrum salicaria	Purple Loosestrife	SNA	NON_NATI		x	

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
			VE			
OLEACEAE	OLIVE FAMILY					
Fraxinus pennsylvanica	Green Ash	S5		x		x
ONAGRACEAE	EVENING PRIMROSE FAMILY					
Epilobium palustre	Marsh Willowherb	S5		x		
Oenothera biennis	Evening Primrose	S5				x
ORCHIDACEAE	ORCHID FAMILY					
Cypripedium parviflorum var. makasin	Small Yellow Lady's- slipper	S4				x
PINACEAE	PINE FAMILY					
Larix laricina	Tamarack	S5		x		
Picea glauca	White Spruce	S5		x		
PLANTAGINACEAE	PLANTAIN FAMILY					
Plantago major	Common Plantain	SNA	NON_NATI VE		x	
POACEAE	GRASS FAMILY					
Agrostis scabra	Ticklegrass	S5				x
Agrostis stolonifera	Creeping Bent	SNA	NON_NATI VE			x
Andropogon gerardii	Big Bluestem	S4				x
Avena fatua	Wild Oats	SNA	NON_NATI VE		x	
Bromus inermis	Smooth Brome	SNA	NON_NATI VE			
Calamagrostis canadensis	Canada Reed Grass	S5		x		x
Elymus repens	Quackgrass	SNA	NON_NATI VE			x
Hordeum jubatum	Foxtail Barley	S5		x	x	x
Muhlenbergia cuspidata	Prairie Muhly	S4				x
Phalaris arundinacea	Reed Canarygrass	S5	NON_NATI VE	x	x	x
Phleum pratense	Timothy	SNA	NON_NATI VE	x		x
Phragmites australis	Common Reed	S5	Cat 2 INVASIVE			x
Poa pratensis	Kentucky Bluegrass	S5		x	x	x
Setaria viridis	Green Bristlegrass	SNA	NON_NATI VE		x	x
Spartina gracilis	Alkali Cordgrass	S4				x
Spartina pectinata	Prairie Cordgrass	S5		x	x	x

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location	Previously Reported by City of Winnipeg
POLYGONACEAE	SMARTWEED FAMILY				
Polygonum sp.	Smartweed				x
Rumex crispus	Curly Dock	SNA	NON_NATI VE	x	x
Rumex occidentalis	Western Dock	S5			x
PRIMULACEAE	PRIMROSE FAMILY				
Glaux maritima	Sea-milkwort	S4S5			
RANUNCULACEAE	CROWFOOT FAMILY				
Anemone canadensis	Canada Anemone	S5		x	x
Ranunculus sp.	Buttercup				x
Thalictrum dasycarpum	Hairy Meadowrue	S5		x	x
Thalictrum venulosum	Veiny Meadowrue	S5			x
RHAMNACEAE	BUCKTHORN FAMILY				
Rhamnus alnifolia	Alder-leaved Buckthorn	S5		x	x
Rhamnus cathartica	Buckthorn	SNA	Cat 2 INVASIVE		x
ROSACEAE	ROSE FAMILY				
Amelanchier alnifolia	Saskatoon	S5		x	x
Argentina anserina	Silver Weed	S5		x	x
Crataegus chrysocarpa	Round-leaved Hawthorn	S4		x	x
Fragaria virginiana	Smooth Wild Strawberry	S5		x	x
Geum aleppicum	Yellow Avens	S5		x	x
Malus pumila	Apple	SNA	NON_NATI VE		x
Prunus pensylvanica	Pin Cherry	S5			x
Prunus virginiana	Chokecherry	S5		x	x
Rosa acicularis	Prickly Rose	S5			x
Rosa sp.	Rose			x	x
Rosa woodsii	Wood's Rose	S4			x
Rubus acaulis	Stemless Raspberry	S5			
Rubus idaeus	Raspberry	S5			x
Rubus pubescens	Trailing Dewberry	S5		x	x
Rubus sp.	Dewberry				x
Spiraea alba	Meadowsweet	S5		x	x
RUBIACEAE	MADDER FAMILY				
Galium boreale	Northern Bedstraw	S5		x	x

FAMILY/Species (Alphabetical)	Common Name	Provincial S Rank	Introduced	Location		Previously Reported by City of Winnipeg
Galium triflorum	Sweet-scented Bedstraw	S5		x		
SALICAEAE	WILLOW FAMILY					
Populus balsamifera	Balsam Poplar	S5				x
Populus deltoides	Cottonwood	S4		x		x
Populus tremuloides	Trembling Aspen	S5		x		x
Salix amygdaloides	Peach-leaved Willow	S4		x		x
Salix exigua	Sandbar Willow	S5		x		
Salix petiolaris	Basket Willow	S4				x
Salix sp.	Willow			x		x
SANTALACEAE	SANDALWOOD FAMILY					
Comandra umbellata	Bastard Toadflax	S5				x
TYPHACEAE	CAT-TAIL FAMILY					
Typha angustifolia	Narrow-leaved Cat-tail	S4	INVASIVE		x	x
ULMACEAE	ELM FAMILY					
Ulmus americana	American Elm	S4				x
Ulmus pumila	Dwarf or Siberian Elm	SNA	NON_NATI VE	x	x	
VIOLACEAE	VIOLET FAMILY					
Viola canadensis	Canada Violet	S5				x
VITACEAE	GRAPE FAMILY					
Parthenocissus quinquefolia	Virginia Creeper	S4				

Appendix C:
Copy of the Request to MCDC
and MCDC Response

Subject: RE: Rare species in the proposed Southwest Rapid Transit project area
Date: Tuesday, April 1, 2014 at 9:56:18 AM Central Daylight Time
From: Friesen, Chris (CWS)
To: 'Maureen Forster'

Maureen

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. **An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present;** in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife and Ecosystem Protection Branch, Manitoba Conservation.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information please contact me directly at (204) 945-7747.

Chris Friesen
Biodiversity Information Manager
Manitoba Conservation Data Centre 204-945-7747
chris.friesen@gov.mb.ca
<http://www.gov.mb.ca/conservaQon/cdc/>

From: Maureen Forster [mailto:mforster3@outlook.com]
Sent: March-24-14 8:31 PM
To: Friesen, Chris (CWS)
Subject: Rare species in the proposed Southwest Rapid Transit project area

Hi Chris

My computer died just before Christmas, and I think I have lost some of my emails because of the switch to a new one.

I had sent you a request to see if there are any species of concern in the Stage 2 Rapid Transit project area in Winnipeg, but I can't find it anywhere.

Can you please let me know if there are any species of concern in the area shown on the attached figures.

It is the proposed alignment for the Stage 2 of the Southwest Rapid Transit system, it starts at the Pembina and Jubilee overpass, goes down the CN rail line and RoW, through the Parker Lands area, then turns south down the Manitoba Hydro RoW to Clarence Avenue, joins with the CN line and RoW again, and stays in the CN line and RoW to Bison Drive.

My apologies if I have already asked you for this info, and if I did, please resend it.

Thank you once again for your time and help.

Regards
Maureen

Maureen Forster, M.Sc., EP
Email: mforster3@outlook.com
Office Phone: 204-886-0127
Mobile Phone: 204-471-1477
Address: P.O. Box 931, Teulon, MB ROC 3B0

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**Appendix D:
Copy of the Request to MHRB
and MHRB Response**

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HR information for Parker Lands area in the City of Winnipeg

From: **Maureen Forster** (mforster3@outlook.com)
Sent: October-24-13 1:46:57 PM
To: hrb@gov.mb.ca; Perry.Blomquist@gov.mb.ca
1 attachment
Parker Lands NA_City Owned.pdf (789.4 KB)

Hello

Could you please tell me if there are any Heritage Resources or any type of Heritage designations(s) for the area in the City of Winnipeg known as the Parker Lands?

Please see the attached map. The site numbers (201, 550) refer to the City of Winnipeg designation as Natural Areas.

There is information on the internet that implies that this area was once occupied by a Métis community and is a historic site.

I am part of the team conducting an environmental assessment for the area, and I would like to know what the actual designation of this area is in terms of municipal, provincial and national laws/policies, and any other information that HRB may have for this area.

Thank you for your time and help.

Regards

Maureen

Maureen Forster, M.Sc., EP

Email: mforster3@outlook.com

Phone: 204-471-1477

Address: P.O. Box 931, Teulon, MB R0C 3B0

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Parker Lands

From: **Blomquist, Perry (CHT)** (Perry.Blomquist@gov.mb.ca) You moved this message to its current location.

Sent: February-05-14 11:08:46 AM

To: 'mforster3@outlook.com' (mforster3@outlook.com)

Hello Maureen,

I have conducted a site search of our database regarding the parker lands and nothing of the archaeological sort has been previously recorded. I am sure that there are a number of historic documents and other resources that can be found regarding this land, but for the archaeology side of things, there is nothing of note. Hope this helps.

Cheers,

Perry Blomquist *B.A., M.A.*

Archaeological Services Officer

Historic Resources Branch

213 Notre Dame Ave, Winnipeg, MB R3B 1N3

Phone (204) 945-1071; Fax (204) 948-2384

E-mail: perry.blomquist@gov.mb.ca



Tourism, Culture, Sport and Consumer Protection