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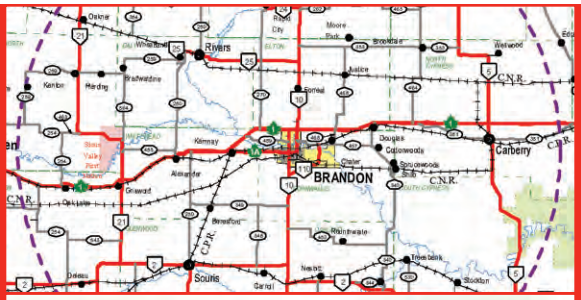

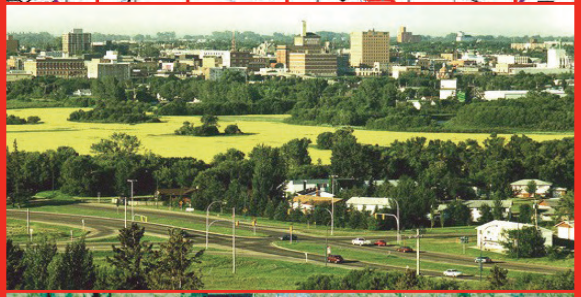

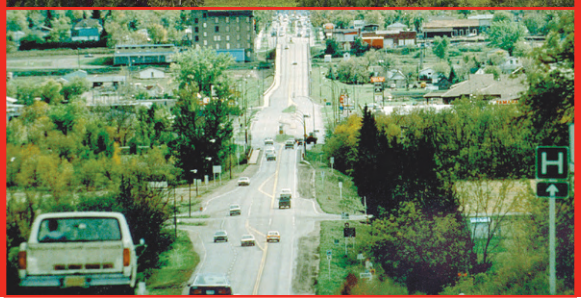

Brandon Area Road Network Development Plan Final Report

FOR PLANNING PURPOSES ONLY

Prepared for:
Manitoba Infrastructure and Transportation
and The City of Brandon

COMMUNITIES

TRANSPORTATION

BUILDINGS

INFRASTRUCTURE

MMM GROUP

December 2007 | 41396.101

BRANDON AREA ROAD NETWORK DEVELOPMENT PLAN

FOR PLANNING PURPOSES ONLY

Prepared For

Manitoba Infrastructure and Transportation
and
The City of Brandon

Submitted By

MMM Group

December 2007

41396.101

STANDARD LIMITATIONS

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EXECUTIVE SUMMARY

Traffic patterns and volumes have been changing throughout the City of Brandon and its surrounding municipalities during the last several years. Continued development and redevelopment within the City of Brandon, including commercial, industrial, institutional and residential, is anticipated to affect traffic patterns and volumes to an even greater extent.

To address these current and anticipated changes, Manitoba Infrastructure and Transportation (MIT) and the City of Brandon (City) commissioned this study to develop a Brandon Area Road Network Development Plan. This Plan establishes a prioritized Infrastructure Investment Plan for the City of Brandon road network and Provincial highways that provide service to and from Brandon within a 60-km surrounding area. Throughout the study process there has been a focus on the interconnectivity, dual funding, and dual responsibility between the Province and the City.

Study Objectives

The objectives of the study include the development of a prioritized Road/Street/Highway Infrastructure Investment Plan for the City of Brandon and its surrounding area. The plan will be used to guide the development and maintenance of a safe, affordable and efficient road network to meet the projected economic development and social needs of the Brandon area over the next 20 years.

The proposed plan will focus on improving public safety, serving the regional economy and social needs while complementing ongoing land development. The plan will recommend solutions with a view to providing an efficient, economical, socially responsible and environmentally sustainable road network in Brandon and its surrounding area. The solutions are to be developed to a conceptual planning level (i.e., single line with associated functional characteristics) with preliminary cost estimates. The plan will recommend strategies that will contribute to sustainable transportation including alternative sources of funding for the recommended solutions.

Methodology

The study focused on six main goals, including:

- Review of current traffic, collisions, roadway conditions, and development patterns.
- A public consultation program that offered residents and stakeholders an opportunity to participate in the study and offer input on transportation-related concerns and mitigation measures.

- Development of a computer-based traffic forecasting model.
- An origin-destination study to identify trip making characteristics.
- Identification of transportation strategies to help guide future transportation decision making, including traffic calming, traffic impact study Policy, alternative funding options, smart growth features, parking standards, road classifications and standards.
- Identification of future transportation infrastructure needs to accommodate forecast year 2026 traffic volumes.

Study Steering Committee

MIT and the City established a Steering Committee to provide guidance and direction to the consultant team based on each of their individual goals. The primary goal of the City of Brandon, with respect to transportation, was to provide a safe, affordable and efficient road network for the users within the City of Brandon. The primary goal of MIT, with respect to transportation, was to provide a safe, affordable and efficient road network for traffic and the transport of goods on the Provincial roadway network within the 60-km study area. Steering Committee members included:

City of Brandon Members	MIT Members
Rod Sage (City Project Director)	Dave Duncan (MIT Project Director)
Ted Snure	Amar Chadha
Steve Hayward	Doug Struthers
Bob McDonald	Brant Magnusson

Environmental Scan

The 2001 Statistics Canada census listed the City of Brandon and surrounding area as having a population of 41,037 people. This marked a 1.1 percent growth in population since the previous 1996 census, a rate that is nearly double that of the Provincial average. Within the entire study area, including the 60-km radius around the city, the 2001 population was 71,885, approximately 57% of which was within the City of Brandon.

Information regarding the transportation mode choice for residents of Brandon to and from places of employment was also reviewed and compared with the Provincial average.

Work-Related Transportation Mode Choice		
Transportation Mode	**Brandon Residents**	**Provincial Average**
Personal Vehicle	78%	72%
Passenger in Personal Vehicle	7%	8%
Public Transportation	3%	9%
Walk / Bicycle / Other	12%	11%

The existing road network for the 60-km study area consists of a mixture of roadway types ranging from local streets to Provincial highways. The primary focus of the study within the City of Brandon was on collector and higher-level roads as these roads carry the bulk of vehicle trips and typically have higher volumes compared to local roads.

The roads around Brandon are comprised of Provincial highways and roads under the jurisdiction of MIT. The primary focus of the study outside the City of Brandon was on provincial trunk highways (PTH) and roads (PR) within a 60-km radius of the City of Brandon that accommodate vehicle trips to and from the city.

A pavement condition assessment was undertaken for roadways within the City of Brandon as well as Provincial highways and roads outside the City of Brandon. Dozens of road segment locations and spot locations were identified as “fair” or worse. Many of these locations were improved in 2006 during pavement work or are planned for improvements in 2007.

A review of design and geometric standards for the City of Brandon found them to be in accordance with the latest revision of the Geometric Design Guide for Canadian Roads by the Transportation Association of Canada (TAC).

The City of Brandon has a designated truck route network, and some of these roads have been further designated for dangerous goods. Changes are recommended to the truck route network and the dangerous goods route based on proposed changes to the major road network.

Parking standards in the City of Brandon are currently controlled by Zoning By-law No. 6642, which identifies minimum parking dimensions as well as the minimum required number of spaces for different land uses, and the Landscape Design Regulations, which sets out specific design standards for landscape screening and internal landscaped islands. The two documents set out a relatively thorough framework for the provision of off-street parking, more so than many jurisdictions

in terms of identifying the number of accessible parking spaces, and setting out landscape design standards. Five modifications to these standards are recommended for consideration.

A review of collision data along Provincial highways for the years 2000 through 2004 was carried out for both the number of reported collisions by road segment and the collision rate. None of the calculated collision rates were sufficiently high enough to warrant further review.

Brandon Transit currently operates 10 transit routes in the City of Brandon that provide access to major destination points in Brandon. Historical transit ridership information was obtained for 1994 through 2006. Annual transit ridership in Brandon has averaged over 750,000 rides per year over the past 13 years. Transit ridership in Brandon tends to peak during the winter months and is lowest during the summer months, typically a reflection of summer vacations and schools being closed.

The Brandon and Area Planning District is a partnership between the City of Brandon, the Rural Municipality of Cornwallis and the Rural Municipality of Elton. The Brandon and Area Planning District Development Plan (By-law #78/01/04), which was revised in 2005, is a long-range plan to guide development in the District. The Plan sets out objectives and policies that direct development locations and standards.

No parking issues were identified during the consultation process with City and MIT personnel. City representatives on the Steering Committee noted early in the process that downtown parking had been examined previously and was not considered a problem.

A high-level overview of safety issues was undertaken within the study area. The identification of critical areas of concern and potential remedial measures was also undertaken. A key element of the overview was a review of intersection collision data where available, and a review of selected highway links within the 60-km study area.

Public Participation

An extensive public consultation program was developed that included:

- A project website (http://www.ndlea.com/brandonroadstudy),
- Two public Open Houses (June 22, 2005 and April 3, 2007),
- Two public Workshops (October 26, 2005 and May 4, 2006),

- A public display (February 3 – 7, 2006 and February 9 – 23, 2006), and
- A formal presentation to City Council (XX, 2007).

In total, more than 700 people visited the project website and over 100 actively participated in the project's open houses and workshops.

Transportation Model

Long-range transportation planning studies such as this typically forecast traffic volumes for a 20-year horizon period using computer-based transportation planning models. For this study a TransCAD model, which was specifically designed for planning, managing, and analyzing the characteristics of transportation systems, was used to develop and analyze the roadway network.

Based on a comparison between existing conditions and forecast Year 2026 conditions, a number of road links were identified as either at or above capacity, particularly in areas expected to accommodate much of the future development. These results suggest that a number of roadway modifications are required in Brandon to accommodate anticipated growth. When these improvements were incorporated, the number of links at or above capacity was dramatically reduced, especially along 1st Street, 18th Street and PTH 1.

Based on TransCAD model results, the environmental scan, and the public consultation program, six general issues and concerns were identified for the transportation network. Strategies to address each specific issue were then developed as the next step in the process leading to recommendations.

Issue Identification and Strategy Development

The following table provides a list of the major issues and concerns that arose during the study and the corresponding strategies that are proposed to be employed to address these issues and concerns in the future.

Issue / Concern	Strategies
1. Alternative Transportation and Environmental Considerations	• Transit development • Adequate multi-use trail system • Ensure sidewalk accessibility
2. Safety	• Minimize traffic related conflicts
3. Route Classification and Goods Movement	• Provide a road system that locates trucks on appropriate routes
4. Access and Traffic Management	• Minimize traffic related conflicts and ensure appropriate access
5. Traffic and Intersection Capacity	• Efficient road network that meets future traffic growth and operation
6. Future Roadway Needs	• Roadway network that meets future traffic and economic needs

Recommendations and Recommended Priorities

Recommended projects were categorized into short-, mid- and long-term planning horizons based on input received through the environmental scan, transportation planning model, public consultation program, and Steering Committee. In addition, some projects were identified as 'beyond horizon year' if they are expected to occur beyond the 20-year study horizon.

Recommended projects identified as 'lower cost' could be undertaken within annual operating budgets or with administrative policy changes. Recommended projects identified as 'Major Capital Upgrades' or 'Major Capital Twinning' would require programming and budgeting in the capital budget process.

Preliminary class D cost estimates (based on 2007 rates and subject to change) were prepared for the recommended road network upgrades based on typical unit costs per metre of roadway, excluding land costs, taxes, utility relocations and engineering. Many of the items recommended, such as changes in classifications and updating of the traffic signal control coordination plans, do

not lend themselves to easily identifiable cost estimates, therefore a yearly allowance was identified.

It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental priorities and will be undertaken as and when funding permits.

Prioritized Recommendations – Lower Cost Items[1]					
Recommendation	**Short-Term**	**Mid-Term**	**Long-Term**	**Beyond Horizon Year**	**Prelim. Cost Estimate[2]**
Truck/Dangerous Goods Route Changes	✓	✓	✓	✓	OP/AD[3]
Update Roadway Classifications	✓	✓	✓	✓	OP/AD
Reassessment of Road Jurisdictions	✓			✓	OP/AD
Traffic Calming Guidelines	✓	✓	✓	✓	OP/AD
Traffic Impact Study Policy	✓	✓	✓	✓	OP/AD
Access Management Strategy	✓	✓	✓	✓	OP/AD
Smart Growth Principles	✓	✓	✓	✓	OP/AD
Synchronization of traffic signals	✓				$100,000
Transit signal priority study/implementation	✓				$100,000
Extended hours of operation for Transit	✓				$300,000/yr
Conceptual design of Western By-pass	✓				$200,000
Modifications to Parking Standards	✓				OP/AD
Traffic count monitoring program	✓	✓	✓	✓	$10,000/yr
Intersection reviews and upgrades	✓	✓	✓	✓	As required
Safety review project recommendations	✓	✓	✓	✓	As required

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[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.
[3] OP/AD indicates a project that can be undertaken within an operational budget or administrative policy change.

Prioritized Recommendations – Major Capital Upgrades[1, 2]				
Recommendation	**Short-Term (to 2012)**	**Mid-Term (to 2019)**	**Long-Term (to 2026)**	**Beyond Horizon Year**
Urban Upgrades				
18th Street (PTH 10): Twin Structures at Assiniboine River (Thompson Bridge)	$17,000,000			
18th Street (PTH 10): CPR Overpass (Daly Overpass)			$20,000,000	
Richmond Avenue: Roundabout at 34th Street	$500,000			
Rural Upgrades				
PTH 1: Phase 1 – Service Roads	$5,000,000	$5,000,000		
PTH 1: Phase 2 – Interchange at 18th Street		$20,000,000	$20,000,000	
PTH 1: Phase 3 – Interchange at 1st Street			$15,000,000	$15,000,000
PTH 1A: CPR Underpass at Kemnay	$2,500,000	$2,500,000		
PTH 10: Forrest By-pass	$5,000,000			
PTH 110: Eastern By-pass Completion	$30,000,000			
Proposed Western By-pass				TBD [3]
Total	**$60,000,000**	**$27,500,000**	**$55,000,000**	**TBD**

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[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.

[3] TBD: To Be Determined

Note: The above recommendations relate to Provincial roadways that are classed as Core routes, or roadways within the City of Brandon itself.

Prioritized Recommendations – Major Capital Twinning (4-lane Divided)[1, 2]				
Recommendation	**Short-Term (to 2012)**	**Mid-Term (to 2019)**	**Long-Term (to 2026)**	**Beyond Horizon Year**
Urban Twinning (4-lane Divided)				
1st Street (PTH 1A): PTH 1 to Braecrest Drive			$5,000,000	
1st Street (PTH 1A): Braecrest Drive to Kirkcaldy Drive		$2,000,000		
1st Street (PTH 1A): Richmond Avenue to PTH 110			$4,000,000	
Victoria Avenue (PTH 1A): 34th Street to 50th Street		$3,000,000		
Victoria Avenue (PTH 1A): 50th Street to Western By-pass				TBD [3]
18th Street (PTH 10): PTH 1 to Braecrest Drive			$5,000,000	
18th Street (PTH 10): Braecrest Drive to Assiniboine River		$2,000,000		
18th Street (PTH 10): Maryland Avenue to Patricia Avenue	$3,000,000			
18th Street (PTH 10): Patricia Avenue to PTH 110			$3,000,000	
Richmond Avenue: 26th Street to 34th Street		$1,000,000		
Rural Twinning (4-lane Divided)				
PTH 10: Brandon to PTH 25	$25,000,000			
PTH 10: PTH 25 to Minnedosa			$40,000,000	
Total	**$28,000,000**	**$48,000,000**	**$57,000,000**	**TBD**

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[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.

[3] TBD: To Be Determined

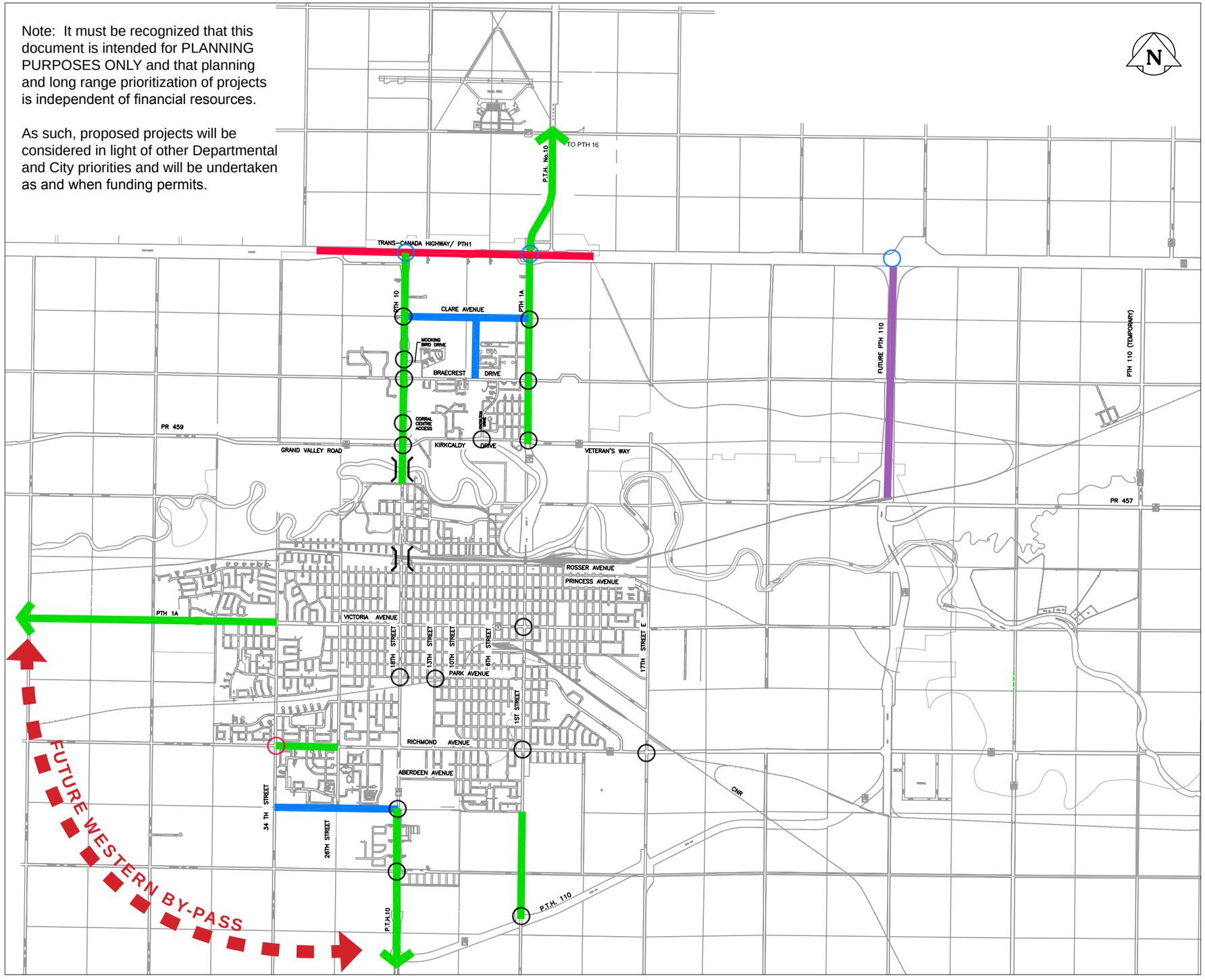
Note: The above recommendations relate to Provincial roadways that are classed as Core routes, or roadways within the City of Brandon itself.

Three recommended projects are not categorized above as they are 'development driven' based on future residential development in Brandon, including Clare Avenue (1st Street to 18th Street), Maryland Avenue (26th Street to 34th Street), and Lark Street (Braecrest Drive to Clare Avenue).

Figure ES-1 illustrates the lower and major capital cost recommendations.

Note: It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources.

As such, proposed projects will be considered in light of other Departmental and City priorities and will be undertaken as and when funding permits.



LEGEND

IDENTIFIED MAJOR IMPROVEMENT PROJECTS

- ONGOING INTERSECTION REVIEWS
- INTERCHANGE
- ROUNDABOUT
- TWIN BRIDGES
- UPGRADE TO 4 LANE DIVIDED
- UPGRADE TO EXPRESSWAY
- UPGRADE TO CORE ROUTE

DEVELOPMENT DRIVEN PROJECTS

- DEVELOPMENT REVIEW

Manitoba

CITY OF BRANDON MANITOBA

MMM GROUP

Source: City of Brandon

PROJECT TITLE

Brandon Area Road Network Development Plan

FIGURE ES.1:
RECOMMENDED UPGRADES

Conclusions

The following conclusions are offered:

1. That as the City addresses future transit service improvements, the measures noted in the Transit Priorities section (7.1.1) are considered.

2. That the smart growth principles noted in the Greenspace and Smart Growth Considerations section (7.1.2) be incorporated when reviewing future development proposals.

3. That the City and MIT undertake the short-term safety initiatives identified in the Safety Improvement Projects section (7.2.1).

4. That the strategies identified in the Traffic Calming Strategy section (7.5.2) be considered when volume and/or speed control measures are deemed necessary.

5. That the City adopt changes to the City's Truck and Dangerous Goods Route Network identified in the Route Classification and Goods Movement section (7.3).

6. That the City adopts the access management guidelines set out in the Access and Traffic Management section (7.4).

7. That modifications noted in the Access Management Strategy for the Brandon Area section (7.4.1) be incorporated into the City's current parking standards.

8. That the policy outlined in the Traffic Impact Study Policy section (7.5.1) and included in Appendix D be adopted by the City and applied to any future development applications.

9. That the City adopts the road classification system, and related design standards, in the Route Classification and Goods Movement section (7.3).

10. That the City and MIT conduct detailed operational reviews at the intersections noted in the Intersections section (7.6.1), selecting two to five intersections per year to examine.

11. That the City and MIT implement road link improvements as noted in the Road Upgrades section (7.6.2).

12. That the alternative funding options discussed in Appendix E be examined in detail by City administration to determine if they are applicable. The funding options focus on incorporating off-site development improvements on a site-by-site basis, transportation assessments, and impact fees.

13. That a traffic count monitoring program be established to monitor operations at key intersections that may need upgrades within the horizon year time frame and review whether adjustments to traffic signal phasing or timing may be required.

14. That traffic control modifications planned by MIT occur within the next two years.

15. That roundabouts continue to be considered at collector – collector intersections if technically feasible as an alternative to traffic signals.

16. That the City ensures the transportation model is updated on a regular basis and maintained for future traffic recommendations.

1.0 INTRODUCTION

1.1 Background

During the past several years, traffic patterns and volumes have been changing throughout the City of Brandon and surrounding municipalities. It is anticipated that traffic patterns will be affected by upcoming and ongoing developments in Brandon, including the proposed development of the former Brandon Mental Health Centre, the industrial sub-division expansion at the Brandon Airport, and several proposed commercial and residential developments between 1st and 18th Streets, south of PTH 1.

Manitoba Infrastructure and Transportation (MIT), in partnership with the City of Brandon (City), commissioned this study to develop a Brandon Area Road Network Development Plan to establish road and street development requirements, focusing on the City of Brandon, as well as Provincial Highways within and around the City that relate to traffic in the City. The goal of the study is to develop a prioritized Infrastructure Investment Plan for the City of Brandon, including roads that provide service to and from Brandon within the 60-km surrounding area shown in Figure 1.1. The plan will be used to guide the development and maintenance of a safe, affordable and efficient road network to meet the projected economic development and social needs of the Brandon area over the next 20 years.

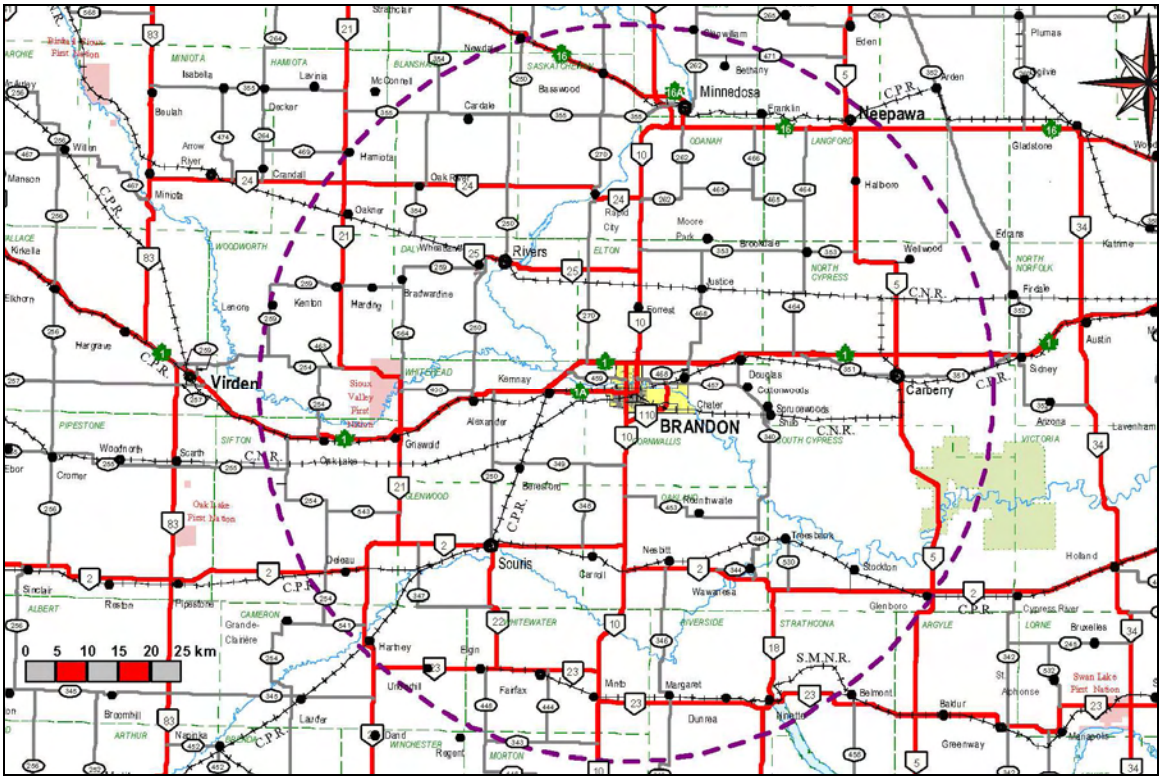


Figure 1.1: Study Area

The objectives of the study include the development of a prioritized Road/Street/ Highway Infrastructure Investment Plan for the City of Brandon and its surrounding area. The plan will be used to guide the development and maintenance of a safe, affordable and efficient road network to meet the projected economic development and social needs of the Brandon area over the next 20 years.

The proposed plan will focus on improving public safety, serving the regional economy and social needs while complementing ongoing land development. The plan will recommend solutions with a view to providing an efficient, economical, socially responsible and environmentally sustainable road network in Brandon and its surrounding area. The solutions are to be developed to a conceptual planning level (i.e., single line with associated functional characteristics) with preliminary cost estimates. The plan will recommend strategies that will contribute to sustainable transportation including alternative sources of funding for the recommended solutions.

The methods that have been used to obtain the study objectives included:

- Reviewing current traffic levels, collision experience, road infrastructure condition, and development patterns.

- Conducting a public consultation program that offered Brandon and area residents an opportunity to participate in the study and offer input to the study team on what are seen as existing transportation-related concerns and what types of mitigation measures should be examined as part of the study.

- Developing a computer-based traffic forecasting model.

- Conducting an origin-destination study to identify trip making characteristics.

- Identifying transportation strategies to help guide future transportation decision making, including measures related to traffic calming, traffic impact study guidelines, alternative funding options, smart growth features, parking standards, road classifications and standards.

- Identifying future transportation infrastructure needs to accommodate forecast year 2026 traffic volumes.

The Infrastructure Investment Plan will focus on improving public safety, serving the regional economy and social needs while complementing ongoing land development. The recommended solutions are intended to provide an efficient, economical, socially responsible and environmentally sustainable road network in Brandon and the surrounding area.

It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental priorities and will be undertaken as and when funding permits.

1.2 Study Direction

The City of Brandon has a designated system of public lanes, local, collector and arterial roads under its jurisdiction and control. There are over 320 kilometres of roads within the Brandon city limits, including approximately 67 kilometres of arterials, 55 kilometres of collectors, and 200 kilometres of local streets. The primary goal of the City of Brandon, with respect to transportation, is to provide a safe, affordable and efficient road network for the users within the City of Brandon.

MIT oversees Highways, classified as core, feeder and recreation/tourist routes, throughout the province and within the 60-km study area. This functional classification system is currently under review by the Province in order to develop a strategic highway system that allows for the recommendations of roads, based on consistent and agreed upon criteria that should be the responsibility of the Province, as well as their service levels. Further, there are two classifications of highways in Manitoba with respect to determination of authority and control. The majority of highways in the province are “Declared Highways”, for which the Minister of Infrastructure and Transportation is the traffic authority and MIT is responsible for all costs of construction and maintenance, exclusive of municipal services. “Designated Highways” are generally connecting links between communities, for which the local government is the traffic authority. The Province remains responsible for the costs of construction and maintenance, exclusive of municipal services. The primary goal of MIT, with respect to transportation, is to provide a safe, affordable and efficient road network for traffic and the transport of goods on the Provincial network within the study area.

MIT and the City established a Steering Committee to provide guidance and direction to the consultant team. Steering Committee members included:

- Dave Duncan, MIT (MIT Project Director)
- Rod Sage, City (City Project Director)
- Amar Chadha, MIT
- Ted Snure, City
- Doug Struthers, MIT
- Steve Hayward, City
- Brant Magnusson, MIT
- Bob McDonald, City

The primary consultant team members included:

- Richard Tebinka, MMM Group, Project Manager
- Kerra Mruss, MMM Group
- Veronica Hicks, MMM Group
- Jerry Pilipowicz, MMM Group
- Jesse Crowder, MMM Group
- Dave Krahn, Dillon Consulting Ltd.
- Bill Kavanagh, Dillon Consulting Ltd.

GCS Technology (safety review) and Wordsnorth Communications (origin-destination surveys) provided additional assistance to the consultant team.

2.0 ENVIRONMENTAL SCAN

2.1 Statistics Canada Demographic Data

The 2006 Statistics Canada census listed the City of Brandon and surrounding study area as having a population of 41,511 people. This marked a 4.5 percent growth in population since the previous 2001 census, a rate that is nearly double that of the provincial average.

Information regarding the transportation mode choice for residents of Brandon to and from places of employment was also reviewed and compared with the provincial average. It should be cautioned that the provincial average is heavily influenced by Winnipeg data, which may not be reflective of data collected in the balance of the province, including Brandon. As an example, the provincial average for transit ridership is skewed by the high transit mode split in Winnipeg, which is reflective of a larger city and not comparable to smaller urban centres, many of which have no transit service. The data showed the following:

- Approximately 78 percent of Brandon residents drive to work in a motorized vehicle, compared with a provincial average of 72 percent.
- Over seven percent of Brandon residents are taken to work as passengers in motorized vehicles, compared with a provincial average of eight percent.
- Approximately three percent of Brandon residents use public transportation as their primary mode of transportation to and from work, compared with a provincial average of nine percent.
- Approximately 11 percent of Brandon residents walk or use a bicycle as their primary mode of transportation to and from work, compared with a provincial average of nine percent.
- Approximately one percent uses a motorcycle, taxicab, or another means of travelling to work, compared with a provincial average of one percent.

A graphical summary of mode of trip information for Brandon is included in Figure 2.1. Applicable comparisons of the Statistics Canada 2001 census data and the survey results are discussed in Section 2.10.

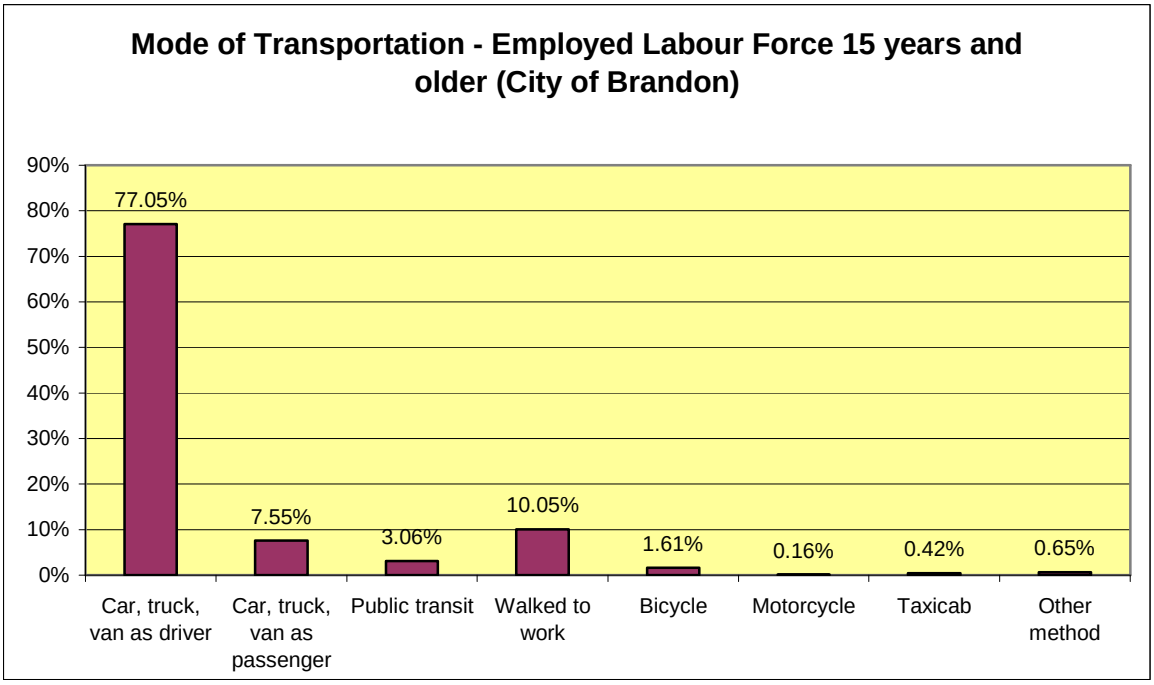


Figure 2.1: Statistics Canada 2001 Mode To Work Information

Statistics Canada demographic data was further reviewed using the PCensus software package for Brandon and a 60 km radius around the City. The 2001 population in the overall study area was 71,885; the City of Brandon comprises 57 percent of the study area population. The study area includes 31,185 dwellings (57 percent within the City).

2.2 Road Network

2.2.1 Existing Roads

The existing road network for the 60-km study area is illustrated in Figure 2.2. The focus of this study is on collector and higher-level roads, which are highlighted.

The streets within the City of Brandon analyzed as part of this study are illustrated in Figure 4.1. Examined roads within the City of Brandon, consisted primarily of collector and higher-level roadways. However, a number of local roads were included as 'connector' links to assist in modelling traffic movements. Roadways classified as collector and higher carry the bulk of vehicle trips and typically have higher volumes compared to local roads.

The roads outside Brandon are comprised of provincial highways, under the jurisdiction of MIT, and municipal roads that are administered by local governments. This study focuses on the major provincial trunk highways within a 60-kilometre radius of the City of Brandon that accommodate vehicle trips to and from the City.

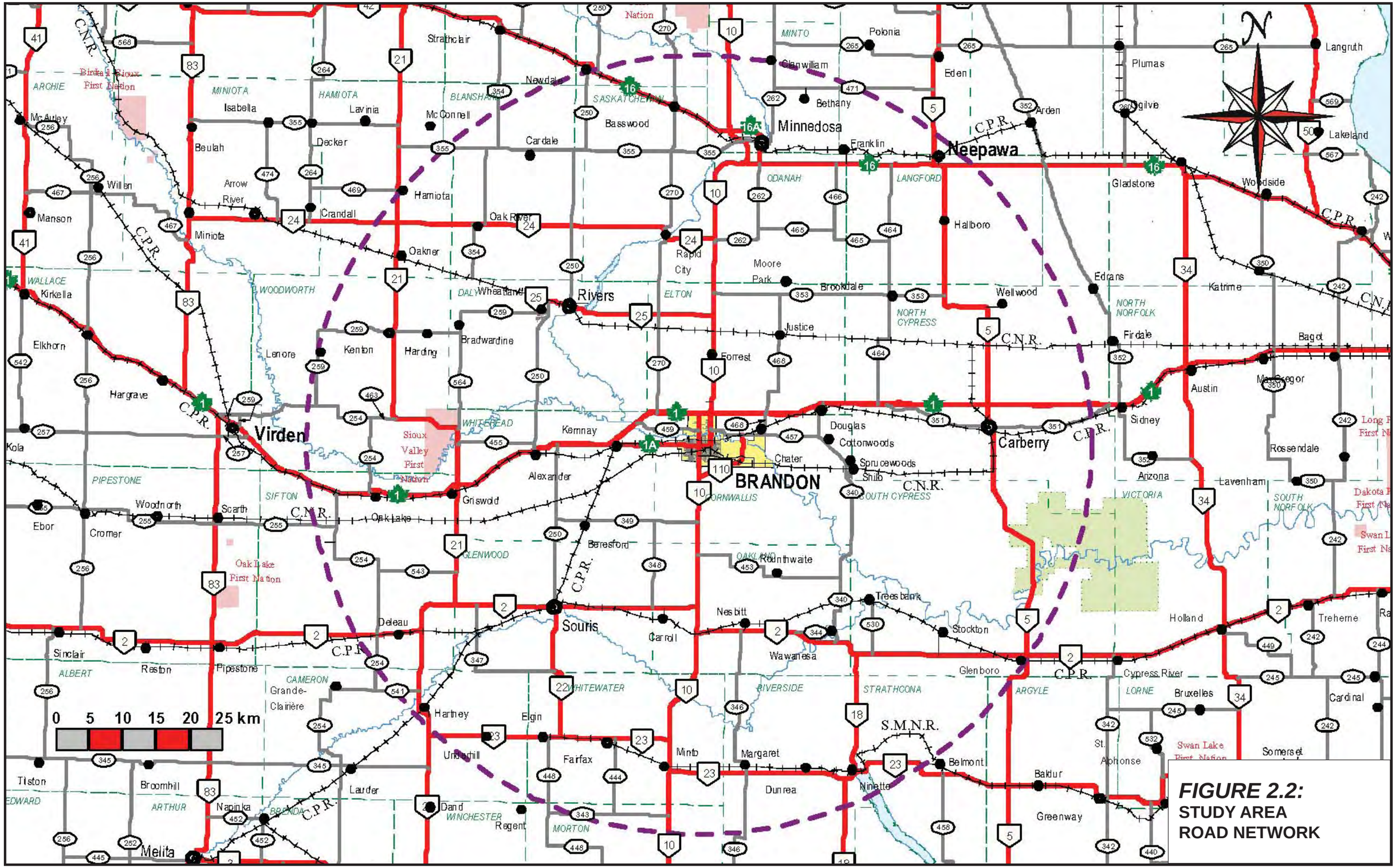


FIGURE 2.2:
STUDY AREA ROAD NETWORK

2.2.2 Road Conditions

The condition of the roadways within and surrounding the City of Brandon have been rated using the Pavement Condition Rating and International Roughness Index methods, respectfully. The condition analyses were carried out in 2005 for the City of Brandon and in 2003 for the roadways under MIT jurisdiction. As such, the ratings are an indication of the pavement condition for the period in time noted and will improve or deteriorate from year to year based on construction works.

2.2.2.1 City of Brandon Roads

Pavement Condition Rating (PCR) is a numerical indicator used across North America to rate the surface condition of pavement. The PCR provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement, which is also an indication of the structural integrity and surface operational conditions (localized roughness and safety). The PCR provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCR is typically used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs.

The PCR is based on a declining performance scale from 100 to 0, with 100 representing the best possible condition and 0 representing the worst possible condition. The pavement is assigned a condition rating that ranges from “Excellent” to “Failed” based on the PCR value. PCR value ranges and the associated Pavement Condition Ratings are listed below in Table 2.1.

Table 2.1: Pavement Condition Rating Scale

PCR	Pavement Condition Rating
85 to 100	Excellent
70 to 85	Very good
55 to 70	Good
40 to 55	Fair
25 to 40	Poor
10 to 25	Very Poor
0 to 10	Failed

A condition analysis was carried out by the study team for collector and higher-level roads within the City of Brandon in 2005, and was accompanied by video documentation of the roadway conditions as experienced in the rating drive-through. Roadway links that were rated at 50 PCR points or less (fair, poor, very poor or failed) are documented in Table 2.2. A number of the noted road links have been addressed in 2006, with additional upgrade work planned for 2007. Roads in which the PCR rating will have improved due to pavement work in 2006 or 2007 are noted with an asterisk in Table 2.2.

Table 2.2: Critical Roadway Links Identified During Pavement Condition Assessment

Street	Location	PCR
1st Street - Southbound	Victoria Avenue to McTavish Avenue	40 *
18th Street - Southbound	Queens Avenue to Maryland Avenue	45 *
18th Street - Southbound	18th Street Bridge to Rosser Avenue	45 *
18th Street - Northbound	Maryland Avenue to Queens Avenue	45 *
18th Street - Northbound	Victoria Avenue to Louise Avenue	45 *
Elderwood Drive	Queens Avenue to Driftwood Crescent	45 *
26th Street	Durum Drive Northward to 2-Lane/4-Lane Transition	45
1st Street - Southbound	McTavish to Park Avenue	47.5 *
Patricia Avenue	1st Street to 9th Street	47.5 *
1st Street - Southbound	Park Avenue to Richmond Avenue	50 *
1st Street	PTH 110 (East By-pass) to Patricia Avenue	50 *
1st Street - Northbound	Madison Avenue to McTavish Avenue	50 *
18th Street - Southbound	Rosser Avenue to Louise Avenue	50 *
18th Street - Northbound	Louise Avenue to Lorne Avenue	50 *
18th Street - Northbound	Daly Overpass (CPR tracks) to Parker Boulevard	50 *
26th Street	Durum Drive to Ottawa Avenue	50
26th Street - Southbound	Violet Crescent to Ottawa Avenue	50
34th Street	200 m South of Patricia Avenue to Patricia Avenue	50
Victoria Avenue - Eastbound	13th Street to 9th Street	50
Victoria Avenue - Eastbound	Whillier Drive to 26th Street	50

Princess Avenue East	Douglas Street to 13th Street East	50
Rosser Avenue	McDiarmid Drive to 30th Street	50
Richmond Avenue East	Percy Street to 17th Street East	50 *
Park Avenue	10th Street to 13th Street	50
Douglas Street	Rosser Avenue to Victoria Avenue East	50

* - Notes roads that were upgraded in 2006, or are planned to be upgraded in 2007, thereby improving the PCR rating

Critical spot locations, such as intersections and localized pavement failures, were also identified in the condition assessment and are documented in Table 2.3. Locations in which the PCR rating will have improved due to pavement work in 2006 are noted with an asterisk in Table 2.3.

Table 2.3: Critical Spot Locations Identified During Pavement Condition Assessment

Street	Location	PCR
Richmond Avenue	Pavement Failure at Mailboxes South of Wankling Drive	35
1st Street / McTavish Avenue Intersection		40 *
Richmond Avenue / Park Avenue South East Intersection		40 *
50th Street (Murray Street) (gravel)	200 m south to 200 m north of Patricia Avenue	40
50th Street (Murray Street) (gravel)	200 m south to 200 m north of Richmond Avenue	40
18th Street Bridge – Daly Overpass		45 *
1st Street / Kirkcaldy Drive Intersection		45
1st Street / Princess Avenue Intersection		45 *
1st Street / Queens Avenue Intersection		45 *
10th Street / Queens Avenue Intersection		45
13th Street / Park Avenue Intersection		45 *
18th Street / Richmond Avenue Intersection	Northbound and southbound lanes	45 *
18th Street / Aberdeen Avenue Intersection		45 *
26th Street / Park Avenue Intersection		45 *
1st Street / Richmond Avenue Intersection		50 *
1st Street / Rosser Avenue Intersection		50 *

13th Street / Victoria Avenue Intersection		50
18th Street / Richmond Avenue Intersection	Eastbound lanes	50 *
18th Street / Hilton – Parker Intersection		50 *
21st Street / Victoria Avenue Intersection		50
26th Street / Pacific Avenue Intersection		50
34th Street / Victoria Avenue Intersection		50
34th Street / Park Avenue Intersection		50

* - Notes locations that were upgraded in 2006, or are planned to be in 2007, thereby improving the PCR rating.

A full table of the observed pavement condition ratings, including ratings higher than 50 PCR points, is included in Appendix A. The Brandon roads pavement condition is graphically illustrated on Figure 2.3. Roadway links that were upgraded to 'adequate' in 2006, or are planned for 2007, are noted in the figure.

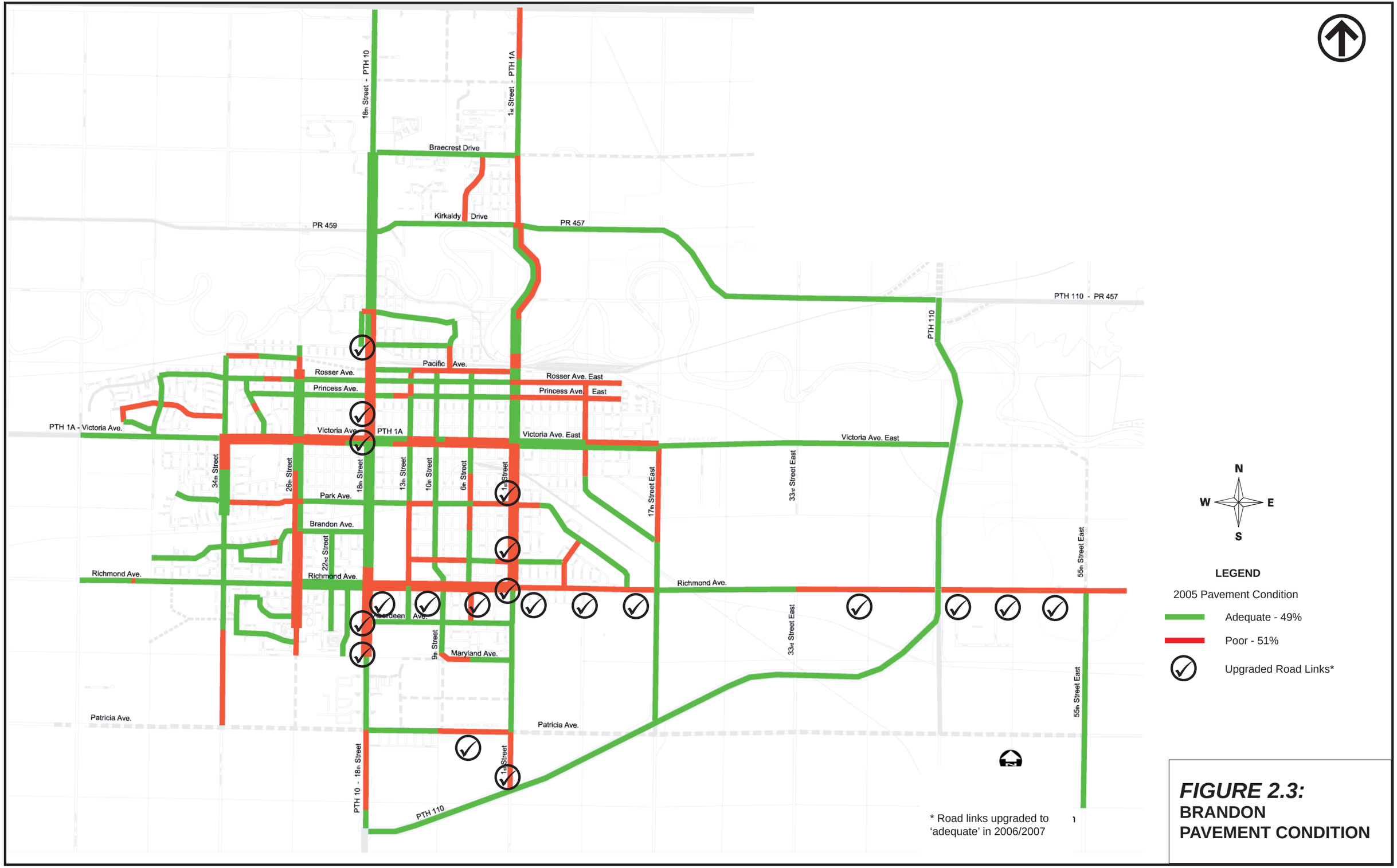


FIGURE 2.3:
BRANDON
PAVEMENT CONDITION

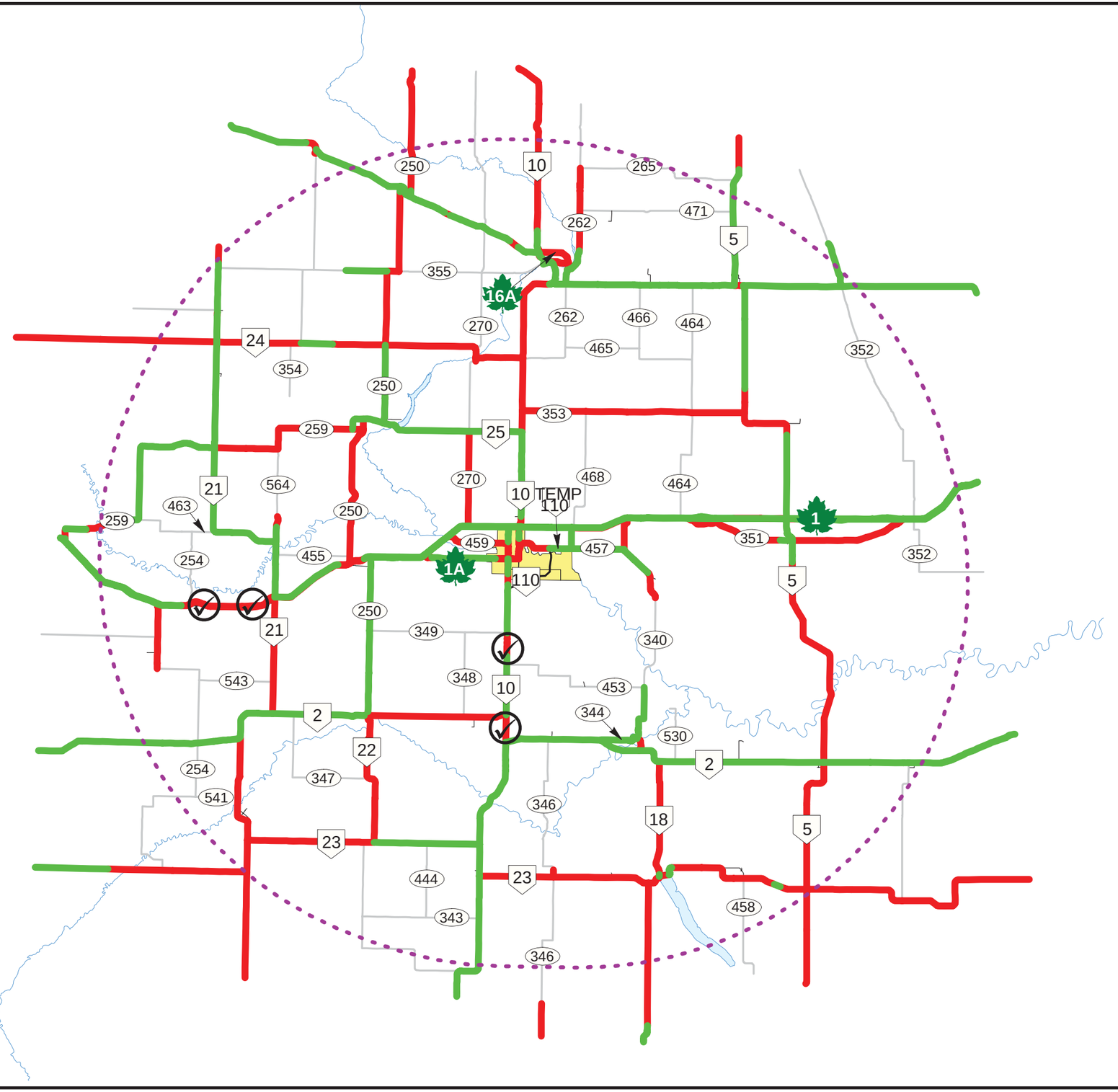
2.2.2.2 Provincial Roads

For roads outside the City of Brandon, MIT measures pavement quality in terms of the smoothness of the pavement surface. The International Roughness Index (IRI) is used to measure pavement roughness on a scale of 0.0 to 5.0. IRI ratings were converted into three broad categories of pavement conditions in the Prairie Provinces Transportation System Study1, and these same classifications are used in this study and are as follows:

- **Good:** Roadway links with IRI values less than 2.5 (IRI < 2.5) are considered to be in good condition.
- **Moderate:** Roadway links with IRI values between 2.5 and 3.5 (2.5 < IRI < 3.5) are considered to be in moderate condition.
- **Poor:** Roadway links with IRI values greater than or equal to 3.5 (IRI > 3.5) are considered to be in poor condition.

Surface condition information for provincial highways and roads around Brandon was obtained from MIT for 2003 and is illustrated in Figure 2.4. Roadway links that were upgraded to 'adequate' in 2006, or are planned for 2007, are noted in the figure.

[1] DS-Lea Consultants and the Battelle-UMTIG Prairie Region Freight Studies Alliance, *Prairie Provinces Transportation System Study*. Transport Canada, December 1998.



LEGEND

2003 Pavement Condition

- Study Area
- Adequate - 49%
- Poor - 51%

Upgraded Road Links*

* Road links upgraded to 'adequate' in 2006/2007

FIGURE 2.4:
PROVINCIAL PAVEMENT CONDITION (2003)

2.3 Functional Classification System

2.3.1 Road Classification Systems

Road classification systems are intended to allow a road network to perform efficiently and safely from both traffic operations and road safety perspectives. This objective is achieved by the designation and operation of roadways to their intended purposes. Classification systems group roads according to the type of service each group is intended to provide and are a fundamental tool for asset management. Typically, urban and rural roadways are grouped into four major hierarchical categories: local streets, collector streets, arterial streets and expressways. Local street traffic is collected by collector roadways, which provide access to arterials, which may then connect to expressways. Grouping roads with similar functions can improve transportation planning, geometric design, maintenance and operations. As well, a road classification system can also aid in managing urban development and access control.

The Transportation Association of Canada specifies various characteristics associated with the classification of a roadway. These characteristics include service function, land service, traffic volume, flow characteristics, design and average running speed, vehicle type and normal connections. Speed limits, traffic volumes and flow characteristics tend to be higher on higher level roadways such as expressways. Conversely, access to abutting property, parking, and pedestrian and cyclist activity is generally limited on higher levels roads. Arterial roadways typically provide relatively high traffic service levels with some property access.

Road classification assists with the establishment of right-of-way widths, cross-sections, pavement structures, drainage systems, and sidewalks. The co-ordination of traffic control guidelines, pavement markings and speed limits is also aided by road classification.

With respect to road classification, the City of Brandon and MIT have differing mandates. The City of Brandon has a transportation focus of providing freight movements as well as local and commuter traffic with a safe, affordable and efficient road network within the City. Concurrently, MIT has a transportation focus towards accommodating the movement of freight into, around and through the City, and study area, in a safe, efficient and affordable manner. The result of these differing perspectives is alternate definitions of functional classification, truck routes and dangerous goods routes for each jurisdiction.

2.3.2 City of Brandon Road Classification

The City has a designated system of collector and arterial roads, as identified on maps found in the City's Traffic By-Law No. 5463/16/87 and on the City's website. The classification of existing roads, including MIT facilities, is shown in Figure 2.5. There are over 320 kilometres of roads within the Brandon city limits, including approximately 67 kilometres of arterials, 55 kilometres of collectors, and 200 kilometres of local streets.

The Brandon and Area Planning District Development Plan By-law No. 78/01/04 (April 2006) classifies roads into the following categories:

a) **Expressways** intended to handle high speed traffic around the City for the efficient movement of people and goods;

b) **Arterial stree**ts intended to accommodate large volumes of traffic with a high level of safety and efficiency;

c) **Collector streets** intended to accommodate moderate volumes of traffic □raveling at moderate speeds;

d) **Local streets** intended to provide for vehicular access to individual building lots and which accommodate low volumes of traffic traveling at low speeds; and

e) **Public lanes** intended to provide for vehicular access to individual properties at locations where it is inappropriate to provide access from a street.

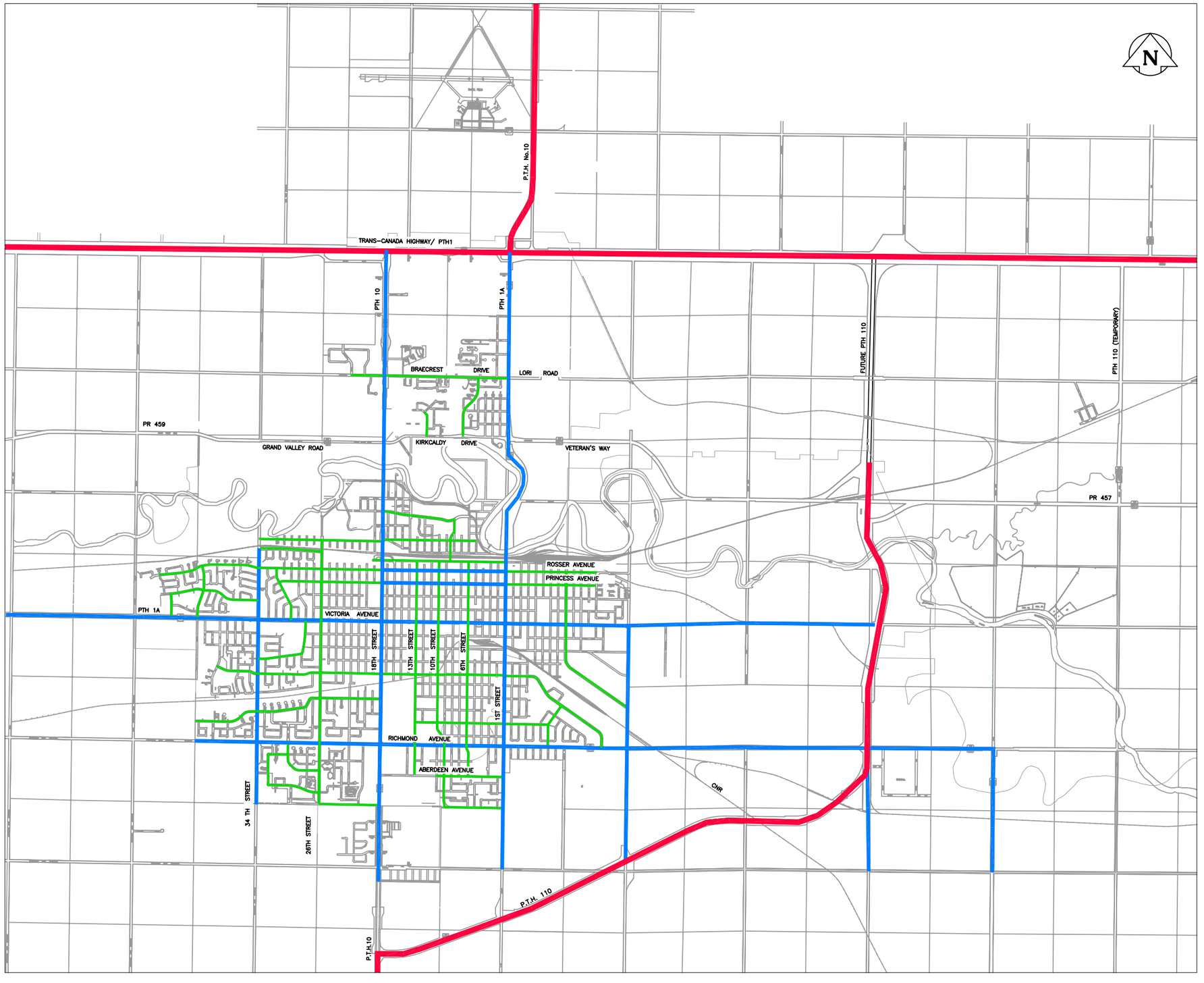
Brandon has a number of key routes classified as arterial within city limits. Examples of these routes are 1st Street, 18th Street, PTH 1A, PTH 110, Victoria Avenue and Richmond Avenue. These routes have been treated as major thoroughfares for commuter, local and truck traffic within the city. Arterials intersect with other arterials and collectors, and collectors intersect with local streets and lanes. Recommended solutions for the various functional classifications should be reflective of the volume and type of traffic using the route.

Preferably, the traffic flow on arterials is typically uninterrupted except at intersections and crosswalks. Direct access should not be permitted on these facilities, except on minor arterials or by site-specific study and design for major developments (e.g., shopping centres).

Road classification dictates design standards for areas such as alternative transportation, sidewalks, parking and right-of-way requirements.

Transit routes are concentrated on the arterial-collector system. Scheduled bus routes avoid local streets. Special design (e.g., lane widening) or separate facilities are required to accommodate bicycle paths on arterials, but bicycles can operate unrestricted on collectors and local streets.

The selection of right-of-way widths must be done with careful consideration of the required lane assignments and clearances for the various municipal utilities. Deviation from the standards will occasionally be required to accommodate major utility corridors, future traffic demands, bicycle paths, etc.



LEGEND

- Expressway / Core Route
- Arterial / Feeder Route
- Collector

Source: City of Brandon

PROJECT TITLE

Brandon Area Road Network Development Plan

FIGURE 2.5:
CITY OF BRANDON ROAD CLASSIFICATION SYSTEM

2.3.3 Provincial Roadways

2.3.3.1 Provincial Classification System

The MIT publication entitled the Transportation Planning Manual from February 1998 includes a highways functional classification policy as well as a design and cross-section standards policy. The Provincial classification includes expressways, primary and secondary arterials and three types of collectors. Factors in differentiating between the roadway classes includes their function servicing through traffic, extent the highway provides access to adjacent lands, the population of areas to be connected, as well as the extent of recreational traffic. This classification system was in use up until 2006.

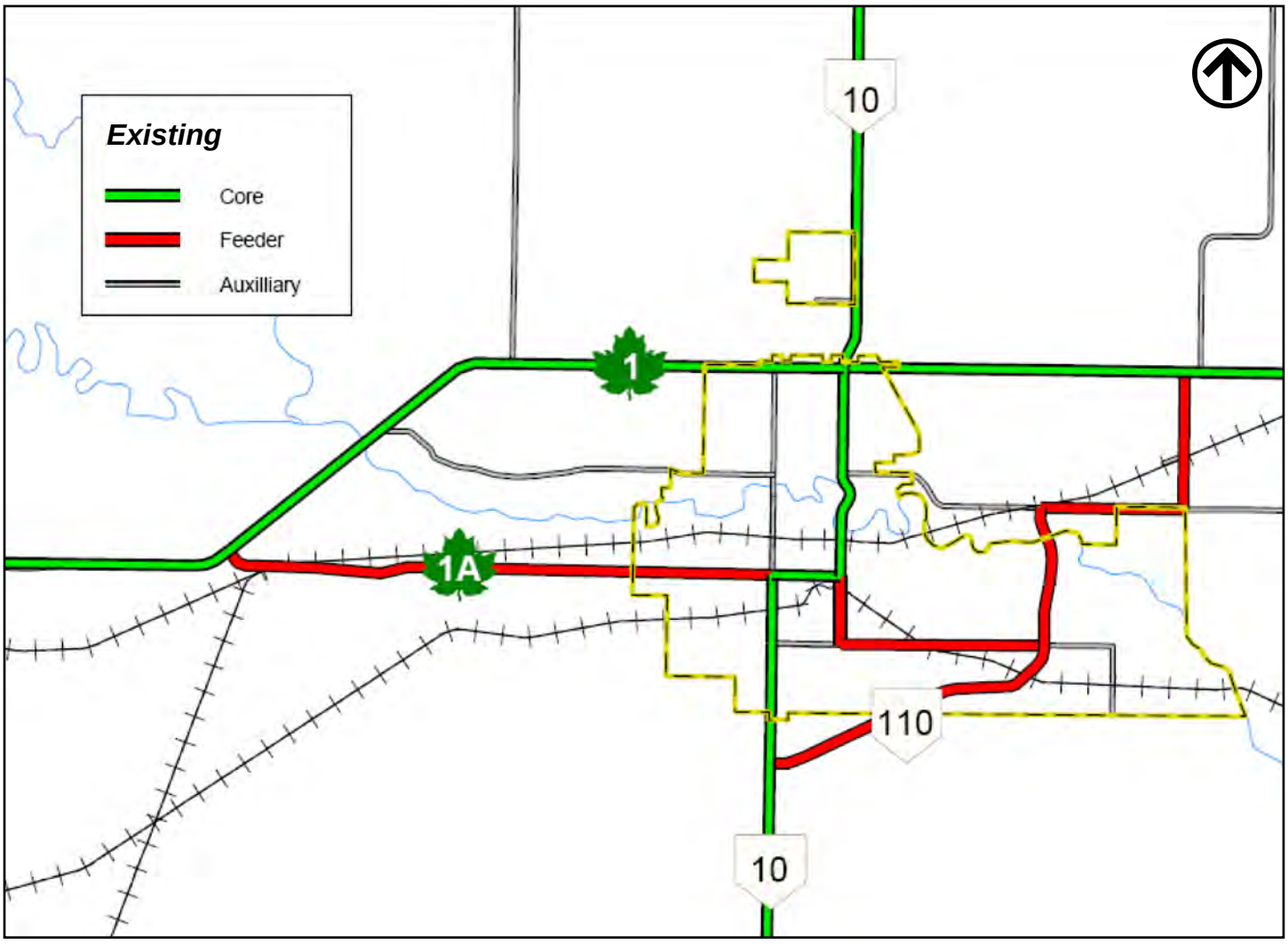
The Province is currently conducting a review of the Provincial highway network that will result in a new classification system. The new Strategic Highway System will comprise the key economic highways throughout the Province and will be identified as Core, Feeder, and Recreation/Tourist Routes). In addition, all other Provincial routes will be include in a secondary system that will be referred to as the Auxiliary Highway System.

Further, there are two classifications of highways in Manitoba with respect to determination of authority and control. The majority of highways in the province are “Declared Highways”, for which the Minister of Infrastructure and Transportation is the traffic authority and MIT is responsible for all costs of construction and maintenance, exclusive of municipal services. “Designated Highways” are generally connecting links between communities, for which the local government is the traffic authority. The Province remains responsible for the costs of construction and maintenance, exclusive of municipal services.

Figure 2.6 shows the existing Provincial Highway Classification System for the Brandon area as it is currently being presented in preliminary discussions (note that this is a proposal and is potentially subject to change). It is included to illustrate the nature of the classification system that is being examined.

Major MIT routes within the study area include PTH 1, PTH 10, PTH 110 (Brandon Eastern Access) and Richmond Avenue. Under the new Strategic Highway System PTH 1 and PTH 1A/PTH 10 are classified as core routes for primary access into and through the City. PTH 1A (to Kemnay), PTH 110 (Brandon Eastern Access) and Richmond Avenue are classified as feeder routes for truck traffic and commuter access to the industrial area in southeast Brandon. These routes have been treated as major thoroughfares for truck traffic through and around the city. As such, the recommended solutions for these roadways reflect the

priorities of the MIT network with respect to functional classification, truck routes and dangerous goods transportation.



Source: Manitoba Infrastructure and Transportation (October 2007)

FIGURE 2.6:
Provincial Highway Classification System

2.3.3.2 Strategic Routes

Criteria for Strategic Core Routes (approximately 4,740 km of highway) includes routes that connect to:

- All National Highway System (NHS) routes,
- Urban centres with a population greater than 10,000,
- Other major population areas with an urban core of at least 5,000 and a minimum catchments area population of 30,000, or
- International border crossings with $250M in trade annually (four crossings qualify, including the PTH 10 Boissevain crossing).

Criteria for Strategic Feeder Routes (approximately 1,440 km of highway) includes routes connecting to a Core Route, and:

- Providing connections to populations greater than 1,000, and either having at least 100 trucks per day, or supporting $150M per year in regional economic development or five percent of Manitoba's GDP;
- Providing connections to major industrial parks and intermodal facilities, and having at least 100 trucks per day; and
- Cross-border spacing between 50 and 80 km, and connects to existing NHS routes in the USA or trade routes with $5M per year, or connects to Class 1 and 2 highways in Saskatchewan that form part of trade routes.

The Eastern Access is currently considered a Feeder Route, however, given that it is expected to play a more important role when the final leg of the Access is completed (the permanent connection to PTH 1) and it carries more of the truck traffic between PTH 1 and routes to the north, and PTH 10 south of Brandon, it should be considered for upgrade to Core Route status.

Criteria for Strategic Routes identified as Recreation and Tourist routes (approximately 410 km of highway) includes:

- Rural routes connecting Primary or Feeder Routes to major recreation routes that have an average route summer daily volume of 1,000 vehicles per day and a seasonal peak increase in traffic of at least 20 percent.

Proposed operating characteristics for the Strategic Highway System are summarized in Table 2.4. In addition to characteristics noted in the table, criteria for Level of Maintenance, Reliability, and Surface Condition/Ride-ability/Rutting are to be determined.

The total proposed routes identified, as part of the Strategic Highway System, is 6,590 km, of which 6,180 km is to meet the RTAC load standard.

Table 2.4: Operating Characteristics

Operating Characteristics	Core Routes	Feeder Routes	Recreation & Tourist Routes
Proposed Legal Classification	PTH	PTH	PTH
Traffic Flow	Uninterrupted	Interrupted	Interrupted
Running Speed	90 – 110 km/hr	70 – 100 km/hr	70 – 90 km/hr
Level of Service	B	B	C (SADT[1])
Land Service	Full/Limited Access Highway	Limited Access Highway	Limited Access Highway
Loading	RTAC Non-Restricted	RTAC Non-Restricted	Non-RTAC
Bridge Loading	> HSS 25 Design Truck / HS 30 Lane Loading / LRFD HL – 93 Loadings		
Surface Type	Paved	Paved	Paved (Traffic Volume Based)
Vertical Clearance	Subject to Applicable Engineering Standards		

[1]SADT – Summer Average Daily Traffic

2.3.3.3 Auxiliary Highways

The balance of the Provincial highway system (11,580 km) is considered under the Auxiliary Highway guidelines. The Auxiliary system includes High Volume (an AADT of at least 2,000 vpd, 390 km of highway qualify), Medium Volume (an AADT of 400 – 2,000 vpd, 3,350 km of highway qualify), and Low Volume (less than 400 vpd, 7,560 km qualify) routes. The High and Medium Volume routes would generally be paved, with Low Volume routes having a gravel surface).

2.3.4 Comparison of Road Classification Standards

A survey of current road standards by classification for other medium sized cities, as well as Winnipeg, was completed. The focus was on arterials, collectors, locals and laneways. The comparison can be found in Appendix F.

2.3.5 Existing Brandon Classification System

Compared to the other jurisdictions examined, Brandon has fewer standards related to roadway classification, although many of the other communities examined were larger in size. Where comparisons are possible, Brandon's standards fall within the range of the other cities examined. General standards from the Transportation Association of Canada (TAC) and the Institute of Transportation Engineers (ITE) are also included in the comparison, as well as from the Smart Code Manual (although these are based on different method of classifying roadways and therefore are not directly comparable).

Table 2.5 summarizes the desirable attributes of the various roads classifications. Road classes are generally distinguished by the combination of attributes, with no rigid distinction between the different classes. Information for expressways is not included, as Brandon does not utilize this classification for City roadways.

Table 2.5: Road Classification System

Road Classification	Traffic Function	Traffic Volumes (vpd)	Design Speed (km/h)	Basic No. of Lanes	Access Control	Intersection Spacing	Right-of-Way
Arterial	Through traffic, restricted land access	5,000 – 30,000	60 - 100	2 or 4	Restricted access	400 m	20 - 40 m
Collector	Through traffic & land access	< 10,000	50 - 70	2 or 4	Access with some restrictions	60 m	20 - 32 m
Local	Land access	< 1500	50 - 60	2	Access with few restrictions	60 m	16 - 20 m

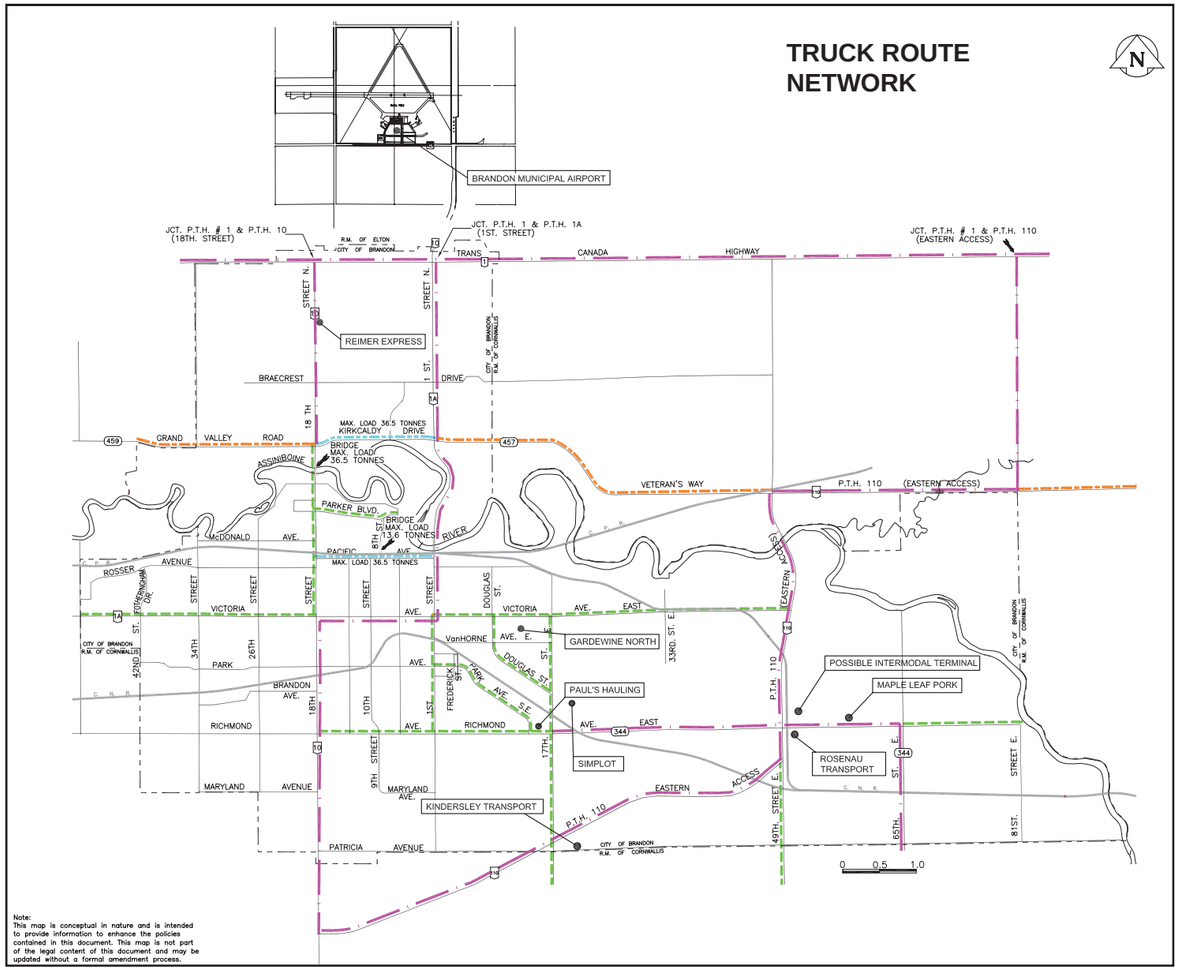
2.4 Design and Geometric Standards

Design and geometric standards for the City of Brandon are in accordance with the latest revision of the Geometric Design Guide for Canadian Roads by the Transportation Association of Canada. Proposed design standards used in the design of Brandon streets are listed in Table G.1 in Appendix G.

2.5 Existing Truck and Dangerous Goods Route System

The City of Brandon has a designated truck route network, and some of these roads have been further designated for dangerous goods. The purpose of the truck route network is to minimize widespread deterioration of the local road system as a result of heavy truck traffic and to minimize traffic hazards and nuisance factors of noise and dust in residential areas. The dangerous goods routes concentrate this traffic to areas less vulnerable to exposure to dangerous goods. The current truck and dangerous goods route network is illustrated in Figure 2.7.

TRUCK ROUTE NETWORK



Note:
This map is conceptual in nature and is intended to provide information to enhance the policies contained in this document. This map is not part of the legal content of this document and may be updated without a formal amendment process.

Source: City of Brandon

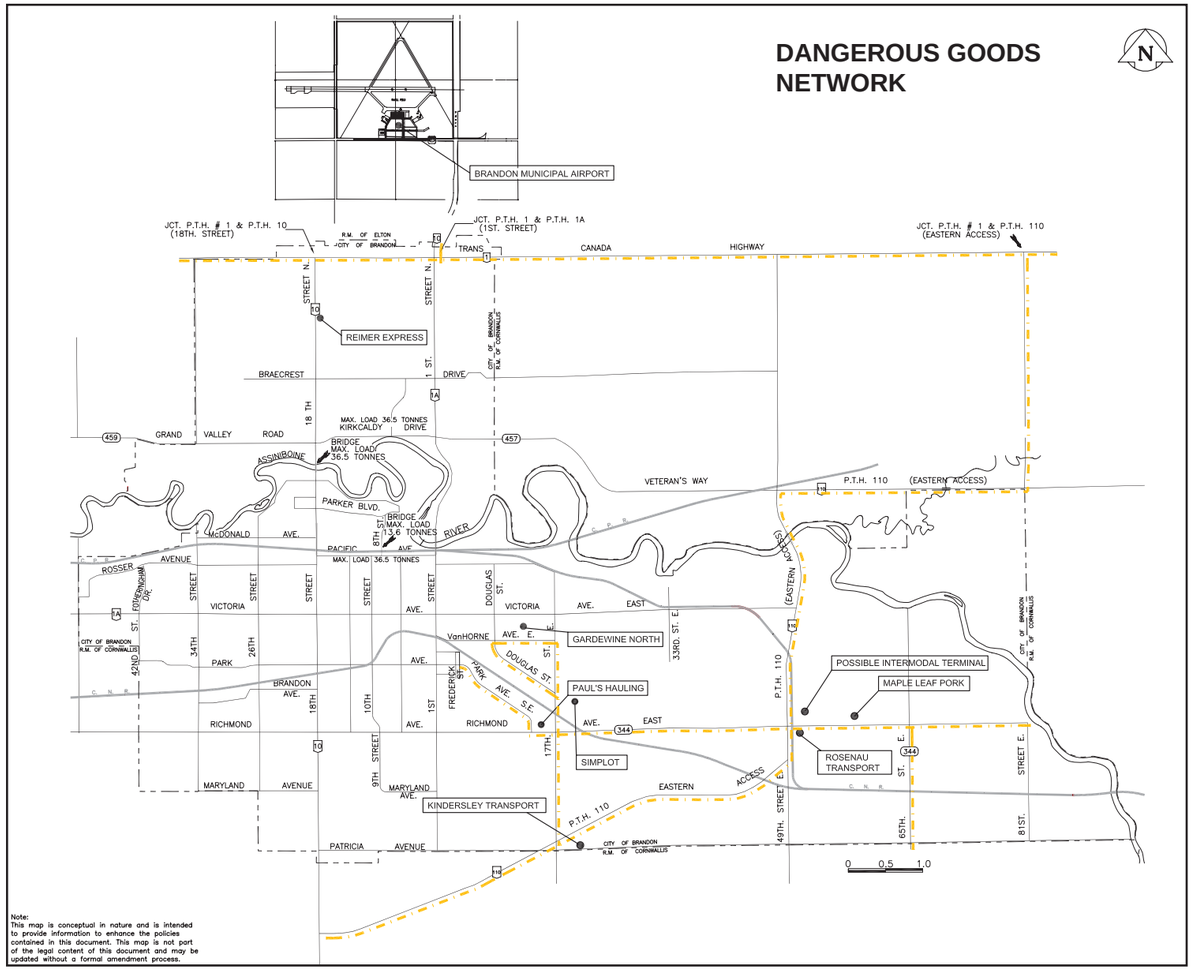
LEGEND

- CITY AND HIGHWAY TRUCK ROUTES – CLASS A1 — GVW 56,500kg
- HIGHWAY TRUCK ROUTES – CLASS B1 — GVW 47,630kg
- CITY RESTRICTED TRUCK ROUTES – CLASS A — GVW 36,500kg
- RTAC PROVINCIAL TRUCK ROUTES — GVW 62,500kg
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCKING CENTRE

DANGEROUS GOODS NETWORK



Note:
This map is conceptual in nature and is intended to provide information to enhance the policies contained in this document. This map is not part of the legal content of this document and may be updated without a formal amendment process.

Source: City of Brandon

LEGEND

- DANGEROUS GOODS ROUTES
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCKING CENTRE

FIGURE 2.7:
CITY OF BRANDON TRUCK AND DANGEROUS GOODS ROUTE NETWORK

2.5.1 Truck Operator Telephone Survey

A survey of truck operators in the Brandon area was undertaken as part of this study. Companies contacted included Paul's Hauling, Maple Leaf Pork, Koch Nitrogen (formerly Simplot Chemicals), Gardewine North, Kindersley Transport, Reimer Express, and Rosenau Transport. Information obtained through the telephone survey includes:

- Paul's Hauling: Estimate of 50 trips in / 50 trips out per day via Eastern Access. Trucks use the Eastern Access due to company policy.
- Maple Leaf Pork: Estimate of 50 trips in / 50 trips out per day live hog trucks, plus 40 reefer (refrigerated) trucks in / 40 trucks out via Eastern Access.
- Koch Nitrogen (formerly Simplot Chemicals): Estimate of 70 trips in / 70 trips out per day via Eastern Access, although trips vary seasonally with a maximum of 200 in/200 out per day. Annually, there are approximately 24,000 trucks in 340 days of operation.
- Gardewine North: Estimate of 15 trips in / 15 trips out per day to/from Winnipeg via Victoria Avenue to the Eastern Access, plus 60 delivery trips per day within Brandon itself via the arterial road system.
- Kindersley Transport: Estimate of three trips in / three trips out via 17th Street/Victoria (PTH 1A); trucks do not use the Eastern Access.
- Reimer Express: Estimate of 12 trips in / 12 trips out via 18th Street (PTH 10).
- Rosenau Transport: Estimate of 10 trips in / 10 trips out via the Eastern Access, with a range of three to 15 depending on the time of year. Rosenau would like to see the construction of a western access.

The majority of the truck traffic seems to be using the Eastern Access, based on the responses. One company stated that more traffic uses 1st Street and 18th Street to access the Trans-Canada Highway than the companies may admit to.

2.5.2 Origin Destination Patterns for Trucks

Information was also requested on general origin-destination patterns to/from Brandon. The summary is graphically illustrated in Figure 2.8. The major origin-destination is to/from the east (44 percent), with approximately the same demand to/from the west and south (25 and 24 percent respectively), the remaining seven percent to/from north of Brandon.

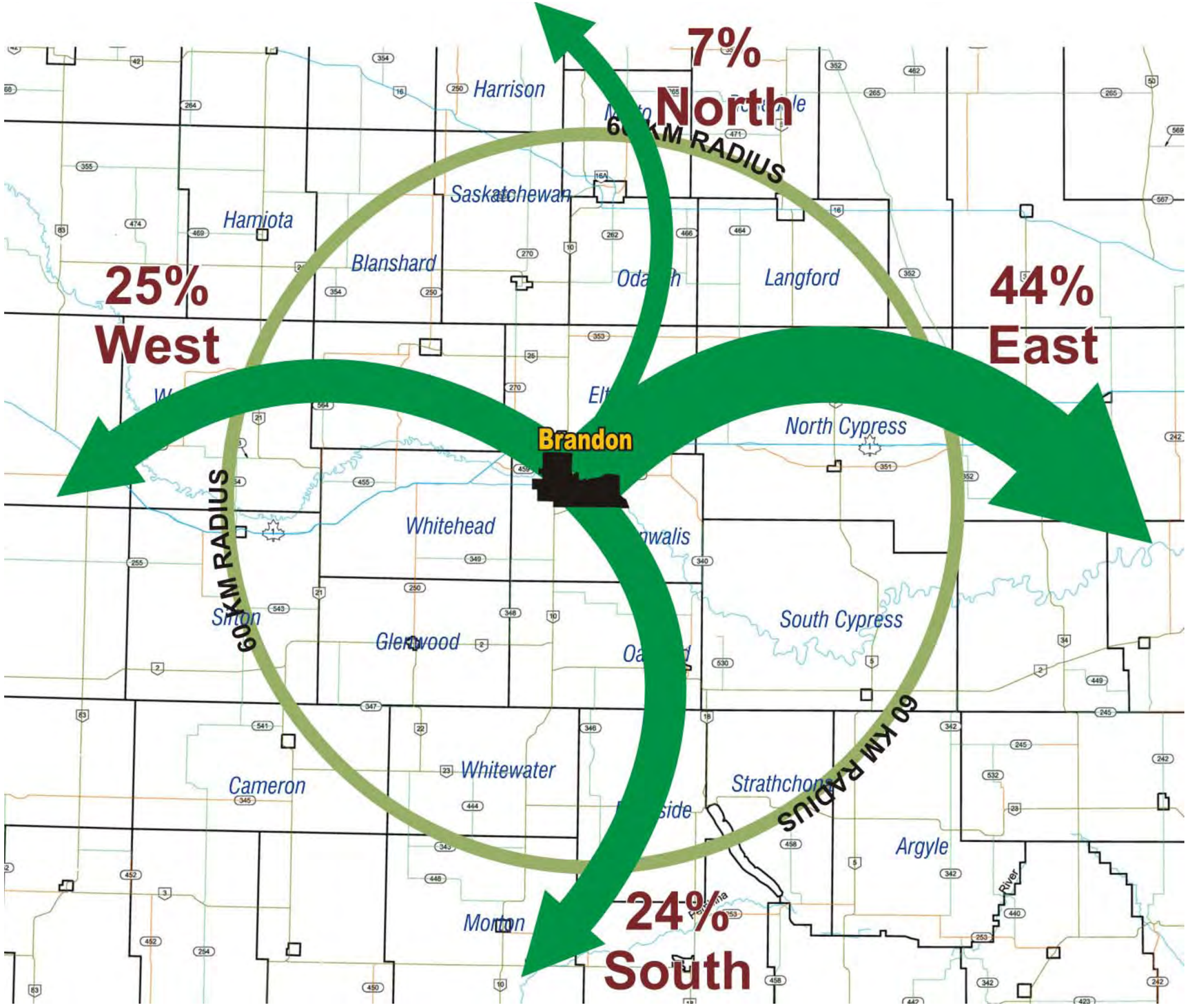


FIGURE 2.8:
TRUCK SURVEY ORIGIN-DESTINATION DATA

2.6 Parking Standards

2.6.1 Parking Issues

Parking issues were not identified during the consultation process with City and MIT personnel. City representatives on the Steering Committee noted early in the process that downtown parking had been examined previously and was not considered a problem.

2.6.2 Existing On-site Parking Standards

Parking standards in the City of Brandon are currently controlled by Zoning By-law No. 6642, which identifies minimum parking dimensions for various angles of parking for both regular and accessible parking. It also sets out the minimum required number of spaces for different land uses, including the minimum number of accessible spaces that must be provided.

The City of Brandon Landscape Design Regulations sets out specific design standards to provide for landscape screening as well as internal landscaped islands.

The two documents sets out a relatively thorough framework for the provision of off-street parking, more so than many jurisdictions in terms of identifying the number of accessible parking spaces, and setting out landscape design standards.

The intent of this study was to review the current City standards and identify possible modifications for consideration by the City, especially for non-residential uses. As noted above, the City of Brandon's standards extend beyond what many urban jurisdictions identify.

2.7 Collision Data and Safety Review

Collision data was provided by MIT for Provincial highways within the study area. However, similar collision data was not available for City of Brandon streets and as such, only collision data for PTH routes outside of Brandon was reviewed. On major routes within the City, a safety review was undertaken in order to supplement and compensate for the limited availability of collision data.

2.7.1 Review of Collision Data on Provincial Highways

MIT has provided historical collision data for the following highways that provide access to the City of Brandon: PTH 1, PTH 2, PTH 5, PTH 10, PTH 16, PTH 25, PR 340, PR 457, PR 468 and PR 610 (Richmond Avenue).

Sectional Collision Rates

Table 2.6 shows the yearly collision distribution of reported collisions by road segment for the years of 2001 through 2004. The table also shows the collision rate for individual highway links. Collision rate is calculated by dividing the total number of collisions by the total vehicle □ilometers of travel on a specific section of highway over a specific period of time and is expressed in collisions per million vehicle □ilometers.

MIT considers a collision rate for rural highways that exceeds 1.5 incidents per MVK (million vehicle □ilometers) on a highway segment as warranting further review. Two sections of rural highway, both on PR 457, demonstrate a collision rate of higher than 1.5 collisions per million vehicles □ilometers and thus, these sections warrant further review. Collision data provided does not indicate specific details of collisions along the road sections and thus further detailed review is warranted.

In addition, MIT monitors rural highway sections with collision rates between 1.0 and 1.5 collisions per MVK on an ongoing basis. Rural highway sections that had a collision rate in the 1.0 to 1.5 range included PTH 1 (1st St. to PR 340), PTH 10 (PTH 2 to PTH 110), PTH 10 (PTH 25 to PTH 24), PTH 16 (PTH 10 to PTH 16A), PTH 110/PR 457 (PTH 110 to PR 468).

Collision rates on urban sections within the City of Brandon can often be considerably higher than those on rural routes. This can be due to local issues that must be reviewed on a site specific basis. As a result, a safety review of the urban sections of these routes has been undertaken and has been appended to this report.

Table 2.6: Yearly Collision Distribution (2001-2004)

Road Link	Segment Length	2001	2002	2003	2004	Total	AADT (2006)	Collision Rate[1]
PTH 1 (PTH 1A to 18th St.)	14.6	1	1	0	1	3	4950	0.03
PTH 1 (18th St. to 1st St.)	1.6	0	6	8	4	18	10160	0.76
PTH 1 (1st St. to PR 340)	17.1	63	55	54	50	222	6700	1.33
PTH 1A (PTH 1W to 34th St.)	11.3	19	9	19	12	59	2620	1.36
PTH 1A (34th St. to 18th St.)	1.9	47	45	49	43	184	14250	4.65
PTH 1A (18th St. to PR 457)	4.5	62	64	94	127	347	14600	3.62
PTH 1A (PR 457 to PTH 1E)	2.2	3	7	13	7	30	9350	1.00
PTH 10 (PTH 2 to PTH 110)	19.8	46	42	28	23	139	3800	1.27
PTH 10 (PTH 110 to N of Maryland Ave.)	1.9	89	21	35	35	180	6200	10.47
PTH 10 (N of Maryland Ave. to Victoria Ave.)	2.5	12	64	70	73	219	17200	3.49
PTH 10 (Victoria Ave. to Assiniboine River)	1.9	38	49	55	70	212	20750	3.68
PTH 10 (Assiniboine River to PTH 1)	3.0	19	23	19	36	97	14100	1.57
PTH 10 (PTH 1 to PTH 25)	14.8	19	23	15	17	74	4300	0.80
PTH 10 (PTH 25 to PTH 24)	11.5	15	9	22	20	66	3900	1.01
PTH 10 (PTH 24 to PTH 16)	15.3	20	21	24	15	80	3600	0.99
PTH 16 (PTH 10 to PTH 16A)	2.0	3	3	3	2	11	2700	1.40
PTH 16 (PTH 16A to PTH 5)	26.1	23	26	33	18	100	3200	0.82
PTH 110 (PTH 10 to PR 457)	10.8	4	5	4	5	18	1780	0.64
PTH 110/PR 457 (PTH 110 to PR 468)	3.2	6	6	2	8	22	3560	1.32
PTH 110/PR 468 (PR 457 to PTH 1)	3.2	0	2	0	1	3	1070	0.60
PR 457 (PTH 1A to PTH 110W)	5.1	6	8	13	8	35	1510	3.11
PR 457 (PTH 110E to PR 340)	8.3	10	13	12	9	44	2230	1.63
1st St. (Richmond Ave. to Victoria Ave.)	1.6	17	24	41	26	108	13000	3.56
Richmond Ave. (18th St. to 1st St.)	1.6	17	27	29	36	109	12000	3.89
Richmond Ave. (1st St. to PTH 110)	4.8	20	12	15	6	53	6000	1.26

[1] Collision rate presented as collisions per million vehicles entering the intersection

Intersection Collision Rates

Table 2.7 shows the number of reported collisions within the study area during the years of 2001 through 2004 at each major intersection on the Provincial highway network. The collision rates for intersections are expressed as collisions per million vehicles entering the intersection. Intersections with a total of less than five collisions (higher than one collision per year) over the four-year data period are not included.

MIT considers an intersection with a collision rate of greater than 1.5 collisions per MVE to be in need of further review. None of the intersections had a collision rate exceeding 1.50 incidents per MVE and, thus, none of these intersections warrant further review. It should

be noted that a Safety Review of urban intersections was undertaken under separate cover and is appended to this document.

Table 2.7: Collision Statistics by Intersection (2001-2004)

Intersection	Collisions	Million Vehicles Entering Per Year (Average)	Collision Rate[1]
PTH 1 / PTH 10 (18th Street)	15	7,654,050	0.49
PTH 1 / PTH 1A (1st Street) / PTH 10	14	8,537,350	0.41
Victoria Ave. (PTH 1A) / 1st Street	40	11,301,130	0.88
1st St. (PTH 1A) / Princess Avenue	12	12,501,250	0.24
1st St. (PTH 1A) / Rosser Avenue	11	13,096,200	0.21
1st St. (PTH 1A) / Kirkaldy Drive (PR 457)	12	11,537,650	0.26
18th St. (PTH 10) / Aberdeen Avenue	16	9,303,850	0.43
18th St. (PTH 10) / Richmond Ave. (PR 610)	74	13,843,355	1.34
18th St. (PTH 10) / Queens Avenue	31	8,245,350	0.94
18th St. (PTH 10) / Brandon Avenue	23	14,742,350	0.39
18th St. (PTH 10) / PTH 1A (Victoria Ave.)	91	15,432,200	1.47
18th St. (PTH 10) / Kirkaldy Drive (PR 459)	22	13,096,200	0.42
PTH 10 / PTH 16	5	3,569,700	0.35
PTH 110 / PR 457W	7	1,737,035	1.01
Richmond Ave. (PR 610) / 13th Street	7	15,910,350	0.11
Richmond Ave. (PR 610) / 9th Street	23	12,501,250	0.46
Richmond Ave. (PR 610) / 1st St.	18	6,373,630	0.71

[1] Collision rate presented as collisions per million vehicles entering the intersection

Table 2.8 shows the number of reported collisions at intersections on the Provincial highway network where there was incomplete traffic data to determine a collision rate for the intersection. These collision statistics are provided for information purposes. Again, it is noted that a Safety Review of urban intersections was undertaken under separate cover. A number of the intersections in table 2.8 are addressed in the Safety Review document.

Table 2.8: Collision Statistics by Intersection (2001-2004)

Intersection	Collisions	Million Vehicles Entering Per Year	Collision Rate
Victoria Ave. (PTH 1A) / 6th Street	21	---[1]	---[2]
Victoria Ave. (PTH 1A) / 8th Street	12	---	---
Victoria Ave. (PTH 1A) / 9th Street	10	---	---
Victoria Ave. (PTH 1A) / 13th Street	17	---	---
Victoria Ave. (PTH 1A) / 26th Street	32	---	---
18th Street (PTH 10) / Parker Boulevard	9	---	---
1st Street (PR 610) / McTavish Avenue	20	---	---

[1, 2] Collision rate could not be calculated due to lack of traffic volume data

2.7.2 Safety Review

A high-level overview of safety issues was also undertaken within the study area as part of the inputs for the ongoing road monitoring program by the City of Brandon. The identification of critical areas of concern and potential remedial measures was also undertaken. A key element of the overview was a review of intersection collision data where available, and a review of selected highway links within the 60-kilometre radius of the study.

Discussions were held with several stakeholders in the Brandon area to get their views and comments on potential safety issues on the road system, including:

- City of Brandon Engineering Staff;
- City of Brandon Transit Staff;
- City of Brandon Police Department;
- Manitoba Infrastructure and Transportation Staff;
- Royal Canadian Mounted Police (RCMP);
- Paul's Hauling; and
- Gardewine North.

The road safety audit involved an assessment of multiple transportation facilities, or roadways, to determine the potential for the geometry and operational features of each

facility to contribute to collisions. The audit was an independent and formal process carried out by road safety engineers who provided opinions, based on experience and expertise, on the safety issues from the perspective of the road user.

The analysis of collision data involved a review of the collision history of multiple facilities to establish collision rates on each facility and to identify possible relationships between those collisions and geometric features or operational conditions of the facility.

The road safety audit was conducted in accordance with traditional safety audit procedures carried out internationally as well as the Transportation Association of Canada's (TAC) "Guide to In-Service Road Safety Reviews". The safety audit focused on the identification of existing and potential road safety concerns on various roads and highways, at major intersections, and at major railroad crossings within the study area.

The audit was field based with day and night time audits conducted during the period May 30 to June 1, 2005. In total, 14 road/highway stretches were included in the road safety audit.

The road safety audit identified a number of geometric and operational safety issues on several roads and highways that have the potential to contribute to collisions. These issues should be addressed through the road improvement / upgrade program to reduce the potential for collisions. Items identified included:

- Short weaving sections;
- Lack of left and right-turn lanes;
- Additional signage and lighting requirements;
- Barrier locations; and
- Sidewalk location/availability.

A collision analysis was carried out at various intersections on the existing road system within the City of Brandon based on collision data provided by MIT. This data included a summary of the number, type, and related statistics of reported collisions. The collision data was examined to determine the frequency, severity and collision rates at 17 intersections from 1996 to 2002. Findings included:

- Frequency refers to the number of collisions per year. Only one of the intersections studied had a collision rate above the MIT threshold of 1.5 collisions per million

vehicles entering (MVE) the intersection (the rate at which an intersection would warrant further examination). The top five locations examined were:

- 18th Street at Victoria Avenue (1.67 collisions per MVE);
- 18th Street at Richmond Avenue (1.35 collisions per MVE);
- 34th Street at Victoria Avenue (1.17 collisions per MVE);
- 18th Street at Park Avenue (1.13 collisions per MVE); and
- 1st Street at Victoria Avenue (1.09 collisions per MVE).

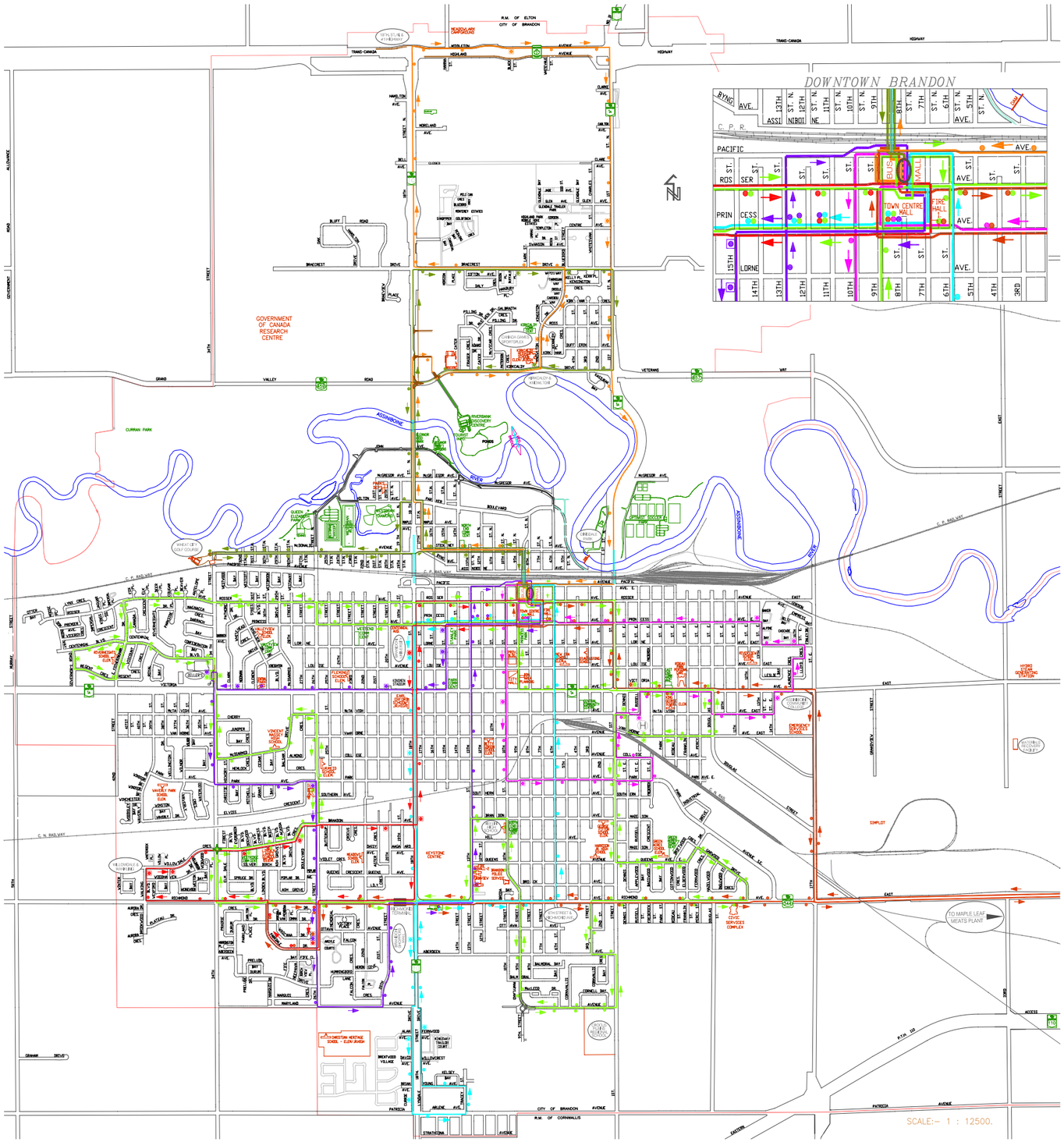
- Severity identifies the type of outcome, such as a fatality, personal injury, or property damage. Comments include:
  - There were no fatalities recorded in the last seven years of data at the intersections examined;
  - 27 percent of collisions involved a personal injury; and
  - 73 percent of collisions involved property damage.
- Time and type of collisions was examined. Comments included:
  - Most collisions occurred on a weekday during the day; and
  - Rear end collisions were the most common (40 percent), followed by left turn with through traffic (20 percent), right angle collisions (20 percent), other (15 percent), side swipes (four percent) and pedestrians (less than two percent).
- Driver error was the primary cause of collisions, with items such as:
  - Driver inattention or distraction;
  - Disobeying traffic control devices;
  - Failing to yield right of way;
  - Following too close; and
  - Driving too fast for travel conditions.

2.8 Brandon Transit

Brandon Transit currently operates 10 transit routes in the City of Brandon, which are illustrated in Figure 2.9. Brandon Transit provides access to major destination points in Brandon, including downtown Brandon, the Keystone Centre, Brandon Shoppers Mall, Brandon Regional Health Centre, Brandon University, Assiniboine Community College, Wheat City Golf Course, Canada Games Sportsplex, Optimist Soccer Park, the Corral Centre and the Maple Leaf Plant.

Historical transit ridership information was obtained from Brandon Transit. Annual ridership for 1994 through 2006 is illustrated in Figure 2.10. Annual transit ridership in Brandon has averaged approximately 780,000 rides per year over the past 13 years. Ridership decreased by almost 12 percent between 2001 and 2003 but increased by an average of over 10 percent between 2004 and 2006.

Monthly ridership for 2003 to 2006 is illustrated in Figure 2.11. Transit ridership in Brandon tends to peak during the winter months due to the weather and community levels of activity, and is lowest during the summer months, typically a reflection of summer vacations and schools being closed.



LEGEND

- Ⓗ - BDN. REGINAL HEALTH CENTRE
- RICHMOND WEST NO. 1:
- KIRKCALDY NO. 3:
- VICTORIA EAST NO. 6:
- REC. CENTRE NO.7:
- 18TH. SOUTH NO. 9:
- CENTRAL BELT NO.10:
- INDUSTRIAL NO. 11-12:
- CITY CIRCULAR: ROUTE 20 & 21-

Manitoba

CITY OF BRANDON MANITOBA

MMM GROUP

Source: City of Brandon

PROJECT TITLE

Brandon Area Road Network Development Plan

FIGURE 2.9:
BRANDON TRANSIT ROUTES

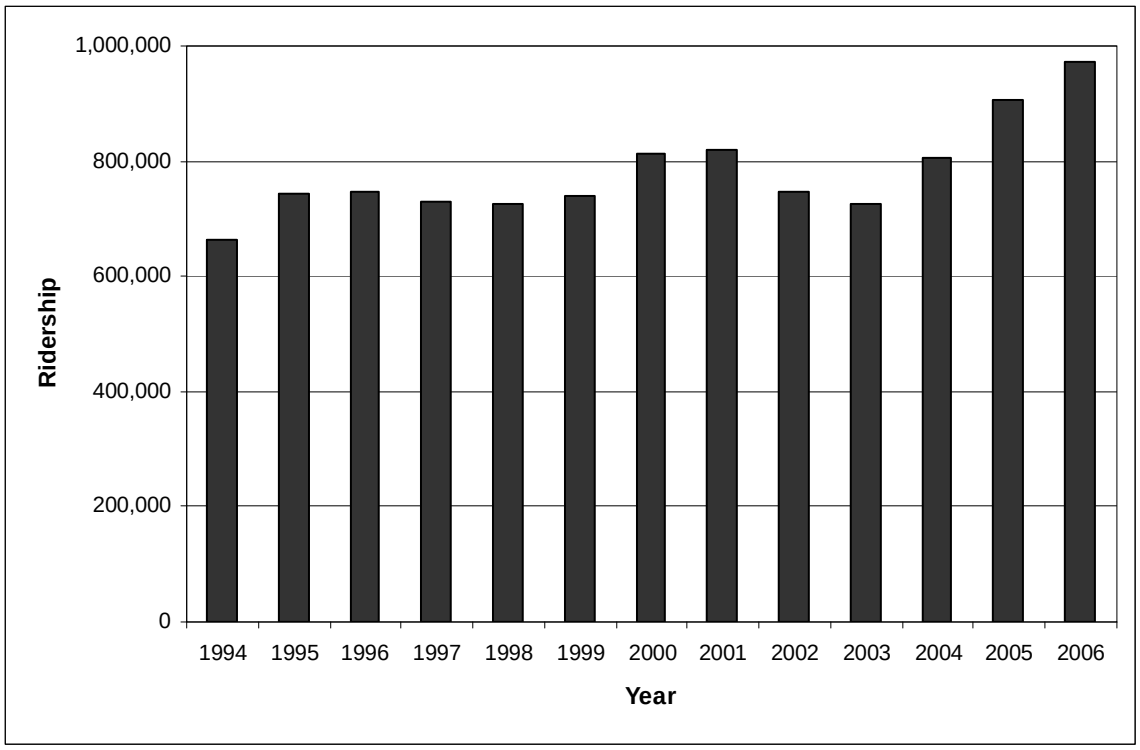


Figure 2.10: Annual Brandon Transit Ridership

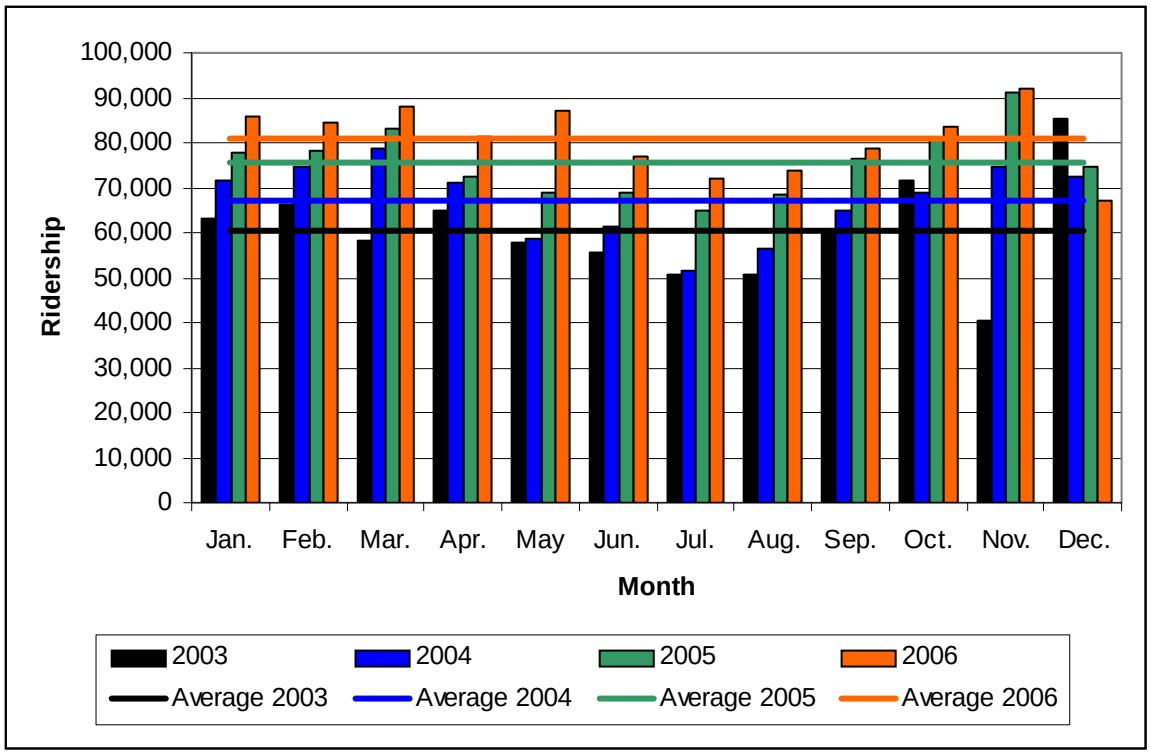


Figure 2.11: Monthly Brandon Transit Ridership

2.9 Brandon and Area Planning District Development Plan

The Brandon and Area Planning District Development Plan (By-law #78/01/04) was revised in 2005. The Brandon and Area Planning District is a partnership between the City of Brandon, the Rural Municipality of Cornwallis and the Rural Municipality of Elton. The Development Plan is a long-range plan to guide development in the District. The Plan sets out objectives and policies that direct development locations and standards.

Section 13.0 of the Plan is focused on Transportation System Policies and includes policies for pedestrian and bicycle systems, public transit, urban roadways, development of roadways, setback requirements, access limitations, parking, loading and services areas, highway protection, designated truck routes, setback from railways, and airport protection in the City of Brandon and the Rural Municipalities of Cornwallis and Elton. Specific objectives of Section 13.0 are [2]:

a) To encourage and promote energy efficiency in all modes of transportation, and to encourage the use of public transit, pedestrian and bicycle systems;

b) To ensure the efficient and logical hierarchy of streets throughout the District, which appropriately serves the adjacent land, uses;

c) To ensure that developments adjacent to provincial highways and urban arterial streets do not adversely affect the safe and efficient movement of traffic; and

d) To provide for a system of truck routes and dangerous goods routes at appropriate locations within the Planning District.

The plan recommends an urban transportation system for the District, including future proposed arterials and collectors, and identifies existing and future paths and trails (as recommended in the Greenspace Master Plan completed in 2002). A copy of the recommended enhancements can be found in Appendix H.

Anticipated development for Brandon during the study horizon is based upon a study of the Brandon and Area Planning District Development Plan as well as discussions with Economic Development Brandon, Provincial and City staff.

Residential development is anticipated to occur in four major areas within the City of Brandon for the 20-year study horizon. These areas located in the north, south, southwest

2 Brandon and Area Planning District Development Plan By-law #78/01/04, August 2005.

and western sections of the City. The northern residential development, as known as the North Hill/Black Property Site, is located in north central Brandon between 1st Street and 18th Street, north of Braecrest Drive and south of the TransCanada Highway. The site is approximately 400 acres in size with about 250 acres designated for residential development. A significant portion of the residential development is anticipated to occur over the next 20 years and is assumed to include 1,200 residential dwelling units. The North Hill/Black Property constitutes the largest single area of residential development since the remaining residential sites within the City are assumed to include approximately 800 dwelling units combined. Therefore, a total of approximately 2,000 residential dwelling units, of varying types, are assumed to come online during the study horizon.

Commercial and industrial growth is anticipated to occur primarily in the northern and southeast sections of Brandon. Commercial development in the order of approximately 150 acres is expected in the North Hill/Black Property development. Commercial development of the North Hill/Black Property is assumed to be a variety of commercial and retail generating approximately 22,300 total daily vehicle trips to and from the site. As well, the former Brandon Mental Health Centre Site is anticipated to be the relocation of the Assiniboine Community College. This relocation, occurring over the next 20 years, was assumed to increase trips to the College by 20 percent to reflect growth of the institution. The forecast transportation planning model also included additional industrial development in southeast Brandon. Two parcels were identified, with total development area of 690 acres.

Brandon officials also anticipate that the inner city area will experience an increase in households, with higher densities occurring. This has also been assumed in the modelling process.

2.10 Origin-Destination Surveys

Origin-destination surveys were conducted to create an origin-destination matrix that can be used in the development of a transportation model. Both a telephone survey and a vehicle intercept survey were conducted as part of the study.

Throughout the telephone and traffic intercept survey, the term “trip” was used to signify a portion of an overall journey that the person may have been making. For example, if the person interviewed traveled from their work to the store and from the store to home, the first trip was taken from their work to the store and the second trip was taken from the store to

their home. Through this method, each stop along the person's overall journey is included in the results. In the case of telephone surveys, a trip was also defined as more than one block from the person's original location.

2.10.1 Telephone Survey

A telephone survey of over 300 Brandon residents was completed in May and June of 2005. The survey included questions on trips taken between 3:30 and 6:00 p.m. the previous day. A copy of the full telephone survey is included under separate cover.

The telephone survey was conducted from a phone list compiled by random selection. Surveyors telephoned numbers from the list and completed interviews from 9:00 a.m. to 9:00 p.m. on Wednesdays, Thursdays and Fridays. The interviewee was a person in the household who was over the age of 16 and had made a trip the previous day between the hours of 3:30 and 6:00 p.m.

The surveyor asked the interviewee about their previous day's trips between the specified hours, as well as general information such as whether they were the driver or passenger, how many people were in the vehicle and the purpose of the trip. If the survey was conducted during the evening (between 6:00 and 9:00 p.m.) the surveyor asked the interviewee about trips made that afternoon. A summary of the telephone survey results is provided below, and the detailed results are included under separate cover.

Although the telephone survey was conducted for residents aged 16 and older, the ages of those surveyed are consistent with 2001 census data obtained for the City of Brandon. In terms of gender, the telephone sampling had a higher percentage of females (57%) than males (43%) due to the time of the surveys and the fact that, as a rule in Manitoba, more females answer the phones than males. The data is accurate within a margin for error of plus or minus five percent, 19 times out of 20.

Using random sampling techniques for the telephone survey, it was anticipated that all 34 zones in Brandon would be appropriately surveyed during the telephone survey (the zone system is discussed in Section 4.2). However, because some zones are industrial, commercial or located on the outskirts of town, there are a number of zones that were not sampled or made up a low percentage of the sampling.

Direct comparisons, with the exception of travel mode, between Statistics Canada information and the results of the telephone survey were not possible due to the differences

between data collection methods and objectives employed during the census and the telephone survey. Information on peak period travel obtained from the phone survey included:

- 69.9 percent of respondents make one to two trips in the peak hour.
- 52.3 percent of travelers are alone in their vehicle during their initial peak hour trip.
- 72.5 percent of initial trips are less than 10 minutes long.
- 89.1 percent of initial trips were made by private vehicle. In comparison, census data for the study area indicates 79 percent of the total employed labour force over the age of 15 utilizes a private vehicle.
- Most reported choosing a travel route because they always used it, followed by it being the shortest route.
- Most trips were for business/work or pleasure/personal business.

2.10.2 Traffic Intercept Survey

A traffic intercept survey was conducted in Brandon over a period of four days (Wednesdays and Thursdays) in July 2005. Vehicles were randomly flagged down between 3:30 and 6:00 p.m., the interview was completed and the driver continued on. Vehicles were stopped and drivers interviewed at five different locations, as indicated below and illustrated in Figure 2.12:

- Northbound vehicles on PTH 10 (18th Street) south of Trans Canada Highway 1,
- Southbound vehicles on Highway 1A (1st Street North) south of Trans Canada Highway 1,
- Westbound vehicles on PR 344 (Richmond Avenue East) west of 17th Avenue East,
- Southbound vehicles on PTH 10 (18th Street) south of PTH 110 By-pass, and
- Westbound vehicles on Highway 1A (Victoria Avenue) west of the Brandon city limits.

A total of 364 surveys were completed over the four-day survey period. On each day, two surveyors and one supervisor were present at two of the five locations. Three locations were surveyed twice and the remaining two locations were surveyed once. The three locations that were surveyed over two days have the three highest daily traffic volumes of

the count locations. A summary of the traffic intercept survey results is provided below, and the detailed results are included under separate cover.

The one-way traffic volumes recorded between 3:30 and 6:00 p.m. at each of the survey locations are listed below in Table 2.9.

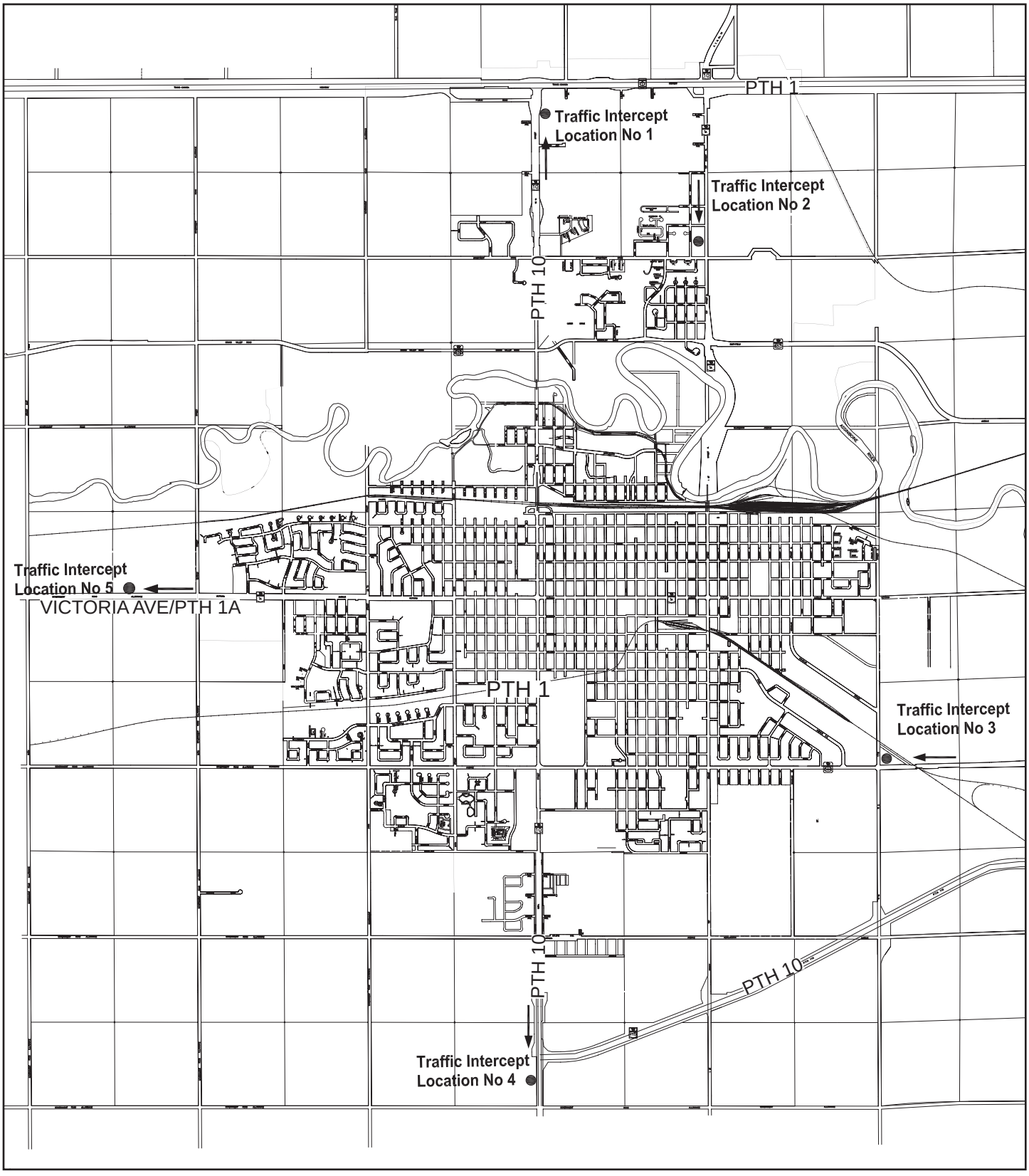


FIGURE 2.12:
TRAFFIC INTERCEPT SURVEY LOCATIONS

Table 2.9: Traffic Volumes Recorded During the Survey Period (3:30 to 6:00 p.m.)

Survey Location	Wednesday, July 6, 2005	Thursday, July 7, 2005	Wednesday, July 13, 2005	Thursday, July 14, 2005
PTH 10 Northbound	--	1,067 vehicles	--	1,050 vehicles
Highway 1A Southbound	--	--	875 vehicles	948 vehicles
PR 344 Westbound	555 vehicles	--	--	--
PTH 10 Southbound	694 vehicles	--	753 vehicles	--
Highway 1A Westbound	--	591 vehicles	--	--

Some of the information on peak period travel obtained from the traffic intercept survey included:

- Most people travel alone in their vehicle.
- Most trips were for business/work or pleasure/personal business.
- The most commonly reported street travelled was 18th Street, followed by 1st Street, Victoria Avenue, and Richmond Avenue (two-thirds of responded noted using at least one of these streets).
- The three most common destinations included the zones in the vicinity of Brandon Shoppers Mall, the Corral Centre, and Superstore.

The results of the traffic intercept survey do not accurately represent the ratio of large trucks that passed each survey location. This is partially due to space limitations at the survey locations. For example, at the PTH 10 northbound survey location, vehicles were directed into an abandoned parking lot in order to complete the survey, however; the turns were tight and trucks had difficulties manoeuvring in and out of the lot. Trucks were sampled at all locations in order to gather some data from the drivers, but the number of trucks sampled should not be used to determine the total number of trucks. This is particularly true at the PR 344 westbound survey locations where there is very heavy truck traffic due to the industrial nature of the adjacent areas.

The survey data accurately reflects the movement of vehicles within Brandon for the hours under research. The survey results represent the driving habits of citizens who travel during the specified times and at the survey locations.

3.0 PUBLIC PARTICIPATION

Public consultation was undertaken in order to allow affected stakeholders the opportunity to provide commentary regarding the direction of the study. Consultation with the public included residents, MLA's, and local municipal and provincial politicians. The process included a project website, two public open houses, two workshops and a public display.

3.1 Project Website

Information about the Brandon Area Road Network Development Plan was available on a project website. The website was hosted by MMM and links to the site were available from the City's website, the MIT website, and the MMM website. Information posted included a summary of the project and material used at the public consultation sessions, along with results.

The City monitored activity on the website (monitoring was unavailable for visitations through the MIT website link for those who directly entered via MMM's website) from March 2006 to the conclusion of the project. Site visits via the City link ranged from nine to 46 "hits" per week, averaging 22. A total of 754 hits were recorded for the 34 weeks the site hits were monitored by the City. Peak visitation occurred after the public displays at Brandon Shoppers Mall and City Hall, suggesting that the public displays were an effective method of providing information to the public.

3.2 Public Open House

An Open House was held in Brandon on June 22, 2005 at the Royal Oak Inn. Approximately 26 people attended, including local staff. The Open House was advertised in the Wheat City Journal and the Brandon Sun. In addition, direct invitations were sent to 75 stakeholders including neighbouring municipalities, MLA's, and residents who had previously indicated their interest in transportation issues.

Participants at the Open House had the opportunity to review information including the study objectives, existing and future transportation networks, and existing and future land use maps. Staff from MIT, the City of Brandon, and the consultant team was available to answer questions. A mapping exercise was conducted that allowed participants to place a dot and comment directly on a map at locations of particular interest to them

(see Appendix B). A comment sheet was provided to obtain feedback from participants on their transportation concerns both inside and outside the City of Brandon. Six comment sheets were completed; four Brandon residents, one RM of Cornwallis resident, and one RM of Wallace resident.

Participants were asked to identify the main existing and future transportation issues within the City of Brandon. The issues identified centered on increased traffic volumes and congestion on arterial routes such as 18th Street, Victoria Avenue and Richmond Avenue. The need for more public transit on 18th Street was also noted.

Participants were also asked to identify specific locations with existing transportation issues within the City of Brandon. Several intersections were identified, including 18th and Richmond, 1st and Richmond, 17th and Richmond Avenue, 18th and Kirkcaldy, and 18th and Braecrest. Lack of traffic control on Richmond East past 1st Street and sequencing of traffic signals along major routes such as Victoria Avenue, Aberdeen Avenue, 18th Street and downtown streets was also mentioned.

Participants were then asked to identify the main existing and future transportation issues in the area within a 60-kilometre radius of the City of Brandon. Safety issues at the intersection of PR 468 and PR 457 were identified, as well as heavy traffic volumes on PTH 1A west of Brandon, to and from Shilo during commute times, and along Victoria and Richmond to and from the Maple Leaf plant. Traffic volumes, access and intersections along PTH 110 and PTH 1 (Trans Canada Highway) were identified as concerns. In addition, the overall quality and condition of the Provincial Highway Network was identified as a concern. The lack of scheduled air service at Brandon Airport was also identified as a concern.

Participants were also asked to identify specific locations with existing transportation issues in the area within a 60-kilometre radius of the City of Brandon. The intersection of PTH 1 (Trans Canada Highway) and PTH 34 at Austin (outside study area) was identified as having safety issues. It was suggested that PTH 10 from Brandon to Riding Mountain Park should be upgraded to a four-lane divided facility.

Additional comments from the participants were solicited regarding other areas of interest or concern. Comments included support for long range planning such as 18th Street and Eastern By-pass upgrades, the desire to have traffic signal sequencing on major routes throughout the City, and the lack of scheduled air service for Brandon.

3.3 Public Workshop

A Public Workshop was held in Brandon on Wednesday, October 26, 2005. The Workshop attracted a total of 35 attendees plus 10 Consultant and Steering Committee team members. Just over a third of the attendees also attended the Public Open House held in June 2005. Several local municipal and provincial politicians participated in the Workshop. Three quarters of attendees were from Brandon, with the balance from six area towns and RM's. All attendees reported that they found the Workshop useful and educational. Approximately 80 percent of participants noted that they attended the Public Workshop due to the direct invitation and eight percent attended due to a media advertisement.

Participants were asked to identify areas of the transportation network within the study area that they felt were "working well" or "not working well" with respect to efficiency, safety, environment, condition of roads, traffic and intersection capacity, and alternative transportation. Areas that a number of the participants felt fell under the category of "working well" included:

- Efficiency: Installation of traffic circles and roundabouts; actuated left-turning signals; intersection of 18th Street and Victoria Avenue and twinning of PTH 1 and completion of Eastern By-pass.
- Safety: Advanced warning signals and signing of City streets.
- Alternative Transportation: Transit system and multi-use pathways.

Areas that a number of the participants felt fell under the category of "not working well" included:

- Efficiency: Lack of signal synchronization.
- Safety: Interference of traffic on Lori Road (Braecrest Drive east of 1st Street) with dangerous goods movement. Pedestrian and traffic conflicts at various intersections such as 34th Street and Victoria Avenue, 34th Street and Rosser Avenue and 1st Street and Victoria Avenue due to geometry.
- Condition of roads: Lack of funding.
- Traffic and intersection capacity: Design, congestion and safety of bridges on 18th Street and access and access management on 18th Street.

- Alternative Transportation: Bus service to Monterey Estates.

The workshop participants were also asked to propose solutions or actions that would achieve the goal of a transportation network within the study area with respect to the above-mentioned categories. A summary of the proposed solutions or actions and their respective impacts can be found in Appendix B. Solutions or actions drawing the most recommendation included:

- Synchronization of traffic signals and use of current technologies impacting efficiency and the environment.
- Construction of Western By-pass in the southwest part of the City of Brandon.
- Completion of PTH 110 (Eastern By-pass) to improve efficiency, safety and traffic and intersection capacity.
- Paving of PR 340 from Shilo to Wawanesa.
- Reconstruct intersection of PTH 1 and PTH 5 to accommodate truck traffic turning for the Midwest Plant at Carberry impacting traffic and intersection capacity.
- Enforce regulations regarding designated trucking routes, livestock trucks are impacting the environment.

3.4 Public Display

A public display was set up at the Brandon Shoppers Mall from Friday, February 3, 2006 through Tuesday, February 7, 2006. The display consisted of two summary boards describing the project as well as two information booklets for people to review. Comment sheets were provided for people to fill out and deposit at the display or send in later. Team staff members were available to provide information and answer questions at the Shoppers Mall display on Friday evening, Saturday morning, Monday evening, and Tuesday morning.

Once the display was removed from the Shoppers Mall, it was set up in the lobby of City Hall for a two-week period from Thursday, February 9, 2006 through Thursday, February 23, 2006.

A total of 17 comment sheets were completed through the public displays. The majority (94 percent) of participants were from within the City of Brandon with one respondent from a neighbouring municipality.

Respondents were asked, "What are the major transportation problems within the City of Brandon?" Access, pedestrian accommodation, safety, public transit and speed were the most frequent responses. As well, participants were afforded the opportunity to include detailed problems within the City and these were noted as the poor condition of the roadways and congestion on the bridges. Further, participants were asked to list any particular locations within Brandon that they felt have transportation issues. The most frequently listed locations were 18th Street North, the 18th Street Bridge and the Corral Centre access entering/exiting 18th Street.

The questionnaire asked participants to name the main transportation problems outside of the City but within the 60-kilometre study area. The main areas of concern were safety, speed and goods movement. Participants were also asked to list any particular locations within the study area outside of Brandon that they felt have transportation issues. The most frequent suggestion was to upgrade PTH 10 to a four-lane divided facility north and south of Brandon.

3.5 Stakeholder Workshop

The second workshop was held in May 2006 and attendance was approximately 25 people. Topic stations facilitated by project team members allowed participants to provide input on four topic areas including: Alternative Transportation Modes, Goods Movements, Traffic and Access Management, and Future Road Networks. Presentation boards including the results of previous consultation sessions, surveys, and research were available for review prior to the workshop. Materials related to the topic areas under discussion at this event were also provided.

The evening started with a presentation including background information on the four topic areas to help educate participants and to assist facilitators in guiding the group discussions. Participants were able to take part in three of the four group discussions. In addition to roundtable discussions, participants also had the opportunity to complete a survey sheet with additional comments. The most frequent proposed actions with respect to each of the four topic areas were:

- Alternative Transportation: Ensure access for disabled persons on transit buses; provide pick-up and drop-off locations for taxis at venues such as the Corral Centre or Clinic and ensure that development accommodates transit and all transportation forms are included in master plan.

- Goods Movement: Relocate all rail outside of City to near the airport, which would also remove rail transport of dangerous goods; ensure more efficient use of rail lines; complete Eastern and Western By-passes and consider outside economics such as the Western By-pass to accommodate potash development at St. Lazare.

- Access and Traffic Management: Improve signal synchronization and install speed humps and the required advisory signage.

- Future Roadway Needs: Complete the Eastern and Western By-pass routes while closing 1st Street, 18th Street, Victoria Avenue and Richmond Avenue to heavy truck traffic.

3.6 Final Open House

A final Open House was held in Brandon on April 3, 2007 in the lobby of City Hall in Brandon. Approximately 25 people attended, including local staff. The Open House was advertised in the Community Edition of the Brandon Sun. In addition, direct invitations were sent to 175 stakeholders including neighbouring municipalities, MLA's, and residents who had previously indicated their interest in transportation issues.

Participants at the Open House had the opportunity to review information including the study objectives, process, and recommendations. Staff from MIT, the City of Brandon, and the consultant team was available to answer questions. A presentation was held to describe the study process, objectives and recommendations as well as afford participants an open forum for discussion.

A mapping exercise was conducted that allowed participants to place a colour coded dot directly on a map showing the infrastructure investments recommended by the study. Participants were asked to prioritize the recommended projects into short, mid and long-term categories. The Open House participants categorized the recommended upgrades provided by the study as follows:

- Short-term priorities:

- Completion of the Eastern By-pass.
- Upgrading of 18th Street North, from PTH 1 to Kirkcaldy Drive, to a four lane divided roadway.
- Intersection reviews at 13th Street and Park Avenue, 1st Street and Richmond Avenue and 17th Street East and Richmond Avenue.

- Mid-term priorities:
  - Upgrading of PTH 10, from Brandon to Minnedosa, to a four lane divided roadway.
  - Upgrading of 1st Street North, from PTH 1 to Kirkcaldy Drive, to a four lane divided roadway.
  - Upgrading of Victoria Avenue, from 34th Street to PTH 1 at Kemnay, to a four lane divided roadway.
  - Improvements to PR 340 east of Brandon

- Long-term priorities:
  - Construction of the Western By-pass
  - Upgrading of PTH 10, south of Brandon, to a four lane divided roadway.

A comment sheet was provided to obtain feedback from participants regarding the preliminary recommendations of the study as well as recommend additional projects believed to be necessary within the study area. Four comment sheets were completed; three Brandon residents and one RM of Cornwallis resident.

Participants were asked to share their thoughts regarding the preliminary recommendations of the study presented at the Open House. Respondents stated that the study was a valid, necessary exercise and a positive effect on Handi-Transit has already been seen.

Participants were also asked to state their agreement or disagreement with any particular recommendations of the study as well as make note of any additional recommendations or projects not listed; none were noted in either case.

Additional comments solicited from the Open House participants included positive reinforcement of the study and its objectives as well as the desire to see the completion of the Eastern By-pass as a top priority, traffic signal controls at the intersection of 13th Street and Park Avenue and a timely completion of the study in order to commence the recommended projects.

3.7 Presentation to Council

In conjunction with the final open house, a presentation to Council on the report's findings and recommendations was presented on October 23, 2007. Councilors were given the opportunity to make comments and request clarifications prior to completing the final report.

3.8 Presentation to MIT Executive Management

A presentation to MIT's Executive Management on the report's findings and recommendations was presented on November 27, 2007. Executive Management was given the opportunity to make comments and request clarifications prior to completing the final report. The study was accepted in principle by MIT Executive Management and was submitted as information for planning purposes to the Hon. Ron Lemiuex, Minister of Infrastructure and Transportation.

4.0 TRANSPORTATION MODEL

Long-range transportation planning studies typically forecast traffic volumes for a 20-year horizon period. In the case of an examination of a small area, manual forecasts may be used, however, when examining a larger area such as a citywide study and beyond, computer-based transportation planning models are generally used. This allows the study team to examine what-if scenarios more readily and provides a base condition that can then be used by the road authority in the future to update traffic forecasts. One of the requirements for this study was to develop such a model; information on the modelling process and outcome are provided in this section.

4.1 GIS Road Network

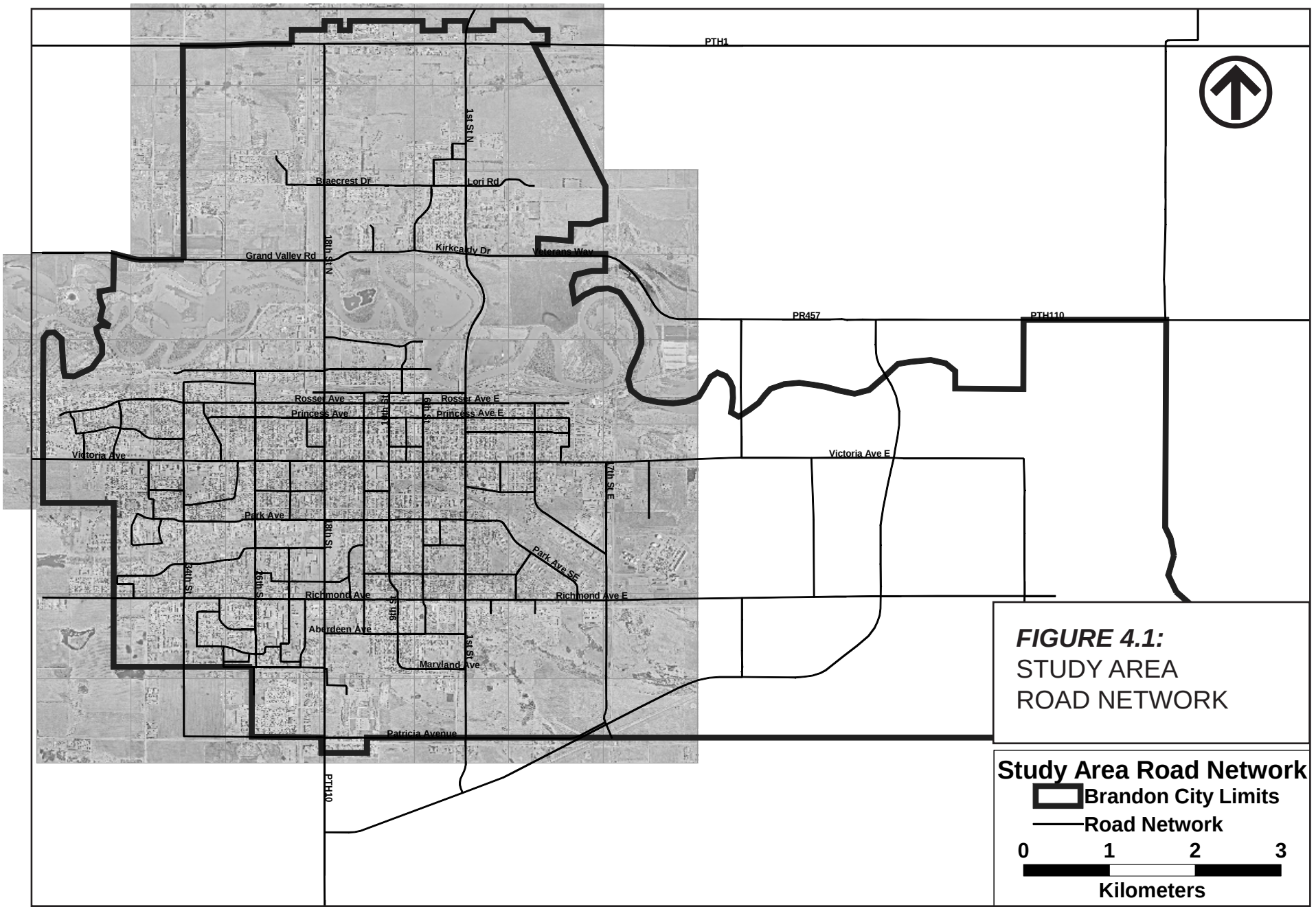
TransCAD Transportation GIS Software was the software used in the development of the road network model. TransCAD Version 4.7 is a geographic information system (GIS) designed for planning, managing, and analyzing the characteristics of transportation systems.

A GIS file of the City of Brandon and surrounding area road network was obtained from MIT. Citywide models often focus on arterial and higher-level roadways only. For the purpose of this project the GIS road network was extended to collector and higher-level roadways; some local roads were included as 'connector' links, which assisted in modelling traffic movements. In conjunction with the Steering Committee, the GIS road network was updated to include accurate road attributes such as speed limits, road condition, surface type, classification etc. For the model, the study area road network, illustrated in Figure 4.1, focused on the portion within the City of Brandon. External network links and zones are included to address trips in/out/through Brandon on the provincial road network; however, these do not extend to the entire 60 kilometre study radius, in part due to a lack of origin-destination information for the various communities within the 60 kilometre radius.

4.2 Zone System

A zone system was developed in conjunction with the Steering Committee for the transportation model and is illustrated in Figure 4.2. The zone system consists of 41 geographic areas defined by common land uses such as agriculture, residential, retail and

commercial areas and separated by “natural boundaries” such as rives, expressways, arterials, and rail lines. An additional seven nodes surround the City of Brandon and act as external zones for vehicles entering, exiting, or passing by/through Brandon on the Provincial highway system. Each zone has its own centroid for which all production and attraction data pertaining to that zone originates.


PTH1
Blaecrest Dr
Lori Rd
1st St N
Grand Valley Rd
18th St N
Kirkcaldy Dr
Veterans Way
PR457
PTH110
Rosser Ave
Rosser Ave E
Princess Ave
Princess Ave E
10th St
13th St
Victoria Ave
Victoria Ave E
17th St E
Park Ave
18th St
Park Ave SE
24th St
20th St
Richmond Ave
Richmond Ave E
30th St
Aberdeen Ave
1st St
Maryland Ave
Patricia Avenue
PTH10
FIGURE 4.1:
STUDY AREA
ROAD NETWORK
Study Area Road Network
Brandon City Limits
Road Network
0 1 2 3
Kilometers

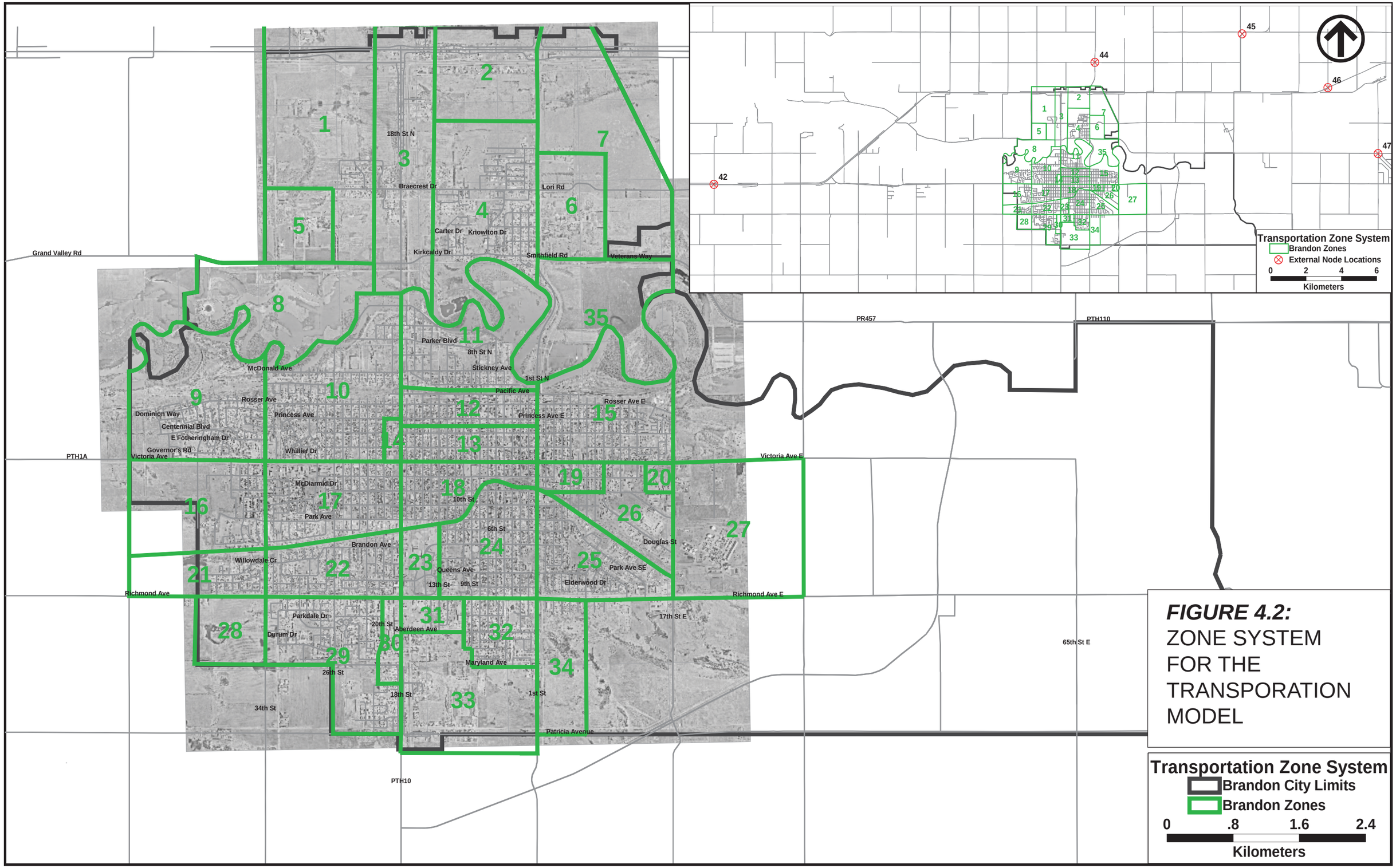


FIGURE 4.2:
ZONE SYSTEM FOR THE TRANSPORATION MODEL

Transportation Zone System
Brandon City Limits
Brandon Zones
0 .8 1.6 2.4
Kilometers

4.3 Transportation Modeling Process

The Brandon and Area transportation forecast/assignment model followed a sequential three-step procedure. Land use and division of the study region into zones determined the foundation of the model. The three steps of the forecasting model are:

- Trip generation, which estimates the volume and location of vehicular trips originating or destined to each of the transportation zones. Vehicular trip generation is comprised of two components; trip production and trip attraction. Trip generation is a function of land uses, household demographics and other socio-economic factors.

- Trip distribution, which matches origins with destinations using a gravity model to forecast balanced productions and attractions at each zone. In addition to the gravity model, a friction factor matrix was employed to model between zone origin and destination.

- Traffic assignment, which represents the key element in the travel demand forecasting process as it predicts the flows of vehicles along each of the roadways within the street network.

Detailed information regarding each step of the forecasting model can be found in Appendix C. The modelling process included current year assignments and related peak hour level of service on road links (required for calibration purposes) as well as 20 year forecast volume assignments for the peak hours based on the existing road network and proposed roadway changes.

4.4 Horizon Year Trip Assignment

4.4.1 Development Trends

A 20-year horizon for the road network model was used based on the study terms of reference. Brandon and Area development assumptions for the road network model were derived from a study of the Brandon and Area Planning District Development Plan, Year 2005. Reference Maps 6a-6d “Residential Priority Infill Areas” [4], as well as discussions with Economic Development Brandon, and Provincial and City staff formed the basis for

determining the locations of development and redevelopment in Brandon over the next 20 years.

Single Family Residential, Duplex, Multi-Family and Mobile Home construction data provided by the Brandon and Area Planning District was analyzed to estimate the expected yearly growth of dwelling units within Brandon [5]. Table C.3, attached in Appendix C, summarizes historical building trends within Brandon and formed the basis for estimating total residential development for the 20-year horizon.

4.4.2 20-Year Development Assumptions

4.4.2.1 Residential Infill Areas

Reference maps identifying "Residential Priority Infill Areas" published in the Brandon and Area Planning District Plan, Year 2005, were the primary source for identifying locations of residential infill growth for the 20-year horizon period [5]. Using historically averaged single family residential building permit issuance rate of approximately 78 per year, it is expected that approximately 1,560 new single family residential units will come online over the next 20 years (approximately 40 percent of all expected new dwelling units). Using the current residential land density of 5 units per acre, and assuming a split of dwelling unit types (single family, duplex, multifamily, mobile home), approximately 2,000 dwelling units were estimated to occupy the infill areas noted in the Brandon and Area Development Plan were noted and are displayed in Figure 4.3. Detailed infill assumptions can be found for each of the proposed development areas in Appendix C.

RESIDENTIAL (250 ac)/
COMMERCIAL/RETAIL (150 ac)–
NORTH HILL BLACK
PROPERTIES

FORMER
BMHC
MENTAL
HEALTH
CENTRE
159 ac

FUTURE
RESIDENTIAL
120 ac

18TH STREET

KIRKCALDY DRIVE

GRAND VALLEY ROAD

ROSSER AVENUE

VICTORIA AVENUE

RICHMOND AVENUE

RESIDENTIAL
43 ac

RESIDENTIAL
52 ac

RESIDENTIAL
16 ac

RESIDENTIAL
52 ac

21 ac
RESIDENTIAL

DWELLING UNIT/
POTENTIAL LAND
INFILL
609 ac

RESIDENTIAL
76 ac

42 ac

RESIDENTIAL
150 ac

LOCATION
OF
INDUSTRIAL
GROWTH
310 ac

LOCATION
OF
INDUSTRIAL
GROWTH
380 ac

FIGURE 4.3:
FORECAST AREA DEVELOPMENT
(AREAS BASED ON THE BADP DEVELOPMENT PLAN)

Brandon City Limits

Development Areas

0 .3 .7 1.0 1.3 1.7
Kilometres

4.4.3 Horizon Year Traffic Assignment without Road Improvements

The Brandon and Area Road network model was updated using the development assumptions listed in Appendix C and the traffic reassigned to include expected traffic and development growth throughout the network. No road network or road capacity improvements were made in this model, as the objective was to identify trends and locations of future traffic congestion in order to identify locations of possible road improvements.

Daily forecast 2026 traffic assignments (combined existing and expected growth) throughout the Brandon and Area road network are based on the existing road network assuming no road or lane capacity improvements are made over the 20-year timeframe. Figures attached in Appendix C, illustrate the a.m. and p.m. peak hour daily forecast 2026 traffic assignments (combined existing and expected growth) throughout the Brandon and Area road network.

Figures illustrating: 1) the a.m. and p.m. peak hour volume/capacity (V/C) ratios and expected level of service for road links within the study area with forecast traffic volumes, and 2) the existing roadway network and link capacities for forecast Year 2026 traffic for the a.m. and p.m. peak hour periods can be found in Appendix C.

4.4.4 List of 20-Year Road Network Improvements

The comparison between the level of service for the current year (2006) and forecast year (2026) shows clearly that roadway modifications are required in Brandon to accommodate anticipated traffic growth.

A number of road network improvements were identified for inclusion in the Year 2026 traffic assignment model based on the results of the Year 2026 traffic assignment without any changes from the current road system, and through discussions with the Steering Committee. The road network improvements included in the “with improvements” scenario include:

- Construction of the remainder of PTH 110 (Brandon Eastern Access) and its connection to PTH 1,

- Decommissioning of Provincial Road 468 (currently connecting Brandon By-pass to the Trans-Canada Highway) as the designated By-pass linkage at the east end of the roadway,
- Upgrade Victoria Avenue West of 34th Street to a four lane divided roadway to PTH 1,
- Upgrade 1st Street from PTH 1 to Rosser Avenue and from the Brandon By-pass to Richmond Avenue East to a four lane divided roadway,
- Upgrade 18th Street from PTH 110 (Brandon Eastern Access) to Aberdeen Avenue to a four lane divided roadway,
- Upgrade all of 18th Street as a four lane divided roadway,
- Upgrade Richmond Avenue as a four lane undivided roadway from 34th Street to 26th Street,
- Upgrade 34th Street to a four lane undivided roadway from Park Avenue to Richmond Avenue,
- Extend Maryland Avenue to 34th Street as a two lane undivided roadway,
- Construction of Clare Avenue on the North Hill – two lanes undivided, and
- Upgrade PTH 10 from PTH 1 to Minnedosa and from Aberdeen Avenue to PTH 2 (south junction) to a four lane divided roadway.

Further, a separate long-range plan to upgrade PTH 1 to an expressway/core route standard was completed in 2002. The recommended design solution involves the construction of Parclo AB interchanges at relocated intersections 18th Street (west junction PTH 10) and 1st Street (east junction PTH 10) as well as the reconstruction of approximately five kilometres of PTH 1.

4.4.5 Traffic Assignment Results

The Brandon and Area Road network model was updated to include likely roadway upgrades and the resultant increase in vehicular capacity. The Year 2026 forecast land use

development was reassigned and examined to identify how the road link upgrades would modify and change traffic patterns throughout the road network.

The forecast 20-year traffic assignments for 24-hour volumes, and forecast 20-year a.m. and p.m. peak hour traffic assignments can be found in Appendix C.

Figure 4.4 illustrates the p.m. peak hour V/C ratios and expected level of service for road links within the study area with forecast traffic but without anticipated improvements to the road network and associated link capacities. Conversely, Figure 4.5 illustrates the p.m. peak hour V/C ratios and expected level of service for road links within the study area with forecast traffic and anticipated improvements to the road network and associated link capacities. Detailed expected V/C ratios and LOS (Year 2026) maps for the a.m. and p.m. peak hour periods can be found in Appendix C.

The analysis with the assumed road upgrades reduces the number of links at or over capacity, especially along 1st and 18th Streets and along PTH 1. A level of service of D is considered acceptable for peak hour conditions in urban areas as attaining a level of service of C can be cost prohibitive. Generally, road links in Figure 4.5, which are at a LOS of E or F (and in some cases D), are typically experiencing higher traffic volumes within the model due to their designation as zone connectors. The road links at or below a level of service E are:

- Rosser Avenue between 1st Street and Douglas Street,
- Princess Avenue between 1st Street and Douglas Street,
- Douglas Street between Lorne Avenue and Rosser Avenue,
- 34th Street between Aberdeen Avenue and Richmond Avenue,
- 26th Street between Rosser Avenue and McDonald Avenue, and
- McDonald Avenue between 26th Street and 18th Street.

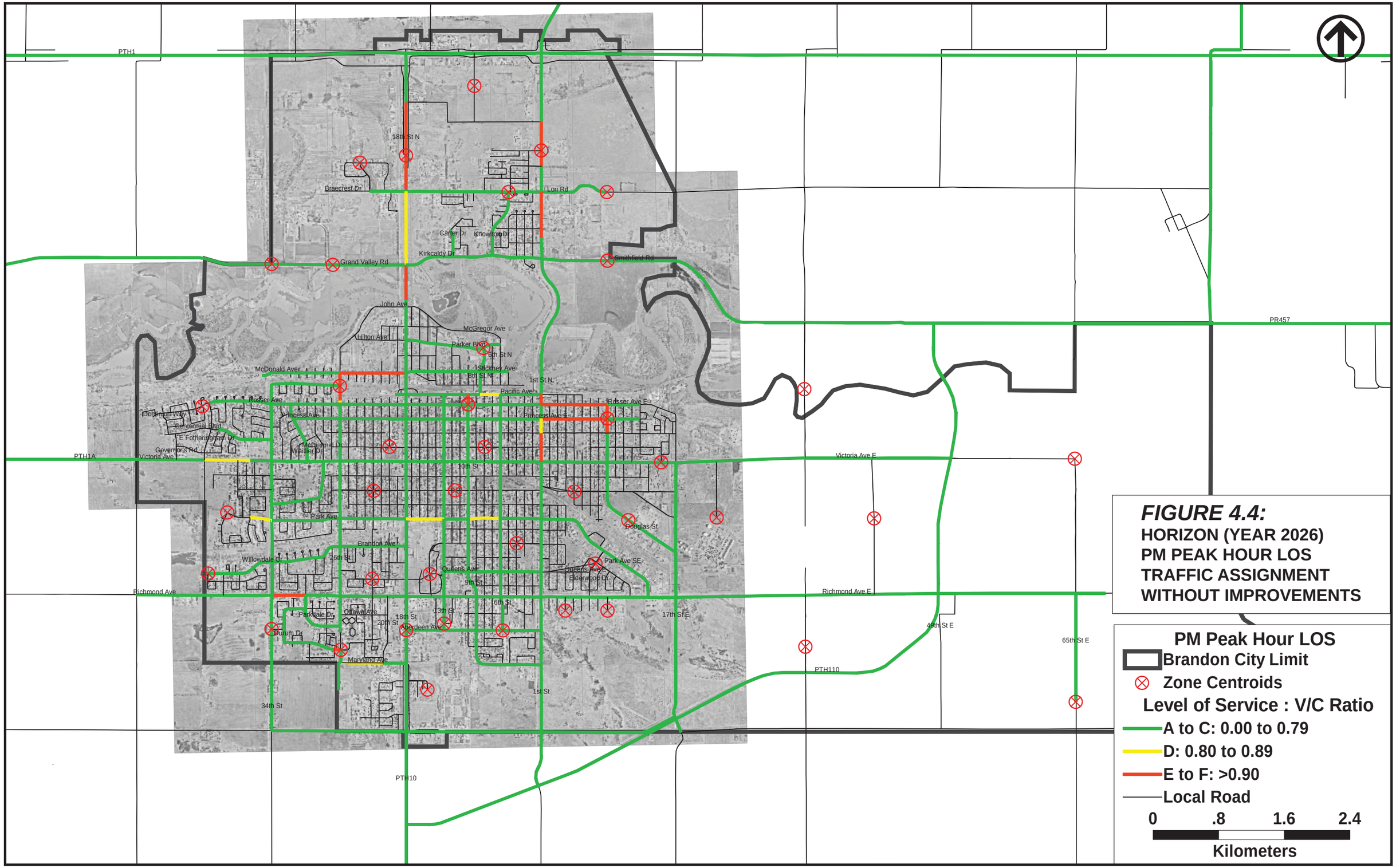


FIGURE 4.4:
HORIZON (YEAR 2026)
PM PEAK HOUR LOS
TRAFFIC ASSIGNMENT
WITHOUT IMPROVEMENTS

PM Peak Hour LOS

- Brandon City Limit
- Zone Centroids

Level of Service : V/C Ratio

- A to C: 0.00 to 0.79
- D: 0.80 to 0.89
- E to F: >0.90
- Local Road

0 .8 1.6 2.4

Kilometers

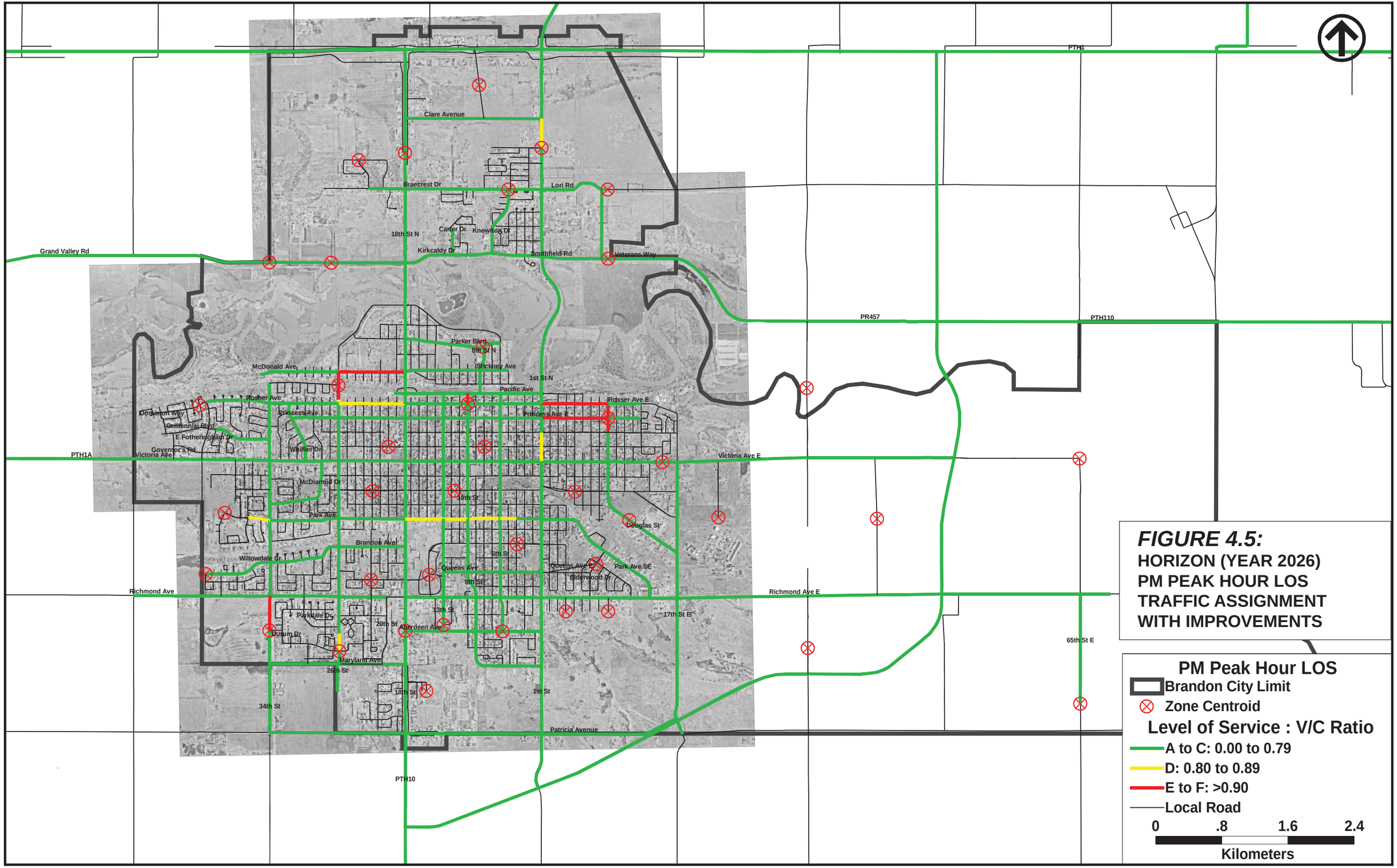


FIGURE 4.5:
HORIZON (YEAR 2026) PM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITH IMPROVEMENTS

PM Peak Hour LOS

- Brandon City Limit
- Zone Centroid

Level of Service : V/C Ratio

- A to C: 0.00 to 0.79
- D: 0.80 to 0.89
- E to F: >0.90
- Local Road

0 .8 1.6 2.4

Kilometers

4.5 Scenario Comparison

The three traffic assignment scenarios (existing conditions, Year 2026 land use without changes to the road system, and Year 2026 land use with changes to the road system) were compared under p.m. peak hour traffic assignments in terms of vehicle-kilometres travelled (VKT), average travel speed (km/hr), total vehicle-hours of travel, and percent of road links at various LOS values for the roads classes as collectors or higher.

Table 4.1: Scenario Comparison

Criteria	2006 Base Model	2026 Model Without Road Improvements	2026 Model With Road Improvements
Percentage of Links at LOS C or Better	98.5%	95%	97%
Percentage of Links at LOS D or Lower	1.5%	5%	3%
Percentage of Links at LOS E or Lower	0%	3.5%	1.5%
Average Travel Speed (km/hr)	68.5	67.8	70.4
Vehicle-Kilometres Travelled	84,642	112,603	110,156
Total Vehicle-Hours	1,248	1,687	1,632

The three columns of Table 4.1 address forecast LOS on the road links in the model. The number of road links at LOS D or lower increases from 1.5 to 5 percent in the forecast year where no road improvements are included. This reduces to three percent with the road improvements added to the model. If only links at or above congestion levels are looked at, the change from the base model to 2026 goes from none, to over 3 percent, however, this is reduced to 1.5 percent with the proposed road improvements. Although there is an increase in links that offer a LOS that is less than desirable, it is not necessarily cost effective to achieve LOS C or better in all cases. It is not always feasible to maintain a desirable LOS as a City grows. It should also be noted that this only addresses road links and not the LOS of intersections themselves, however, as road link LOS values decrease, typically, so do the intersection LOS values.

The average link speed is forecast to decrease modestly, however, the proposed road improvements forecasts an improvement in speeds. It should be noted that the relatively high average travel speed is a reflection of the inclusion of highway links outside of the

urban portion of the study area where speed limits are in the 80 – 100 km/hr range. Much of the improved travel speed is also attributed to improvements in the highway system (e.g., upgrades along PTH 1, completion of PTH 110). In examining urban links, there is a drop in forecast travel speed in the "without improvements" scenario from 68.5 km/hr to 67.8 km/hr. The "with improvements" scenario is slightly higher, at 70.4 km/hr, than existing conditions.

The vehicle-kilometres travelled is a reflection of growth in the City, as well as longer average travel lengths as development extends beyond the existing developed area. The reduction in the "with improvements" scenario is again primarily a function of the improvements in the highway system, especially PTH 110.

The total vehicle-hours of travel in the afternoon peak hour increases due to new growth resulting in additional trips on the network, average trip lengths increasing, and reductions in LOS as volumes increase.

5.0 ISSUE IDENTIFICATION

5.1 Study Inputs

The study has determined a number of issues and concerns for the transportation network within the study area. These issues and concerns have been determined through:

- An environmental scan, which included a condition analysis of the City and Provincial road network, a collision data and safety review, and telephone and traffic interrupt origin-destination surveys. The environmental scan outlined the current transportation system and conditions while providing a level of detail regarding travel in the Brandon area.

- Public consultation in the form of two Open House meetings, a public display kiosk at Brandon Shoppers Mall and City Hall and two workshops involving both the public and invited stakeholders. Information from the study was presented to the public for their input and comment.

- A transportation planning model, which forecast a 20 year horizon operational deficiencies with respect to road links and intersections. The model provided an opportunity for the study team to examine what-if scenarios more readily and provided a base condition that can then be used by the road authority in the future to update traffic forecasts.

5.2 Issue Identification

The issues identified through the environmental scan, public consultation and transportation planning model were classified into six theme groups:

- Alternative Transportation and Environmental Considerations,
- Safety,
- Route Classification and Goods Movement,
- Access and Traffic Management,
- Future Roadway Needs, and
- Traffic and Intersection Capacity.

A number of issues were found to occur in more than one theme group.

5.2.1 Alternative Transportation and Environmental Considerations

Alternative transportation and environmental considerations related to several issues were raised during the public consultation aspect of the study, including:

- Interference of traffic with dangerous goods movement, and pedestrian and traffic conflicts at various intersections such as 34th Street and Victoria Avenue, 34th Street and Rosser Avenue and 1st Street and Victoria Avenue, oftentimes due to geometry.

- Lack of bus service to Monterey Estates.

- Access for disabled persons on transit buses.

- Provide pick-up and drop-off locations for taxis at venues such as the Corral Centre or at various Clinics throughout the City.

- Ensure that development accommodates transit and all modes are included in the transportation master plan.

5.2.2 Safety

The environmental scan of historical collision data, a detailed safety review (submitted under separate cover) and public consultation determined transportation concerns within the City of Brandon as well as on the surrounding roadways within the study area.

Collision data was obtained for key Provincial highway links outside the City of Brandon within the 60 km radius. The majority of the road segments experienced collision rates below the MIT threshold of 1.5 collisions per MVKT. One exception is PR 457, which experienced collision rates of 3.11 and 1.63 for the sections from PTH 1A to 110W and 110E to PR 340, respectively. These segments of PR 457 exceeded the MIT threshold and thus warrant further review.

Collision data, within the City of Brandon, was examined to determine the frequency, severity and collision rates at 17 intersections for which data from 1996 to 2002 was available. The safety review determined that only one of the intersections studied, 18th Street at Victoria Avenue, had a collision rate of 1.67 per MVE, which is above the MIT threshold of 1.5 collisions per MVE. The review also determined that there were no fatalities recorded in the last seven years of data at the intersections examined and driver error was the primary cause of collisions.

Safety concerns raised during the public consultation portion of the study included pedestrian-vehicle conflicts at several intersections within Brandon, lack of traffic control and truck traffic accommodations.

5.2.3 Route Classification and Goods Movement

Stakeholders concerns with respect to route classification and goods movement include the volume of truck traffic in and through the City and the accommodation of dangerous good movements. Specific issues raised by stakeholders who participated in the workshop in May 2006 with respect to route classification and goods movement included:

- Relocating all rail outside of City to near the airport, thereby reducing travel delays within the City.

- Ensure more efficient use of rail lines.

- Locate truck routes away from residential areas.
- Completion of Eastern and Western By-passes to accommodate truck movements, thereby reducing truck traffic within the City.

5.2.4 Access and Traffic Management

Access and traffic management are the manner in which local, regional, or provincial authorities control the interface between the road network and the adjoining properties. Depending on the roadway type, access to the adjacent land uses, typically through a driveway, can be plentiful and individual, such as in a residential area, or joint and occasional, such as in an urban commercial area.

Various comments were submitted regarding access and traffic management from participants at both the open houses and workshops. Frequent concerns included:

- The lack of signal synchronization and use of current technologies.
- Installation of speed humps and the required advisory signage.
- Location of private approaches along major routes that impact congestion and safety.

5.2.5 Traffic and Intersection Capacity

Traffic and intersection capacity deficiencies were identified through public consultation and the transportation model forecast. Participants from the open houses, public display and workshops identified congestion and heavy traffic volume areas at numerous locations within the study area.

Using the transportation forecast model, deficiencies were identified through the forecast road link LOS for Year 2026 conditions in terms of road cross-section needs or a need for new road linkages. However, the other area that must be addressed in the future is intersections. Intersections that will need to be monitored, to determine possible operational or geometric modifications, were identified through discussions with the Steering Committee, and examining critical road links in the model.

A number of road links are forecast to be near, at, or above, the available capacity by the Year 2026, based on assumed land use growth levels and patterns, or are links deemed important to address goods movement activity.

In examining Figures 4.4 and 4.5 (Year 2026 LOS without road improvements), other links are identified as being at LOS D or lower, however, these are likely due to local or collector links being used as a zone centroid.

A wide variety of control options and a number of new signals have been installed in the last 10 years. It was suggested that there is a need to develop a new coordination plan for traffic control signals in the City. A number of older controllers without pedestrian actuation may be providing more green time for certain phases than may otherwise be required to only accommodate vehicular traffic.

5.2.6 Future Roadway Needs

Future needs of the roadway network within the study area, as determined from public consultation and transportation planning model, include:

- Completion of the Eastern and Western By-pass routes while closing 1st Street, 18th Street, Victoria Avenue and Richmond Avenue to heavy truck traffic.
- Upgrading of PR 340 from Shilo to Wawanesa as an asphalt surface treated roadway.
- Upgrading of the following road links to four-lane divided roadways:
  - PTH 10, north and south of Brandon.
  - 18th Street North, from PTH 1 to Kirkcaldy Drive.
  - Victoria Avenue, from 34th Street to PTH 1 at Kemnay.

6.0 STRATEGY DEVELOPMENT

The purpose of this section is to present the strategies that will be used to address the theme issues identified in Section 5. These strategies are derived through careful consideration of the issues and concerns that have been raised and reflect current practice in the transportation planning industry for dealing with the issues and concerns that have been identified.

Again, stemming from the public consultation, transportation modelling and environmental scan aspects of the study, six major themes have been identified for strategy development. The six themes identified include:

- Alternative Transportation and Environmental Considerations,
- Safety,
- Route Classification and Goods Movement,
- Access and Traffic Management,
- Future Roadway Needs, and
- Traffic and Intersection Capacity.

These themes are similar to the topic areas presented at the stakeholder and public workshops in October 2005 and May 2006 but have been focused to encompass issues of significant concern.

6.1 Alternative Transportation and Environmental Considerations

From the issue identification process it was determined that there is a need and desire to encourage increased transit ridership and to promote other means of transportation as a way to reduce traffic congestion and to promote environmental stewardship. The following three strategies are proposed to address these issues/concerns:

- Transit development to encourage transit ridership. This includes transit signal priority systems to increase transit efficiency and speed, as well as future development considerations (e.g., location of collector streets, higher density development along or near potential transit routes, pedestrian system to connect origins and destinations to transit routes) for transit accessibility in planned

residential developments. Transit development will address the lack of bus service and ensure that development accommodates transit.

- Development of a multi-use trail system to ensure adequate infrastructure for pedestrians and bicyclists. The City has identified existing and future paths and trails (as recommended in the Greenspace Master Plan completed in 2002, attached in Appendix H). A multi-use trail system ensures that development accommodates all modes in the transportation master plan.

- Ensuring sufficient sidewalk accessibility (e.g., provision of sidewalks in areas where pedestrian activity is likely, provision of adequate pararamps, pedestrian refuges, etc. at intersections) for pedestrians to encourage and accommodate pedestrian traffic throughout the City of Brandon. Sufficient sidewalk accessibility ensures access for disabled persons and reduces pedestrian-vehicle conflicts.

6.2 Safety

From the Issues Identification, it was determined that safety of the traveling public is a concern. A review of collision statistics and a detailed safety review were undertaken to determine safety issues. The goal of road safety is to reduce the number of potential conflicts, thus minimizing collisions and subsequent damage, injuries or deaths on the road network. The following strategies are recommended to address safety concerns:

- Creating and implementing traffic calming guidelines that include a “combination of physical features that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users” as defined by the Institute of Transportation Engineers. Two types of traffic calming measures exist, one that seeks to control the volumes along a particular roadway / network and the other which seeks to control the speed. A detailed comparison of both traffic calming types, and policies in other jurisdictions can be found in Appendix E.

- Modifying truck and dangerous goods route designations. Modifying truck route designations will alleviate through truck traffic within the City of Brandon while modifying dangerous goods truck routes will reduce potential contamination. Both modifications reduce potential conflicts with other motorists using the road network.

- Implementing a comprehensive access and traffic management strategy in which local or provincial authorities control the interface between the road network and the

adjoining properties. Detailed information regarding access management strategies and existing policies within the study area are attached in Appendix E.

- Performing intersection reviews to determine locations on the City and Provincial road network to determine geometric and/or operational deficiencies, and the necessary mitigation measures.

- Implementing mitigation measures to address items identified from road safety reviews. A safety review and recommendations were provided as part of the study under separate cover.

- Updating road classifications to allow the road network to perform efficiently and safely from both traffic operations and road safety perspectives. This objective is achieved by the designation and operation of roadways to their intended purposes.

- Reviewing, in detail, road segments exceeding MIT's collision rate threshold of 1.5 incidents to determine site-specific mitigation measures. In general terms, the availability of multi-lane divided highways and left and right-turn lanes can be effective mitigation measures.

6.3 Route Classification and Goods Movement

Efficient route classification and goods movement involves a strategy that provides a road system that locates trucks on appropriate routes in order to minimize congestion, delay and conflict with other road users. The proposed strategy involves:

- Modifying truck and dangerous goods route designations. Modifying truck route designations will alleviate through truck traffic within the City of Brandon while modifying dangerous goods truck routes will reduce potential contamination. Both modifications reduce potential conflicts with other motorists using the road network.

- Updating road classifications to allow the road network to perform efficiently and safely from both traffic operations and road safety perspectives.

6.4 Access and Traffic Management

A successful access and traffic management strategy incorporates a comprehensive strategy in which local or provincial authorities control the interface between the road

network and the adjoining properties. The recommended strategy for access and traffic management involves the following components:

- Utilizing smart growth principles focusing on providing alternative modal choices and transportation planning for future development. The City should continue to encourage modal alternatives when reviewing development proposals. Detailed information regarding smart growth principles, strategies and other items to consider can be found in Appendix E.

- Developing a traffic impact study guideline for the City of Brandon to assess the impacts of a new or changed development on the existing and proposed transportation system. Traffic impact studies should also suggest transportation system improvements to mitigate any negative affects of increased travel demand caused by the development. Background information regarding traffic impact study guideline creation as well as a proposed Traffic Impact Study Guideline for the City of Brandon is included in Appendix D.

- Implementing a comprehensive access and traffic management strategy in which local or provincial authorities control the interface between the road network and the adjoining properties. Common measures include allowing median openings at targeted locations such as public street intersections or approaches serving major developments, traffic signal control at appropriate spacing, combining approaches for multiple properties, encouraging cross-easement agreements, etc. Detailed information regarding access management strategies and existing policies within the study area are attached in Appendix E.

- Synchronizing traffic signals through a coordinated set of timing plans in order to create smooth traffic flow. Ideally, a coordinated signal system would allow vehicles to travel through the study road network with the fewest stops at intersections, while minimizing delay for side streets.

6.5 Traffic and Intersection Capacity

The transportation planning model was used to assess and determine where capacity was required to accommodate current and future traffic demand. Access and traffic management strategies outline above will preserve capacity thereby extending the life of the existing road system. This strategy involves recommendations previously described,

including synchronization of traffic signals, intersection reviews and upgrades, reviewing the possible impacts of planned developments, and a traffic count monitoring program.

- Update signal controllers would offer MIT greater flexibility in setting coordination plans and add vehicular capacity to the corridors in the plan. It is recognized that MIT is not in favour of additional pedestrian actuation due to additional user complaints regarding waiting for a "walk" signal indication; however, MIT recognizes the importance of accommodating all road users, especially in the diverse urban environment.

- The traffic signal controls located along PTH 1, 1st Street, 18th Street, Victoria Avenue and Richmond Avenue are all under the jurisdiction of MIT. Currently, all four streets are controlled by a single coordination plan, which is approximately 10 years old. MIT hope to prepare an updated traffic synchronization coordination plan in 2007. Some intersections are actuated, some are semi-actuated, and five have pedestrian buttons.

- Updating road classifications to allow the road network to perform efficiently and safely from both traffic operations and road safety perspectives. This objective is achieved by the designation and operation of roadways to their intended purposes.

6.6 Future Roadway Needs

The road network should meet the future transportation and economic needs of the study area. This strategy involves numerous recommendations, such as:

- Upgrading of critical routes to four lane divided facilities to create positive impacts on transportation safety, goods movement, access management and capacity.

- Conducting a traffic count program to monitor operations at key intersections that may need upgrades within the horizon year time frame and review whether adjustments to traffic control measures may be required.

- Additional items described above, including:

    - Modifying truck and dangerous goods route designations.

    - Synchronizing traffic signals.

    - Implementing a comprehensive access and traffic management strategy.

- Developing a traffic impact study guideline for the City of Brandon.
- Utilizing smart growth principles.
- Updating road classifications.
- Performing intersection reviews.
- Implementing project recommendations stemming from road safety reviews.

- Updating road classifications to allow the road network to perform efficiently and safely from both traffic operations and road safety perspectives. This objective is achieved by the designation and operation of roadways to their intended purposes.

6.7 Quick Reference to Issues and Strategies

Table 6.1 shows each issue as well as their respective strategies and general recommendations that are being proposed to address the issue. Alternative funding options that could be considered for the recommendations and strategies stated below are found in Appendix E.

Table 6.1: Study Issues and Related Strategies

Issues	Strategies	Recommendations
Alternative Transportation and Environmental Considerations	Transit development	Transit signal priority
		Future development considerations
	Adequate multi-use trail system	Greenspace planning and development
	Ensure sidewalk accessibility	Intersection reviews and upgrades
Safety	Minimize traffic related conflicts	Traffic calming guidelines
		Truck route classification modifications
		Dangerous goods route modifications
		Access management strategy
		Intersection reviews and upgrades
		Safety review project recommendations
		Update roadway classifications
Route Classification and Goods Movement	Provide a road system that locates trucks on appropriate routes	Truck route classification modifications
		Dangerous goods route modifications
		Update roadway classifications
Access and Traffic Management	Minimize traffic related conflicts and ensure appropriate access	Smart growth principles
		Traffic impact study policy
		Access management strategy
		Synchronization of traffic signals
Traffic and Intersection Capacity	Efficient road network that meets future traffic growth and operation	Synchronization of traffic signals
		Intersection reviews and upgrades
		Traffic count monitoring program
Future Roadway Needs	Roadway network that meets future traffic and economic needs	Twinning of critical routes
		Traffic count monitoring program
		Dangerous goods route modifications
		Truck route classification modifications
		Traffic impact study policy
		Access management strategy
		Smart growth principles
		Synchronization of traffic signals
		Intersection reviews and upgrades
		Safety review project recommendations

7.0 RECOMMENDATIONS

7.1 Alternative Transportation and Environmental Considerations

7.1.1 Transit Priorities

Brandon Transit currently operates a downtown terminal that provides a convenient point for transfers between routes. A diamond lane has also been implemented on a portion of 18th Street southbound. Other features that should be considered include:

- Encouraging higher densities in new residential developments along potential transit routes.
- Ensuring collector road patterns in new developments that would place most residences within 400 metres walking distance of a potential transit route.
- Examining transit signal priority along arterial roads in conjunction with future traffic signal upgrades planned by MIT.
- Extension of transit operating hours, including:
  - Regular and Handi Transit operation from 6:00 a.m. to midnight, Monday through Saturday.
  - Handi Transit service from 9:00 a.m. to 5:00 p.m., Sundays and holidays.
  - An additional two hours of peak demand Handi Transit service.

7.1.2 Greenspace and Smart Growth Considerations

A future transportation plan for the City of Brandon and surrounding 60 kilometre area should accommodate safe and efficient pedestrian and cyclist movement. This has been addressed by long term goals previously set out by the City and thus, future greenspace requirements should reflect the City's Greenspace Master Plan prepared in 2002 (attached in Appendix H).

As well, utilizing smart growth principles focusing on providing alternative modal choices and transportation planning for future development is recommended. The City should continue to encourage modal alternatives when reviewing development proposals. Detailed

information regarding smart growth principles, strategies and other items to consider can be found in Appendix E.

7.2 Safety

7.2.1 Safety Improvement Projects

A general safety review was undertaken, focusing on major roadways within the City for which historical collision information was available. In general terms, the findings suggest the following programs that should be addressed in the short term:

- Addition of, or extension of, left and right turn lanes.
- Replacement of signage that has lost useable reflectivity, and in some areas, additional signage.
- Ensuring lighting levels meet current guidelines.
- Provision of sidewalks where pedestrian activity is expected to occur.
- Improved pedestrian amenities near the soccer complex.
- Consistency in the 18th Street cross-section.
- Review of the extent of crossing protection required at the CPR at-grade crossing.
- Inconsistent intersection configurations along Park Avenue.
- Lack of sidewalks, bus pads and transit stops along 18th Street between Maryland Avenue and Richmond Avenue.

Details on locations and specific needs are included as part of a separate report prepared for the City and MIT entitled Brandon Area Road Network Development Plan Safety Review.

7.3 Route Classifications and Goods Movement

7.3.1 Functional Classifications

Material presented during the consultation sessions with stakeholders identified proposed changes in road classification, as illustrated in Figure 7.1. Existing road classifications for

the City of Brandon and MIT roadways are illustrated in Figures 2.5 and 2.6, respectively. Two types of classification changes are shown; changes to existing road classifications and possible new road network links in planned development areas (illustrated in Figure 4.3).

Classification modifications are based on predicted traffic volumes and thus potential upgrades or downgrades should be based on traffic monitoring results of arterial routes in the network. In some cases, such as Aberdeen Avenue, the recommendation is contingent upon the City of Brandon's Development Services Division reviewing Residential Development within the southeast portion of the City to determine if there is a need or warrant to downgrading.

City of Brandon Classifications:

Roads recommended for further review include:

- Aberdeen Avenue, 10th to 18th Streets, from local to collector status: the street currently functions as a collector, including providing access to a retail centre at 18th Street at Aberdeen.
- Aberdeen Avenue, 1st to 10th Streets, from collector to local status: the street serves a residential community and the City has implemented traffic calming features in the area to control speeds and volumes.
- 6th Street, Richmond Avenue to Aberdeen Avenue, from collector to local status: with the reclassification of Aberdeen Avenue, the collector status would terminate at a local street.

Recommended changes to existing classifications include:

- 49th Street East, PTH 110 to Patricia Avenue, from collector to local status: the street currently functions as a collector, however upon completion of the Eastern Access it is to be downgraded to a local street.
- Maryland Avenue, 26th Street to 34th Street, from local to collector: with increased residential development this portion of Maryland Avenue will be upgraded to collector street status.

- 42nd Street, Park Avenue to Victoria Avenue: upon completion of the Park Avenue connection with 42nd Street, both Park Avenue and 42nd Street are to be classified as collector streets.

- 50th Street, Rosser Avenue to Victoria Avenue: upon completion of the Rosser Avenue connection with 50th Street, both Rosser Avenue and 50th Street are to be classified as collector streets.

- McDonald Avenue, 26th Street to 34th Street, from collector to local: further extension of the street is not anticipated in the future and thus the street should be downgraded to local status.

- PTH 110, PTH 10 to PR 457, from arterial/feeder to expressway/core route: upon completion of the Eastern By-pass, PTH 110 will be reclassified as an expressway/core route.

Provincial Highway Classifications through Brandon:

Figure 7.1 shows the existing Strategic Highway System being developed by MIT. However, MIT has recently announced that construction of the Brandon Eastern By-pass (PTH 110) and the new Assiniboine River Bridges on 18th Street (PTH 10) has been approved. Therefore, it is recommended that upon completion of these projects, the future Strategic Highway Network within Brandon be changed to reflect the following (also shown in Figure 7.1):

- Brandon Eastern Access (PTH 110) be changed from Feeder designation to Core designation,

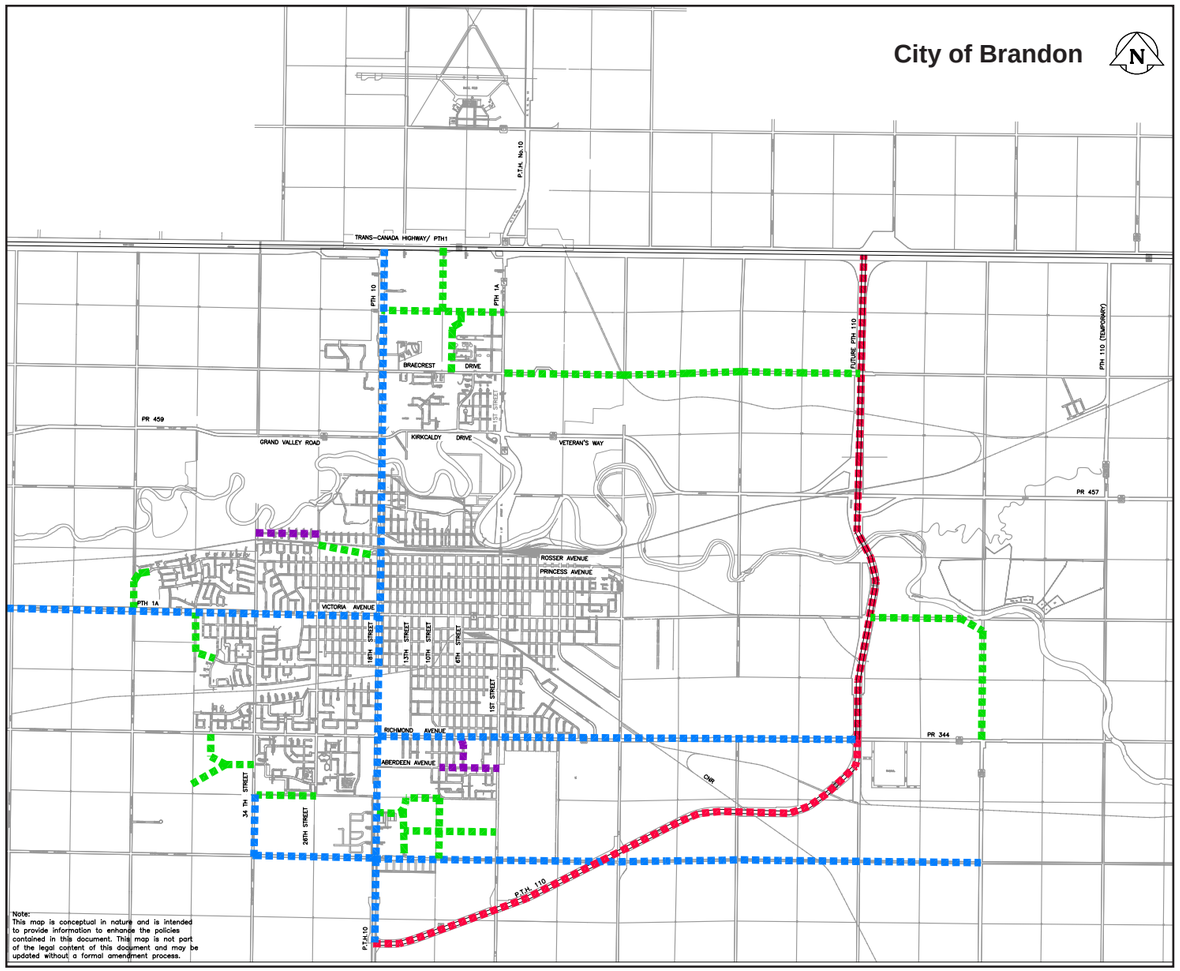
- 18th Street (PTH 10) be changed from Auxiliary/Core designation to Feeder designation,

- PTH 1A (1st Street) from Richmond Avenue to PTH 1 (Trans-Canada Highway) be changed from Core/Feeder designation to Auxiliary designation, and

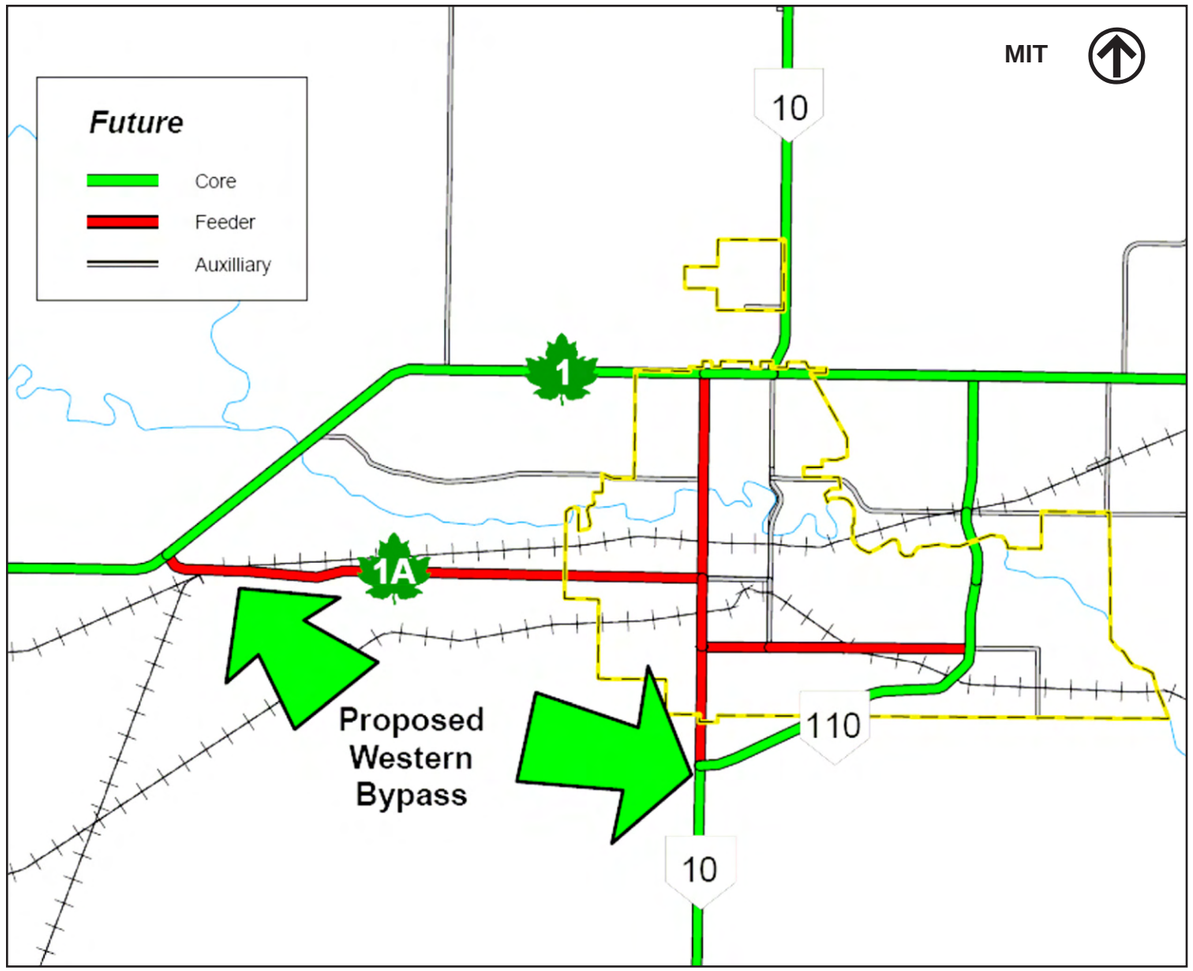
- Temporary Brandon Eastern Access (PR 457 and PR 468) be changed from Feeder designation to Auxiliary designation.

Effective immediately:

- Richmond Avenue (PR 610) from 18th Street to PTH 110 be changed to the Feeder designation, and
- PR 610 (Richmond Avenue) from PTH 110 easterly be changed to the Auxiliary designation.



Source: City of Brandon



Source: MIT

LEGEND

- Proposed Core Route
- Proposed Arterial / Feeder Route
- Proposed Collector
- Proposed Downgrading From Collector to Local

FIGURE 7.1:
PROPOSED ROAD CLASSIFICATIONS

7.3.2 Dangerous Goods and Truck Route System

Recommended changes to the truck route network and the dangerous goods route reflect the proposed changes to the major road network as well as feedback from the consultation process. The most significant change is the recommendation to complete the eastern access, to change the eastern access truck route to the planned future alignment (the northerly extension of PTH 110) from the current temporary alignment. When this occurs, the designated truck route for PTH 10 for trucks travelling to/from north of Brandon to/from south of Brandon or to/from PTH 1 should be identified as using the future by-pass route. The classification of PTH 110 is then suggested to change from a feeder to a core route. Under this scenario, non-truck traffic would continue to use the current through-town route to provide access to businesses along the route. The modifications to the dangerous goods route network to reflect the revised truck routing are shown in Figure 7.2.

The information discussed in Section 2.5, coupled with the fact that most truck operations are located in southeast Brandon, reinforces the importance of PTH 110 (the Eastern Access) and the need to complete the access with the planned connection at PTH 1 (approximately in line with the extension of 49th Street, compared to the current temporary connection at the extension of 81st Street). The completion of this link, with its enhanced geometric connections with PTH 1, is expected to shift some truck traffic from the "through town" routes to the by-pass. Highway commercial, truck-type development along the corridor will be beneficial to realize the fullest possible diversion to this route. With this change, it is recommended that the following road links be downgraded and/or removed in the future upon further goods movement studies as designated truck routes:

- 1st Street, between PTH 1 and Victoria Avenue,
- Victoria Avenue, between 18th Street and 1st Street,
- Veteran's Way, between PTH 110 and former PTH 110, and
- Veteran's Way, between 1st Street North and PTH 110.

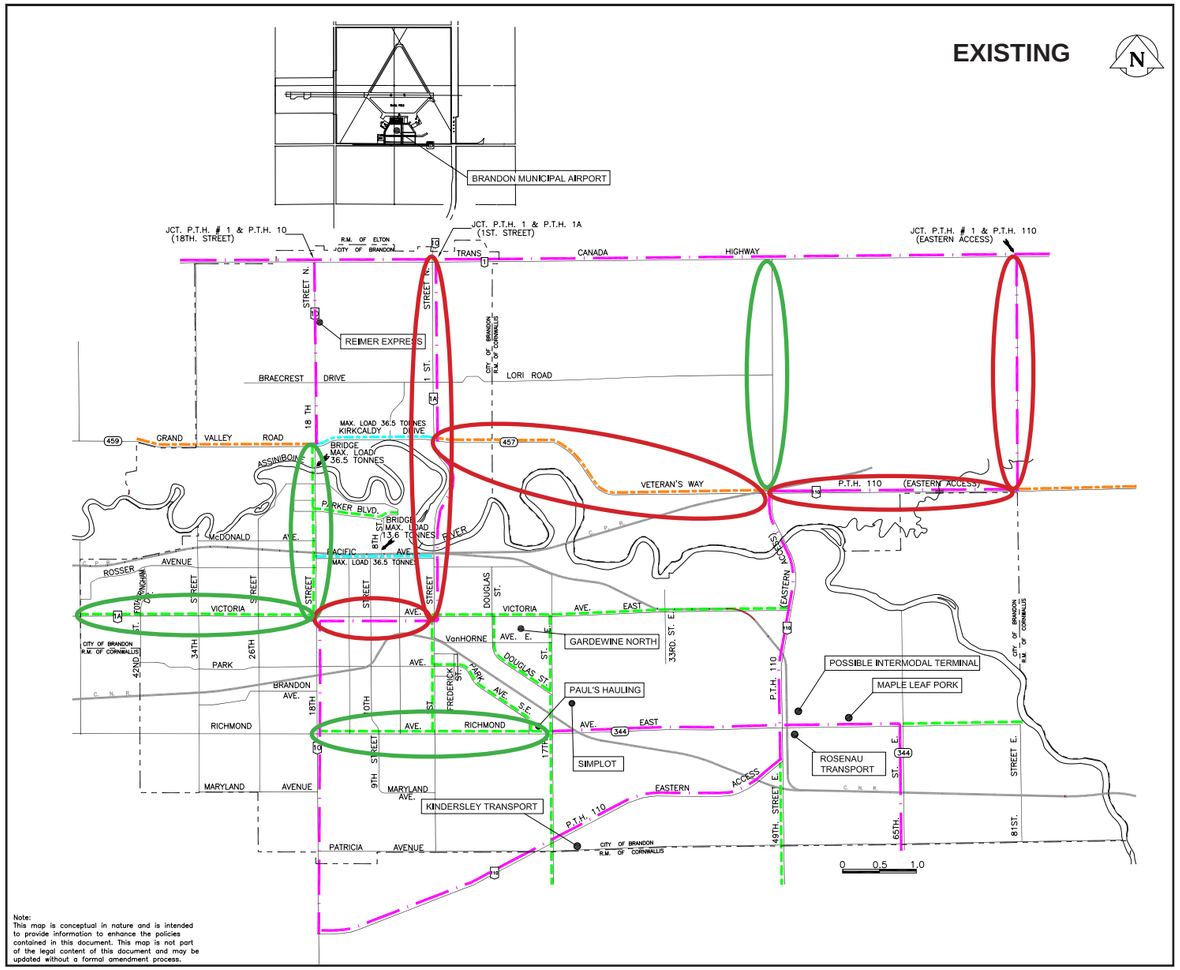
These changes force non-Brandon truck traffic to make use of PTH 110, but would still allow trucks to use these routes if they are making a pick-up/delivery within the City. The desired intent is to remove through truck traffic from the city, however since there are still shipping destinations within Brandon, there will still remain some degree of truck traffic

traveling within the City. Remaining truck traffic in Brandon will consist of terminal-to-terminal traffic, shuttling of trailers and deliveries/pick-ups.

Jurisdictional control of the truck route system within the City of Brandon is planned to undergo change regarding auxiliary and feeder routes, shown in Figure 7.3. Discussions should occur regarding auxiliary routes and a possible shift from MIT control to the City in the near future, while transfer of selected feeder routes could be discussed in the long term. These modifications are dependant on a number of factors; primarily adequate funding for suggested road upgrades.

Figure 7.3 offers a comparison of the existing truck route system with the recommended modifications within the study area.

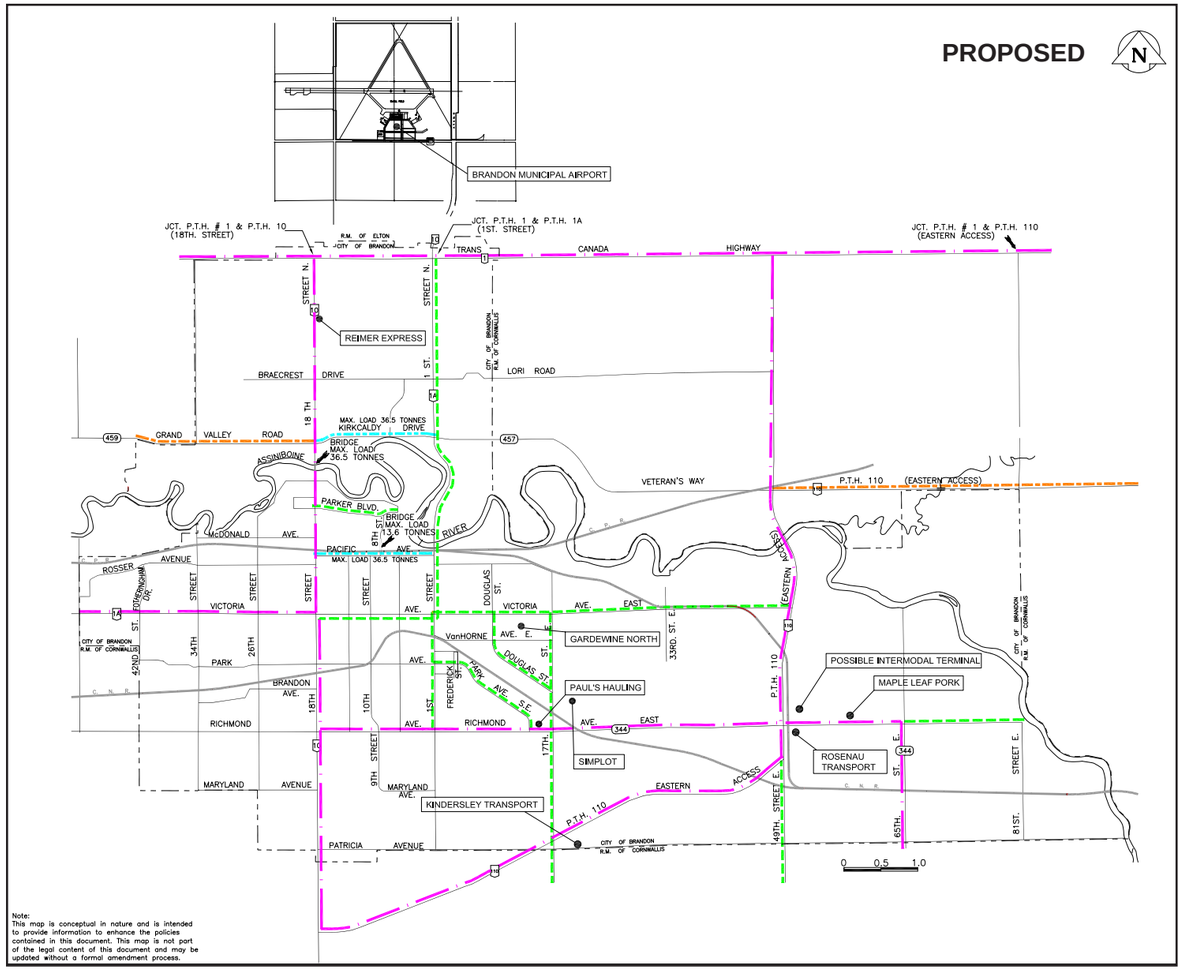
EXISTING



Note:
This map is conceptual in nature and is intended to provide information to enhance the policies contained in this document. This map is not part of the legal content of this document and may be updated without a formal amendment process.

Source: City of Brandon

PROPOSED



Note:
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Source: City of Brandon

LEGEND

- CITY AND HIGHWAY TRUCK ROUTES – CLASS A1 — GVW 56,500kg
- HIGHWAY TRUCK ROUTES – CLASS B1 — GVW 47,630kg
- CITY RESTRICTED TRUCK ROUTES – CLASS A — GVW 36,500kg
- RTAC PROVINCIAL TRUCK ROUTES — GVW 62,500kg
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCK ROUTES TO BE REMOVED/DOWNGRADED
- TRUCK ROUTES TO BE ADDED/UPGRADED
- TRUCKING CENTRE

LEGEND

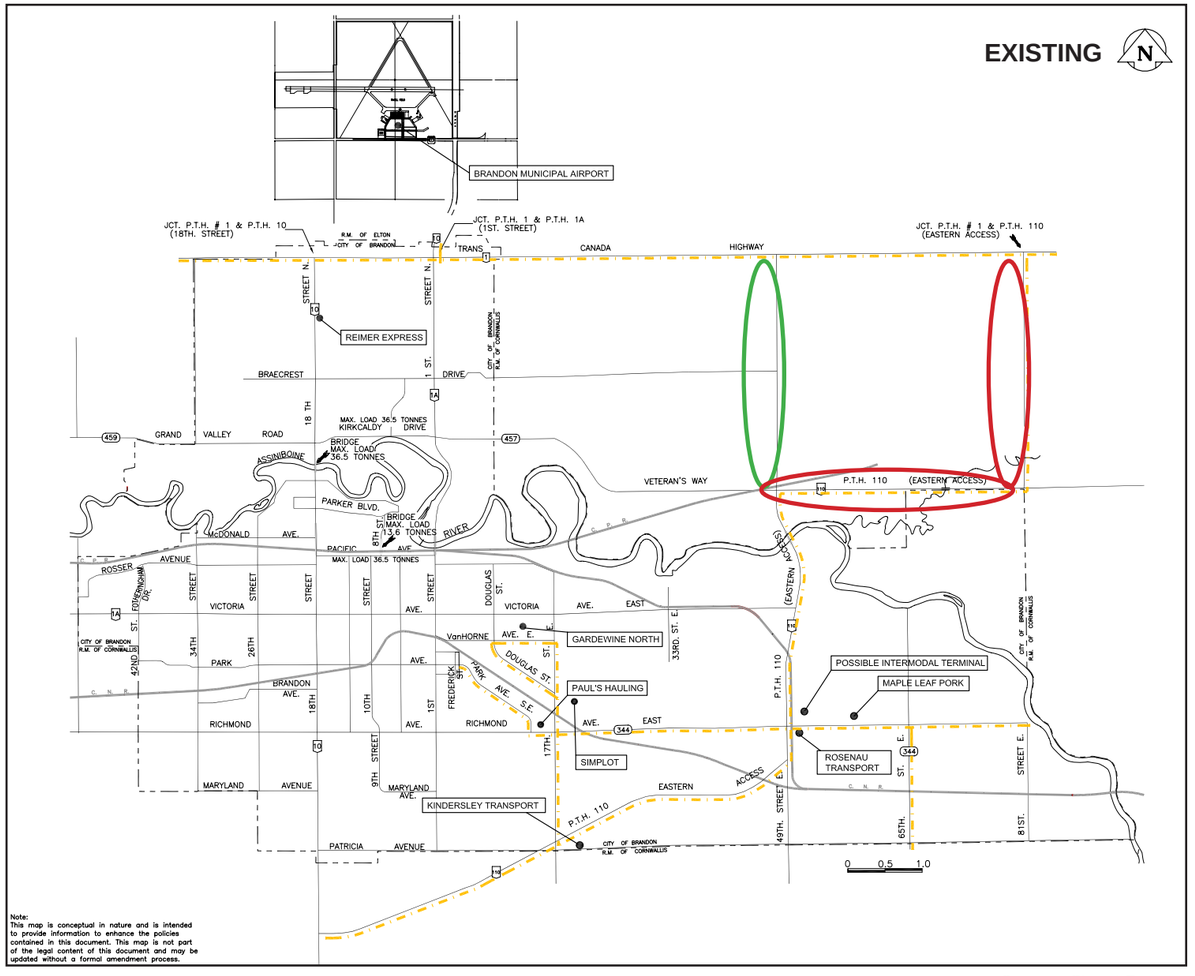
- CITY AND HIGHWAY TRUCK ROUTES – CLASS A1 — GVW 56,500kg
- HIGHWAY TRUCK ROUTES – CLASS B1 — GVW 47,630kg
- CITY RESTRICTED TRUCK ROUTES – CLASS A — GVW 36,500kg
- RTAC PROVINCIAL TRUCK ROUTES — GVW 62,500kg
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCKING CENTRE

FIGURE 7.3:
CITY OF BRANDON TRUCK ROUTES AND TRUCKING COMPANY LOCATIONS

EXISTING



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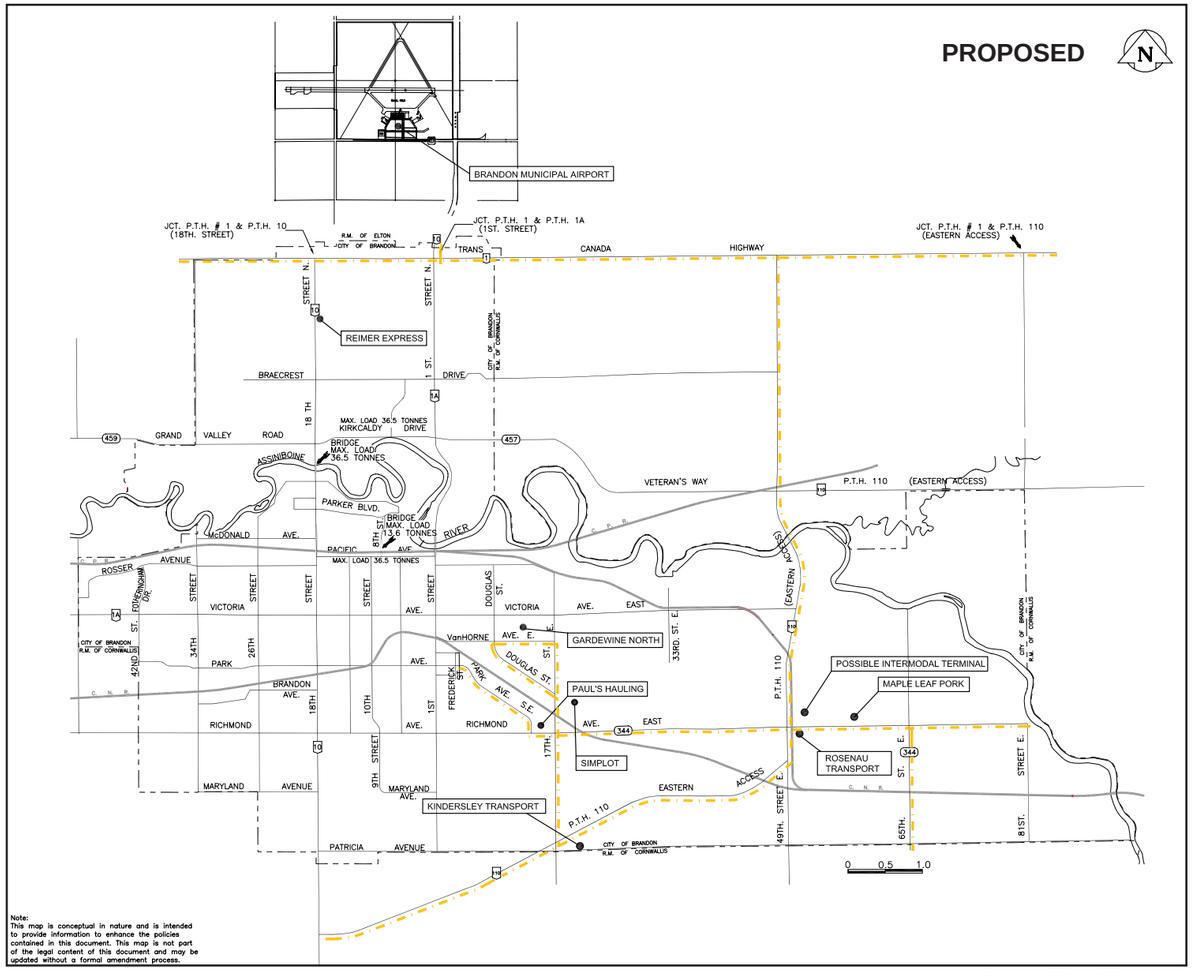
Source: City of Brandon

PROPOSED



Note:
This map is conceptual in nature and is intended to provide information to enhance the policies contained in this document. This map is not part of the legal content of this document and may be updated without a formal amendment process.

Source: City of Brandon

LEGEND

- DANGEROUS GOODS ROUTES
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCKING CENTRE
- DANGEROUS GOODS ROUTES TO BE REMOVED
- DANGEROUS GOODS ROUTES TO BE ADDED

LEGEND

- DANGEROUS GOODS ROUTES
- RAILWAYS
- PROV. TRUNK HIGHWAY
- PROV. ROAD
- CITY OF BRANDON LIMITS

EFFECTIVE: JAN./ 76
REVISED: 1979, 1989, 1993, 1997.

- TRUCKING CENTRE

FIGURE 7.2:
CITY OF BRANDON DANGEROUS GOODS ROUTE NETWORK

7.4 Access and Traffic Management

7.4.1 Access Management Strategy for the Brandon Area

The following four strategies are recommended for access management within the Brandon Area:

1. **Develop a high-level access management strategy** for highways and arterial streets within and around the City of Brandon that identifies the degree of access control (and location) for each roadway type. This strategy should be published in a major planning document. The City of Brandon policies should be coordinated with MIT to ensure a coordinated approach from an urban and rural highways perspective.

2. **Develop a roadway system** that includes both existing and planned/proposed facilities. Inventory each facility and its roadway type, which would have a corresponding degree of access management associated with it. Develop a roadway classification system that allows for an appropriate range of access depending on the intended function of each type of road system.

3. **Regulate the placement of new driveways**, including their location, number per block, and design. In situations where driveways already exist, work to consolidate them and update their design as redevelopment occurs.

4. **Consolidate parking lots and site developments** by incorporating connect in between individual parking lots through cross easement agreements as redevelopment occurs with internal circulation, reduced highway/arterial access, and access to side streets.

As the Brandon Area Planning District Development Plan already has some access management policies, portions of these strategies are already in existence.

Strategies 1 and 2 have already been initiated in previous studies and supplemented with this Road Network Development Plan. Section 4.0 of this document identifies the existing major roadway network within and around Brandon while Section 7.0 presents the planned/proposed major roadway network. The figures in these sections illustrate the location of routes (existing and proposed) where access management should be a priority, primarily along core and feeder highways and arterial streets.

Strategies 3 and 4 would require an update to the existing City of Brandon Design Standards and Guidelines and could include topics such as:

- Median openings on arterial roads would be limited to public street intersections and major adjacent developments where sufficient spacing exists to adjacent median openings to provide adequate storage lanes for turning traffic.

- Median openings that accommodate left turns would provide for sufficient storage to accommodate the forecast 95th percentile queue, with a minimum of 15 metres.

- All-directional intersections along urban arterial roads would ideally occur at intervals of no less than 200 metres (400 metres preferred), with traffic signals considered at every second intersection. Access to adjacent lands would ideally occur via the intersecting roads on arterial streets.

- The minimum distance between an approach and an intersecting urban roadway would be six metres, with 15 metres separation from rail rights-of-way, measured along the property line.

- The minimum distance between approaches on a collector or arterial roadway should be 50 metres (15 metres in residential areas) measured along the property line, with no approach closer than three metres from an adjoining property line.

- No internal aisles on adjacent development shall be allowed within six metres of the road right-of-way, with a minimum of 24 metres required for commercial uses greater than 3,000 square metres of building area.

- Exit approaches along divided major roadways shall be situated such that exiting traffic is able to enter the left turn lane at the end of the forecast 95th percentile queue.

- Joint use approaches will be provided whenever technically feasible to facilitate access management, with cross-access agreements between the adjacent property owners. Such cross-access agreements may not be voided without the written consent of the applicable road authority, the City of Brandon or MIT. The City of Brandon and MIT should encourage these types of agreements whenever practical.

The consultant team suggestions for modifications to the current parking standards are attached in Appendix G.

7.4.2 Provincial Access Management

MIT has an adopted access management process as part of the Transportation Planning Policy: TP 1/98, A Highway Functional Classification System for Rural Provincial Highways in Manitoba (attached in Appendix G). It defines various road classifications and functions, provides general design standards, and guidance on access and land use control.

The Province is currently in the midst of modifying its classifications system, with a shift to functional classifications based on economic sustainability criteria, as discussed elsewhere in this report. Suggesting changes to the Province's system is beyond the scope of this study.

Access management should be coordinated on the core routes that enter the City to ensure consistent treatment of access management requirements between the City and Provincial routes.

7.5 Traffic and Intersection Capacity

7.5.1 Traffic Impact Study Policy

The recommendation for developing a traffic impact study guideline for the City of Brandon is based on a need to assess the impacts of a new or changed development on the existing and proposed transportation system. This allows the road authority a mechanism to assess if off-site transportation modifications are needed, and who is responsible for the modifications. If the road authority is responsible for some of the works, it allows for the works to be progressed. A proposed Traffic Impact Study Guideline for the City of Brandon is included in Appendix D.

7.5.2 Traffic Calming Strategy

The following traffic calming strategies are recommended for the City of Brandon as they have low implementation costs, require little educational outreach, and modify traffic movements/driver behaviour in a way the City can effectively manage and plan. The strategies are methods that have been identified in the literature as being effective, low cost and easily manageable. Prior to implementing traffic calming measures, traffic engineering reviews should be undertaken to assess which traffic calming measures are needed to mitigate traffic issues identified by area residents. Additional detailed information with regards to traffic calming strategies may be found in Appendix E of this plan.

The following is a brief list of traffic calming measures that have proven to be effective in medium-sized cities and could be considered for future use in the City of Brandon:

- Volume control measures:
  - Partial closures and diagonal diverters on local streets.
  - Right-in/right-out islands and raised medians along collector streets.
- Speed control measures:
  - Speed tables on local residential streets; speed tables are longer (in the direction of travel) than speed humps, they can be used in combination with raised crosswalks and textured pavements for additional benefits while allowing for easier snow removal and driver manoeuvrability.
  - Bulb-outs/chokers and center island narrowing along local or collector streets; bulb-outs/chokers would be most appropriate on collector streets that permit on-street parking (the bulb-out would then occupy the parking lane and provide protection for parked vehicles) while the center island narrowing would be most appropriate on collector streets that do not permit parking and have one travel lane in each direction.

7.5.3 Roundabouts

The City has built two roundabouts and has been pleased with their operational performance, driver understanding, and public acceptance. The City should continue the use of roundabouts at any collector – collector intersection where they are technically feasible as an alternative to traffic signal control.

Roundabouts have been shown to reduce collisions at intersections where stop signs or signals were previously installed for traffic control. Roundabouts create a safer intersection for several reasons:

- Eliminating red light running – a roundabout is designed to allow for continuous traffic flow without requiring vehicles to stop, and thus eliminates the concern of drivers accelerating to make it through an amber or red light.

- Reduced potential of serious collisions – since vehicles travel in the same direction due to the circular design of roundabouts, head-on and intersection 90 collisions are eliminated.

- Reduced traffic speeds – vehicles must yield prior to entering a roundabout and thus are forced to slow down while traveling through the roundabout.

7.5.4 Traffic Signal Controls

It is recommended that a signal synchronization program be implemented to improve the efficiency of traffic flow within the study area. The traffic signal controls located along PTH 1, 1st Street, 18th Street, Victoria Avenue and Richmond Avenue are all under the jurisdiction of MIT. Currently, the loop of 1st Street, 18th Street, Richmond Avenue and Victoria Avenue, is controlled by a single traffic control coordination plan, which is approximately 10 years old. MIT hope to prepare an updated coordination plan in 2007. Some intersections are actuated, some are semi-actuated, and five have pedestrian buttons (Richmond Avenue at 6th and 13th Streets, Victoria Avenue at 8th, 9th, and 10th Streets). A number of intersections are not included in the coordination plan (18th Street at Aberdeen Avenue, Parker Boulevard, Kirkcaldy Drive, the Corral Centre, and PTH 1, PTH 1 at PTH 10 (18th Street), 1st Street at Kirkcaldy Drive and PTH 1).

The wide variety of control options, and a number of new signal installations in the last 10 years suggests that the planned new coordination plan is desirable. A number of older controllers without pedestrian actuation may result in more green time for certain phases than may otherwise be required to only accommodate vehicular traffic. Updated controllers should offer MIT greater flexibility in setting coordination plans and add vehicular capacity to the corridors in the plan. It is recognized that MIT is not in favour of additional pedestrian actuation due to additional user complaints regarding waiting for a “walk” signal indication, however, MIT recognizes the importance of accommodating all road users, especially in the diverse urban environment. Any concerns with inappropriate use or misunderstanding of designed operations by pedestrians must be mitigated through a continued education program.

It is recommended that updated turning movement traffic counts be collected at the MIT-controlled traffic signals and that the timing/phasing/coordination plans be updated. This may require updated controller units. Pedestrian actuation is recommended, especially on

routes without regular pedestrian activity, in order to maximize the green time available for the major route.

7.6 Future Roadway Needs

7.6.1 Intersections

The following intersections should be examined at the operational level to determine possible operational or geometric modifications. These locations would also be appropriate for a traffic count program every three to five years to update the LOS analysis to identify the timing for modifications. The intersections below are ranked as short-term, beyond short-term, and development-driven locations. City and MIT staff, on a year-to-year basis, would determine the exact timing for specific intersection reviews.

Intersections identified for review in the short-term include:

- 1st Street and Victoria Avenue,
- 1st Street and Lori Road (proposed access to Assiniboine Community College),
- 13th Street and Park Avenue,
- 17th Street East & Richmond Avenue,
- 18th Street and Cumberland Avenue (access to Monterey Estates),
- 18th Street and Maryland Avenue,
- 18th Street and Patricia Avenue,
- 34th Street and Victoria Avenue, and
- 34th Street and Richmond Avenue (planned for a possible roundabout).

Intersections identified for review beyond the short-term include:

- 1st Street and Veteran's Way,
- 1st Street and Richmond Avenue,
- 18th Street and Braecrest Drive,

- 18th Street and Kirkcaldy Drive,
- 18th Street and Park Avenue,
- Knowlton and Kirkcaldy Drive, and
- Richmond Avenue and PTH 110.

Intersections identified as being development-driven include:

- 1st Street and Clare Avenue, and
- 18th Street and Clare Avenue.

The relocation of the Assiniboine Community College occurred after completion of the study forecasts, however, a separate Traffic Impact Study has been carried out using the proposed guidelines included in this report. The results of that study should be consulted to identify potential intersection modifications to facilitate the development of the College on 1st Street.

7.6.2 Road Upgrades

The following road links are forecast to be near, at, or above, the available capacity by the Year 2026, based on assumed land use growth levels and patterns, or are links deemed important to address to accommodate truck activity:

- 1st Street, four lane divided (4LD) from PTH 1 to PTH 110,
- 18th Street, four lane divided (4LD) from PTH 1 to PTH 110,
- Park Avenue, 4th to 18th Streets intersection configurations,
- Richmond Avenue, 26th to 34th Streets as 4LD roadway,
- Victoria Avenue, 34th Street to west City limit as 4LD roadway,
- Eastern leg of PTH 110 (Brandon By-pass) from PR 457 to PTH 1,
- PTH 10, PTH 1 to PTH 16 as 4LD roadway,

- Clare Avenue, 1st to 18th Streets as a two lane collector (timing will be development-driven), and

- Maryland Avenue, 20th to 34th Streets as a two lane collector (timing will be development-driven).

Of these, the upgrade to a four lane divided facility is estimated to be required in the 10 to 15 year time frame for 18th Street, however, actual timing will be dependant on the rate of traffic growth. The upgrade to 18th Street is forecast to delay the need to upgrade 1st Street based on forecast redistribution of traffic to make use of the added capacity. However, this will need to be confirmed through the traffic monitoring program.

For year 2026 LOS without road improvements, other links are identified as being at LOS D or lower, however, these are likely due to local or collector links being used as a zone centroid.

7.7 Program Implementation Plan

Recommendations stemming from the results of this study are based on assumptions and priorities at the present time. Implementation of any recommendations should be based upon actual monitored traffic, budgetary considerations, growth patterns and infrastructure failure.

Many of the items discussed in this report are based on current traffic information and 20-year forecasts, which are in turn based on a number of assumptions. Actual trigger points should be based on traffic volumes and not points in time. As such, it is suggested that a routine traffic count program be undertaken at major intersections, especially traffic signal controlled locations, to determine if adjustments to signal phasing/timing is needed, or if geometric modifications are required. Counts every three to five years should suffice.

Accommodating safe and efficient pedestrian and cyclist movement addresses long term goals previously set out by the City and should reflect the City's Greenspace Master Plan prepared in 2002 (attached in Appendix H).

It is also recommended that collision data for the road network links and intersections be collected to identify areas and locations that can be addressed with informed policy decisions and program options to improve safety.

7.8 Recommended Upgrades

Recommended projects have been categorized, in Tables 7.1 and 7.2, by the six issues identified based on input received through the environmental scan, transportation planning model and consultation exercises. Each recommendation has been categorized to indicate which issues will be addressed by implementation of the project.

The prioritized recommendation list was based on the results of the environmental scan, traffic forecasts and level of service estimates, safety review, input from the consultation process (e.g., attendees of the final open house in April 2007 were asked to identify project timing, and comments from earlier consultation exercises also noted project priorities in some cases), and input from the Steering Committee.

Projects that are considered able to be undertaken within annual operating budgets, or with administrative policy change, are shown in Table 7.1. Table 7.2 includes specific recommendations for various locations and road links within the study area.

Table 7.1: Recommendations: Policies and Strategies

Recommendation	Alt. Trans.[1]	Safety	Route Class./ Goods Move.	Access Man.	Capacity	Roadway Needs
Truck/Dangerous Goods Route Changes		✓	✓		✓	✓
Traffic Calming Guidelines		✓				
Reassessment of Road Jurisdictions		✓	✓		✓	✓
Update Roadway Classifications		✓	✓		✓	✓
Traffic Impact Study Policy				✓	✓	✓
Access Management Strategy		✓		✓	✓	
Smart Growth Principles	✓			✓	✓	✓
Synchronization of traffic signals	✓			✓	✓	✓
Transit signal priority study/implementation	✓					
Extended hours of operation for Transit	✓					
Conceptual design of Western By-Pass			✓		✓	✓
Modifications to Parking Standards				✓		
Traffic count monitoring program		✓	✓	✓	✓	✓
Intersection reviews and upgrades *	✓	✓	✓	✓	✓	✓
Safety review project recommendations *	✓	✓	✓	✓	✓	

* Relates to investigative studies. The detailed studies may result in the identification of higher cost capital upgrade requirements.

[1] Table headings: Alt. Trans. = Alternate Transportation and Environmental Concerns; Route Class./ Goods Move. = Route Classification and Goods Movement; Access Man. = Access and Traffic Management.

Table 7.2: Recommendations: Road Link Upgrades and Improvements

Recommendation	Alt. Trans.[1]	Safety	Route Class./ Goods Move.	Access Man.	Capacity	Roadway Needs
18th Street (PTH 10): CPR Overpass (Daly)		✓			✓	✓
18th Street (PTH 10): Bridge Twinning at Assiniboine River (Thompson)			✓		✓	✓
Richmond Avenue: Roundabout at 34th Street		✓			✓	
PTH 1: Phase 1 – Service Roads		✓		✓	✓	✓
PTH 1: Phase 2 and 3 – Interchanges at 18th Street and 1st Street		✓	✓	✓	✓	✓
PTH 1A: CPR Underpass at Kemnay		✓	✓			✓
PTH 10: Forrest By-pass	✓	✓	✓	✓		✓
PTH 110: Eastern By-Pass Completion		✓	✓		✓	✓
Proposed Western By-pass		✓	✓		✓	✓
Upgrades to 4-lane Divided						
1st Street (PTH 1A): PTH 1 to Braecrest Drive		✓			✓	✓
1st Street (PTH 1A): Braecrest Drive to Kirkcaldy Drive		✓			✓	✓
1st Street (PTH 1A): Richmond Avenue to PTH 110					✓	✓
Victoria Avenue (PTH 1A): 34th Street to 50th Street		✓	✓	✓	✓	✓
Victoria Avenue (PTH 1A): 50th Street to Proposed Western By-pass			✓		✓	✓
18th Street (PTH 10): PTH 1 to Braecrest Drive		✓	✓	✓	✓	✓
18th Street (PTH 10): Braecrest Drive to Assiniboine River		✓	✓	✓	✓	✓
18th Street (PTH 10): Maryland Avenue to Patricia Avenue		✓	✓		✓	✓
18th Street (PTH 10): Patricia Avenue to PTH 110		✓	✓		✓	✓
Richmond Avenue: 26th Street to 34th Street			✓	✓	✓	✓
PTH 10: Brandon to PTH 25		✓	✓		✓	✓
PTH 10: PTH 25 to Minnedosa		✓	✓		✓	✓
PTH 10: PTH 110 to South Jct. PTH 2		✓	✓		✓	✓

[1] Table headings: Alt. Trans. = Alternate Transportation and Environmental Concerns; Route Class./ Goods Move. = Route Classification and Goods Movement; Access Man. = Access and Traffic Management.

7.9 Project Prioritization and Cost Estimates

Recommended projects have been categorized in Tables 7.3, 7.4 and 7.5 into short, mid and long-term planning horizons based on input received through the environmental scan, transportation planning model and consultation exercises. In addition, some projects have been identified as 'beyond horizon year' if they are expected to occur beyond the 20-year study horizon.

The prioritized recommendation list was based on the results of the environmental scan, traffic forecasts and level of service estimates, safety review, input from the consultation process (e.g., attendees of the final open house in April 2007 were asked to identify project timing, and comments from earlier consultation exercises also noted project priorities in some cases), and input from the Steering Committee.

Table 7.3 identifies projects that are considered 'lower cost', which can be undertaken within annual operating budgets, or with administrative policy changes. Tables 7.4 and 7.5 include higher cost items that require programming and budgeting in the capital budget process. Figure 7.4 offers a graphical representation of the recommended lower and major capital cost upgrades to the study area road network.

Three recommended projects are not categorized in this manner as they are 'development driven' based on future residential development in Brandon, and hence are not identified in Tables 7.3, 7.4 and 7.5. These include:

- Clare Avenue (1st Street to 18th Street),
- Maryland Avenue (26th Street to 34th Street), and
- Lark Street (Braecrest Drive to Clare Avenue).

These are links identified through the development review component of this study, but should not be considered as a definitive list of development-driven roadway projects that may occur in the future.

Preliminary class D cost estimates, shown in Table 7.3, 7.4 and 7.5, were prepared for the recommended road network upgrades. Preliminary cost estimates have been based on typical unit costs per metre of roadway, excluding land costs, taxes, utility relocations and engineering. It should be noted that costs are based on 2007 rates and are subject to change.

Many of the items recommended, such as changes in classifications, intersection modifications (determined as part of an operational review of the intersection), and updating of the traffic signal control coordination plans do not lend themselves to easily identifiable cost estimates, therefore a yearly allowance is identified.

It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental priorities and will be undertaken as and when funding permits.

Table 7.3: Prioritized Recommendations: Lower Cost Items

Recommendation[1]	Short-Term	Mid-Term	Long-Term	Beyond Horizon Year	Prelim. Cost Estimate[2]
Truck/Dangerous Goods Route Changes	✓	✓	✓	✓	OP/AD[3]
Update Roadway Classifications	✓	✓	✓	✓	OP/AD
Reassessment of Road Jurisdictions	✓			✓	OP/AD
Traffic Calming Guidelines	✓	✓	✓	✓	OP/AD
Traffic Impact Study Policy	✓	✓	✓	✓	OP/AD
Access Management Strategy	✓	✓	✓	✓	OP/AD
Smart Growth Principles	✓	✓	✓	✓	OP/AD
Synchronization of traffic signals	✓				$100,000
Transit signal priority study/implementation	✓				$100,000
Extended hours of operation for Transit	✓				$300,000/yr
Conceptual design of Western By-pass	✓				$200,000
Modifications to Parking Standards	✓				OP/AD
Traffic count monitoring program	✓	✓	✓	✓	$10,000/yr
Intersection reviews and upgrades *	✓	✓	✓	✓	As required
Safety review project recommendations *	✓	✓	✓	✓	As required

[1] It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental and City priorities and will be undertaken as and when funding permits.

[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.

[3] OP/AD indicates a project that can be undertaken with an operational budget or administrative policy change.

* Relates to investigative studies. The detailed studies may result in the identification of higher cost capital upgrade requirements.

Note: The above recommendations relate to Provincial roadways that are classed as Core routes, or roadways within the City of Brandon itself.

The first item is identified as an on-going item in that changes to the truck/dangerous goods routes is contingent on certain roadway upgrades/additions being completed.

Table 7.4: Prioritized Recommendations: Major Capital Upgrades

Recommendation[1, 2]	Short-Term (to 2012)	Mid-Term (to 2019)	Long-Term (to 2026)	Beyond Horizon Year
Urban Upgrades				
18th Street (PTH 10): Twin Structures at Assiniboine River (Thompson Bridge)	$17,000,000			
18th Street (PTH 10): CPR Overpass (Daly Overpass)			$20,000,000	
Richmond Avenue: Roundabout at 34th Street	$500,000			
Rural Upgrades				
PTH 1: Phase 1 – Service Roads	$5,000,000	$5,000,000		
PTH 1: Phase 2 – Interchange at 18th Street		$20,000,000	$20,000,000	
PTH 1: Phase 3 – Interchange at 1st Street			$15,000,000	$15,000,000
PTH 1A: CPR Underpass at Kemnay	$2,500,000	$2,500,000		
PTH 10: Forrest By-pass	$5,000,000			
PTH 110: Eastern By-pass Completion	$30,000,000			
Proposed Western By-pass				TBD [3]
Total	$60,000,000	$27,500,000	$55,000,000	TBD

[1] It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental and City priorities and will be undertaken as and when funding permits.

[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.

[3] TBD: To Be Determined

Note: The above recommendations relate to Provincial roadways that are classed as Core routes, or roadways within the City of Brandon itself.

The PTH 1 upgrade to an expressway standard is shown as three components, and as multi-term projects due to the total cost and the staging needs for implementation. In this case, the external service roads must be constructed prior to work proceeding on PTH 1 itself.

Further, although outside the 20-year scope of this study, the completion of the Western By-pass should be taken under consideration as a long-term road link upgrade to alleviate through truck traffic within Brandon. Therefore, the necessary accommodations for right-of-way protection/acquisition, environmental considerations and land use planning should be undertaken to prepare for this project.

Upgrades to 1st and 18th Streets between PTH 1 and the Assiniboine River are split into two components as the northern portion is tied to the planned upgrade to PTH 1.

Table 7.5: Prioritized Recommendations: Major Capital Twinning (4-lane Divided)

Recommendation[1, 2]	Short-Term (to 2012)	Mid-Term (to 2019)	Long-Term (to 2026)	Beyond Horizon Year
Urban Twinning (4-lane Divided)				
1st Street (PTH 1A): PTH 1 to Braecrest Drive			$5,000,000	
1st Street (PTH 1A): Braecrest Drive to Kirkcaldy Drive		$2,000,000		
1st Street (PTH 1A): Richmond Avenue to PTH 110			$4,000,000	
Victoria Avenue (PTH 1A): 34th Street to 50th Street		$3,000,000		
Victoria Avenue (PTH 1A): 50th Street to Western By-pass				TBD [3]
18th Street (PTH 10): PTH 1 to Braecrest Drive			$5,000,000	
18th Street (PTH 10): Braecrest Drive to Assiniboine River		$2,000,000		
18th Street (PTH 10): Maryland Avenue to Patricia Avenue	$3,000,000			
18th Street (PTH 10): Patricia Avenue to PTH 110			$3,000,000	
Richmond Avenue: 26th Street to 34th Street		$1,000,000		
Rural Twinning (4-lane Divided)				
PTH 10: Brandon to PTH 25	$25,000,000			
PTH 10: PTH 25 to Minnedosa			$40,000,000	
PTH 10: PTH 110 to South Jct. PTH 2		$40,000,000		
Total	$28,000,000	$48,000,000	$57,000,000	TBD

[1] It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources. As such, proposed projects will be considered in light of other Departmental and City priorities and will be undertaken as and when funding permits.

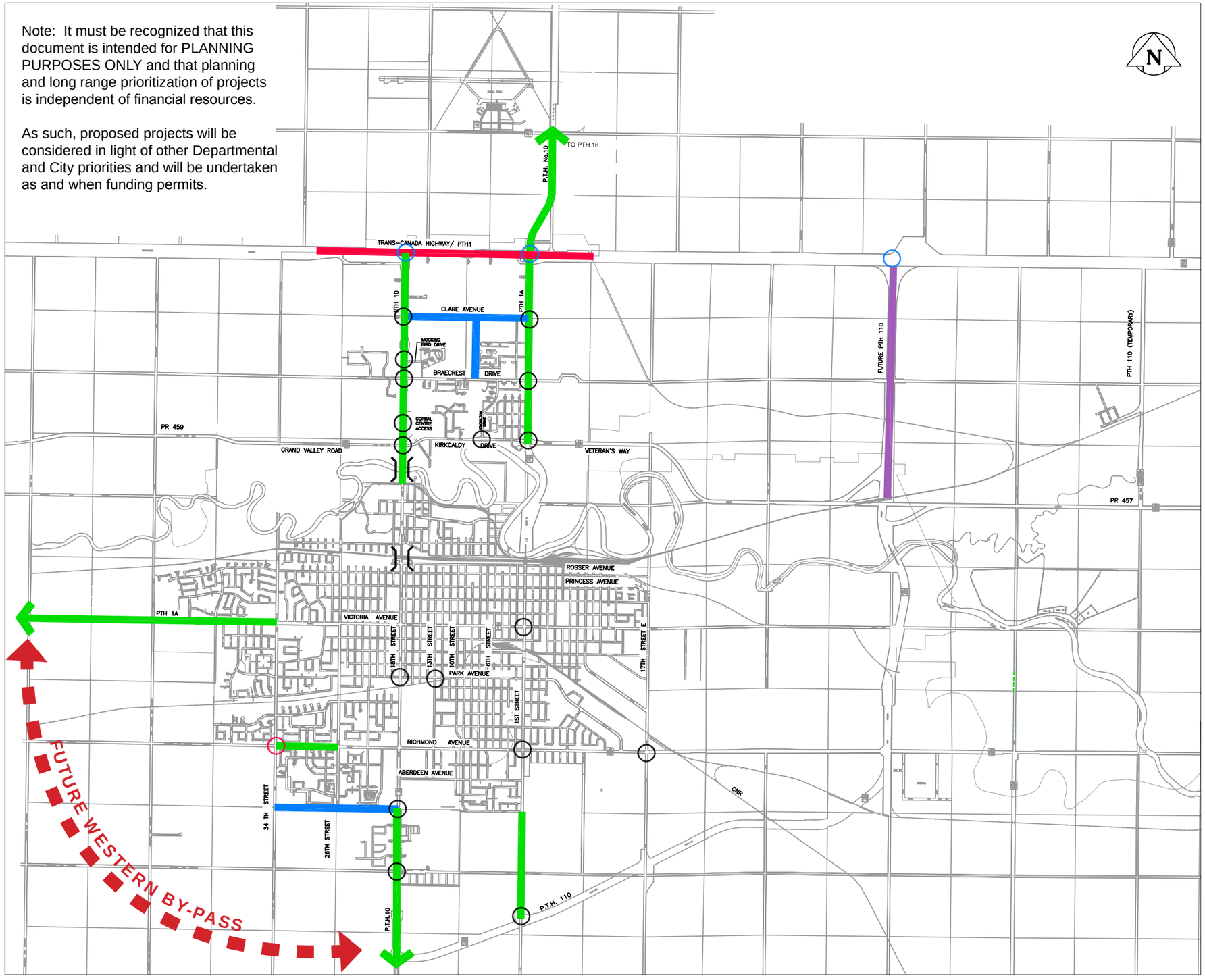
[2] Estimated costs in this table are based on 2006 dollars and were developed to be used as a parameter in the prioritization of the projects. These estimates will change in the future as a result of inflation and should not be used for future budgeting purposes.

[3] TBD: To Be Determined

Note: The above recommendations relate to Provincial roadways that are classed as Core routes, or roadways within the City of Brandon itself.

Note: It must be recognized that this document is intended for PLANNING PURPOSES ONLY and that planning and long range prioritization of projects is independent of financial resources.

As such, proposed projects will be considered in light of other Departmental and City priorities and will be undertaken as and when funding permits.



LEGEND

IDENTIFIED MAJOR IMPROVEMENT PROJECTS

- ONGOING INTERSECTION REVIEWS
- INTERCHANGE
- ROUNDABOUT
- TWIN BRIDGES
- UPGRADE TO 4 LANE DIVIDED
- UPGRADE TO EXPRESSWAY
- UPGRADE TO CORE ROUTE

DEVELOPMENT DRIVEN PROJECTS

- DEVELOPMENT REVIEW

Manitoba

CITY OF BRANDON MANITOBA

MMM GROUP

Source: City of Brandon

PROJECT TITLE

Brandon Area Road Network Development Plan

FIGURE 7.4:
RECOMMENDED UPGRADES

8.0 CONCLUSIONS

The following conclusions are offered:

1. That as the City address future transit service improvements, the measures noted in Section 7.1.1 are considered.

2. That the smart growth principles noted in Section 7.1.2 be incorporated when reviewing future development proposals.

3. That the City and MIT undertake the short-term safety initiatives identified in Section 7.2.1.

4. That the traffic calming strategy identified in Section 7.5.2 be considered when volume and/or speed control measures are deemed required.

5. That the City adopt changes to the City's Truck and Dangerous Goods Route Network identified in Section 7.3.

6. That the City adopts the access management guidelines set out in Section 7.4.

7. That modifications noted in Section 7.4.1 be incorporated into the City's current parking standards.

8. That the traffic impact study policy outlined in Section 7.5.1 and included in Appendix D be adopted by the City and applied to any future development applications.

9. That the City adopts the road classification system, and related design standards, in Section 7.3.

10. That the City and MIT conduct detailed operational reviews at the intersections noted in Section 7.6.1, selecting two to five intersections per year to examine.

11. That the City and MIT implement road link improvements as noted in Section 7.6.2.

12. That the alternative funding options discussed in Appendix E be examined in detail by City administration to determine if they are applicable. The funding options focus on incorporating off-site development improvements on a site-by-site basis, transportation assessments, and impact fees.

13. That a traffic count monitoring program be established to: monitor operations at key intersections that may need upgrades within the horizon year time frame; and review whether adjustments to traffic signal phasing or timing may be required.

14. That traffic control modifications planned by MIT occur within the next two years.

15. That roundabouts continue to be considered at collector – collector intersections if technically feasible as an alternative to traffic signals.

16. That the City ensures the traffic model is updated on a regular basis and maintained for future traffic recommendations.

9.0 REFERENCES

[1] Caliper Corporation, Travel Demand Modelling with TransCAD 4.8, 2005.

[2] Caliper Corporation, Travel Demand Modelling with TransCAD 4.8, 2005.

[3] Caliper Corporation, Travel Demand Modelling with TransCAD 4.8, 2005.

[4] Information on residential permit trends provided by the Brandon and Area Planning District, 2005.

[5] Brandon and Area Planning District Development Plan, Reference Maps 6a-6d "Residential Priority Infill Areas," 2005.

APPENDIX A

CONDITION ASSESSMENT

Brandon Road Condition Assessment - By Condition Rating

Street	Locations				PCR Rating	Comments
13th	Aberdeen	to	Richmond		57.5	
13th	Richmond	to	Brandon		55	
13th	Brandon	to	Park		55	
13th	Park	to	McTavish		57.5	
13th	McTavish	to	Victoria		60	
13th	Victoria Intersection				55	
13th	Victoria	to	Louise		60	
13th	Louise	to	Princess		57.5	
13th	Princess	to	Rosser		55	
13th	Rosser	to	Pacific		52.5	
17th Street East	PTH 110 (East Bypass)	to	Richmond		65	
17th Street East	Richmond	to	Douglas		62.5	
17th Street East	Douglas	to	Victoria Avenue East		52.5	
18th Street - Northbound	Douglas	to	PTH 110 (East Bypass) Intersection Treatment		80	
18th Street - Northbound	PTH 110 (East Bypass) Intersecti	to	Patricia		55	
18th Street - Northbound	Patricia	to	Maryland		60	
18th Street - Northbound	Maryland	to	Aberdeen		45	
18th Street - Northbound	Aberdeen Intersection				45	
18th Street - Northbound	Aberdeen	to	Richmond		45	
18th Street - Northbound	Richmond	to				
18th Street - Northbound	Richmond Intersection				45	
18th Street - Northbound	Richmond	to	Queens		45	
18th Street - Northbound	Queens	to	Brandon		60	
18th Street - Northbound	Brandon	to	Park		65	
18th Street - Northbound	Park	to	Victoria		70	
18th Street - Northbound	Victoria	to	Louise		55	
18th Street - Northbound	Louise	to	Lorne		50	
18th Street - Northbound	Lorne	to	Princess		55	
18th Street - Northbound	Princess	to	Rosser		55	
18th Street - Northbound	Rosser	to	18th Street Bridge		45	
18th Street - Northbound	18th Street Bridge				45	
18th Street - Northbound	18th Street Bridge	to	Parker		50	
18th Street - Northbound	Parker Intersection				45	
18th Street - Northbound	Parker	to	Hilton		50	
18th Street - Northbound	Hilton	to	Assiniboine River Bridge		60	
18th Street - Northbound	Assiniboine River Bridge					
18th Street - Northbound	Assiniboine River Bridge	to	Kircaldy		80	
18th Street - Northbound	Kircaldy	to	Braecrest		70	
18th Street - Northbound	Braecrest	to	PTH 1 (Trans Canada Highway)		70	
18th Street - Southbound	PTH 1 (Trans Canada Highway)	to	2/3 mile south		60	
18th Street - Southbound	2/3 mile south	to	Braecrest		80	new pavement
18th Street - Southbound	Braecrest	to	Kircaldy		77.5	
18th Street - Southbound	Kircaldy	to	Assiniboine River Bridge		75	
18th Street - Southbound	Assiniboine River Bridge				60	
18th Street - Southbound	Assiniboine River Bridge	to	18th Street Bridge		57.5	
18th Street - Southbound	18th Street Bridge				55	
18th Street - Southbound	18th Street Bridge	to	Rosser		55	
18th Street - Southbound	Rosser	to	Princess		50	
18th Street - Southbound	Princess	to	Louise		50	
18th Street - Southbound	Louise	to	Victoria		45	
18th Street - Southbound	Victoria	to	McTavish		60	
18th Street - Southbound	McTavish	to	Park		70	
18th Street - Southbound	Park	to	Brandon		60	
18th Street - Southbound	Brandon	to	Queens		60	
18th Street - Southbound	Queens	to	Richmond		45	
18th Street - Southbound	Richmond Intersection				45	
18th Street - Southbound	Richmond	to	Aberdeen		45	
18th Street - Southbound	Aberdeen	to	Maryland		45	
18th Street - Southbound	Maryland	to	Patricia		52.5	
18th Street - Southbound	Patricia	to	PTH 110 (East Bypass) Intersection Treatment		55	
18th Street - Southbound	PTH 110 (East Bypass) Intersecti	to	PTH 110 (East Bypass)		70	
19th	Hilton	to	McDonald		57.5	
1st Street - Northbound	PTH 110	to	Patricia			
1st Street - Northbound	Patricia	to	Maryland			
1st Street - Northbound	Maryland	to	Aberdeen			
1st Street - Northbound	Aberdeen	to	Richmond			
1st Street - Northbound	Richmond	to	Madison	4-lane divided	55	curbs good
1st Street - Northbound	Madison	to	Park	4-lane divided	50	
1st Street - Northbound	Park	to	McTavish	4-lane divided	50	
1st Street - Northbound	McTavish	to	Victoria	4-lane divided		
1st Street - Northbound	Victoria	to	Princess	4-lane divided	67.5	
1st Street - Northbound	Princess	to	Rosser	4-lane divided		
1st Street - Northbound	Rosser	to	Pacific	4-lane divided		
1st Street - Northbound	Pacific	to	1st Street Bridge			
1st Street - Northbound	1st Street Bridge	to			55	
1st Street - Northbound	1st Street Bridge	to	roadway curves	4-lane divided	60	pavement around curves 5.25
1st Street - Northbound	roadway curves	to			52.5	
1st Street - Northbound	roadway curves	to	Kircaldy		52.5	
1st Street - Northbound	Kircaldy	to	Braecrest		52.5	
1st Street - Northbound	Braecrest	to	Highways Approach		60	
1st Street - Northbound	Highways Approach	to	PTH 1 (Trans Canada Highway)		55	
1st Street - Southbound	PTH 1 (Trans Canada Highway)	to	Braecrest	2-lane	57.5	smooth, but broken
1st Street - Southbound	Braecrest	to	Kirclady	2-lane	57.5	smooth, but broken
1st Street - Southbound	Kirclady	to	1st Street Bridge	4-lane divided	62.5	
1st Street - Southbound	1st Street Bridge			4-lane divided	55	
1st Street - Southbound	1st Street Bridge	to	Rosser	4-lane divided	57.5	
1st Street - Southbound	Rosser	to	Princess	4-lane divided	57.5	
1st Street - Southbound	Princess	to	Victoria	4-lane divided	60	
1st Street - Southbound	Victoria	to	McTavish	4-lane divided	40	
1st Street - Southbound	McTavish Intersection				40	
1st Street - Southbound	McTavish	to	Park	4-lane divided	47.5	
1st Street - Southbound	Park	to	Richmond	4-lane divided	50	curbs good
1st Street - Southbound	Richmond Intersection				50	
1st Street - Southbound	Richmond	to	Aberdeen	2-lane	70	
1st Street - Southbound	Aberdeen	to	Maryland	2-lane	70	
1st Street - Southbound	Maryland	to	Patricia	2-lane	80	
1st Street - Southbound	Patricia	to	PTH 110 (East Bypass)	2-lane	50	gravel
20th Street	Richmond	to	Ottawa		60	
20th Street	Ottawa	to	Maryland		57.5	
22nd	Heron	to	Ottawa		62.5	
22nd	Ottawa	to	Richmond		60	
22nd	Richmond	to	Queens		60	

Brandon Road Condition Assessment - By Condition Rating

Street	Locations			PCR Rating	Comments
22nd	Queens	to	Brandon	57.5	
26th Street - Northbound	4-lane Transition	to	Ottawa	50	
26th Street - Northbound	Ottawa	to	Richmond	55	
26th Street - Northbound	Richmond	to	Violet	55	
26th Street - Northbound	Violet	to	Brandon	55	curbs damaged
26th Street - Northbound	Brandon	to	Park	60	
26th Street - Northbound	Park	to	Van Horne	70	
26th Street - Northbound	Van Horne	to	Victoria	65	
26th Street - Northbound	Victoria	to	Princess	67.5	
26th Street - Northbound	Princess	to	Rosser	67.5	
26th Street - Northbound	Rosser	to	4-lane Transition		
26th Street - Southbound	McDonald	to	Pacific	60	
26th Street - Southbound	Pacific Intersection			50	
26th Street - Southbound	Pacific	to	Rosser	55	
26th Street - Southbound	Rosser	to	Princess	60	
26th Street - Southbound	Princess	to	Lorne	60	
26th Street - Southbound	Lorne	to	Victoria	65	
26th Street - Southbound	Victoria Intersection			55	
26th Street - Southbound	Victoria	to	Van Horne	60	
26th Street - Southbound	Van Horne	to	Park	55	
26th Street - Southbound	Park	to	Brandon	55	
26th Street - Southbound	Brandon	to	Violet	55	
26th Street - Southbound	Violet	to	Richmond	50	
26th Street - Southbound	Richmond	to	4-lane Transition	50	
26th Street - Southbound	4-lane Transition	to	Durum	45	
26th Street - Southbound	Durum	to	Maryland	50	
34th Street - Southbound	Pacific	to	Rosser	57.5	
34th Street - Southbound	Rosser	to	Victoria	65	
34th Street - Southbound	Victoria Intersection			50	
34th Street - Southbound	Victoria	to	Van Horne	55	
34th Street - Southbound	Van Horne	to	McDiarmid	60	
34th Street - Southbound	McDiarmid	to	Park	57.5	
34th Street - Southbound	Park	to	2-lane Transition	57.5	
34th Street - Southbound	2-lane Transition	to	Willowdale	57.5	
34th Street - Southbound	Willowdale Traffic Circle			70	
34th Street - Southbound	Willowdale	to	Richmond	57.5	
34th Street - Southbound	Richmond	to	Aberdeen	60	no shoulders
34th Street - Southbound	Aberdeen	to	200 m south	60	
34th Street - Southbound	200 m south	to	Particia	50	
65th Street East	Richmond	to	1 mile south of Richmond	57.5	
65th Street East	1 mile south of Richmond	to	Pavement End	70	
6th	Pacific	to	Rosser	60	
6th	Rosser	to	Princess	60	
6th	Princess	to	Victoria	60	
6th	Victoria Intersection			57.5	
6th	Victoria	to	Van Horne	57.5	
6th	Van Horne	to	Park	52.5	
6th	Park	to	Brandon	55	
6th	Brandon	to	Brock	60	
6th	Brock Intersection			55	
6th	Brock	to	Richmond	60	
6th	Richmond Intersection			55	
6th	Richmond	to	Aberdeen	60	
8th	8th Street Bridge			50	
8th	Stickney	to	Parker	60	
9th	McLeod	to	Aberdeen	57.5	
9th	Aberdeen	to	Richmond	60	pavement blowout 100m south of Richmond
9th	Richmond	to	Queens	62.5	
9th	Queens	to	Brandon	60	
9th	Brandon	to	Park	60	
9th	Park	to	McTavish	60	
9th	McTavish	to	Victoria	67.5	
9th	Victoria	to	Princess	65	
9th	Princess Intersection			55	
9th	Princess	to	Rosser	57.5	
9th	Rosser	to	Pacific	57.5	
Aberdeen	1st	to	9th	60	
Aberdeen	9th	to	18th	65	
Braecrest	1st	to	Knowlton	60	
Braecrest	Knowlton	to	18th	57.5	
Brandon Avenue	26th Intersection			57.5	
Brandon Avenue	26th	to	18th	57.5	
Centennial	34th	to	Fotheringham	55	
Centennial	Fotheringham	to	Governors	55	
Douglas	Rosser	to	Princess	50	
Douglas	Princess	to	Victoria Avenue East	50	
Douglas	Victoria Avenue East	to	Van Horne	55	
Douglas	Van Horne	to	17th Street East	57.5	alligator cracking
Durum	26th	to	Marquis	57.5	
Durum	Marquis	to	Aberdeen	57.5	
Durum	Aberdeen	to	Parkdale	57.5	
Elderwood	Richmond	to	Queens	55	
Elderwood	Queens	to	Driftwood	45	
Elderwood	Driftwood	to	Park	52.5	
Fotheringham	Victoria	to	Rosser	67.5	
Hilton	18th Intersection			50	
Hilton	18th	to	19th	55	
Kircaldy	1st Intersection			45	
Kircaldy	1st	to	18th	57.5	
Knowlton	Braecrest	to	Kircaldy	55	
Maryland	1st	to	McLeod	57.5	
Maryland	McLeod	to	9th	55	
Murray (50th)	Patricia	to	200 m North of Patricia	40	gravel
Murray (50th)	200 m North of Patricia	to	200 m South of Richmond	55	gravel
Murray (50th)	200 m South of Richmond	to	200 m North of Richmond	40	gravel
Murray (50th)	200 m North of Richmond	to	PTH 1A (Victoria)	45	gravel
Pacific	6th	to	9th	55	
Pacific	13th	to	18th	60	
Pacific	26th	to	Westscott	60	
Pacific	Westscott	to	34th	55	
Park Avenue	Richmond Intersection			40	
Park Avenue	Richmond	to	Frederick	57.5	

Brandon Road Condition Assessment - By Condition Rating

Street	Locations			PCR Rating	Comments
Park Avenue	Frederick	to	1st	55	
Park Avenue	1st Intersection			55	
Park Avenue	1st	to	6th	55	
Park Avenue	6th Interection			60	
Park Avenue	6th	to	10th	60	
Park Avenue	10th	to	13th	50	
Park Avenue	13th Intersection			45	
Park Avenue	13th	to	18th	60	
Park Avenue	18th Intersection			60	
Park Avenue	18th	to	26th	60	
Park Avenue	26th Intersection			45	
Park Avenue	26th	to	34th	52.5	
Park Avenue	34th Intersection	to		50	
Park Avenue	34th	to	Waverley	57.5	
Parkdale	Durum	to	26th	57.5	
Parker	8th	to	18th	55	
Patricia	34th	to	1/2 mile west	70	gravel
Patricia	1/2 mile west	to	Murray (50th)	40	gravel
Patricia	18th	to	Strathcona	65	
Patricia	Strathcona	to	1st	47.5	AST
PR 457	PTH 110 (East Bypass)	to	1st	57.5	
Princess	13th Street East	to	Douglas	50	
Princess	Douglas	to	1st	55	
Princess	1st Intersection			45	
Princess	1st	to	6th	60	
Princess	6th	to	9th	57.5	
Princess	9th	to	10th	57.5	
Princess	10th	to	13th	60	
Princess	13th	to	15th	55	
Princess	15th	to	18th	60	
Princess	18th Intersection			55	
Princess	18th	to	26th	57.5	
Princess	26th	to	Whillier	57.5	
PTH 110 (East Bypass)	Richmond	to	33rd Street East	72.5	
PTH 110 (East Bypass)	33rd Street	to	17th Street East	75	
PTH 110 (East Bypass)	1st	to	18th	77.5	
PTH 110 (East Bypass)	Richmond	to	1st	75	
PTH 110 (East Bypass)	Victoria	to	Richmond	75	
PTH 110 (East Bypass)	Assiniboine River Bridge	to	Victoria	75	
PTH 110 (East Bypass)	Assiniboine River Bridge	to		65	
PTH 110 (East Bypass)	PR 457	to	Assiniboine River Bridge	75	
Queens	Elderwood	to	1st	57.5	
Queens	1st Intersection			45	
Queens	1st	to	3rd	55	
Queens	3rd	to	6th	57.5	
Queens	6th	to	10th	55	
Queens	10th Intersection			45	
Queens	10th	to	13th	55	
Regent	Governors	to	Fotheringham	60	
Richmond - Eastbound	50th	to	1/2 mile west	60	gravel
Richmond - Eastbound	1/2 mile west	to	Mailboxes	80	
Richmond - Eastbound	Mailboxes			35	pavement blowout
Richmond - Eastbound	Mailboxes	to	Wankling	70	pavement blowouts 3.5
Richmond - Eastbound	Wankling	to	34th	65	
Richmond - Eastbound	34th	to	26th	60	
Richmond - Eastbound	26th	to	18th	57.5	
Richmond - Eastbound	18th intersection	to		50	
Richmond - Eastbound	18th	to	13th	55	
Richmond - Eastbound	13th	to	9th	52.5	
Richmond - Eastbound	9th	to	6th	55	
Richmond - Eastbound	6th	to	1st	55	
Richmond - Eastbound	1st	to	Percy	52.5	
Richmond - Eastbound	Percy	to	17th Street East	50	
Richmond - Eastbound	17th Street East	to	1 mile east of 17th Street East	60	
Richmond - Eastbound	1 mile east of 17th Street East	to	PTH 110 (East Bypass)	55	
Rosser	Rosser	to	34th	57.5	
Rosser	34th	to	Whillier	57.5	
Rosser	Whillier	to	30th	60	
Rosser	30th	to	McDiarmid	50	
Rosser	McDiarmid	to	26th	60	
Rosser	26th Intersection			60	
Rosser	26th	to	18th	60	
Rosser	18th	to	11th	60	
Rosser	11th	to	6th	65	
Rosser	6th	to	1st	60	
Rosser	1st Intersection			50	
Rosser	1st	to	Douglas	55	
Rosser	Douglas	to	13th Street East	55	
Silverbirch	Willowdale West Junction	to	Linden	62.5	
Silverbirch	Linden	to	Willowdale East Junction	57.5	
Stickney	8th	to	18th	57.5	
Victoria - Eastbound	Murray (50th)	to	34th	60	
Victoria - Eastbound	34th	to	Whillier	55	
Victoria - Eastbound	Whillier	to	26th	50	
Victoria - Eastbound	26th	to	21st	55	
Victoria - Eastbound	21st Intersection			50	
Victoria - Eastbound	21st	to	18th	60	
Victoria - Eastbound	18th	to	15th	60	
Victoria - Eastbound	15th	to	13th	55	
Victoria - Eastbound	13th	to	9th	50	
Victoria - Eastbound	9th	to	1st	55	
Victoria - Eastbound	1st	to	Douglas	57.5	
Victoria - Eastbound	Douglas	to	17th Street East	57.5	
Victoria - Eastbound	17th Street East	to	33rd Street East	75	
Victoria - Eastbound	33rd Street East	to	PTH 110 (East Bypass)	77.5	
Victoria - Westbound	PTH 110 (East Bypass)	to	33rd Street East	77.5	
Victoria - Westbound	33rd Street East	to	17th Street East	77.5	
Victoria - Westbound	17th Street East	to	Douglas	55	
Victoria - Westbound	Douglas	to	1st Street	60	
Victoria - Westbound	1st Street	to	9th	55	
Victoria - Westbound	9th	to	10th	60	
Victoria - Westbound	10th	to	13th	55	

Brandon Road Condition Assessment - By Condition Rating

Street	Locations			PCR Rating	Comments
Victoria - Westbound	13th Intersection			50	
Victoria - Westbound	13th	to	18th	60	
Victoria - Westbound	18th	to	26th	55	
Victoria - Westbound	26th	to	Whillier	55	
Victoria - Westbound	Whillier	to	34th	55	
Victoria - Westbound	34th Intersection			50	
Whillier	Rosser	to	Whitehead	57.5	
Whillier	Whitehead	to	Noonan	55	
Whillier	Noonan	to	Victoria	57.5	
Willowdale	Winter	to	34th	57.5	
Willowdale	34th Traffic Circle			70	
Willowdale	34th	to	Ashgrove	65	
Willowdale	Ashgrove	to	Silverbirch	55	
Willowdale	Silverbirch	to	26th	62.5	

APPENDIX B

PUBLIC CONSULTATION

Brandon Area Road Network Development Plan Study

Public Open House – June 22, 2005

Comment Sheet

Comments in brackets (not in bold or italics) **have been added by the consultant team.**

1. Where do you live?

City of Brandon **x** Neighbouring Municipality (please specify) _____
Other (please specify) _____

2. Please indicate what you consider the main transportation issues within the City of Brandon (e.g. traffic volume, access problems, noise, pedestrian accommodation, cyclist accommodation, safety, environmental issues, parking, public transportation, barrier-free accessibility, intersections, speed, goods movement etc.) both now and in the future.

- ***Traffic volume on 18th St. North. 18th needs to be twinned from Rosser Ave. to Trans Canada.***
- ***Increased traffic volume on major arteries, 18th and Richmond***
- ***Traffic volume***
- ***There is a lot of congestion along the 18th St, Arterial Roadway. There should be some more public transit along this artery, to create a long term solution and time traffic lights in sequence***
- ***Traffic volume, good movement and 18th Street, Vic and Richmond Ave good movement 18th Street North***
- ***Scooter issues, sidewalks rough, cut-ins in front of McDonalds on Richmond Ave, not close enough to light button***

3. Are there particular locations within the City of Brandon that you consider as having transportation issues?

- ***Traffic route on Kirkcaldy Dr. should be eliminated***
- ***No traffic control on Richmond East past 1st St.***
- ***18th Richmond, 1st Richmond, 17th Richmond***
- ***Aberdeen Ave, 18th Street, Victoria Ave(West), Kirkcaldy Dr. Downtown streets and roads need to be sequenced. Make public transportation a priority!***
- ***Intersection Kirkcadly, Braecrest Drive to 18th.***
- ***Intersection 18th and Richmond. Pedestrians walking across no lines on road to direct them.***

4. Please indicate what you consider the main transportation issues are outside of the City of Brandon (within 60 km) (e.g. traffic volume, access problems, noise, pedestrian accommodation, cyclist accommodation, safety, environmental issues, barrier-free accessibility, intersections, speed, goods movement , etc.) both now and in the future.

- ***Intersection at Hwy 468 & 457 is not safe as it exists for truck traffic to 110 as it does not allow trucks to stay in proper lane to turn west, forcing them into eastbound lane and oncoming traffic.***
- ***Heavy commuter traffic mixing with traffic destined for home along 1A West of Brandon to Kenny*** (Kenry)
- ***Air service***
- ***To and from Shilo during commute times, and to and from Maple Leaf Foods Plant along Victoria Ave and Richmond Ave.***
- ***Routing of 110 though 457 towards Trans Canada. Traffic volume, access and intersections***
- ***Quality of roads (pavement and gravel), sidewalks need work between Queens and Richmond*** (18th Street)

5. Are there particular locations outside the City of Brandon (within 60 km) that you consider as having transportation issues?

- ***#1 and Austin Intersection*** (outside the study area)
- ***To and from Shilo and Maple Leaf***
- ***See above. Paving of Highway 340 south of Shilo towards Wawanesa***
- ***Austin Intersection dangerous – lots of accidents*** (outside the study area)
- ***4-lane Highway #10 from Brandon to Riding Mountain Park***

6. Do you have any additional comments? (Please feel free to use the back of the sheet)

- ***Lack of turning lanes in the median on 18th St Northbound, turning into McTavish west of 18th***
- ***Glad to see long range planning – 1) 18th St. 2) Building completion of eastern access***
- ***More investment in common sense solutions that are made for long term sustainability (more transit investment, sensible development).***
- ***Use of censored lights*** (provide vehicle detection sensors to provide traffic responsive signal timings)***, make better than automobile, free up traffic on 18th St.***
- ***Extra lanes – could be used on 18th St. to accommodate traffic, also on North Hill area (18th St. bridge)***
- ***Sequencing – Make traffic lights in sequence, have them censored*** (provide vehicle detection sensors to provide traffic responsive signal timings) ***and have an "on demand system". Keep lights off at night to keep flow of traffic constant. Make it so the travel down 18th St. downtown is as bottleneck free as possible.***
- ***Look at rural roads – do something about Victoria Ave. E., and Richmond Ave. E, to make flow better and less at one time. These routes will grow with more congestion as Industrial area grows***
- ***Shilo route may pose and problem in the future***
- ***Pave Hwy#270 from Hwy#25 to Rapid City. This would bring the trucks off Hwy#10***

Optional:
Name: _____
Address: _____
Telephone #: _____
Email: _____

Refer to Sign up sheet for names and addresses
If you wish to return this survey by mail or fax, please send completed sheet no later than June 29, 2005 to:

ND LEA Engineers & Planners Inc.
Suite 111-93 Lombard Avenue
Winnipeg MB, R3B 3B1
Tel:(204)-943-3178 Fax:(204)-943-4948
www.ndlea.com

October 2005 Workshop Results: Working/Not Working Well

Issues	Working Well	Not Working Well
Efficiency	Traffic Circles (4)	Lack of 4 laning (18th)
	18th & 1st Work well (except two bottlenecks on 18th)	Lack of signal synchronization (4)
	On-Demand left turn signals (2)	Turn signals to Keystone
	1st Street cross section	Flow through traffic (trucks) in Souris
	Traffic Calming - channelization	4-way stops
	Victoria/18th (2)	Rosser & Princess 1 way street system for visitors to Brandon
	Richmond Between 18th & 26th	Truck turning & movements, design does not allow turning
	Twinning of #1 (2)	Brandon as regional health centre need ambulance access
	PTH 110 Bypass (3)	#10 North & funneling of traffic from #1
		Eastern access
		Downtown one-way streets need to be discussed
Safety	Advanced warning signals (2)	Lack of sufficient turning radii
	Signing of City streets (2)	Lack of advanced warning signals
	Eastern access (takes dangerous goods off Richmond)	Traffic on Low Road - Dangerous Goods interference (2)
		Piling snow in the medians
		34th St. @ Victoria pedestrian and traffic conflict due to geometry.
		34th & Rosser pedestrian and traffic conflict due to geometry
		1st and Victoria pedestrian and traffic conflict due to geometry especially for seniors
		Truck routes not working (big trucks in 1st street and Richmond)
		Movement of farm machinery
		Hwy#10 dangerous at #2 and #16
Environment	Transit system is adequate	
		No using alternative fuels for buses
Condition of Roads	Design of pavement (base etc.)	Lack of funding (2)
	18th -26th (nice X-Section)	Lack of shoulders on some highways
		Delays due to construction
		Too much patching, not enough paving especially the highways

Issues	Working Well	Not Working Well
Traffic and Intersection Capacity	18th Bridges River and Railway	**18TH Street**
	18th Street/ 1st street operations (except bottleneck)	- Bridges (design, congestion, safety etc) (7)
	Turning lanes on highways	- Access and access management (3)
	Keep #1 as is, on location with 2 interchanges	- Congestion
	18th & Victoria merge lanes	- Truck Traffic
	On Demand left turn signals	- Safety
		18th St. N. at Monterey Estates
		18th St. @ cemetery design
		18th (Rosser- Kirkaldy)
		Heavy traffic volumes (generally)
		Road from Douglas to CFB Shilo too restricted
		Lack of passing lane on PTH 10
		Truck traffic in City
		Lack of 4 laning
		Incomplete Eastern access - trucks in town
		Lack of passing lanes
		Longer turning lanes
		Larger radius
		Further length of AAW lights
		Willowdale at Ashgrove Blvd. Design
		Truck access to MidWest plant at Carberry
Alternative Transportation	Transit (2)	Bus service to Monterey Estates (2)
	Path System (4)	Rural Pedestrian crossing (e.g., Forrest, Elgin)
	Yield to Bus lanes on 18th	Busses are empty, more circulous routes are needed
		Bike paths are only usable for 6 months of the year
		Walking downtown works but is prohibitive for longer trips
		Non protected pedestrian crossing on highways (Forest) created a safety issue
Other	Consultation Process	Predictability Re: Future row plans (e.g., Business)
	Keep up the good snow removal service	
		Route Signing
		Under funding

Proposed Actions and Solutions

Solution or Action	Efficiency	Safety	Environment	Condition of Roads	Traffic and Intersection Capacity	Alternative Transportation	Other
Keep monitoring traffic/conducting traffic studies	✔				✔		
Synchronize signal lights and use current technologies (4)	✔		✔				
Stop putting in four-way stops	✔				✔		
Install lights at 18th and Monterrey Estates	✔	✔			✔		
Install traffic signals at Queens, Kirkcaldy and 18th	✔	✔			✔		
Construct #110 West (6)	✔	✔			✔		
Complete #110 East (7)	✔	✔			✔		
Widen passing lanes on Low Road to Shilo				✔	✔		
Upgrade 340 from Douglas to Shilo				✔	✔		
Pave 340 from Shilo to Wawanesa (2)				✔			
18th Street							
Re-direct traffic to 1st from 18th					✔		
Eliminate trucks on 18th St. North		✔		✔	✔		
Stop access to 18th from commercial developments	✔				✔		
Re-construct 18th Street	✔			✔	✔		
Widen 18th Street bridges	✔				✔		
Widen 18th Street	✔				✔		
Establish an access management plan for 18th St.	✔				✔		
Prevent trucks from using 18th (enforce by-law)		✔		✔	✔		
Keep 18th N. service roads	✔				✔		
Establish a 3rd crossing for the Assiniboine River							

Solution or Action	Efficiency	Safety	Environment	Condition of Roads	Traffic and Intersection Capacity	Alternative Transportation	Other
Install longer turning lanes					✔		
Design Hwys #5/#1 for truck turning to Midwest Plant at Carberry (3)		✔			✔		
Outlaw distractions such as cell phones		✔					
Establish a road safety coalition with highways, police, city, MPI and hospitals		✔					
Establish programs to improve driving skills		✔					
Establish regulations for dangerous goods routes		✔	✔				
Construct overpasses to prevent idling	✔		✔				
Establish vehicle emission inspections			✔				
Ensure livestock trucks stay on routes and clean trucks before leaving livestock yards (enforce regulations) (2)			✔	✔			
Start fixing and/or widening bridges		✔		✔			
Improve Low Road to Shilo (truck traffic, widen roads to accommodate heavy loads)		✔		✔			
Stop landscaping islands on major streets		✔					✔
Financial							
Establish more local improvement levies to finance further road construction				✔			
Ensure better road maintenance and enhancement				✔			
Establish increased highway funding and better funding allocation				✔			
Initiate more public discussions regarding costs							✔
Provide more funding				✔			
Establish a better maintenance schedule				✔			
Ensure gasoline tax is directed to road upgrades / repairs				✔			
Direct mining royalties to road system				✔			
Continue to spend wisely considering limited funding							✔
Stop under funding: think big to attract economic development							✔

Solution or Action	Efficiency	Safety	Environment	Condition of Roads	Traffic and Intersection Capacity	Alternative Transportation	Other
Planning							
Establish a better asset management program for streets				✔			
Keep communicating with stakeholders and the public							✔
Stop consultation because problems & solutions have been identified							✔
Stop temporary patch projects with design (i.e., small projects) and do large overall complete project				✔			
Stop looking at individual issues and incorporate overall planning and stick to it							✔
Ensure city / province acquire ROW's identified in plans (do not prevent owners from developing with no timeline)							✔
Begin acquiring ROW's once plan is adopted							✔
Establish a long term strategy with a vision							✔
Follow the development plan and not deviate to create traffic problems							✔
Maintain good preliminary planning (leading to things like traffic calming / channeling)					✔		
Change Richmond & 9th from timer light to trip	✔				✔		
Stop having straight signaled intersections (i.e., 13th & Victoria)	✔				✔		
Do not do northern Brandon corridor							✔
Install warning for amber light at signal		✔					
Stop creating mid-block pedestrian corridors		✔				✔	
Utilize smaller buses			✔			✔	
Recognize the needs and importance of the taxi industry						✔	
Keep paths and expand them						✔	
Establish more bike paths, incorporate lanes into bike path system						✔	
Establish rapid rail to Shilo						✔	
Stop portable signs restricting vision and distractions to drivers.		✔					

Solution or Action	Efficiency	Safety	Environment	Condition of Roads	Traffic and Intersection Capacity	Alternative Transportation	Other
Ensure information signs are up to date and current (the more info the better)							✔
Maintain traffic calming measures	✔	✔			✔		
Ensure current technologies for signal phasing and traffic lights are used	✔		✔				
Keep truck traffic segregated from central city areas (i.e., Residential)		✔		✔			
Keep consulting on cycle/ walk paths in the City						✔	
Use railway instead of truck movements	✔					✔	
4 lane #1- #110 on both bridges	✔				✔		
Consider St. Lazare potash mine re: transportation issues to US							✔
Ensure business can continue in areas of future ROW's							✔
Keep twinning #1 (2)					✔		
Twin #10 Nesbit to Minnedosa to accommodate Health Services for outside of Brandon					✔		
Stop being reactive with infrastructure. Don't wait for problems to occur.				✔			✔
Research what other jurisdictions are doing							✔
Encourage use of alternate modes by incorporating community partners (environmentally sustainable)			✔			✔	
Continue to keep public safety in mind		✔					
Continue using high standard of construction materials/				✔			
Research & develop new construction techniques				✔			✔
Eliminate meter parking downtown							✔
Stop changing bus routes and circulation times						✔	
Install no parking signs on north side of Aberdeen							✔
Install 3-way stop at Aberdeen and 3rd		✔					✔
Eliminate buses on 3rd Street South		✔		✔			✔
Eliminate through traffic on Brock					✔		✔

Topic Area	Comment	Proposed Action
Alternative Transportation	Sidewalk maintenance in winter creates safety issues and discourages walking	Reduce HandiTransit advance booking time
	Smaller city with manageable traffic, only difficulty in downtown	Increase transit opportunity hours of day/hours of week
	Empty buses on regular routes	Ensure access for disabled on Transit buses (low floor kneeling buses) 2
	HandiTransit requires 24h advanced booking	
	Pedestrian crosswalk signals are too short	Provide pick up/drop off locations for taxis (e.g., Clinic, Corral Centre) 2
	Is VIA rail accessible?	Establish and expand the green corridor system
	Difficult to obtain transit critical mass in Brandon	Raise level of service through training for taxi drivers
	On 20 yr time frame need option of HandiTransit and regular transit routes together	Encourage shared ride taxis
	Difficulty waiting at Corral Centre	Add Corral Centre to mall bus routes
	Many inaccessible places without sidewalks	Accommodate pedestrians, wheelchairs, stroller and the visually impaired by providing snow maintenance for interconnected system access
	More smart development	Consider aging population and mobility in future planning
	Taxis provide alternative transportation service	Develop an integrated transportation system
	Gaps in coordination/promotion of taxi service	Install bike racks on buses
		Establish a shuttle service to Rivers and Winnipeg Airport
		Encourage High Occupancy Vehicle travel (HOV)
		Ensure development accommodates transit and that all transportation forms are included in master plans 3
		Establish bike routes in inner city
		Establish criteria for taxi driver employment (knowledge of city)
		Ensure efficient use of buses
		Establish campus route at BMHC/ACC
		Provide more frequent service to Maple Leaf
		Add taxis to bus lane on 18th
Goods Movement	Rail traffic is blocking city streets	Develop a long term rail plan
	#110 south of Veteran's Way works well	Relocate all rail outside of city (to near the airport), this would take the rail-hauled dangerous goods outside the city 2
	Get traffic moving faster through City	Ensure better use of rail (combine CP & CN) 2
	BAD = hog trucks 1st to Richmond	Complete Eastern and Western bypasses = Ring Rd to get traffic off 18th Street 4
	TransCanada working well	Construct North-Eastern bypass (from Airport to Eastern Access)
	PTH 110 (Eastern Bypass) south of Veteran's Way working well	Construct a merge ramp at 18th and Trans Canada Highway
	Too much truck traffic in city	Construct interchange at #1 & #110
	CP Rail Operations operate better than CN Rail operations	Relocate part of #10 - 10A
		Develop an interchange at Trans Canada Highway
		4-lane 18th Street
		Extend 17th Street East north to Veteran's Way and to the TransCanada
		Improve 1st Street from Trans-Canada to #110
		Construct truck route by extending 17th St E northerly to TransCanada Hwy for better truck access, and companies in the industrial area would be able to use this route for both east and west destined traffic
		Upgrade Veteran's Way so that truck traffic travelling south on 1st St (from TCH) can travel over to already constructed portion of Eastern Bypass
		Use ramp-merge design for service roads to tie back into TransCanada Hwy (i.e. at 18th and TCH for west-bound north-service road traffic back onto TCH). This would get this traffic away from the 18th St/TCH intersection
		Extend 17th St. E. north to Veteran's Way and to TCH
		Merge north service road @ TCH and #10 onto TCH for westbound trucks and cars
		Encourage air traffic use by providing better access to airport; air traffic should not be discounted because the percentage is low;
		Consider air service in future plans
		Air service can grow
		Encourage air traffic by providing better access to airport
		Provide better access from air to Trans Canada Highway west
		Establish intermodal facility in industrial area
		Incorporate trucker friendly developments and policies
		Develop fuelling and servicing depots in the industrial area
		Provide for servicing & fuelling @ 110
		Consider outside economics (I.e. Western access to accommodate potash development @ St. Lazare) 2

Topic Area	Comment	Proposed Action
Access and Traffic Management	Transportation including Handi-Transit	Improve signal synchronization, especially in afternoon peak 3
	18th St. inconsistent 4 lanes, 3 lanes, 2 lanes; changes at bridges	Install speed bumps '30km' signs to advise 3
	Roundabouts work well	Ensure new developments have appropriate access for public transit
	Too much traffic on 18th St.	Allow bus lanes to include taxis
	Difficult for through traffic to get through Brandon	Educate the public about bus lanes
	Appropriate access for Public	Designate left turn lanes 1st & McTavish and 18th & Brandon
		Restrict residential access on Victoria and 1st Street via service roads
		Ensure controlled access at major routes (use back lanes)
		Install caution speed sign for speed humps 30 km/hr
		Ensure Provincial routes use urban light standards
		Increase pedestrian safety @ roundabouts
		Install interchange at TransCanada Hwy
		Construct bypass for thru/non-stopping traffic
		Improve 18th St. at top of hill (arterial class road)
		Improve traffic management at 1st and Pacific
		Install sensor loops along Victoria Ave (for pm)
		Construct west bypass, finish east bypass
Future Roadway Needs	Hazardous areas (safety): Pacific at 1st and 18th; 26th & McTavish; 34th & McDermot; southbound 18th at Capitol Theatre	Construct Clare Ave, N/S road between 1st and 18th
	Richmond Ave crosswalks	Twinning PTH 10 (Brandon to Minnedosa)
	18th & Richmond, 18th & Rosser, twin 1st, PTH 1-110	Twinning 18th St. both bridges and S. to PTH 110
		Twinning Richmond Ave E to Maple Leaf
		Improve intersections at Richmond & 18th; Rosser & 18th; Richmond and 17th East
		Complete Hwy 110 to connect with Hwy 1
		Extend 110 to the north off Hwy 1 bypassing Elton on east side and connect to Hwy 10 about 1 or 2km north of Elton
		Close 1st Street, 18th Street, Victoria Avenue and Richmond Avenue to all heavy truck traffic. Re-route all truck traffic north-south or vice versa around Brandon along 110 on the east side with the new shorter connection between the TransCanada Hwy and Hwy 110, it will be easier and faster for trucks to bypass Brandon
		Construct a bypass on the west side of Brandon connecting Victoria Ave. to Hwy 10 south to where Hwy 110 connects with 10.
		Establish a primary route for through traffic
		Consider existing congestion
		Consider future development areas
		Undertake 1st St upgrades to ACC

Brandon Area Road Network Development Plan Study
Final Public Open House – April 3, 2007
Comment Sheet

Note: Numbers in parenthesizes indicate number of a specific response received.

1. Where do you live?

City of Brandon **(3)** Neighbouring Municipality (please specify) **Cornwallis (1)**
Other (please specify) _____

2. Have you previously attended a workshop or open house session associated with this study?

Yes **(4)** No _____

3. Have you visited the study website?

Yes _____ No **(4)**

4. Please tell us your thoughts regarding the preliminary recommendations of the study presented today.

- **A good start (1)**
- **Study and its recommendations are valid and needed. There has already been an effect on Handi-Transit Services. (1)**

5. Are there any particular recommendations or projects that you do not agree with? If yes, please list them, along with reasons why.

- **No (2)**

6. Are there any particular recommendations or projects that you felt should have been included but were not? If yes, please list them with along reasons why.

- **No (1)**

7. Do you have any additional comments? (Please feel free to use the back of the sheet)

- **Very worthwhile exercise, just need political will with related funding to carry out. (1)**
- **Go ahead and do the job. (1)**
- **Eastern By-Pass completion should be the top priority. (1)**
- **13th Street and Park Avenue needs traffic signal controls. (1)**
- **Two and a half years of study and when works will commence it could be another two and a half years. (1)**
- **Traffic counts should have been done as part of the study and were not. (1)**
- **Construction delays are unacceptable and authorities need to act on these issues before cost becomes the major factor. (1)**
- **The study is a good first step but time is of the essence. (1)**

APPENDIX C

TRANSPORTATION MODEL INFORMATION

1.0 TRANSPORTATION MODEL

2.0 TRIP GENERATION

2.1 PCensus Software

For the Brandon and Area trip assignment model, Statistics Canada demographic data was collected using the PCensus software package. The PCensus software allows for a defined geographic area to be isolated and queried for specific data, such as number of dwelling units, household income and primary mode of transportation to and from their place of employment. This data provided the basis for the trip production estimates.

The PCensus software also provided data on the number of people who work in the retail, service and basic employment sector by zone. While the data indicates in what employment sector people work, minimal data pertaining to the location of their employer was available; hence, a series of regression equations were used to provide a first estimate of trip attraction by zone. Additional demographic information on Brandon employment zones was obtained from Economic Development Brandon and used to verify and calibrate the model.

2.2 TransCAD QRM Methodology for Trip Generation and Trip Balancing

TransCAD's Quick Response Method (QRM) for Trip Generation provides an alternative method developing trip production and attraction estimates that are based on a default trip-rate table from NCHRP 187 [1]. The QRM procedure uses a cross-classification table based on the population of the study area and total number of households per defined zone for estimating productions for three separate trip purposes; home-based work, home-based other, and non-home-based. In this model, the QRM method was used for developing home-based other and non-home based trips while PCensus data was used to accurately estimate home-based work trip production.

TransCAD's QRM procedure for Trip Attraction was employed for additional insight into the number of trips attracted to a zone. This QRM procedure is also based on a series of regression equations that estimate the number of person trips destined to a zone based on the number of people working in the retail and non-retail employment sector within each zone as well as the number of dwelling units within each zone. This information was available through PCensus software.

Calibrating TransCAD's QRM procedure for trip attraction was done manually based on local knowledge of the study area. To calibrate the home-based work attraction estimates a list indicating business type and number of full and part time employees by zone was provided from the City of Brandon. Home-based other attraction trips were adjusted in areas where the primary zone use was institutional and hence had very few people living within but still attracted a high volume of visitors daily.

The most significant institutional zones that were adjusted were Brandon University and Assiniboine Community College. To address the issue of public institutions receiving very little attraction values from the regression equation method, both Brandon University and Assiniboine Community College was contacted and student/casual parking stall data was collected and is summarized in Table C.1. It was assumed that over the course of a day each stall would be occupied at least one time, which becomes the "attraction" parameter for the model. The results collected are shown in the table below.

Table C.1: University and College Parking Supply

Parking Type	Brandon University	Assiniboine Community College*
Student/Visitor Parking		
Electrical stalls	390	324
Non-electrical stalls		37
Ticket dispenser	80	
Meter parking	30	
Sub-Total	**500**	**361**
Staff Parking		
Electrical stalls	230	219
Non-electrical stalls		9
Sub-Total	**230**	**218**
Total	**730**	**579**
Off campus "on-street" parking		+/- 50

*ACC administration estimated approximately 110 empty spaces at any given time.

For the purpose of the Brandon and Area assignment model, total trips originating at each of the transportation zones must equal the total trips attracted to the transportation zones. Since separate models were used to estimate trip productions and attractions TransCAD's QRM balancing method was used. By holding trip production constant, trip attraction data was adjusted such that the total number of trips produced in the model equalled the number of trips attracted within the model.

3.0 TRIP DISTRIBUTION

3.1 Data Preparation

For the purposes of forecasting traffic generation, production and attraction, estimates for each zone was located at a road node closest to the geographical centroid of each zone

within the GIS road network. Additional "connector" road linkages were added to the GIS road network to model shortest path movements within each of the transportation zones.

A friction factor matrix is a "between zone" matrix that contains the friction factors for travel that are associated with any pair of zones. The friction factor influences the likelihood that a trip generated at a zone is attracted to each of the possible destination zones. Friction factors for the Brandon model were created using a gamma function and data collected compiled by NCHRP365 1998, "Travel Estimation Techniques for Urban Planning [2]."

3.2 Developing the Origin/Destination and Production/Attraction Matrices

To develop the production/attraction matrix, a gravity model used the forecast balanced productions and attractions at each zone as well as the friction factor matrix to route the production/attraction estimates to each of the zone nodes. Since there is a relationship between purpose of a trip (i.e., between: home-based work, home-based other and non-home-based) and the willingness of an individual to travel certain distances, TransCAD, in routing the data through the gravity application allows for a different routing function to be used to estimate different trip purposes. This same idea is present in developing the friction factor matrix (i.e., friction factors are dependant on the type of trip being modeled). Modeling different traffic patterns by trip type allows TransCAD to more accurately identify and create an origin/destination matrix since different trips types command different trip path behaviour.

To convert the 24-hour production/attraction (P/A) matrix to a 24-hour origin/destination (O-D) matrix, the standard TransCAD procedure was followed. The procedure is based on the assumption that all trips depart and return in one day and hence the only input required for this procedure is the P/A Matrix. This procedure also allows for person trips to be converted to vehicle trips based on average vehicle occupancy. The model assumed vehicle occupancy of 1.1 persons per trip. Additionally, using the same procedure, a time of day analysis was done using an hourly lookup table that estimates volume of travel by a percent distribution throughout the day. Using this procedure estimates for a.m. peak and p.m. peak hour flows were generated.

Six external nodes representing the primary routes in and out of the City of Brandon were created around Brandon's perimeter. Existing average annual daily traffic (AADT) volumes obtained from MIT were used to predict the number of trips entering and exiting the City of Brandon on a 24-hour count. The external nodes were located as follows:

- PTH 1 west of Brandon
- PR 270 north of PTH 1
- PTH 10 north of PTH 1
- PR 468 north of PTH 1

- PTH 1 east of PTH 110
- PR 457 East of PTH 110
- PTH 10 South of PTH 110

The percentage of external traffic destined to and through Brandon was first assumed by the TransCAD QRM procedure and then manipulated to more accurately show existing conditions. Once the P/A data was manipulated into O-D data using standard TransCAD procedures, the database file was further adjusted to mimic observed travel characteristics. Using the report 'Brandon Area Provincial Highway Study' prepared by Underwood McLellan Ltd in 1984, the traffic distribution by percent AADT was determined and assumed to have remained relatively constant (as a percentage) since the time of the study. Vehicle intercept surveys conducted as part of this study, offered further O-D information for the external zones and within Brandon. Using the above sources, estimates on vehicle pass by trips (vehicles that travel past Brandon on the Provincial road network) versus vehicles that enter the City of Brandon from an external location were created.

4.0 TRAFFIC ASSIGNMENT

Using the revised 24-hour origin/destination flow matrix, a traffic assignment was conducted using the Stochastic User Equilibrium (SUE) Assignment method. The traffic assignment represents the key element in the travel demand forecasting process as it predicts the flows of vehicles along each of the roadways within the street network. The SUE Assignment method distributes trips between the O-Ds among multiple paths. It assumes that not all drivers are aware of the shortest path or best route between origin and destination nodes so it assigns some vehicles along less-attractive routes. Which path the trips are most likely to follow is based on the Method of Successive Averages, which distributes trips on reasonable paths based on travel time and road capacity. It does not assign trips to all available paths but nor is it an 'All or Nothing' assignment [3].

5.0 MODEL CALIBRATION

The model was run under existing road network, and land use characteristics to attempt to closely replicate existing travel patterns. Available traffic count data was collected and a number of new traffic counts were requested as part of this study to assist in model calibration. Model results were compared in terms of total trips through the system, screen line totals, and comparisons on a link-by-link basis to identify links that are noticeably high or low compared to the base line count data.

Calibrating the model was done by adjusting travel speed, and hence travel time, for each individual link throughout the model beginning with the posted speed limit. A comparison of known AADT values and the observed TransCAD distribution was analysed to see how well data corresponded on the major routes into and throughout Brandon. To calibrate the model, adjustments to the roadway travel speeds were made

depending on the outcome of the previous model assignment. For instance, road links that showed excessive traffic volumes from what the model forecast (when compared to known AADT information) were reassigned a lower travel speed and hence a higher travel time. The procedure of running a traffic assignment and comparing the results to known AADT values was again applied with each iteration further bringing the TransCAD model results closer to the observed AADT values. No turning, transition or traffic control penalties were included with the model assignment.

A modified screen line analysis was conducted to assist in the calibration of the model to known AADT data. A screen line analysis is a comparison between known directional AADT values along an identified cross-section with modeled traffic assignment results. The screen line method is typically applied to the model calibration process and is also useful in calculating traffic volumes traveling in a certain direction. As AADT values were not available throughout the entire model a model comparison was conducted on a screen line using crossing streets where AADT values were know. Over three screen line comparisons comprising of 17 points, the modeled traffic assignment was within an error of approximately 10%. The three screen lines were at the following locations;

- North/south from the TransCanada Highway to the Brandon By-Pass, east of 18th Street,
- East/west from 34th Street to 1st Street, north of Victoria Avenue,
- East/west from 34th Street to 1st Street, south of Richmond Avenue.

Further fine-tuning was made through adjustments to zone centroid connectors to better reflect actual movements, and adding additional centroid connectors to help distribute trips to multiple boundary roads around a zone. The consultant team reviewed the preliminary assignments, and also reviewed the results with the Steering Committee, until an acceptable base year assignment was achieved.

5.1 Current Year Traffic Assignment Results

Calibrated traffic assignment volumes, illustrated in Figure C.1, based on current annual average daily traffic (AADT) data formed the basis for future traffic predictions on the Brandon and Area road system. Figure C.2 illustrates the calibrated 24-hour (daily) traffic assignment using the TransCAD GIS software package.

Using the a hourly look-up table, estimates for AM and PM traffic volumes were modelled based on calibrated 24-hour traffic volumes. Attached are illustrations of current year a.m. (Figure C.3) and p.m. (Figure C.4) peak hour modelled traffic volumes for the Brandon area road network.

5.2 Method of Calculating V/C Ratios and Level of Service for Road Links

Volume to capacity ratio (V/C) is a ratio of flow rate to road capacity for a given road link. Volumes to Capacity ratios are often used as a tool to identify traffic congestion

and locations where road network improvements may need to occur to improve traffic flow.

To calculate V/C ratios, the lane capacities summarized in Table C.2 were used. The lane capacity was derived as an average of a variety of sources including the Highway Capacity Manual.

Table C.2: Lane Capacity by Roadway Functional Class

Functional Class	Capacity (vphpl*)
Expressway	1500
Major Arterial	1125
Minor Arterial	750
Collector	525
Local	350

*vphpl = vehicles per hour per lane

To calculate the V/C ratio, a.m. and p.m. peak hour forecast traffic volumes for each link direction were divided by the number of lanes for each link and again divided by its lane capacity, which is dependant on its functional class noted in Table C.2.

Level of Service (LOS) is a qualitative measure of traffic flow on a road link and is highly influenced by the V/C ratio. Figure C.5 graphically illustrates LOS.

Figure C.6 and Figure C.7 illustrate existing V/C ratios and LOS for the road network in and around Brandon for the a.m. and p.m. peak hour periods. These periods are typically used for analysis since they are often the busiest and; therefore, most critical time for traffic movements. These figures are representative of forecast traffic congestion and related driver discomfort.

It should be noted that the transportation planning model identifies forecast LOS for the road linkages and not the intersections. Intersections are the typical bottlenecks in a roadway system, i.e., the roadway link may have sufficient capacity, but an intersection may not, which results in congestion at the intersection and can also result in downstream congestion of the approach road linkages. Intersection LOS is typically calculated with an operational model such as Synchro, which is based on the volumes, geometry, and traffic control of an intersection to forecast an intersection LOS. This is generally the next step to a study such as this.

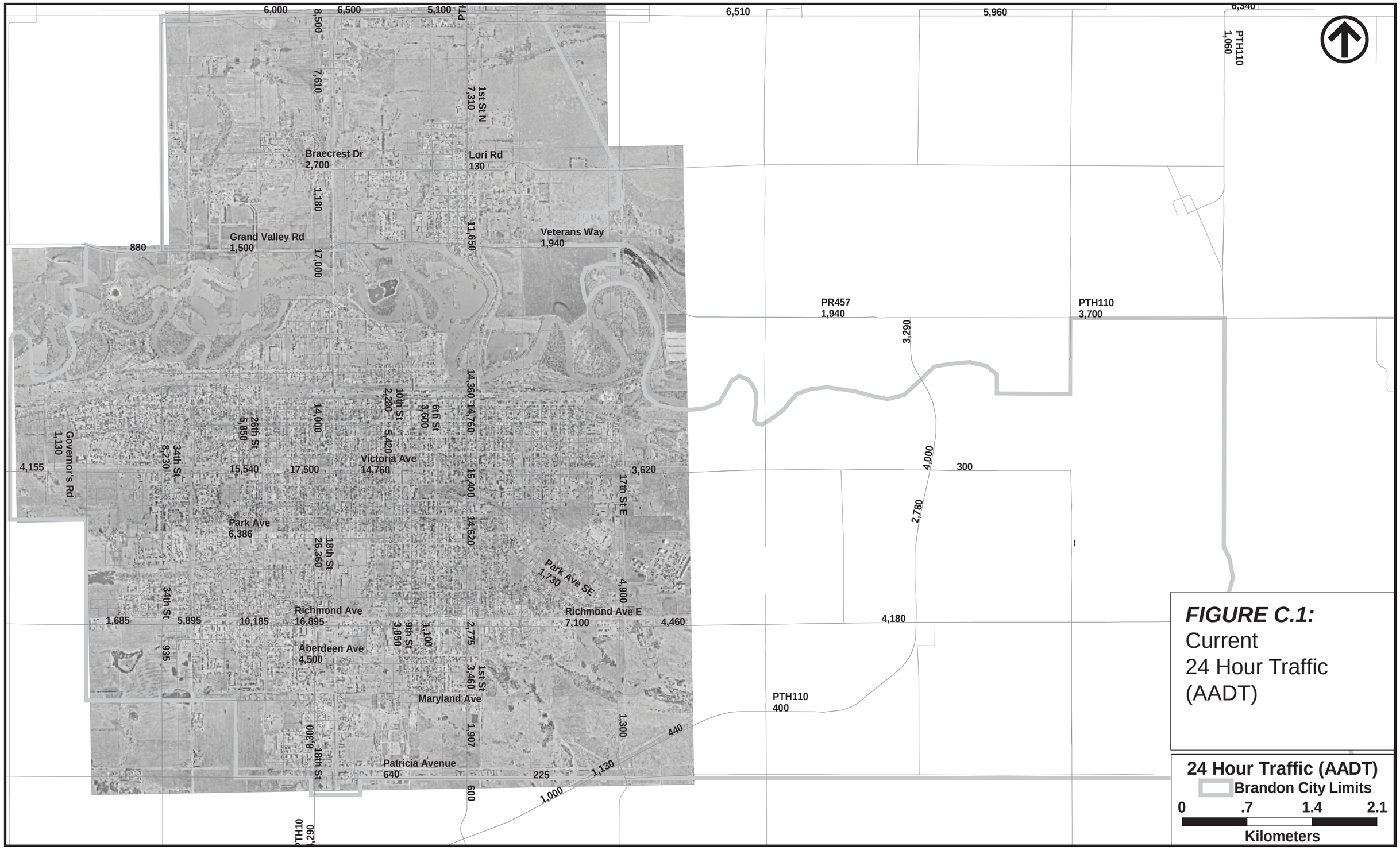


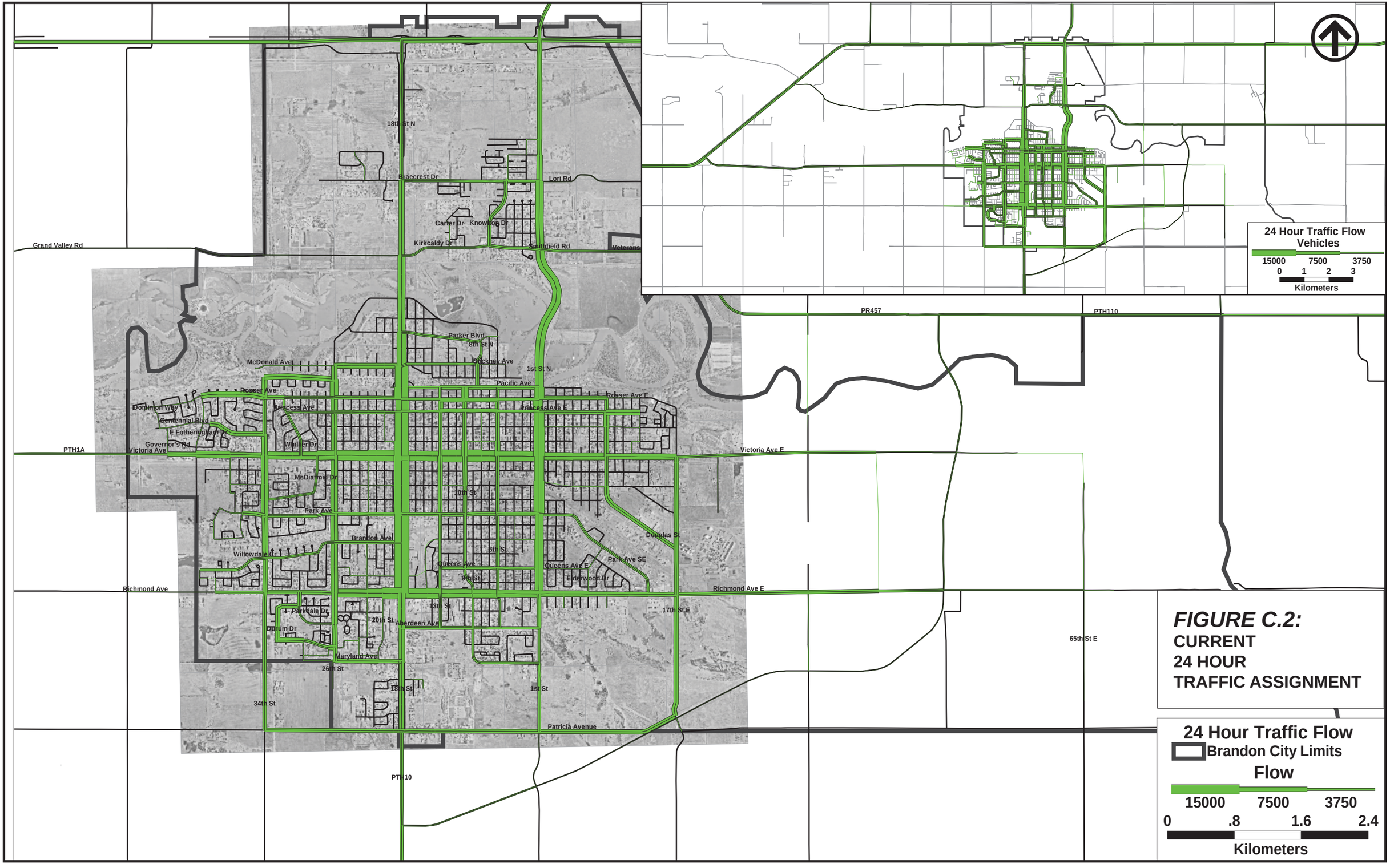
FIGURE C.1:
Current
24 Hour Traffic
(AADT)

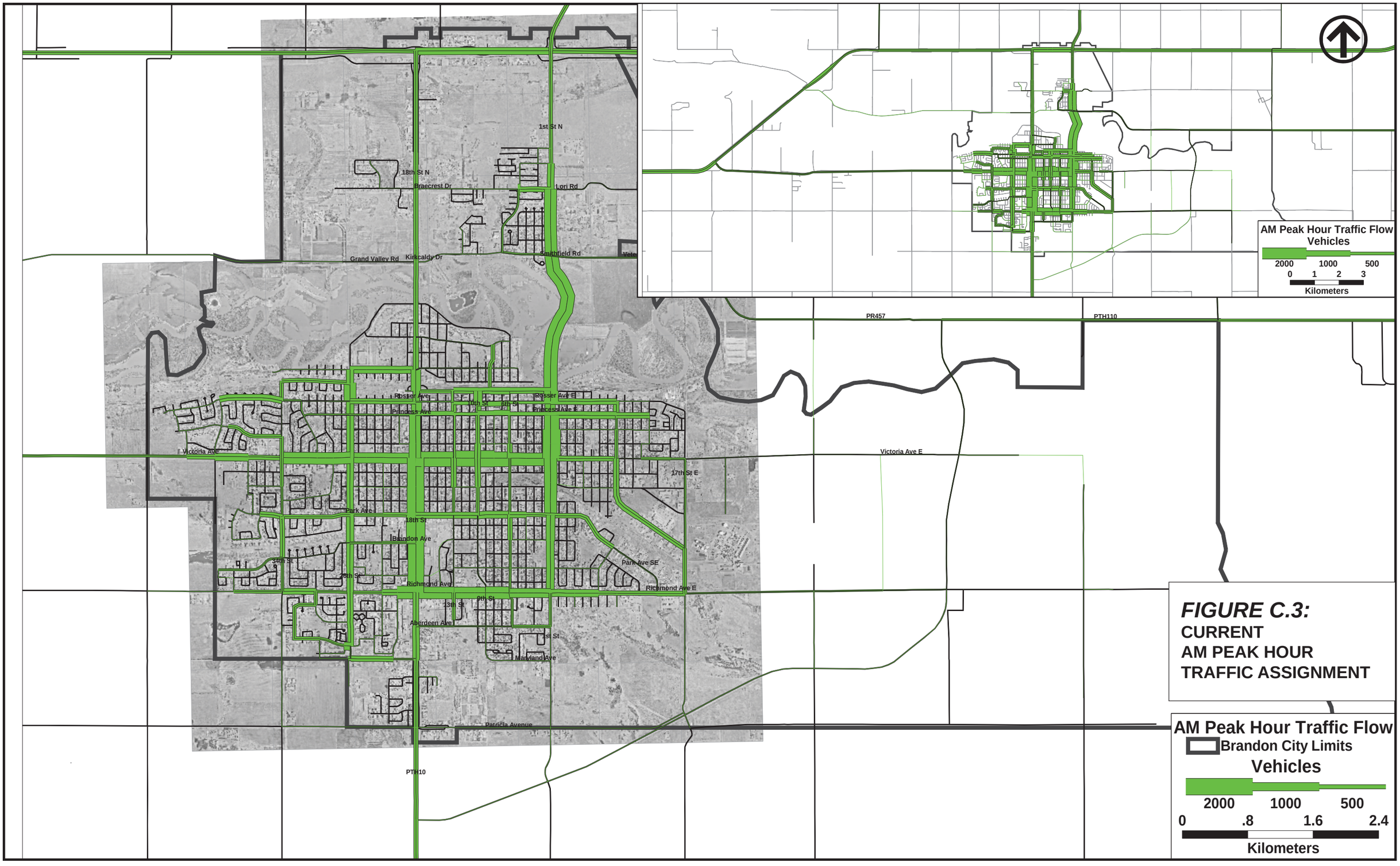
24 Hour Traffic (AADT)

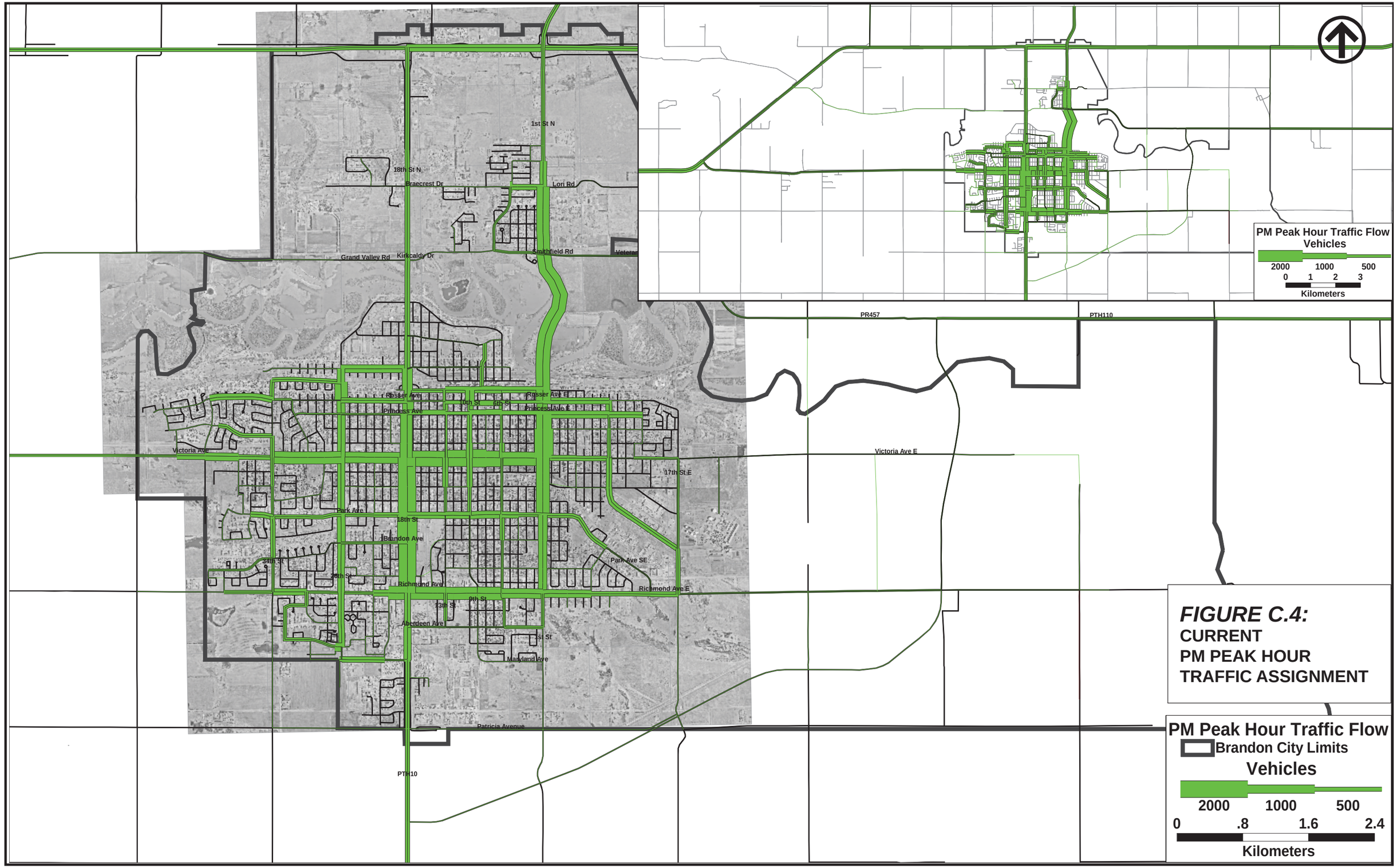
Brandon City Limits

0 .7 1.4 2.1

Kilometers


18th St N
Braecrest Dr
Lori Rd
Carter Dr
Knowlton Dr
Kirkcaldy Dr
Grand Valley Rd
Smithfield Rd
Veterans
PR457
PTH110
Parker Blvd
8th St N
McDonald Ave
Strickney Ave
1st St N
Pacific Ave
Rosser Ave
Rosser Ave E
Dominion Way
Princess Ave
Princess Ave E
Centennial Blvd
E Fotheringham Dr
Governor's Rd
Victoria Ave
PTH1A
Whillier Dr
Victoria Ave E
McDiarmid Dr
10th St
Park Ave
Douglas St
Brandon Ave
3th St
Willowdale Dr
Park Ave SE
Queens Ave
Queens Ave E
9th St
Elderwood Dr
Richmond Ave
Richmond Ave E
13th St
17th St E
Parkdale Dr
20th St
Aberdeen Ave
Dorum Dr
Maryland Ave
26th St
65th St E
18th St
1st St
34th St
Patricia Avenue
PTH10
24 Hour Traffic Flow
Vehicles
15000
7500
3750
0
1
2
3
Kilometers
FIGURE C.2:
CURRENT
24 HOUR
TRAFFIC ASSIGNMENT
24 Hour Traffic Flow
Brandon City Limits
Flow
15000
7500
3750
0
.8
1.6
2.4
Kilometers


1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Yeta
Rosser Ave
10th St
6th St
Rosser Ave E
Princess Ave
Princess Ave E
Victoria Ave
17th St E
Park Ave
18th St
Brandon Ave
34th St
26th St
Richmond Ave
Park Ave SE
Richmond Ave E
9th St
23rd St
Aberdeen Ave
7st St
Maryland Ave
Patricia Avenue
PTH10
PR457
PTH110
Victoria Ave E
AM Peak Hour Traffic Flow
Vehicles
2000
1000
500
0
1
2
3
Kilometers
FIGURE C.3:
CURRENT
AM PEAK HOUR
TRAFFIC ASSIGNMENT
AM Peak Hour Traffic Flow
Brandon City Limits
Vehicles
2000
1000
500
0
.8
1.6
2.4
Kilometers


1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Rosser Ave
Princess Ave
10th St
6th St
Rosser Ave E
Princess Ave E
Victoria Ave
Victoria Ave E
17th St E
Park Ave
18th St
Brandon Ave
34th St
26th St
Richmond Ave
Park Ave SE
Richmond Ave E
9th St
33rd St
Aberdeen Ave
1st St
Maryland Ave
Patricia Avenue
PTH10
PR457
PTH110
PM Peak Hour Traffic Flow
Vehicles
2000 1000 500
0 1 2 3
Kilometers
FIGURE C.4:
CURRENT
PM PEAK HOUR
TRAFFIC ASSIGNMENT
PM Peak Hour Traffic Flow
Brandon City Limits
Vehicles
2000 1000 500
0 .8 1.6 2.4
Kilometers

LEVEL OF SERVICE

Highway traffic congestion is expressed in terms of Level of Service (LOS) as defined by the Highway Capacity Manual (HCM). LOS is a letter code ranging from "A" for excellent conditions to "F" for failure conditions. The conditions defining the LOS for roadways are summarized as follows:

LOS A

Represents the best operating conditions and is considered free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.

V/C Ratio: 0 - 0.59

LOS B

Represents reasonably free-flowing conditions but with some influence by others.

V/C Ratio: 0.60 - 0.69

LOS C

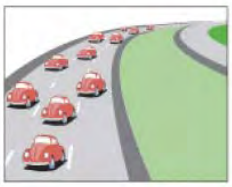
Represents a constrained constant flow below speed limits, with additional attention required by the drivers to maintain safe operations. Comfort and convenience levels of the driver decline noticeably.

V/C Ratio: 0.70 - 0.79

LOS D

Represents traffic operations approaching unstable flow with high passing demand and passing capacity near zero, characterized by drivers being severely restricted in maneuverability.

V/C Ratio: 0.80 - 0.89



LOS E

Represents unstable flow near capacity. LOS E often changes to LOS F very quickly because of disturbances (road conditions, accidents, etc.) in traffic flow.

V/C Ratio: 0.90 - 0.99

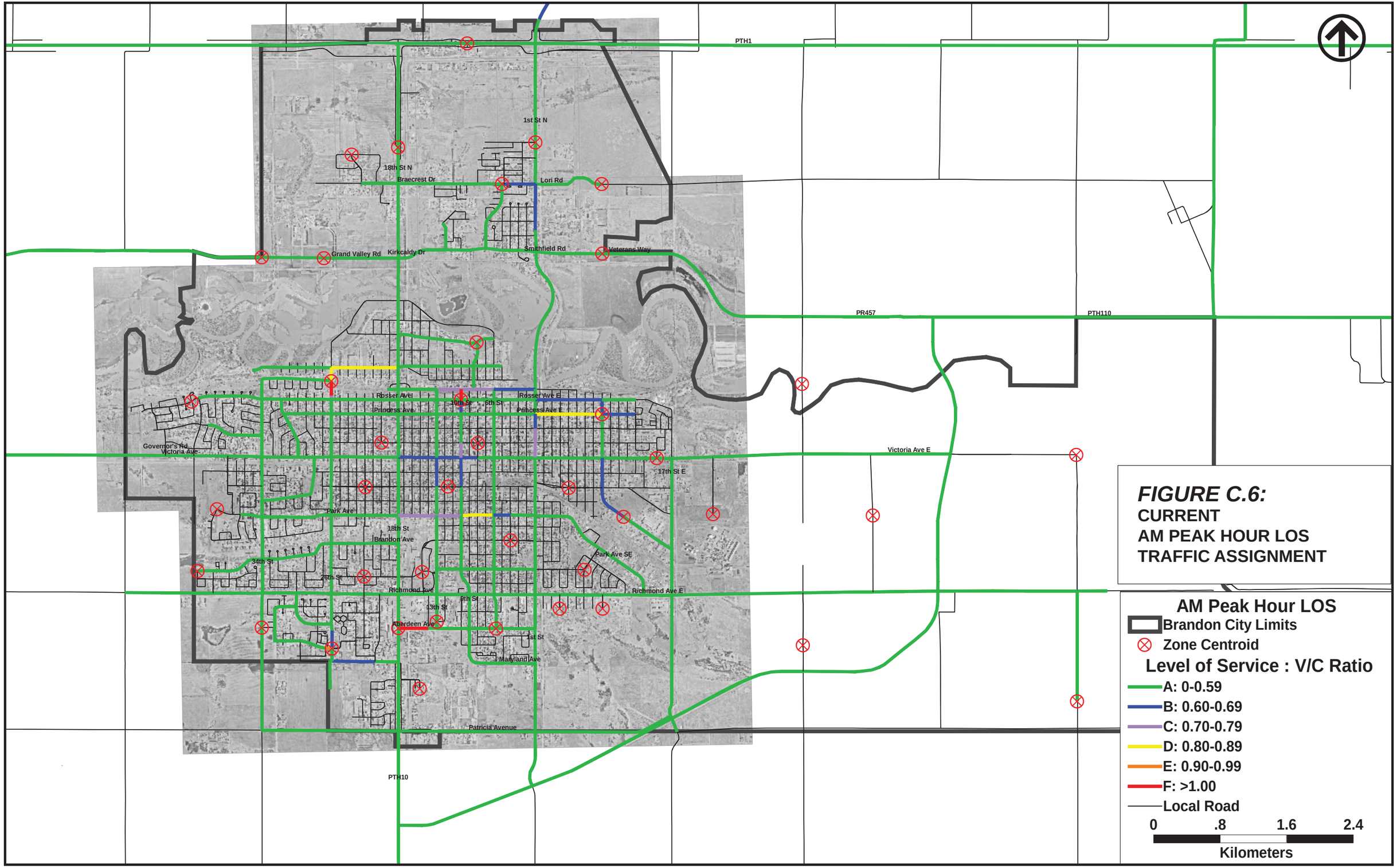
LOS F

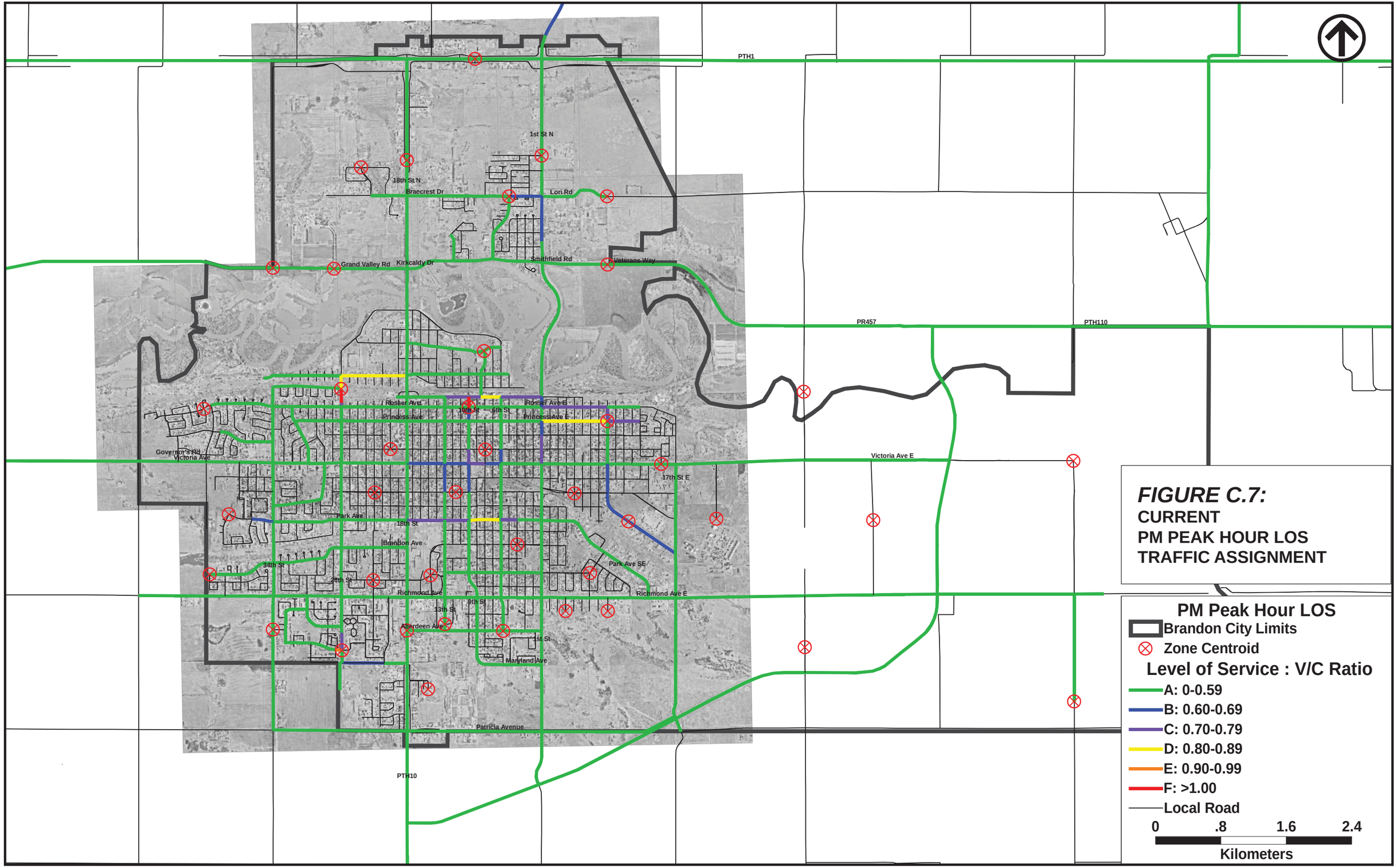
Represents the worst conditions with heavily congested flow and traffic demand exceeding capacity, characterized by stop-and-go waves, poor travel time, low comfort and convenience, and increased accident exposure.

V/C Ratio: 1.0 or greater

Source: Route 228 Project Website, McCormick Taylor, Inc.

FIGURE C.5:
LEVEL OF SERVICE


PTH1
1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Veterans Way
PR457
PTH110
Victoria Ave E
17th St E
Rosser Ave
Princess Ave
10th St
6th St
Rosser Ave E
Princess Ave E
Governor's Rd
Victoria Ave
Park Ave
18th St
Brandon Ave
34th St
26th St
Richmond Ave
9th St
13th St
Aberdeen Ave
1st St
Maryland Ave
Park Ave SE
Richmond Ave E
Patricia Avenue
PTH10
FIGURE C.6:
CURRENT
AM PEAK HOUR LOS
TRAFFIC ASSIGNMENT
AM Peak Hour LOS
Brandon City Limits
Zone Centroid
Level of Service : V/C Ratio
A: 0-0.59
B: 0.60-0.69
C: 0.70-0.79
D: 0.80-0.89
E: 0.90-0.99
F: >1.00
Local Road
0
.8
1.6
2.4
Kilometers


PTH1
1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Veterans Way
PR457
PTH110
Rosser Ave
Rosser Ave E
10th St
5th St
Princess Ave
Princess Ave E
Governor's Rd
Victoria Ave
Victoria Ave E
17th St E
Park Ave
18th St
Brandon Ave
34th St
26th St
Park Ave SE
Richmond Ave
Richmond Ave E
9th St
13th St
Aberdeen Ave
1st St
Maryland Ave
Patricia Avenue
PTH10
FIGURE C.7:
CURRENT
PM PEAK HOUR LOS
TRAFFIC ASSIGNMENT
PM Peak Hour LOS
Brandon City Limits
Zone Centroid
Level of Service : V/C Ratio
A: 0-0.59
B: 0.60-0.69
C: 0.70-0.79
D: 0.80-0.89
E: 0.90-0.99
F: >1.00
Local Road
0
.8
1.6
2.4
Kilometers

6.0 HORIZON YEAR TRIP ASSIGNMENT

Table C.3: Historical Dwelling Unit Construction Trend

Year	Single Family	Duplex	Multi Family	Mobile Homes	Total
1981	66	8	n/a	n/a	74
1982	91	8	29	n/a	128
1983	214	16	n/a	n/a	230
1984	126	22	284	n/a	432
1985	102	4	170	n/a	276
1986	144	18	123	n/a	285
1987	115	20	86	n/a	221
1988	49	28	196	n/a	273
1989	45	34	18	13	110
1990	24	28	17	3	72
1991	23	16	n/a	7	46
1992	53	30	n/a	7	90
1993	72	18	36	8	134
1994	74	34	27	5	140
1995	60	6	20	0	86
1996	53	4	29	5	91
1997	83	8	36	3	130
1998	121	34	23	2	180
1999	48	8	250	40	346
2000	45	4	26	25	100
2001	39	12	22	25	98
2002	67	4	81	42	194
2003	80	4	165	67	316
Yearly Average	**78**	**16**	**86**	**17**	**197**
20-Year Estimate					**3,940**

6.1 The Former Brandon Mental Health Centre Site

Correspondence with Brandon Economic Development as well as personnel from the North Hill Development Consortium indicated that the most likely form of development at the former Brandon Mental Health Center site would be the relocation of the Assiniboine Community College. While the shift will take a few years, the entire move of Assiniboine Community College is expected to occur within the 20-year horizon period.

As an overall master plan for the development of the former Brandon Mental Health Centre site was not available the following assumptions were made regarding future demographics:

- Trips attracted to the current Assiniboine Community College site were shifted and added to the former BMHC site.
- Total trips attracted to the relocated Assiniboine Community College were increased by 20 percent to reflect growth throughout the college over the next 20-years.
- The existing Assiniboine Community College site would become occupied by another use that would have similar transportation demand; therefore, trip production and attraction estimates for this site remained the same as currently estimated.
- A small residential component was also assumed for the former Brandon Mental Health Centre redevelopment.

6.2 North Hill/Black Property Site Development

The North Hill/Black Property site is located in north central Brandon between 1st Street and 18th Street, north of Braecrest Drive and south of the TransCanada Highway. The site is approximately 400 acres in size with about 250 acres designated for residential development and approximately 150 acres designated for commercial development. Correspondence with City of Brandon Officials and a review of the Brandon and Area Development Plan, Year 2005, indicated that a significant portion of the residential and commercial designated area will occur over the next 20-years and this land will support the majority of commercial and retail development within Brandon.

The following development assumptions were made in estimating the level of growth on the North Hill/Black Property property.

- 1,200 residential dwelling units (250 acres @ 4.5 units/acre)
- Approximately 50% of land designated for commercial development will be developed (75 acres, totalling 620,000 sq. ft. of leasable floor area).

Using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Edition (ITE, 2003) a blended trip rate was devised based on the assumed land-uses described in Table C.4.

Table C.4: North Hill/Black Lands Blended Trip Generation Rate

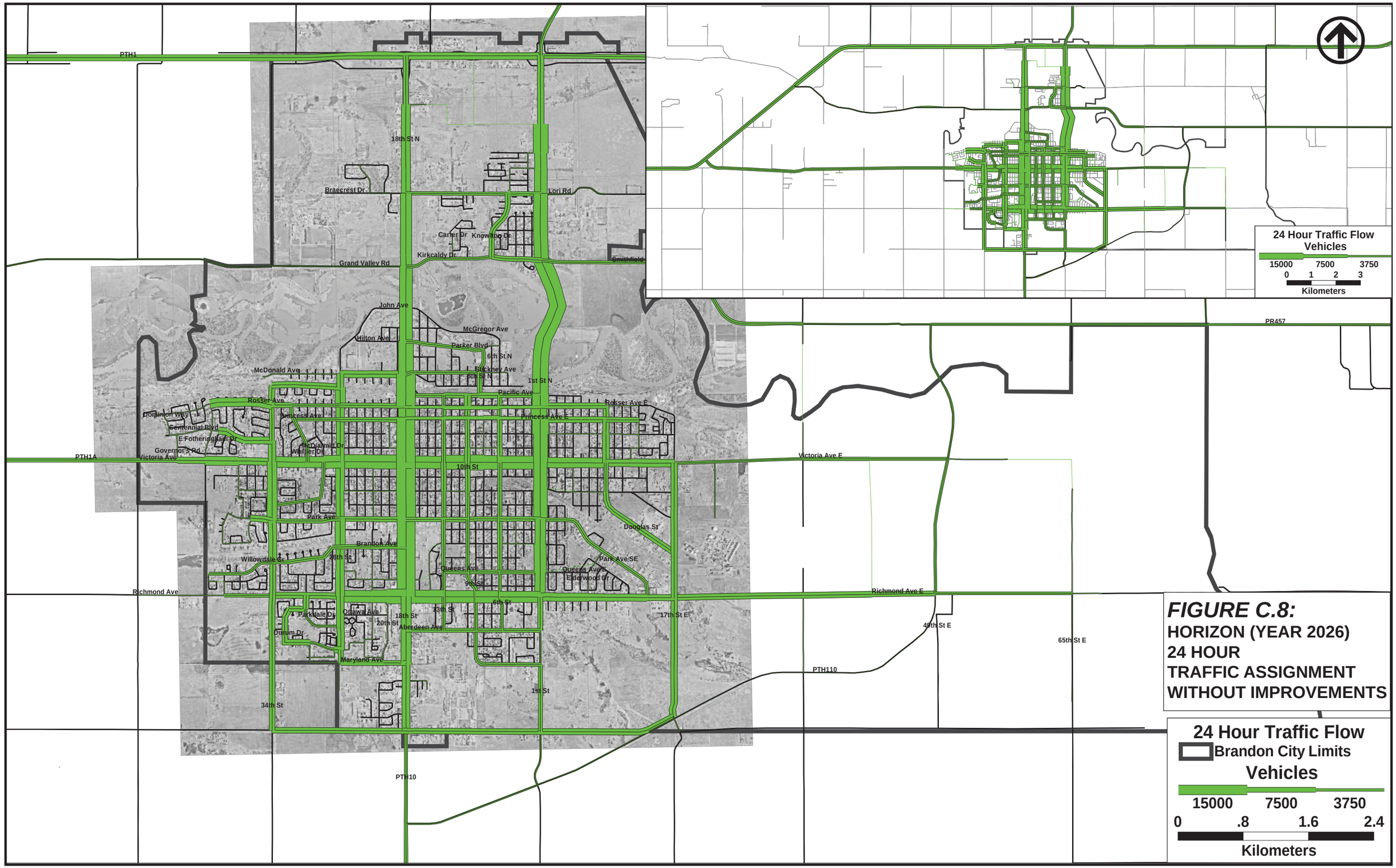
Land-Use	Area (sq. ft. GLA)	ITE Trip Rate (Daily Trips/1000 ft^2 GLA)
Grocery Store	35,000	102.24
Hardware Store	100,000	32.12
Convenience Centre	5,000	31.02
Restaurant	10,000	127.15
Bank/Financial Institution	10,000	21.49
General Retail	300,000	43.00
Office	80,000	3.32
Light Industrial	80,000	6.97
Total/Average	**620,000**	**35.78**
Total Daily Vehicle Trips		**22,300**

The blended daily trip rate of 35.78 vehicle trips per 1,000 sq. ft. gross leasable floor area (GLA) identified in Table C.4 corresponds to approximately 22,300 total daily vehicle trips to and from the retail/commercial component of the North Hill/Black Lands site; this was added to the area road network model.

In examining the V/C ratio graphics, and comparing the existing conditions (Figures C.6 and C.7), with the forecast Year 2026 condition with no roadway modifications (Figures C.10 and C.11), items to look for include links that are at LOS D or lower. LOS D, although considered acceptable for peak hour conditions, are the most likely links to drop to a lower LOS between current and horizon year conditions.

One road link was at or above capacity in the a.m. peak hour under existing conditions (Aberdeen Avenue between 13th and 18th Streets), and three links were forecast to operate at LOS D). The forecast Year 2026 scenario with no roadway modifications results in a number of additional links at or above capacity, as well as additional links at LOS D. A number of the links that are forecast to experience a reduction in LOS relate to the areas expected to feature much of the future development (e.g., 1st and 18th Streets north of the Assiniboine River. The Aberdeen link in Figure C.6 improves in the Year 2026 scenario even though there are no roadway modifications. Future development changes to O-D matrix to reflect changes in attractiveness of the traffic zones. It is believed that this has shifted the split of traffic entering/exiting the zone from the three zone centroid connectors to alter the LOS.

The p.m. peak hour LOS forecasts under existing conditions identify four links at LOS D, with no links at a lower LOS. The forecast Year 2026 LOS adds a number of links that are at or over capacity plus additional links at LOS D.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Lori Rd
Carter Dr
Knowlton Dr
Kirkcaldy Dr
Grand Valley Rd
Smithfield
John Ave
McGregor Ave
Hilton Ave
Parker Blvd
6th St N
McDonald Ave
Buckley Ave
8th St N
1st St N
Pacific Ave
Rosser Ave
Rosser Ave E
Dominion Way
Princess Ave
Princess Ave E
Centennial Blvd
E Fotheringham Dr
Governor's Rd
Victoria Ave
PTH1A
McDiarmid Dr
Wheeler Dr
10th St
Victoria Ave E
Park Ave
Douglas St
Brandon Ave
26th St
Willowdale Cr
Park Ave SE
Queens Ave
Queens Ave E
Elderwood Dr
9th St
Richmond Ave
Richmond Ave E
6th St
Parkdale Dr
Ottawa Ave
18th St
13th St
17th St E
20th St
Aberdeen Ave
Durum Dr
49th St E
65th St E
Maryland Ave
PTH110
1st St
34th St
PTH10
PR457
24 Hour Traffic Flow
Vehicles
15000
7500
3750
0
1
2
3
Kilometers
FIGURE C.8:
HORIZON (YEAR 2026)
24 HOUR
TRAFFIC ASSIGNMENT
WITHOUT IMPROVEMENTS
24 Hour Traffic Flow
Brandon City Limits
Vehicles
15000
7500
3750
0
.8
1.6
2.4
Kilometers

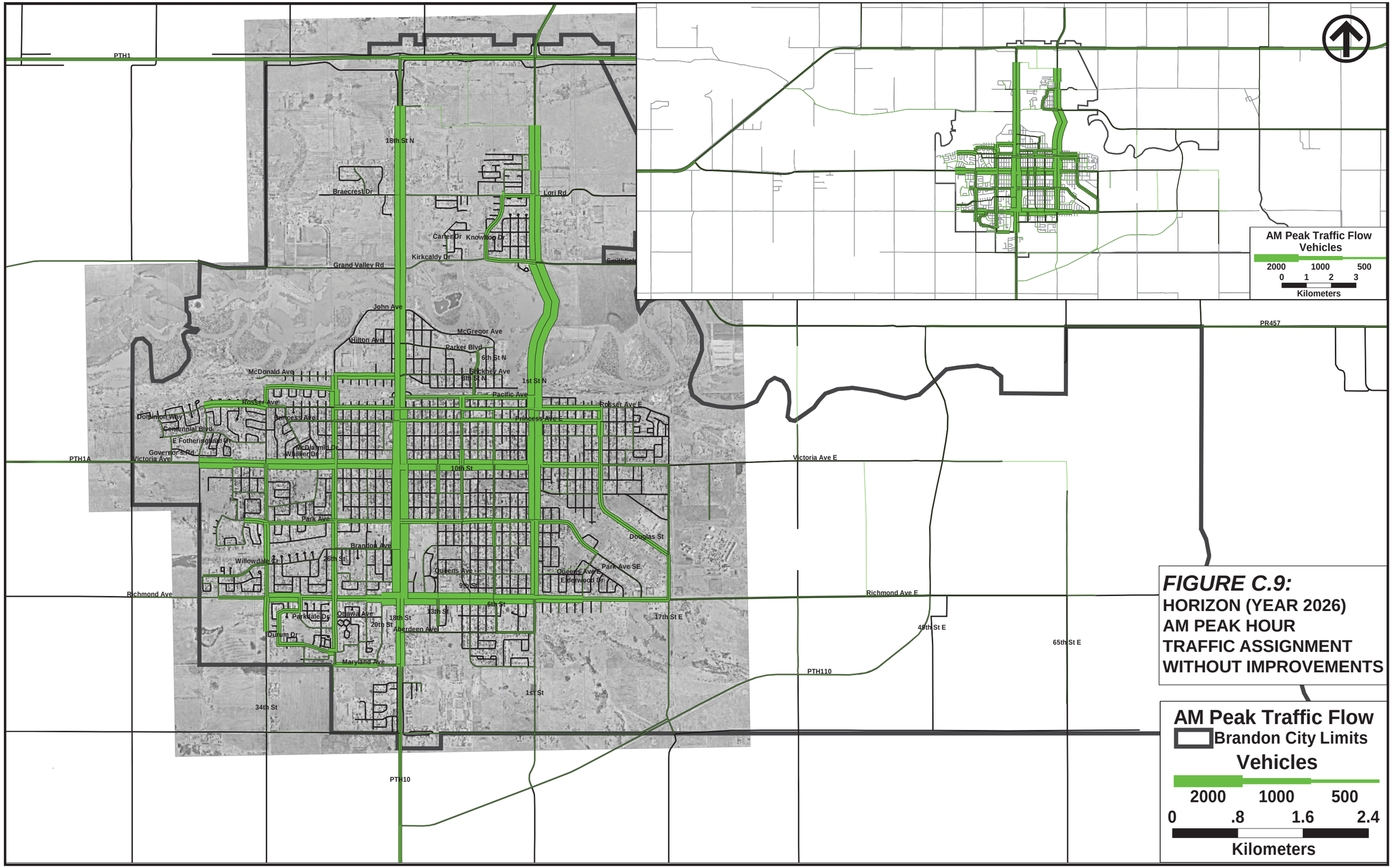


FIGURE C.9:
HORIZON (YEAR 2026) AM PEAK HOUR TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

AM Peak Traffic Flow

Brandon City Limits

Vehicles

2000 1000 500

0 .8 1.6 2.4

Kilometers

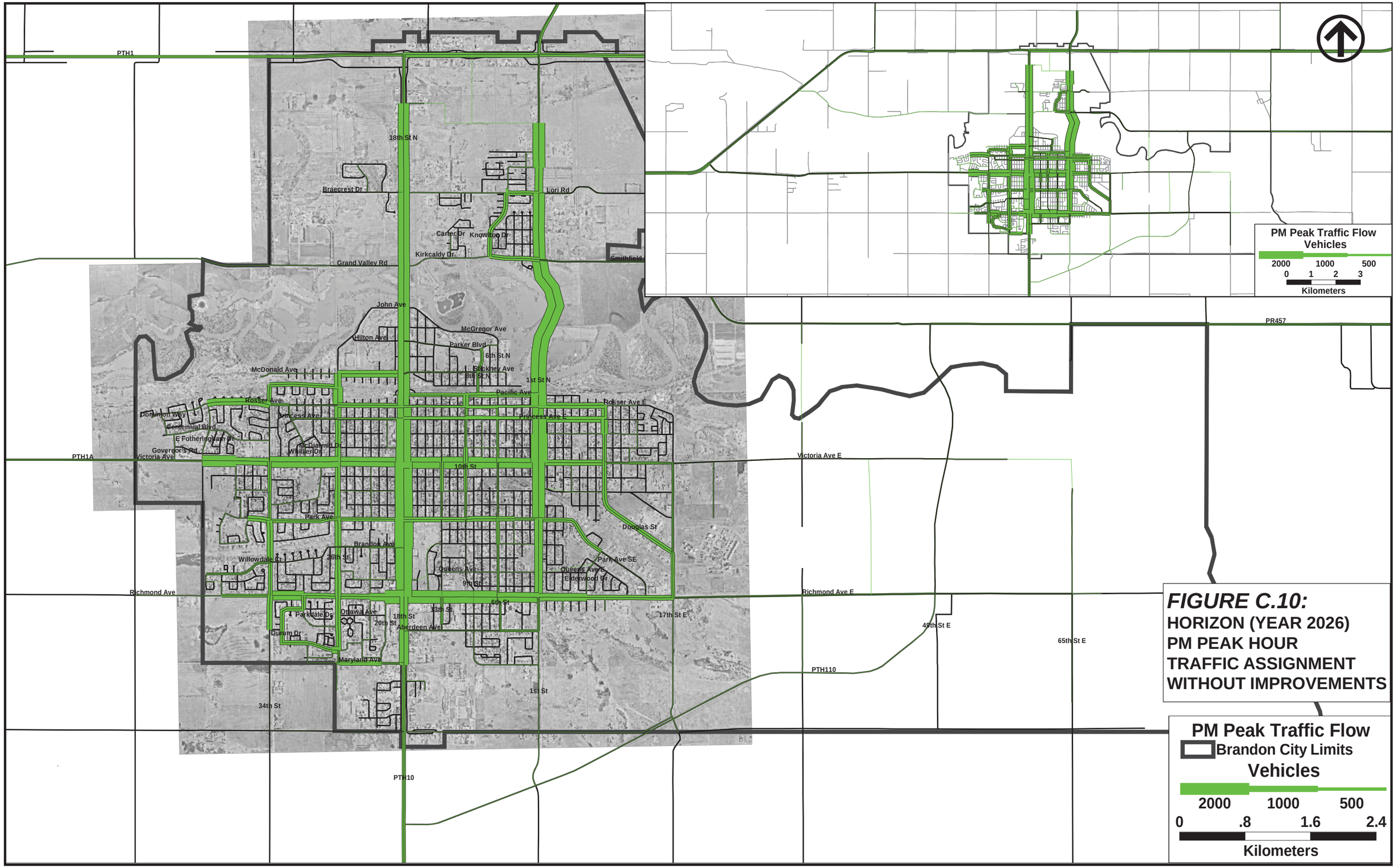


FIGURE C.10:
HORIZON (YEAR 2026) PM PEAK HOUR TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

PM Peak Traffic Flow

Brandon City Limits

Vehicles

2000 1000 500

0 .8 1.6 2.4

Kilometers

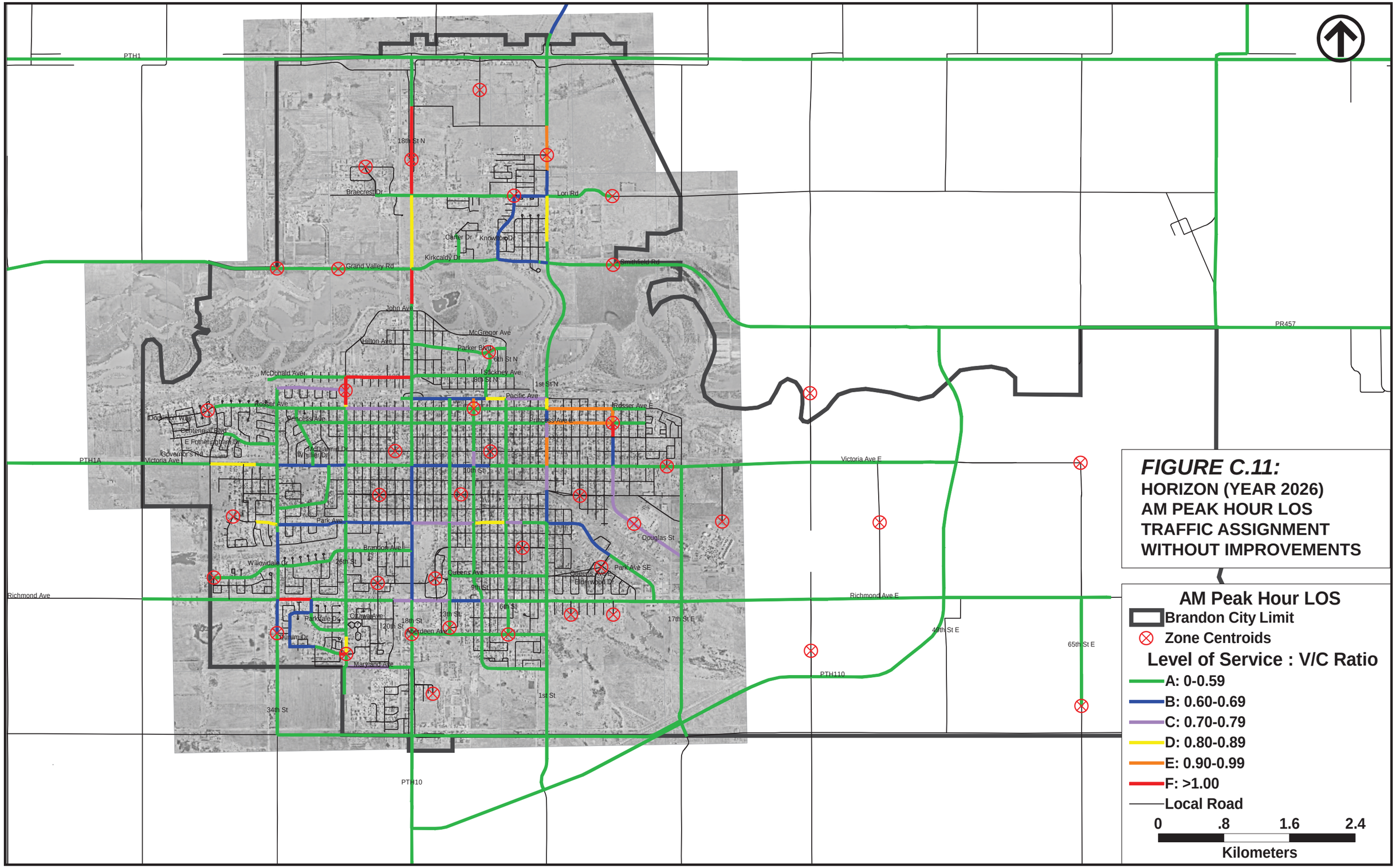


FIGURE C.11:
HORIZON (YEAR 2026) AM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

AM Peak Hour LOS

- Brandon City Limit
- Zone Centroids

Level of Service : V/C Ratio

- A: 0-0.59
- B: 0.60-0.69
- C: 0.70-0.79
- D: 0.80-0.89
- E: 0.90-0.99
- F: >1.00
- Local Road

0 .8 1.6 2.4

Kilometers

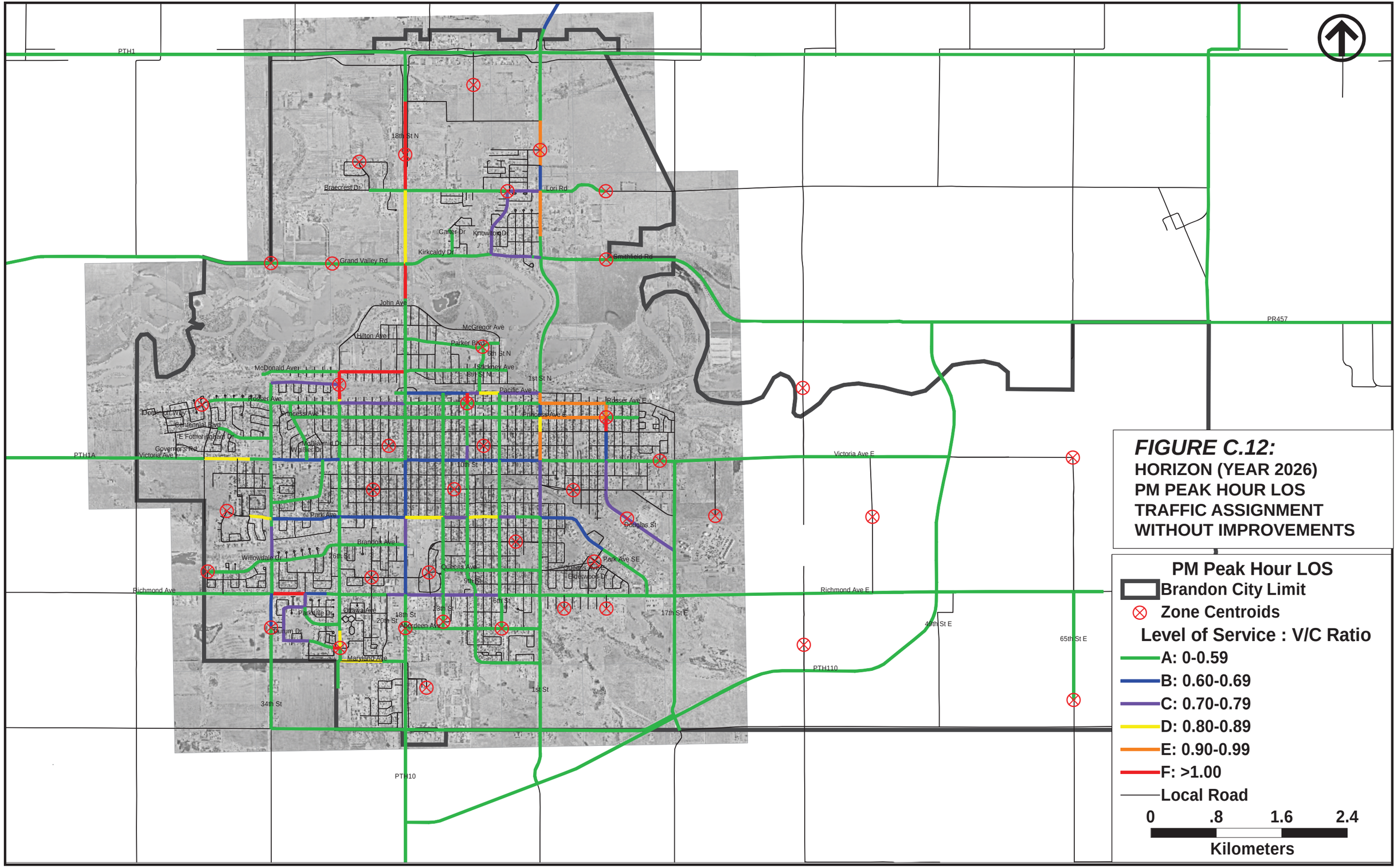


FIGURE C.12:
HORIZON (YEAR 2026)
PM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

PM Peak Hour LOS

- Brandon City Limit
- Zone Centroids

Level of Service : V/C Ratio

- A: 0-0.59
- B: 0.60-0.69
- C: 0.70-0.79
- D: 0.80-0.89
- E: 0.90-0.99
- F: >1.00
- Local Road

0 .8 1.6 2.4

Kilometers

LEVEL OF SERVICE

Highway traffic congestion is expressed in terms of Level of Service (LOS) as defined by the Highway Capacity Manual (HCM). LOS is a letter code ranging from "A" for excellent conditions to "F" for failure conditions. The conditions defining the LOS for roadways are summarized as follows:

LOS A

Represents the best operating conditions and is considered free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.

V/C Ratio: 0 - 0.59

LOS B

Represents reasonably free-flowing conditions but with some influence by others.

V/C Ratio: 0.60 - 0.69

LOS C

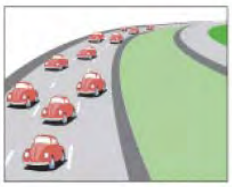
Represents a constrained constant flow below speed limits, with additional attention required by the drivers to maintain safe operations. Comfort and convenience levels of the driver decline noticeably.

V/C Ratio: 0.70 - 0.79

LOS D

Represents traffic operations approaching unstable flow with high passing demand and passing capacity near zero, characterized by drivers being severely restricted in maneuverability.

V/C Ratio: 0.80 - 0.89



LOS E

Represents unstable flow near capacity. LOS E often changes to LOS F very quickly because of disturbances (road conditions, accidents, etc.) in traffic flow.

V/C Ratio: 0.90 - 0.99

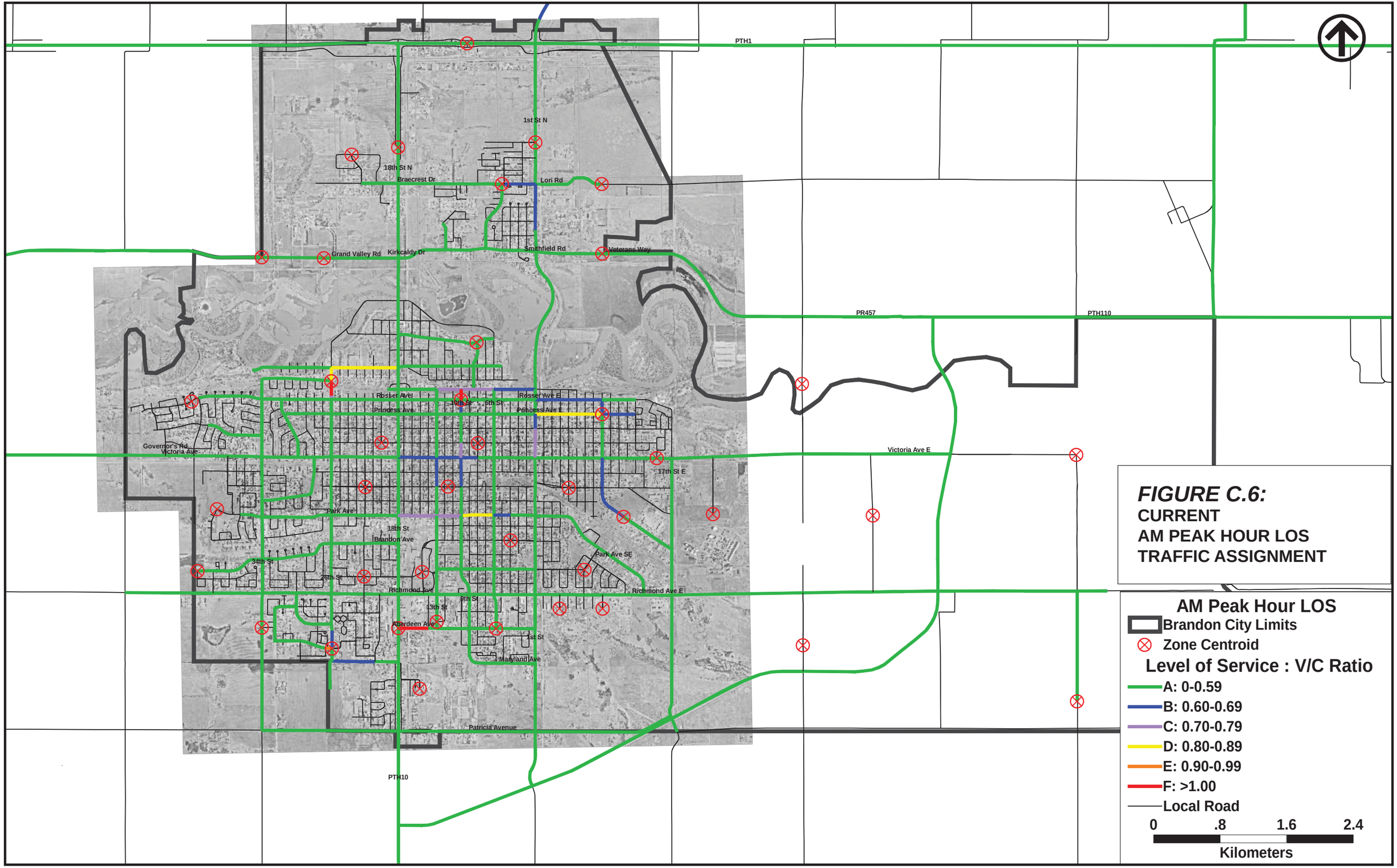
LOS F

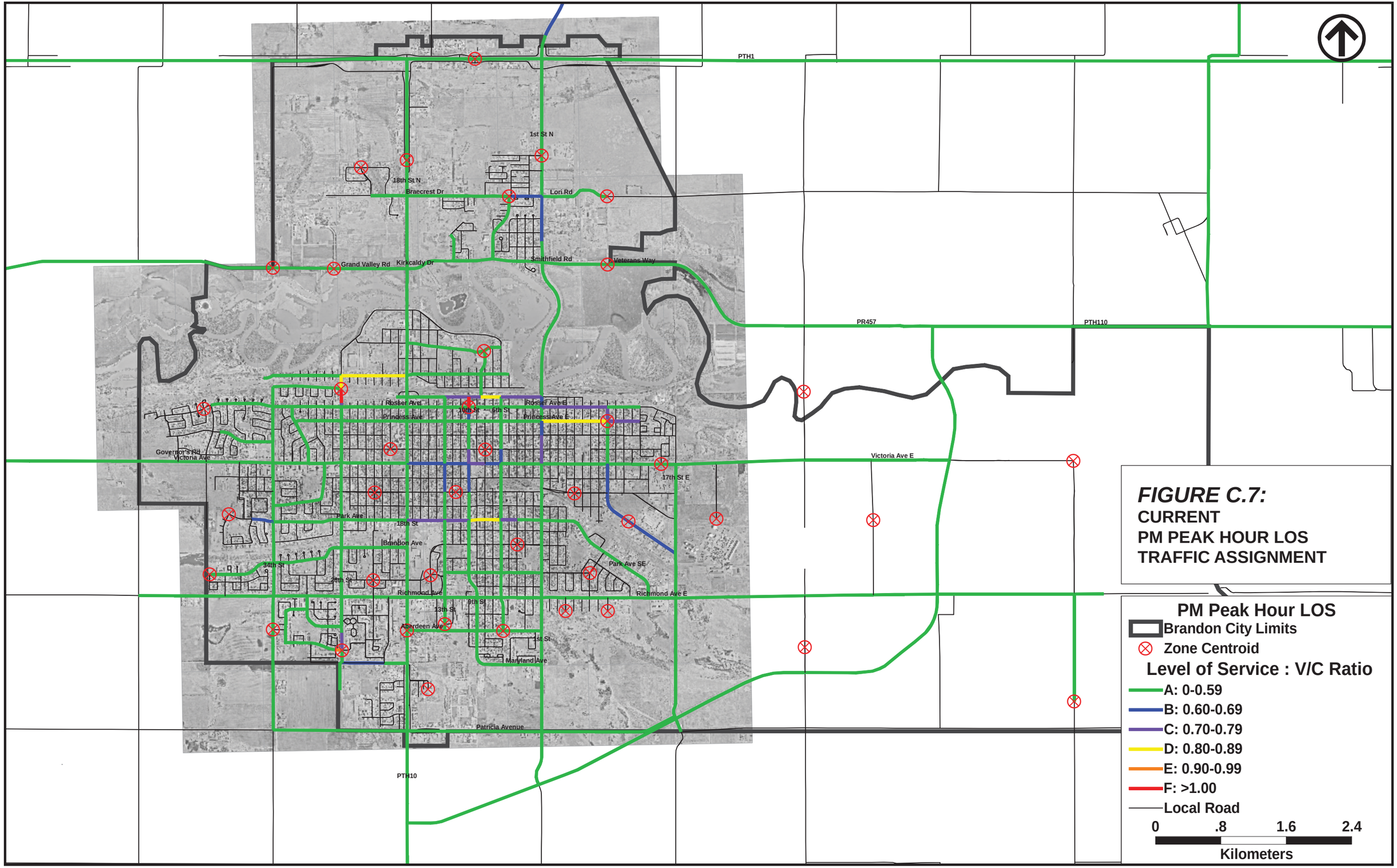
Represents the worst conditions with heavily congested flow and traffic demand exceeding capacity, characterized by stop-and-go waves, poor travel time, low comfort and convenience, and increased accident exposure.

V/C Ratio: 1.0 or greater

Source: Route 228 Project Website, McCormick Taylor, Inc.

FIGURE C.5:
LEVEL OF SERVICE


PTH1
1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Veterans Way
PR457
PTH110
Victoria Ave E
17th St E
Rosser Ave
Princess Ave
10th St
6th St
Rosser Ave E
Princess Ave E
Governor's Rd
Victoria Ave
Park Ave
18th St
Brandon Ave
34th St
26th St
Richmond Ave
9th St
13th St
Aberdeen Ave
1st St
Maryland Ave
Park Ave SE
Richmond Ave E
Patricia Avenue
PTH10
FIGURE C.6:
CURRENT
AM PEAK HOUR LOS
TRAFFIC ASSIGNMENT
AM Peak Hour LOS
Brandon City Limits
Zone Centroid
Level of Service : V/C Ratio
A: 0-0.59
B: 0.60-0.69
C: 0.70-0.79
D: 0.80-0.89
E: 0.90-0.99
F: >1.00
Local Road
0
.8
1.6
2.4
Kilometers


PTH1
1st St N
18th St N
Braecrest Dr
Lori Rd
Grand Valley Rd
Kirkcaldy Dr
Smithfield Rd
Veterans Way
PR457
PTH110
Rosser Ave
Rosser Ave E
10th St
5th St
Princess Ave
Princess Ave E
Governor's Rd
Victoria Ave
Victoria Ave E
17th St E
Park Ave
18th St
Brandon Ave
34th St
26th St
Park Ave SE
Richmond Ave
Richmond Ave E
9th St
13th St
Aberdeen Ave
1st St
Maryland Ave
Patricia Avenue
PTH10
FIGURE C.7:
CURRENT
PM PEAK HOUR LOS
TRAFFIC ASSIGNMENT
PM Peak Hour LOS
Brandon City Limits
Zone Centroid
Level of Service : V/C Ratio
A: 0-0.59
B: 0.60-0.69
C: 0.70-0.79
D: 0.80-0.89
E: 0.90-0.99
F: >1.00
Local Road
0
.8
1.6
2.4
Kilometers

6.0 HORIZON YEAR TRIP ASSIGNMENT

Table C.3: Historical Dwelling Unit Construction Trend

Year	Single Family	Duplex	Multi Family	Mobile Homes	Total
1981	66	8	n/a	n/a	74
1982	91	8	29	n/a	128
1983	214	16	n/a	n/a	230
1984	126	22	284	n/a	432
1985	102	4	170	n/a	276
1986	144	18	123	n/a	285
1987	115	20	86	n/a	221
1988	49	28	196	n/a	273
1989	45	34	18	13	110
1990	24	28	17	3	72
1991	23	16	n/a	7	46
1992	53	30	n/a	7	90
1993	72	18	36	8	134
1994	74	34	27	5	140
1995	60	6	20	0	86
1996	53	4	29	5	91
1997	83	8	36	3	130
1998	121	34	23	2	180
1999	48	8	250	40	346
2000	45	4	26	25	100
2001	39	12	22	25	98
2002	67	4	81	42	194
2003	80	4	165	67	316
Yearly Average	**78**	**16**	**86**	**17**	**197**
20-Year Estimate					**3,940**

6.1 The Former Brandon Mental Health Centre Site

Correspondence with Brandon Economic Development as well as personnel from the North Hill Development Consortium indicated that the most likely form of development at the former Brandon Mental Health Center site would be the relocation of the Assiniboine Community College. While the shift will take a few years, the entire move of Assiniboine Community College is expected to occur within the 20-year horizon period.

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6.2 North Hill/Black Property Site Development

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- Approximately 50% of land designated for commercial development will be developed (75 acres, totalling 620,000 sq. ft. of leasable floor area).

Using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Edition (ITE, 2003) a blended trip rate was devised based on the assumed land-uses described in Table C.4.

Table C.4: North Hill/Black Lands Blended Trip Generation Rate

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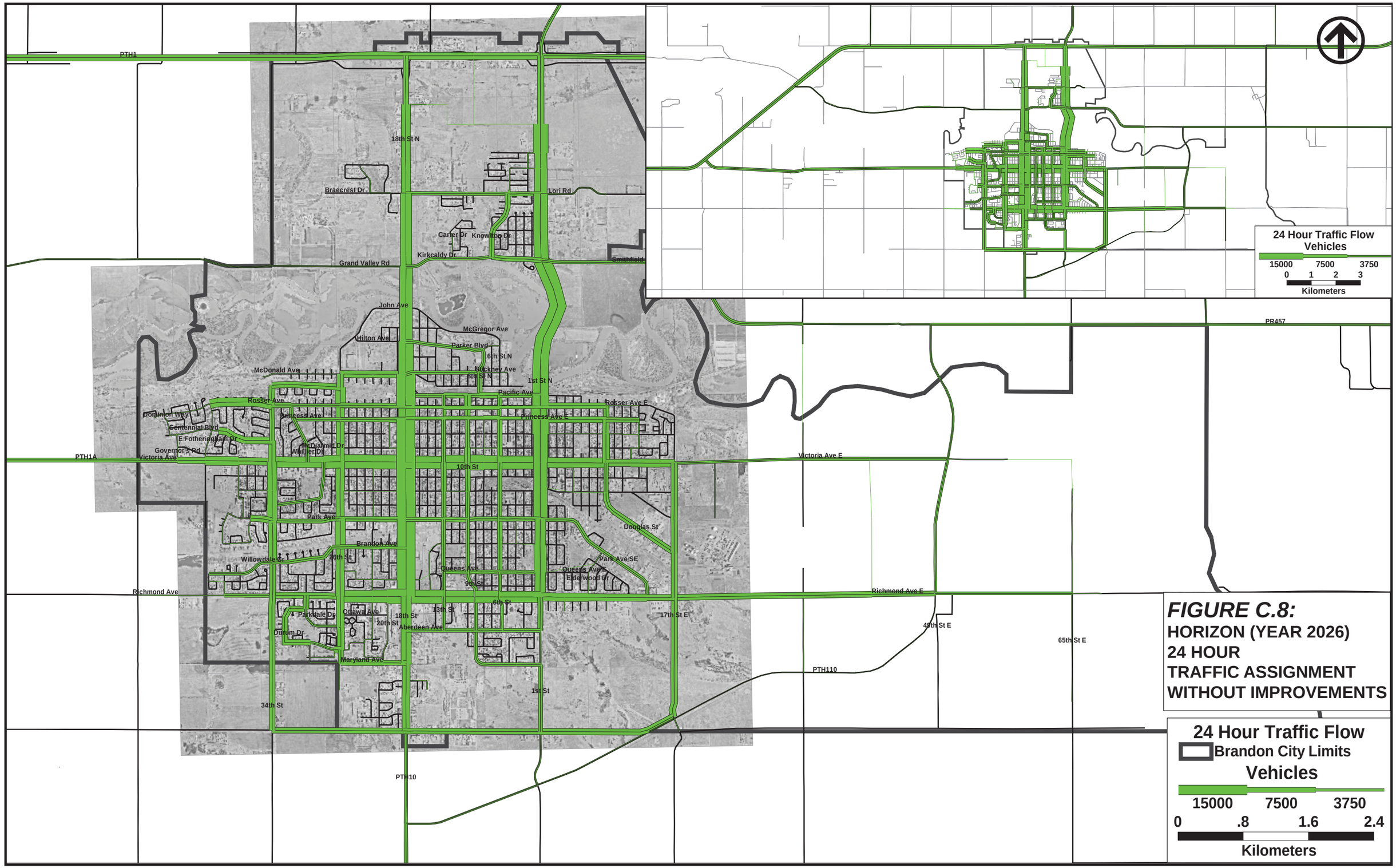
One road link was at or above capacity in the a.m. peak hour under existing conditions (Aberdeen Avenue between 13th and 18th Streets), and three links were forecast to operate at LOS D). The forecast Year 2026 scenario with no roadway modifications results in a number of additional links at or above capacity, as well as additional links at LOS D. A number of the links that are forecast to experience a reduction in LOS relate to the areas expected to feature much of the future development (e.g., 1st and 18th Streets north of the Assiniboine River. The Aberdeen link in Figure C.6 improves in the Year 2026 scenario even though there are no roadway modifications. Future development changes to O-D matrix to reflect changes in attractiveness of the traffic zones. It is believed that this has shifted the split of traffic entering/exiting the zone from the three zone centroid connectors to alter the LOS.

The p.m. peak hour LOS forecasts under existing conditions identify four links at LOS D, with no links at a lower LOS. The forecast Year 2026 LOS adds a number of links that are at or over capacity plus additional links at LOS D.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18th St N
Braecrest Dr
Lori Rd
Carter Dr
Knowlton Dr
Kirkcaldy Dr
Grand Valley Rd
Smithfield
John Ave
McGregor Ave
Hilton Ave
Parker Blvd
6th St N
McDonald Ave
Buckley Ave
8th St N
1st St N
Pacific Ave
Rosser Ave
Rosser Ave E
Dominion Way
Princess Ave
Princess Ave E
Centennial Blvd
E Fotheringham Dr
Governor's Rd
Victoria Ave
PTH1A
McDiarmid Dr
Wheeler Dr
10th St
Victoria Ave E
Park Ave
Douglas St
Brandon Ave
26th St
Willowdale Cr
Park Ave SE
Queens Ave
Queens Ave E
Elderwood Dr
9th St
Richmond Ave
Richmond Ave E
6th St
Parkdale Dr
Ottawa Ave
18th St
13th St
17th St E
20th St
Aberdeen Ave
Durum Dr
49th St E
65th St E
Maryland Ave
PTH110
1st St
34th St
PTH10
PR457
24 Hour Traffic Flow
Vehicles
15000
7500
3750
0
1
2
3
Kilometers
FIGURE C.8:
HORIZON (YEAR 2026)
24 HOUR
TRAFFIC ASSIGNMENT
WITHOUT IMPROVEMENTS
24 Hour Traffic Flow
Brandon City Limits
Vehicles
15000
7500
3750
0
.8
1.6
2.4
Kilometers

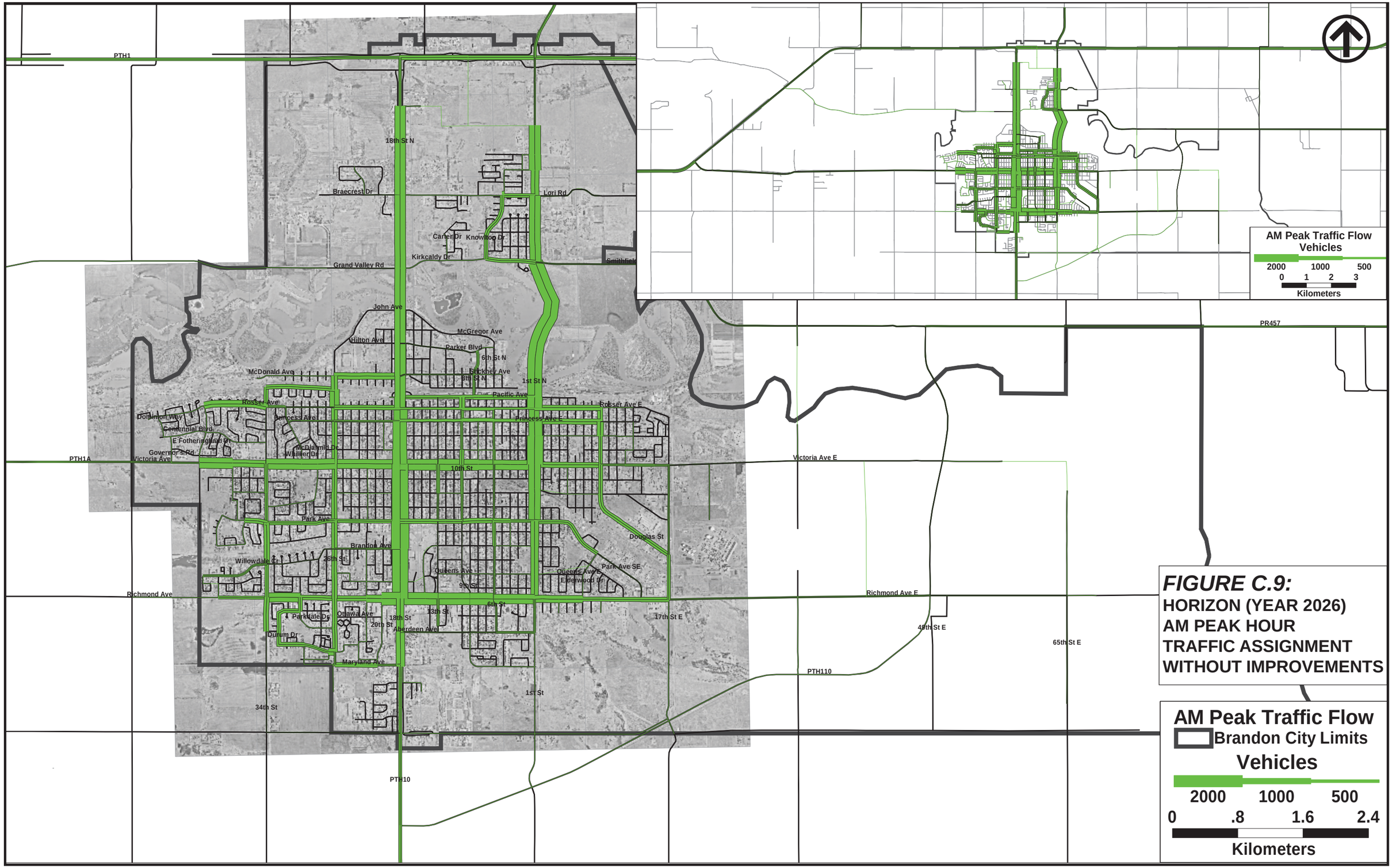


FIGURE C.9:
HORIZON (YEAR 2026) AM PEAK HOUR TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

AM Peak Traffic Flow

Brandon City Limits

Vehicles

2000 1000 500

0 .8 1.6 2.4

Kilometers

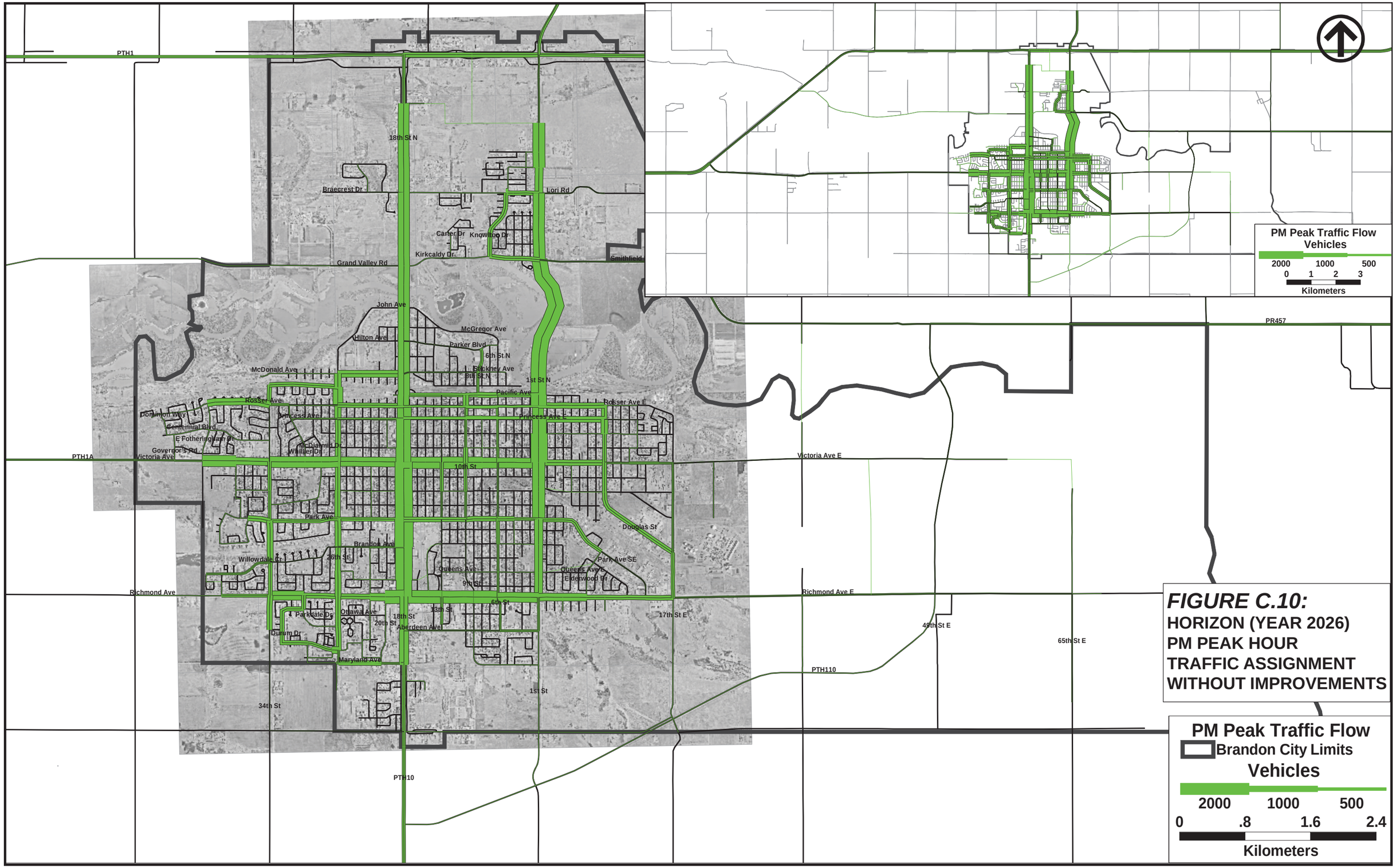


FIGURE C.10:
HORIZON (YEAR 2026) PM PEAK HOUR TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

PM Peak Traffic Flow

Brandon City Limits

Vehicles

2000 1000 500

0 .8 1.6 2.4

Kilometers

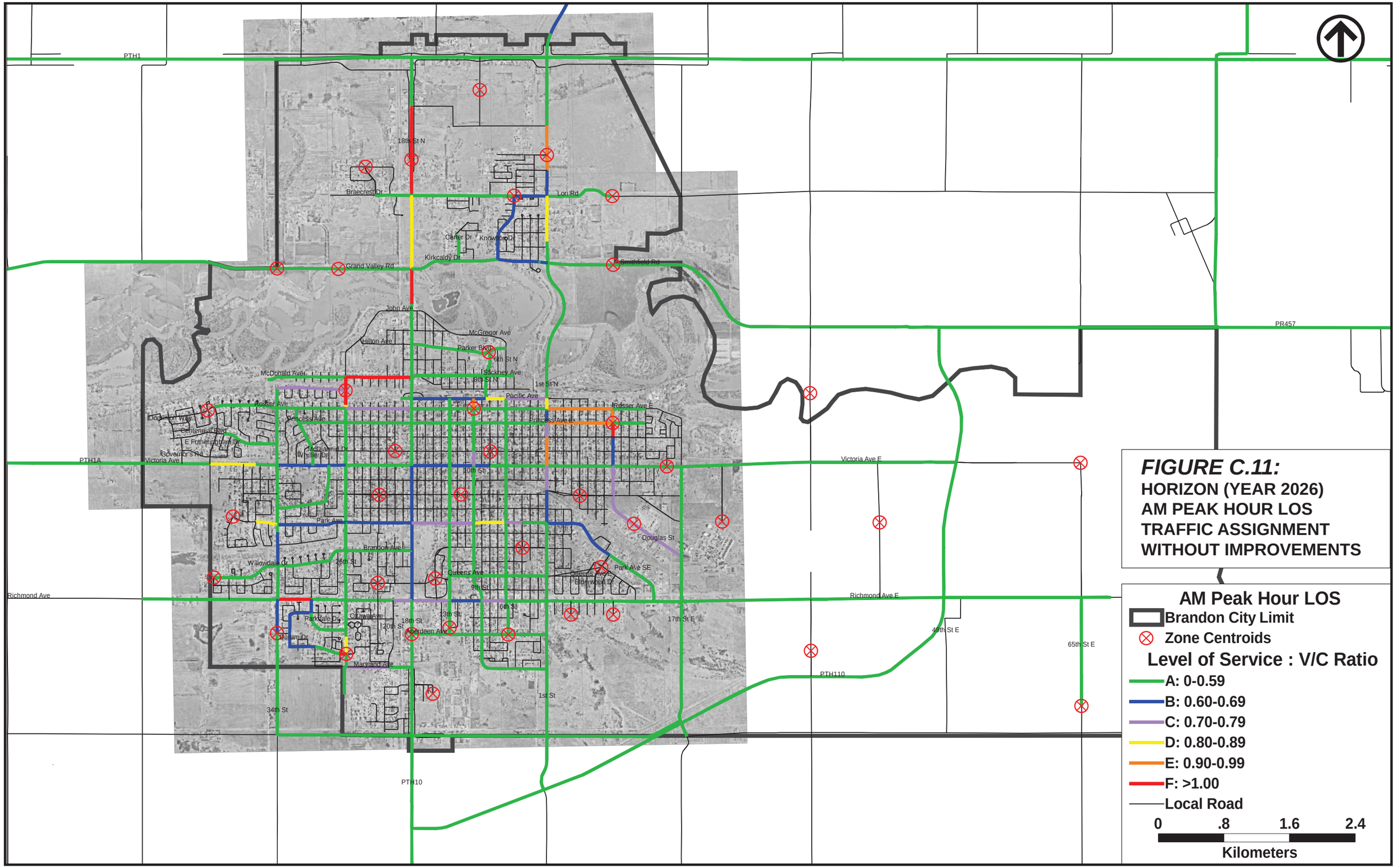


FIGURE C.11:
HORIZON (YEAR 2026) AM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITHOUT IMPROVEMENTS

AM Peak Hour LOS

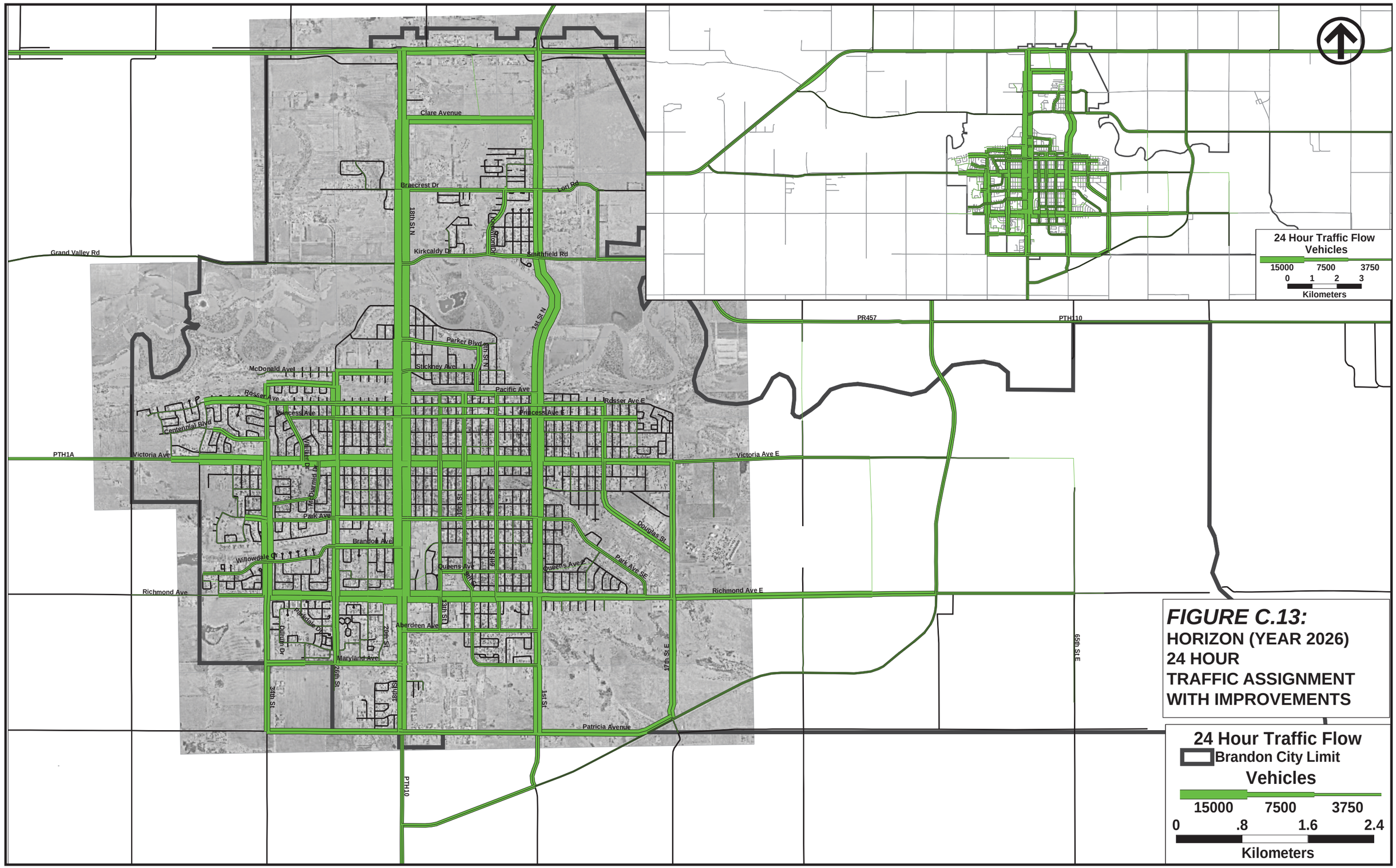
- Brandon City Limit
- Zone Centroids

Level of Service : V/C Ratio

- A: 0-0.59
- B: 0.60-0.69
- C: 0.70-0.79
- D: 0.80-0.89
- E: 0.90-0.99
- F: >1.00
- Local Road

0 .8 1.6 2.4

Kilometers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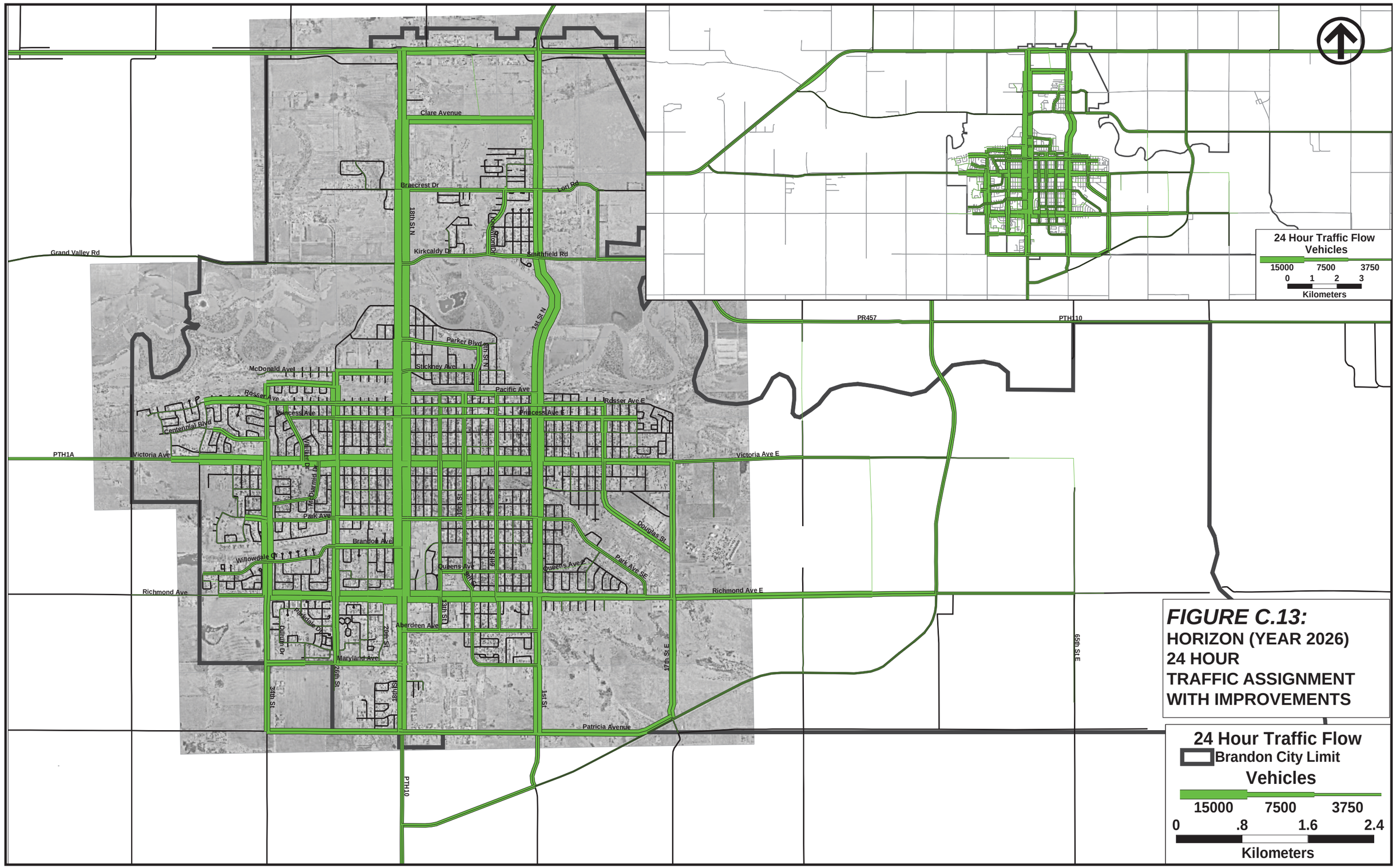
Braecrest Dr
Lori Rd
18th St N
Rosewood Dr
Kirkcaldy Dr
Grand Valley Rd
Southfield Rd
1st St N
Parker Blvd
9th St N
McDonald Ave
Stickney Ave
Pacific Ave
Rosser Ave
Rosser Ave E
Princess Ave
Princess Ave E
Centennial Blvd
PTH1A
Victoria Ave
Victoria Ave E
Diamond Dr
1st St
Park Ave
Brandon Ave
Douglas St
Willowdale Dr
Queens Ave
Queens Ave E
Park Ave SE
Richmond Ave
Richmond Ave E
Aberdeen Ave
13th St
20th St
Maryland Ave
17th St E
26th St
30th St
18th St
1st St
Patricia Avenue
PTH10
PR457
PTH110
65th St E
24 Hour Traffic Flow
Vehicles
15000
7500
3750
0
1
2
3
Kilometers
FIGURE C.13:
HORIZON (YEAR 2026)
24 HOUR
TRAFFIC ASSIGNMENT
WITH IMPROVEMENTS
24 Hour Traffic Flow
Brandon City Limit
Vehicles
15000
7500
3750
0
.8
1.6
2.4
Kilometers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Lori Rd
18th St N
Rosewood Dr
Kirkcaldy Dr
Grand Valley Rd
Southfield Rd
1st St N
Parker Blvd
9th St N
McDonald Ave
Stickney Ave
Pacific Ave
Rosser Ave
Rosser Ave E
Princess Ave
Princess Ave E
Centennial Blvd
PTH1A
Victoria Ave
Victoria Ave E
Diamond Dr
1st St
Park Ave
Brandon Ave
Douglas St
Willowdale Dr
Queens Ave
Queens Ave E
Park Ave SE
Richmond Ave
Richmond Ave E
Aberdeen Ave
13th St
20th St
Maryland Ave
17th St E
26th St
30th St
18th St
1st St
Patricia Avenue
PTH10
PR457
PTH110
65th St E
24 Hour Traffic Flow
Vehicles
15000
7500
3750
0
1
2
3
Kilometers
FIGURE C.13:
HORIZON (YEAR 2026)
24 HOUR
TRAFFIC ASSIGNMENT
WITH IMPROVEMENTS
24 Hour Traffic Flow
Brandon City Limit
Vehicles
15000
7500
3750
0
.8
1.6
2.4
Kilometers

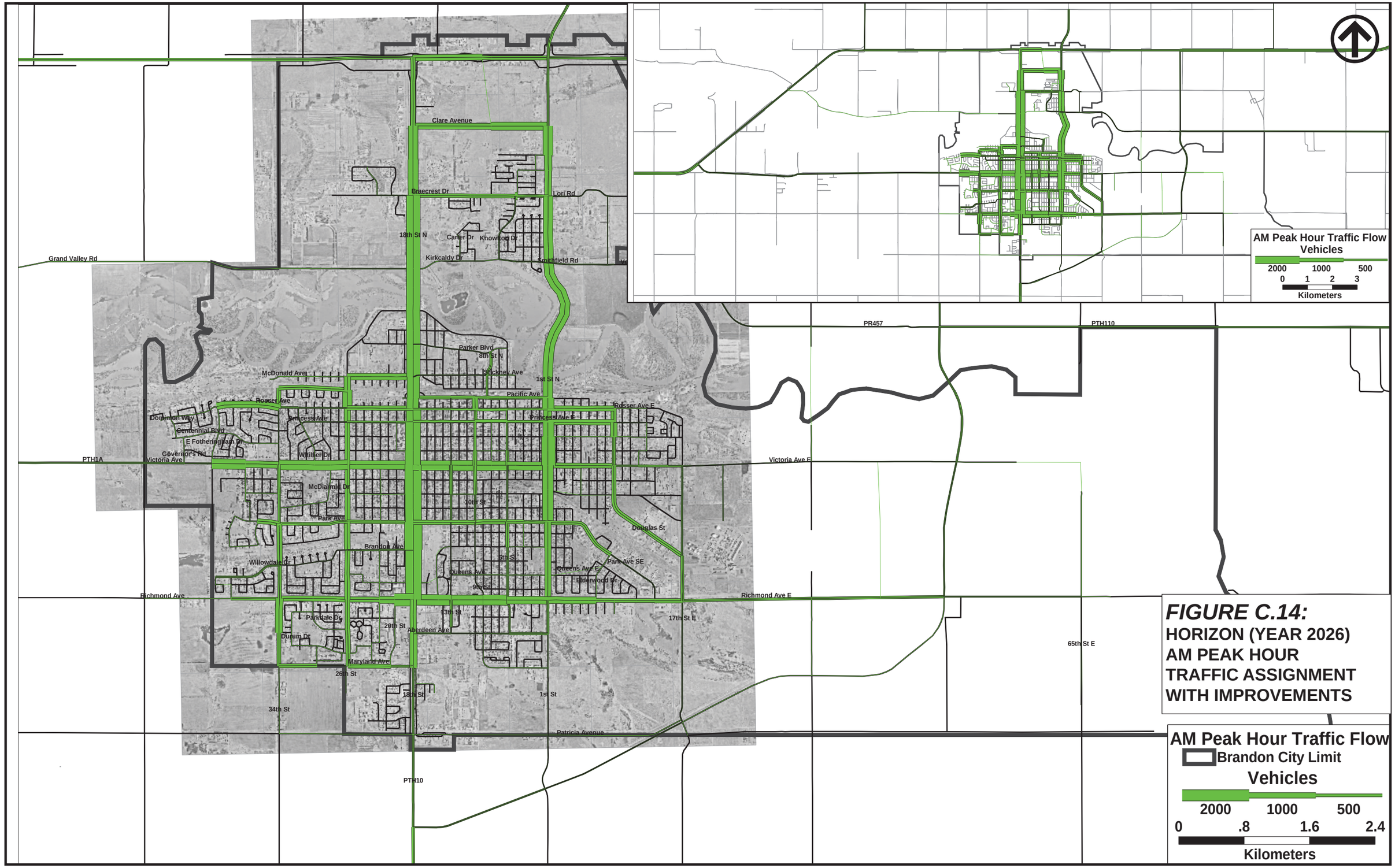

FIGURE C.14:
HORIZON (YEAR 2026) AM PEAK HOUR TRAFFIC ASSIGNMENT WITH IMPROVEMENTS

AM Peak Hour Traffic Flow

Brandon City Limit

Vehicles

2000 1000 500

0 .8 1.6 2.4

Kilometers

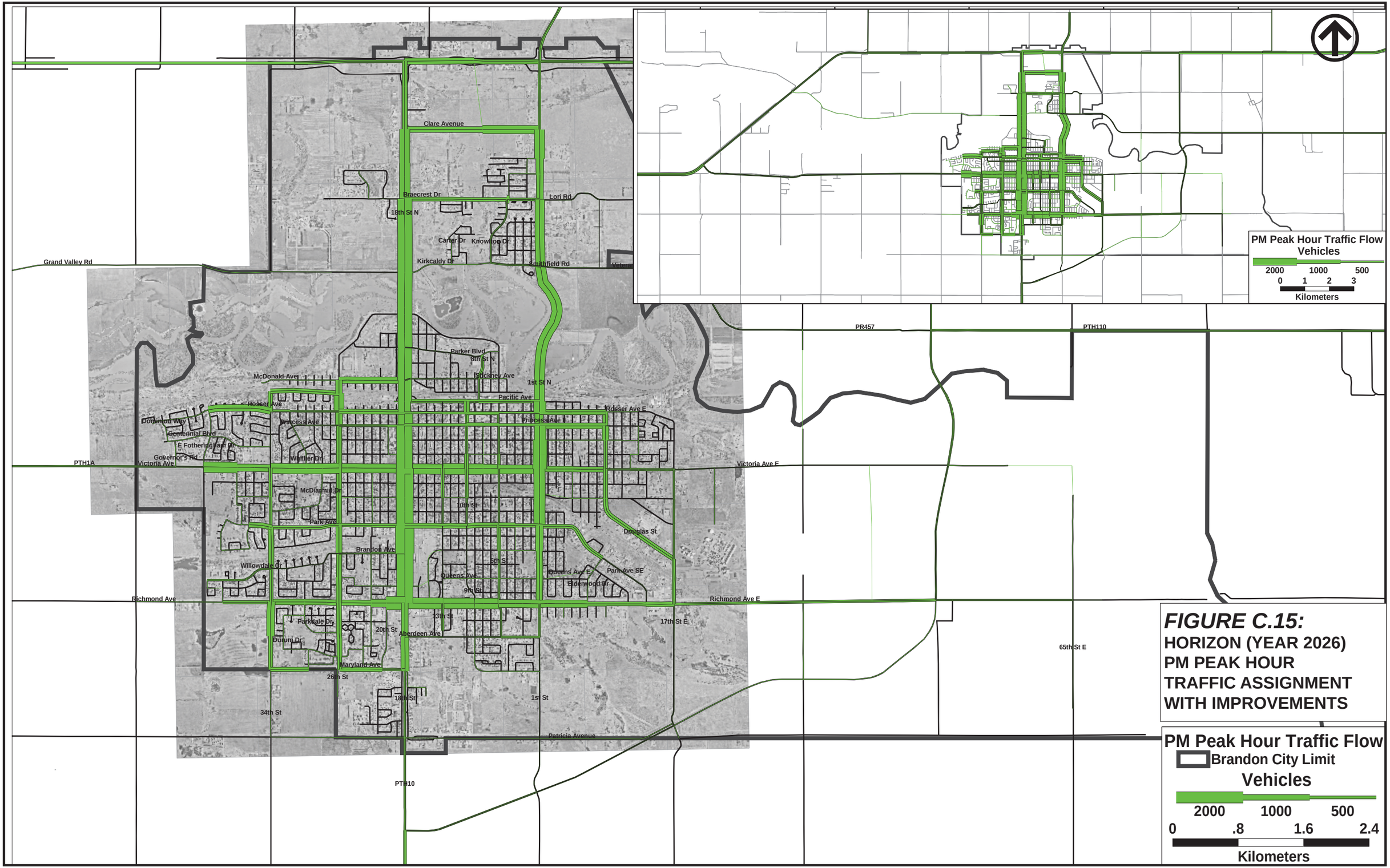

FIGURE C.15:
HORIZON (YEAR 2026) PM PEAK HOUR TRAFFIC ASSIGNMENT WITH IMPROVEMENTS

PM Peak Hour Traffic Flow
Brandon City Limit
Vehicles
2000 1000 500
0 .8 1.6 2.4
Kilometers

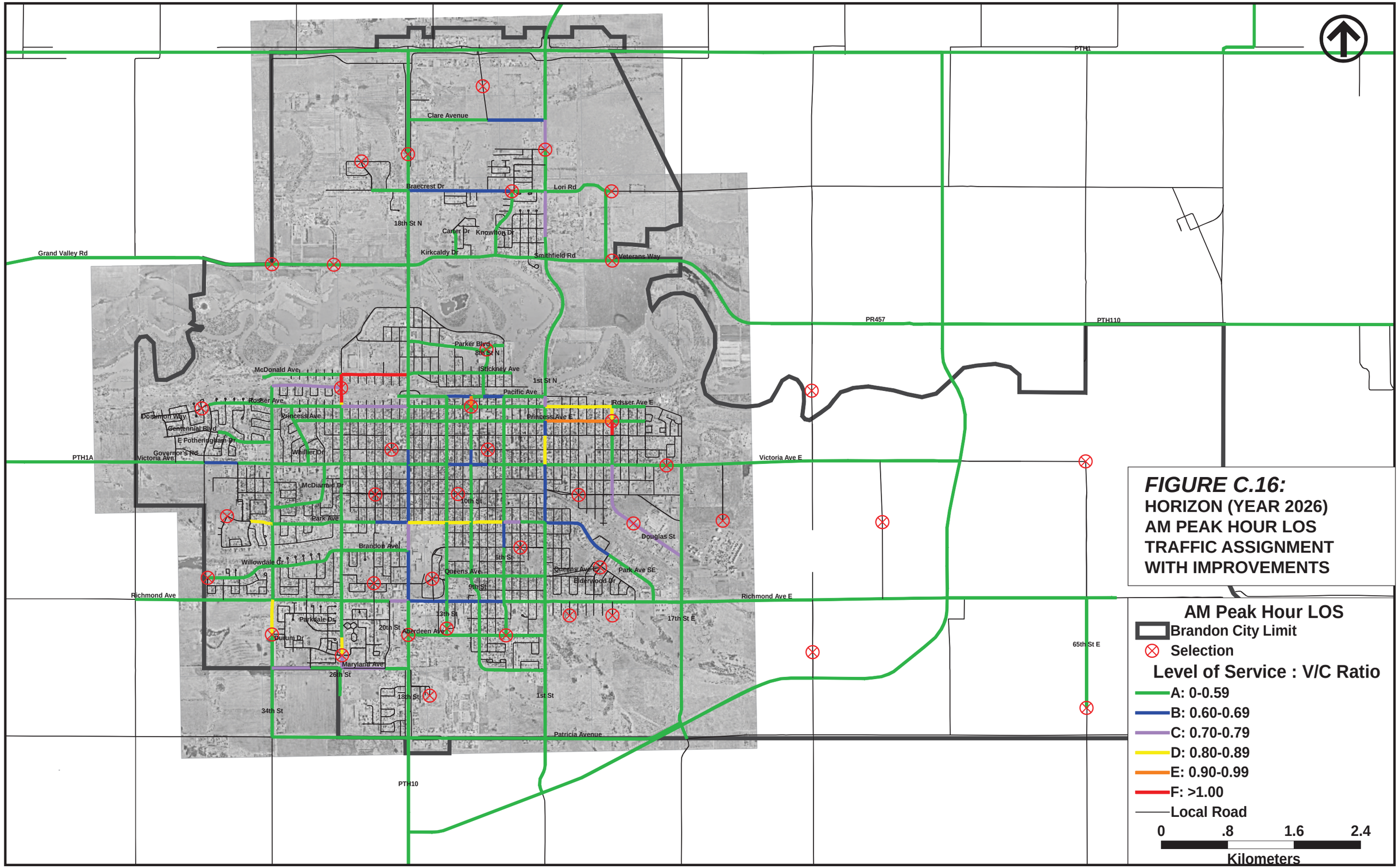

FIGURE C.16:
HORIZON (YEAR 2026) AM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITH IMPROVEMENTS

AM Peak Hour LOS

- Brandon City Limit
- Selection

Level of Service : V/C Ratio

- A: 0-0.59
- B: 0.60-0.69
- C: 0.70-0.79
- D: 0.80-0.89
- E: 0.90-0.99
- F: >1.00
- Local Road

0 .8 1.6 2.4

Kilometers

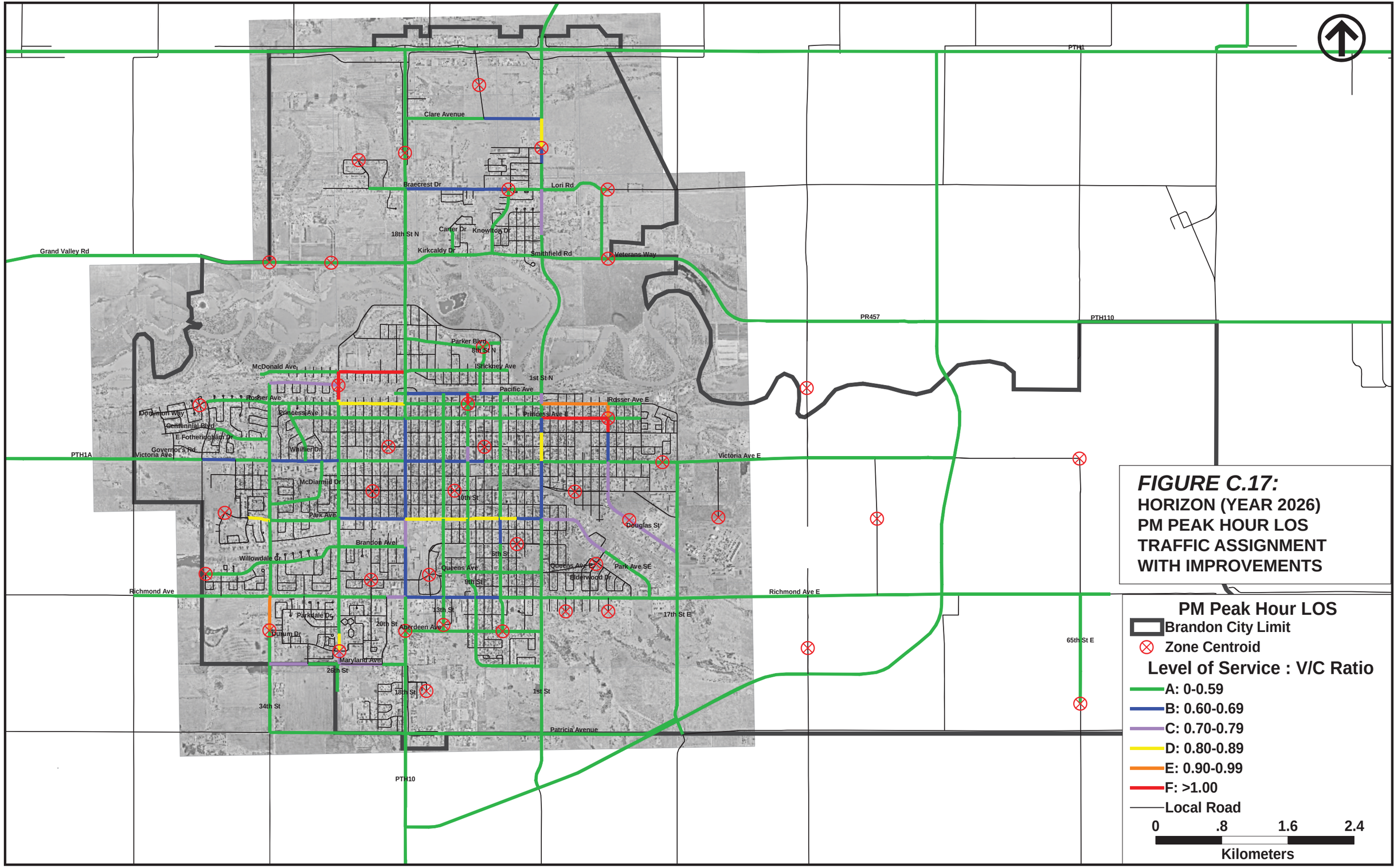

FIGURE C.17:
HORIZON (YEAR 2026) PM PEAK HOUR LOS TRAFFIC ASSIGNMENT WITH IMPROVEMENTS

PM Peak Hour LOS

- Brandon City Limit
- Zone Centroid

Level of Service : V/C Ratio

- A: 0-0.59
- B: 0.60-0.69
- C: 0.70-0.79
- D: 0.80-0.89
- E: 0.90-0.99
- F: >1.00
- Local Road

0 .8 1.6 2.4

Kilometers

APPENDIX D

TRAFFIC IMPACT STUDY POLICY

1.0 TRAFFIC IMPACT STUDY POLICY FOR THE CITY OF BRANDON

A review of guidelines for the preparation of Traffic Impact Studies (TIS) was conducted from a variety of municipalities including MIT, Saskatoon, Ministry of Transportation for Ontario, Toronto, Ottawa, Halton, Halifax, St. Clair, and Hamilton. This section provides a general overview of typical components for TIS guidelines.

1.1 Warrants

The need to conduct a traffic impact study most often results when a proposed development is expected to generate over 100 additional peak hour, peak direction trips to or from the site during the roadway or development's peak hour. The objective of a traffic impact study is to assess the impacts of a new or changed development on the existing and proposed transportation system. It should also suggest transportation system improvements to mitigate any negative affects or increased travel demand caused by the development.

A traffic impact study may also be required when less than 100 peak hour trips are generated if the development:

- Is located is an area of rapid population growth or in an area of existing high traffic congestion.
- Generates traffic that would result in a volume/capacity ratio greater than 0.85 for the overall or shared/turning movement at a signalized intersection.
- Generates traffic that would result in a volume/capacity ratio greater than 1.0 for exclusive turning movements at a signalized intersection
- Has direct vehicular access to a major collector or arterial street.
- Is not identified in the local development plan.
- Requires the implementation of a traffic signal.
- Has the potential to cause adverse safety impacts on the road network.
- Have inadequate horizontal and vertical curves at the access points.
- Lacks left or right turn lanes at access points.

Traffic impact studies are most often required during a Zoning By-law Amendment application or a Plan of Subdivision application and have a shelf life of five years provided the study area has developed as planned.

1.2 Components of a Traffic Impact Study

Typically a traffic impact study should include the following:

- **Introduction:** This section should include a description of the type of development, name of the developer, current and proposed land use designation, total building size, total usable square footage, site plan, number of parking spaces, proposed hours of operations, expected date of occupancy, planned phasing of development, proposed access locations and the location of existing and proposed transit facilities.

- **Study Area:** The study area should include all locations where traffic on the network is expected to grow by at least five percent. The study area should include a description of adjacent roads including lane configurations, turning restrictions, vehicle type restrictions, location of transit routes, on-street parking, bicycle routes, location of pedestrian crosswalks, and any improvements that are being considered in a five-year horizon period.

- **Background Traffic:** Existing traffic volumes and turning movements should be obtained from traffic counts less than two years old. Signal timing at signalized intersections, pedestrian traffic volumes and transit ridership information should also be collected. Growth factors should be determined using a forecast model that incorporates all developments being proposed within the study's horizon years and includes an appropriate mode split between transit, vehicular and alternative uses.

- **Travel Demand:** Forecasts of travel demand generated by the proposed development should be completed using appropriate rates found in the ITE Trip Generation Manual or manual calculations based on anticipated trips. This section should include:

    - Trip generation – pass-by, new and internal trips.

    - Trip distribution – based on the size and type of development and existing land uses and traffic patterns.

    - Trip assignment – considering roadway capacities and travel times.

- **Traffic Analysis:** This section should review intersection and transit level of service, site access, safety issues, roadway and intersection geometry, suitability of parking/loading facilities, sightlines, on-site circulation, and bicycle/pedestrian access routes.

- **Recommendations:** This section should include transportation system mitigation measures and recommendations that address right of way needs, funding, cost effectiveness and construction sequencing. Most jurisdictions surveyed required a qualified transportation engineer experienced in transportation planning and traffic engineering to oversee a traffic impact study. The municipality should have a list of

qualified consultants and have it made available on request. All traffic impact studies should be submitted under engineer's seal and signed and dated accordingly.

1.3 Definition of a Traffic Impact Study

Traffic impact refers to the effect a certain type or magnitude of development will have on the surrounding transportation system. A Traffic Impact Study (TIS) provides a way of assessing the adequacy of the existing or future transportation system to accommodate additional traffic generated by a proposed development, redevelopment or land rezoning. It is also to assist in determining what improvements may be required to the roadway system to maintain a satisfactory level of service.

1.4 Requirements for a Traffic Impact Study

A traffic impact study will be required to support a development or redevelopment proposal under the following situations:

- When a proposed development is expected to generate 100 or more vehicle trips, in total (inbound and outbound) during the morning or afternoon street/avenue peak hour
- When a specified large amount of land use is being rezoned and expected to have a transportation system or community impact
- When a proposed development will occur in a sensitive area (environmentally, or in areas where traffic concerns currently exist or are anticipated)
- At the discretion of the City Engineer, Engineering Department

The proponent should contact the Engineering Department early in the planning process to apprise the Department of the proposed plans and obtain a determination on whether a TIS will be required and the specific parameters.

1.5 Purpose of a Traffic Impact Study

A Traffic Impact Study will indicate the effects of a proposed development on an existing or future roadway system. It is also the intent of the TIS to recommend necessary geometric or operational improvements to the roadways in order to satisfactorily accommodate additional traffic at a reasonable level of service, in line with the City's level of service guidelines.

A traffic impact analysis shall constitute an essential part of the development review process. Specifically, a TIS will address the following:

- Identify the additional traffic contribution of a particular site development to existing roadway system traffic loads
- Provide a credible basis for estimating roadway improvements attributed to a proposed development to maintain a satisfactory level of service (LOS)
- Ensure that the proposed plan, and the associated traffic, is compatible with the existing and future transportation policy of the City of Brandon

1.6 Contents of a Traffic Impact Study

A Traffic Impact Study shall be prepared under the supervision of a qualified and experienced transportation engineer, licensed in the Province of Manitoba. The exact parameters for a TIS required for a specific proposal will follow the guidelines identified in Appendix D, and any specific features as set out by the Engineering Department.

1.7 Proponent's Role

It is the responsibility of the proponent (developer/owner or the owner's designated agent) to have a TIS prepared by a qualified and experienced transportation engineer licensed in the Province of Manitoba. Following completion of the report the TIS shall be submitted to the Engineering Department in conjunction with the development application.

Three copies of the final report, sealed by a Professional Engineer registered in the Province of Manitoba, as well as a PDF digital copy shall be submitted.

1.8 City's Role

The City's role will be to:

- Provide a generic guideline for conducting the study (Appendix D.1)
- Supply readily available data and relevant reports
- Review the submitted report thoroughly and objectively
- Approve or reject the TIS in a timely fashion
- Circulate (if necessary) the TIS to other City Departments, Utility Organizations, or external agencies

1.9 Costs

All costs associated with the preparation of a TIS shall be borne by the applicant.

APPENDIX D.1
GUIDELINES FOR PREPARATION OF A TRAFFIC IMPACT STUDY

Project Description

Project description should include, but not limited to: the purpose and nature of the project; land use type and intensity; development phasing planned and expected completion dates.

Study Area

The study area should be defined in consultation with the Engineering Department. At a minimum, intersections adjacent to the site will be examined; other intersections to be included will be determined on a site-by-site basis. All major roadways and intersections within the study area must be shown on the plan.

Existing Conditions

Describe all existing conditions, including:

- Current land use of the site and the surrounding area
- Roadway geometrics
- Intersection control devices, with details on phasing and cycle lengths
- Current turning movement traffic volumes
- Traffic restrictions and speed limits
- Transit routes (if relevant to the proposed development)
- Pedestrian and cyclists facilities (if relevant to the proposed development)

Design Hours

Both morning and afternoon peak periods should be considered in the analysis. For shopping centres, Saturday afternoon peak period may be required

- Major retail – p.m. street peak and Saturday afternoon peak hours
- Small scale retail/restaurant/general commercial – p.m. street peak hour
- Residential/office/industrial – a.m. and p.m. street peak hours
- Sports venues – peak hour of operation

Daily traffic link volumes will also be required for proposed residential/industrial subdivisions to confirm appropriate street classifications, and related right-of-way requirements.

Horizon Year Traffic Scenarios

Traffic scenarios will include:

- Existing conditions
- Opening day
- Full build out (which may be the same as opening day)
- Full build out plus five years

Background Traffic

Current traffic count data may be available from the City or Manitoba Infrastructure and Transportation in the case of provincial roadways within the City. Where current (no more that five years old, or less is significant development has occurred in the area) is not available, the proponent will be responsible for collecting traffic data needed for the design hour analysis.

Background traffic should be documented in the report, stating all assumptions pertaining to future traffic projections. In general background traffic is described as the traffic that is on the road network prior to the addition of traffic from the proposed development, rezoning or redevelopment. Background traffic growth should be developed from historical traffic counts plus consideration of other planned developments in the area. The City will typically provide reports for other developments, as available. Growth factors may be reviewed with the Engineering Department prior to completing the TIS to ensure that they are satisfactory to the City.

Reference should be made to other relevant studies that may assist the proponent in determining future background traffic levels and possible changes in the area transportation system. The City will provide copies to the proponent.

Site Traffic Generation

Ideally, trip generation measured at local comparable sites should be applied. If not available or feasible, trip generation measured at other Canadian cities can be used. If these are not available, the latest version of the ITE Trip Generation Manual may be utilized. Trip generation rates, the source, and trip generation, should be summarized and documented. The analysis should show take into account the following:

- The sources of the trip generation rates
- The methodology, data collection and analysis procedure of any special trip generation studies being used in the study
- Identify the trip generation rates for each land use component within the development proposal

- Identify any variations from the normally accepted generation rates that are being proposed; the reasons for the variation must be fully documented
- Assumptions on drop-in (pass-by) traffic, internal trips, joint trips, etc. must be identified and the rational for the assumptions provided.

Site Traffic Distribution

The assumed trip distribution must be identified and the rational for the selected distribution provided.

Site Traffic Assignment

Identify the trip assignment used to allocate new trips to the area street system..

Development Staging

Anticipated staging for the development should be identified, as well as the possible timing for full build out.

Graphics

The report should include graphics illustrating:

- Study area
- Proposed site plan with the full right-of-way width and geometrics of adjacent roadways
- Existing traffic
- Development traffic
- Existing plus development traffic for opening day and full build out
- Forecast traffic for full build out plus five years
- Proposed transportation system modifications.

Capacity Analysis

Capacity analysis time frames will in part be dependant on the nature of the development and guidance provided by the Engineering Department, as follows:

- Major retail – p.m. street peak and Saturday afternoon peak hours
- Small scale retail/restaurant; industrial – p.m. street peak hour
- Office/general commercial – a.m. and p.m. street peak hours
- Residential – a.m. and p.m. street peak hours

All major arterial and collector roadways and intersections within the study area should be examined for the specified peak hours to ensure that adequate capacity and traffic signal coordination are maintained. The operational performance of all signalized intersections, major unsignalized intersections, and proposed private approaches should be analysed and documented in the final report. For any roadway section or intersection that is sensitive to weaving, vehicle queuing must be evaluated.

The type and level of analysis and evaluation will include documentation of levels of service for intersections. Operational analysis will preferable be done using the latest version of Synchro software. Both LOS and ICU should be identified in the report for overall intersection performance (where available) and for critical movements. A saturation flow rate of 1750 vph should be used, unless field measurements at the study area would indicate a more appropriate value.

If Synchro is deemed not appropriate or applicable in the particular study area, the latest version of Highway Capacity Software can also be utilized.

The key calculations/operational model print outs should be provided in an appendix to the report or in a separately bound technical report.

Along with intersection operational analysis, forecast traffic queues for auxiliary lanes should be identified in order to determine the length of the lanes.

The City has established a preferred LOS of C during peak hours of operation, although LOS D may be accepted if there is no cost effective manner of achieving LOS C. In the case where current LOS levels do not achieve these targets, a lower level of service may be accepted, however, post development LOS should meet or exceed pre-development LOS.

Pedestrians and Cyclists

Pedestrians and cyclists are an integral part of the transportation network and should be accommodated within the planning process. The report should identify how internal, and external pedestrian linkages will be accommodated. In the case of residential developments, bikeway connections should be identified where existing or planned adjacent bikeway facilities exist.

Transportation System Modifications

All transportation system geometric and operational modifications identified as necessary to serve the proposed development should be listed along with the timing for implementation. The geometric modifications, as well as proposed private approaches, should be shown on a functional plan indicating dimensions, radii, required pavement widening, right-of-way needs, traffic control devices and other significant characteristics.

City of Brandon standards will apply; where specific City standards do not exist, TAC standards may be used. In the case of a need for left turn lanes, the minimum acceptable length is 15 m.

Private approaches shall be located, and configured, in such a manner as to avoid disruption to the public street system.

If changes to traffic control are proposed, warrants should be reviewed and documented in the report. MIT warrants will typically apply.

Financial responsibility for geometric and operational modifications should be identified. The proponent will be responsible for modifications solely required to serve the proposed development. In the case of items that may also be of value to the general travelling public, the City may consider cost sharing. Any cost sharing will be assessed on a site-by-site basis.

Other Items

Additional requirements may be required on a site-by-site basis and should be reviewed with Engineering Department staff prior to undertaking the TIS.

Table of Contents

A suggested table of contents is provided following this section. Sub-sections may change to suit to site-specific report requirements.

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APPENDIX E

STRATEGY DEVELOPMENT

1.0 TRAFFIC CALMING MEASURES

Traffic calming is characterized by the Transportation Association of Canada (TAC) as the alteration of motorist behaviour on an individual roadway or roadway network as well as the management of traffic (changes in routes and flows) within that network. The Institute of Traffic Engineers defines traffic calming as "the combination of mainly physical features that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users". Two types of traffic calming measures exist, one that seeks to control the volumes along a particular roadway / network and the other which seeks to control the speed. Although they are presented below separately, volume control measures typically have an impact on speed, and vice versa. A range of traffic calming measures within both types is described below.

1.1 Traffic Calming Measures for Volume Control

Volume control measures are intended to direct traffic to the appropriate type of roadway facility based on the intended trip. They are often used to reduce cut-through or pass-through traffic by prohibiting certain movements within a neighbourhood. Non-local traffic would thus be directed to collector or arterial roadways, rather than residential streets. Examples of volume control measures include:

- Partial closures close one direction of travel for a short distance on an otherwise two-way street.
- Full closures completely close the street to through traffic by placing some type of barrier across the roadway, but typically leaving the sidewalks open.
- Diagonal diverters block through movements and create two separate L-shaped streets at an intersection by placing a barrier diagonally across the intersection.
- Right-in/right-out islands are raised concrete islands located at intersections that prohibit a vehicle from turning left or traveling straight through an intersection.
- Raised medians are non-traversable medians within the centre of a roadway that prohibit certain movements from cross streets or driveways.

Table E.1: Volume Control Traffic Calming Measures

Measure	Advantage	Disadvantage
Partial Closures	Very effective at reducing traffic volumes while maintaining two-way pedestrian and bicycle access.	They may limit residential and commercial access and must be designed to effectively prevent 'short cuts' around the barriers.
Full Closures	Very effective at reducing traffic volumes while maintaining pedestrian and bicycle access.	They may be expensive, may limit business and residential access, and could require legal procedures.
Diagonal Diverters	They reduce traffic volumes while maintaining an open intersection and providing full pedestrian and bicycle access.	They may be expensive and would require curb reconstruction. They may also lead to additional travel for local residents and emergency vehicles.
Right-In/Right-Out Islands	Reduce pass-through traffic and decrease traffic volumes, which could improve noise and air quality.	May lead to additional travel for local residents and emergency vehicles.
Raised Medians	Can improve safety by prohibiting dangerous movements while reducing the amount of cut-through traffic that crosses a major street.	Require sufficient roadway width to accommodate raised median (or expensive reconstruction) and limit turns for local residents and emergency vehicles.

1.2 Traffic Control Measures for Speed Control

Speed control measures are intended to slow the flow of traffic along a particularly roadway by changes in the roadway geometry. These changes could include horizontal curvature, lane widths, and/or vertical elements within the roadway itself. Examples of speed control measures include:

- Speed humps are rounded raised areas that span the width of the roadway. They are typically several metres long, which distinguish them from the much shorter speed bumps.

- Speed tables are large speed humps that have a flat top that is typically long enough to accommodate the entire wheelbase of a passenger vehicle. They have slightly higher design speeds than speed humps and can be more aesthetically pleasing.

- Raised crosswalks are simply speed tables that contain crosswalk markings and the appropriate pedestrian signage. They assist in not only slowing traffic, but

also create a safer crossing location for pedestrians by raising them above the roadway elevation.

- Textured pavement could include either stamped pavement, colour pavement, or alternative paving materials such as bricks or stones. They may be used to highlight an entire area (intersection), or just a portion (crosswalk).

- Traffic circles are raised islands placed in intersections, which prevent traffic from going straight through an intersection.

- Chicanes slow travel speeds by forcing frequent turns by either curb extensions or on-street parking that alternates sides along a roadway to create an s-shaped movement.

- Bulb-outs / chokers are curb extensions at specific locations that narrow the travel lane by widening the sidewalk or planting strips.

- Center island narrowing are raised islands located in the centre of a street that narrow the travel lanes in one or more directions.

The historical focus for traffic calming has been on local residential streets, however, traffic calming has been implemented on collector streets as well. Both vertical and horizontal deflection measures may be appropriate for local streets; horizontal deflection measures may be more appropriate on collector streets.

Table E.2: Speed Control Traffic Calming Measures

Measure	Advantage	Disadvantage
Speed Humps	Relatively inexpensive, easily navigable by cyclists and very effective at slowing travel speeds.	May increase noise and air pollution as well as result in unwanted slowing of emergency vehicles.
Speed Tables	Provide a smoother ride for large vehicles (emergency vehicles) and are effective at reducing travel speed, though not as effective as speed humps.	They may increase noise and air pollution, and their aesthetic components (textured materials) can be expensive.
Raised Crosswalk	Improve both pedestrian and vehicle safety and are effective at reducing travel speeds, though again, not as effective as speed humps.	They may impact drainage needs and may result in increased noise and air pollution.
Textured Pavement	Can be used to reduce traffic over an extended length and can be very aesthetically pleasing.	Typically expensive and can be more difficult for individuals with mobility and visual needs to navigate.
Traffic Circles	Very effective at moderating speeds and improving safety.	Difficult for large vehicles to navigate.
Chicanes	Discourage high speeds by forcing frequent turns and are easily negotiable by large vehicles.	They must be designed appropriately and may be costly to implement (new curb construction).
Bulb-Outs / Chokers	Easily navigable by large vehicles and reduce both travel speed and volumes.	Not as effective as reducing speed as other measures due to no/minimal horizontal/vertical deflections, and may require cyclists to merge with vehicular traffic.
Center Island Narrowing	They increase pedestrian safety, slow travel speed and may reduce traffic volumes.	Not as effective as reducing speed as other measures due to no/minimal horizontal/vertical deflections.

1.3 Examples in Other Area Cities

Examples of warrants are provided below for two cities in the area. Both Fargo and Winnipeg tested alternative traffic calming measures as demonstration projects; both selected the use of speed humps on local streets following input by residents on measures they felt were acceptable and effective.

1.3.1 City of Fargo

The City of Fargo, North Dakota developed a series of warrant criteria for the implementation of traffic calming measures (focussing on speed humps) on local streets. A written request that meets the following criterion must be submitted prior to any traffic calming mitigation is to proceed:

A) **Road System Warrant:** A road system warrant will be granted if the neighbourhood road system is substantially complete (75 percent of the study land area).

B) **Volume Warrant:** A volume warrant will be granted if daily traffic volumes exceed 2,500 vehicles on local roads and 5,000 vehicles on local collectors.

C) **Volume/Speed Warrant:** A volume/speed warrant will be granted if two of the three criteria listed below are met and are based on roads with a posted speed of 50 kilometres per hour.

- For local roads: daily traffic volumes exceed 1,000 vehicles, average speed exceeds 50 kilometres per hour or the 85th percentile speed exceeds 55 kilometres per hour.

- For local collector roads: daily traffic volumes exceed 2,500 vehicles, average speed exceeds 50 kilometres per hour or the 85th percentile speed exceeds 55 kilometres per hour.

Note that either condition A + B or A + C must be met in order for the warrant to be deemed successful.

Once a successful traffic calming warrant has been submitted, a neighbourhood traffic group made up of representatives from the affected street is created. The traffic group is made responsible for facilitating petitions and working with City staff. Among their first tasks is to develop a request petition signed by 75 percent of the property owners on the affected street in order for the process to continue.

The second step is to prepare a traffic study and define local boundaries (generally given by collector or arterial streets, intersections or natural barriers). The primary concern of the traffic study is to distinguish real traffic problems from ones that are perceived by the residents. The study should also offer operational improvements that could solve the problem without having to resort to traffic calming measures. Traffic calming alternatives should be identified as required.

The third step is to petition the residents of the affected street. This petition requires 60 percent approval with a minimum 50 percent response in order for the warrant to continue.

The forth step is to design, detail and prepare a cost breakdown for the proposed traffic calming mitigation measure in the affected area. Again, a survey of all fronting properties should be conducted and receive a minimum of 60 percent approval for the proposed plan. The final report should be submitted to the City for the final decision and allocation of funds.

The fifth and final step is to monitor and follow up on the successfulness of the traffic calming measure.

1.3.2 City of Winnipeg

The City of Winnipeg has published a guideline for the installation of speed humps on local streets. Specific warrant criteria are in place to determine where speed humps may be appropriate as a traffic calming measure. The warrant criteria are as follows:

- Warrant #1: The street is a local residential street and is not a transit route, snow route or a residential collector street.
- Warrant #2: Submission of a petition representing a minimum of 70 percent of the residents in the block on both sides of the street supporting the installation of speed humps.
- Warrant #3: At least one of the following criteria is met:
    - Average speed exceeds the speed limit (50 km/hour); or
    - At least 15 percent of vehicles exceed the speed limit by 5 km/hour or more (55 km/hour); or
    - At least 10 percent of vehicles exceed the speed limit by 10 km/hour or more (60 km/hour).

Where all of the warrant criteria are met, speed humps will be installed following the installation guidelines outlined below on the basis of the date of receipt of petition, subject to the availability of funding:

- Speed humps shall be spaced at approximately 100 metre intervals.
- There shall be a distance of approximately 50 metres between a speed hump and an intersecting street or public lane.
- Object markers shall accompany each speed hump and a “bump ahead” sign and advisory speed tab (30 km/hour) shall be placed in advance of each series of speed humps in a block (in both directions).

- Speed humps should not be placed in front of driveways or installed over, or contain, manholes or water valves or be located adjacent to fire hydrants.
- In locating speed humps, existing street lighting should be taken advantage of as much as possible to increase night time visibility.
- Speed humps should not be located in horizontal or vertical curves.
- Speed humps should be placed at higher elevation points to accommodate proper drainage.
- If possible, speed humps should be placed in line with property lines for noise abatement and aesthetic reasons.
- Speed humps should not be placed on major emergency vehicle response routes.

The number of speed humps is not specified in the City's guideline, however, City staff have noted that the use of a single hump is likely to only occur on short laneways, with multiple humps generally used for most applications.

2.0 ACCESS MANAGEMENT STRATEGY

Access management is the manner in which local, regional, or provincial authorities control the interface between the road network and the adjoining properties. Depending on the roadway type, access to the adjacent land uses, typically through a driveway, can be plentiful and individual, such as in a residential area, or joint and occasional, such as in an urban commercial area.

2.1 Existing Policies for the City of Brandon

Existing access management policies in use within the Brandon area, as well as their effectiveness, are discussed below. Industry principles and best practices are then presented followed by access management strategies that would best compliment the functional classification system in the Brandon area.

Although a specific access management plan does not exist for the City of Brandon, strategies and basic guidelines pertaining to access management have been developed and adopted. The City of Brandon Design Standards and Guidelines (Zoning By-Law No. 6642 Appendix C, August 2005) discusses both residential access within the central neighbourhoods as well as site design within commercial priority areas.

It notes that when possible, residential 'driveways from lanes are most desirable. 'Driveways from the street will be allowed only if access from lane is not possible.'

In commercial priority areas it states that 'there should be only two points of access/egress to parking areas per block to minimize interruptions of the pedestrian environment and to reduce vehicle conflicts.'

Both these guidelines seek to control and manage the movement of vehicular traffic between roadways and their adjacent properties. In one case the management is intended more for aesthetic purposes meant to improve the quality of life within a certain neighbourhood while in the other case the management is intended to improve the pedestrian environment and roadway traffic operations, as well as overall safety.

Within its Development Plan (April 2006), the Brandon and Area Planning District references on multiple occasions the provision of access for residential, commercial, industrial and transit purposes, among others. It presents a series of roadway definitions that explain the intent of each facility type:

- Expressways intended to handle high speed traffic around the city for the efficient movement of people and goods (e.g., PTH 1).
- Arterial streets intended to accommodate large volume of traffic with a high level of safety and efficiency (e.g., Richmond Avenue).

- Collector streets intended to accommodate moderate volumes of traffic traveling at moderate speeds (Brandon Avenue).

- Local streets intended to provide for vehicular access to individual building lots (e.g., 3rd Street).

- Public lanes intended to provide vehicular access to individual properties at locations where inappropriate from street.

Based on these definitions the level of access increases as the classification of the roadway decreases from top to bottom. This principle is further elaborated on in various sections of the Development Plan, including such strategies as:

- Along rural highways where commercial uses are permitted, when more than one development is proposed, access will be located at a common access point. (Section 3.5)

- Encourage agro-industrial development to locate in clusters in order to minimize highway access points. (Section 8.2.12)

Both these strategies are intended to consolidate the number of access points along a highway (expressway – arterial street). Consolidating access points reduces potential vehicular conflict areas (thus improving safety) while increasing the safe traveling speed and efficiency of the roadway.

Two other sections of the Development Plan present strategies for access limitations and highway protection. The intent and policy direction of each are listed below.

Access Limitations (Section 13.2.6)

Intent: To provide for a high level of safety and efficiency along arterial streets, particularly along 18th Street, 1st Street, Richmond Avenue and Victoria Avenue.

Policy: The use of service roads or shared vehicular circulation systems and driveways among adjoining properties will be encouraged, along with rear roadways where appropriate. Frequently used driveways will be appropriately separated from roadway intersections in order to minimize traffic congestion and traffic hazards in the vicinity of the intersection.

Highway Protection (Section 13.2.8)

Intent: To ensure the efficient and safe functioning of highways under provincial jurisdiction…of a provincial highway to move traffic safely and efficiently.

Policy: Any types of development, including rural residential, highway / agro commercial and industrial will be subject to…development will occur in a cluster pattern utilizing common access points in order to minimize interference with highway traffic and to ensure a high standard of safety.

The strategies contained within the Brandon and Area Planning District Development Plan are intended to manage the access permitted along arterial streets and highways to achieve not only better safety along the facility but to also move traffic as efficiently as possible.

Within the transportation planning and traffic engineering profession there are a number of professional and technical societies and organizations that review, research and publish information related to access management and access control. The Transportation Research Board (TRB) identifies ten access management principals in its Access Management Manual (2003), as presented below in Table E.3 in Appendix E.

While these ten principals may not be appropriate for all areas and situations, they do provide a starting point for the review of existing access management policies and procedures and provide a framework for possible modifications, revisions, or additions to existing policy.

The Center for Urban Transportation Research (CUTR)[1] and the Victoria Transport Policy Institute (VTPI)[2] also cite ten access management strategies, as listed below:

- Lay the foundation for access management in the local comprehensive plan.
- Limit the number of driveways per lot (generally, one per parcel).
- Locate driveways away from intersections.
- Connect parking lots and consolidate driveways (so vehicles can travel between parcels without re-entering an arterial).
- Provide residential access through neighbourhood streets (residential driveways should generally not connect directly to arterials).
- Increase minimum lot frontage on major streets (minimum lot sizes on arterials should be larger than on minor streets).
- Promote a connected street system (avoid street networks that force all local traffic onto arterials).
- Encourage internal access to get out of parcels (i.e., locations in shopping centers located on arterial streets).
- Regulate the location, spacing and design of driveways.
- Coordinate with the provincial/state transportation department.

[1] *Ten Ways to Manage Roadway Access in Your Community*, Center for Urban Transportation Research, University of South Florida, 1998.
[2] *TDM Encyclopedia, Access Management: Coordination Between Roadway Design and Land Use Development to Improve Transportation*, Victoria Transport Policy Institute, Updated May 9, 2005.

Most of the strategies identified in both listings are similar to one another in their intent and desired outcome.

Table E.3: TRB Access Management Principles

Access Management Principles	Description
Provide a specialized roadway system.	Different types of roadways serve different functions. It is important to design and manage roadways according to the primary functions that they are expected to serve.
Limit direct access to major roadways.	Roadways that serve higher volumes of regional through traffic need more access control to preserve their traffic function. Frequent and direct property access is more compatible with the function of local and collector roadways.
Promote intersection hierarchy.	An efficient transportation network provides appropriate transitions from one classification of roadway to another. For example, freeways connect to arterials through an interchange that is designed for transition. Extending this concept to other roadways results in a series of intersection types that range from the junction of two major arterial roadways to a residential driveway connecting to a local street.
Locate signals to favour through movements.	Long, uniform spacing of intersections and signals on major roadways enhances the ability to coordinate signals and to ensure continuous movement of traffic at desired speed. Failure to carefully locate access connections or median openings that later become signalized can cause substantial increases in arterial travel times. In addition, poor signal placement may lead to delays that cannot be overcome by computerized signal timing systems.
Preserve the functional area of intersections and interchanges.	The functional area of an intersection or interchange is the area that is critical to its safe and efficient operation. This is the area where motorists are responding to the intersection or interchange, decelerating, and manoeuvring into the appropriate lane to stop or complete a turn. Access connections too close to intersections or interchange ramps can cause serious traffic conflicts that result in collisions and congestion.
Limit the number of conflict points.	Drivers make more mistakes and are more likely to have collisions when they are presented with the complex driving situations created by numerous conflict points. Conversely, simplifying the driving task contributes to improved traffic operations and fewer collisions. A less complex driving environment is accomplished by limiting the number and type of conflicts between vehicles, vehicles and pedestrians, and vehicles and bicycles.
Separate conflict areas.	Drivers need sufficient time to address one set of potential conflicts before facing another. The necessary spacing between conflict areas increases as travel speed increases, to provide drivers adequate perception and reaction time. Separating conflict areas helps to simplify the driving task and contributes to improved traffic operations and safety.
Remove turning vehicles from through traffic lanes.	Turning lanes allow drivers to decelerate gradually out of the through lane and wait in a protected area for an opportunity to complete a turn. This reduces the severity and duration of conflict between turning vehicles and through traffic and improves safety and efficiency of roadway intersections.
Use non-traversable medians to manage left-turn movements.	Medians channel turning movements on major roadways to controlled locations. Research has shown that the majority of access-related crashed involved left-turns. Therefore, non-traversable medians and other techniques that minimize left turns or reduce driver workload can be especially effective in improving roadway safety.
Provide a supporting street and circulation system.	Well-planned communities provide a supporting network of local and collector streets to accommodate development as well as unified property access and circulation systems. Interconnected street and circulation system support alternative modes of transportation and provide alternative routes for bicyclists, pedestrians, and drivers. Alternatively, commercial strip development with separate driveways for each business forces even short trips onto arterial roadways, thereby reducing safety and impeding mobility.

Source: Transportation Review Board, Access Management Manual, Transportation Review Board, 2003.

3.0 SMART GROWTH AND ALTERNATIVE MODE STRATEGIES

The US Environmental Protection Agency (EPA) defines smart growth as "development that serves the economy, the community, and the environment. It changes the terms of the development debate away from the traditional growth/no growth question to "how and where should new development be accommodated."

The EPA website (http://www.epa.gov/smartgrowth/index.htm) offers the following principles:

- Mix land uses
- Take advantage of compact building design
- Create a range of housing opportunities and choices
- Create walkable neighbourhoods
- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty, and critical environmental areas
- Strengthen and direct development towards existing communities
- Provide a variety of transportation choices
- Make development decisions predictable, fair, and cost effective
- Encourage community and stakeholder collaboration in development decisions

From a transportation perspective, smart growth focussing on providing people modal choices, with alternatives to driving such as to walk, ride a bike, or take transit. In Brandon's case, the City has a public transit system and offers innovative modal alternatives to driving where feasible (e.g., special service to industrial plants to the east). The City has identified existing and future paths and trails (as recommended in the Greenspace Master Plan completed in 2002).

An important aspect of smart growth relates to future development planning. The City should continue to encourage modal alternatives when reviewing development proposals; items to consider include:

- Provision of pedestrian corridors from sidewalks to the building(s), especially from bus stops (in the case of commercial developments).
- Provision of bike storage on-site, and secure, weather-protected storage for employees and students.

- Provision of a mix of land uses in residential developments, with higher densities when feasible, as well as employment opportunities within larger scale developments.

- Provision of pedestrian and bicycle corridors within residential developments serving destinations such as schools, recreation areas, shopping areas, external pedestrian/bike linkages.

- Consideration of transit routing when planning land use locations (e.g., encouraging higher density development along transit routes).

- Encouraging infill development and higher density development where feasible.

- Preserving open space and protects sensitive areas.

4.0 COMPARISON OF ALTERNATIVE FUNDING OPTIONS

4.1 Off-site Development Improvements

A common practise is to enter into a development agreement on a site-specific basis that sets out requirements for the development to proceed, and responsibility to install and pay for various off-site improvements. It can also set out cost sharing arrangements. This process can apply to any type of infrastructure. The City of Brandon commonly uses this process.

An example is a development that requires road improvements such as turn lanes and a traffic signal. If at an approach serving the development, all of the cost is typically allocated to the development, although cost sharing may be feasible if more than one new development will be served by the traffic signal, in which case the cost can be allocated to the various developments on an area basis, or commonly, by traffic contribution level.

In the case where improvements are at a public intersection and benefits the public at large and possibly multiple developments, the cost may be apportioned between not only the development(s) but also by the road authority.

4.2 Transportation Assessments

An assessment for off-site transportation works (also applicable to municipal trunk services) is a flat assessment charge applied throughout the City. It is recognized that some developments may under pay and others overpay, with a balancing out in the long run. The funds are pooled by the road authority/city and used to build road capacity upgrades to arterials or higher classification roads.

The City of Saskatoon uses this process. Saskatoon's rates in 2005 were $234.50 per front metre of development lands for the Arterial Road Levy (including one turn lane into the site at access points), $40.95 per front metre for street lighting, $13.30 per front metre for City inspection of works, $11.35 per front metre for signing and traffic signals. This

is over and above development-specific requirements, e.g., if a double left turn lane was required the development would also have to pay for the cost of the second turn lane over and above the arterial levy.

4.3 Impact Fees

District impact fees are a common funding mechanism in many U.S. jurisdictions; the City of Winnipeg also implemented a transportation impact fee for the Charleswood area in southwest Winnipeg. The road authority/city will identify a specific benefiting area, conduct an area transportation study that looks at existing conditions and forecast development changes over a set time period. The impact on the major roadways due to the forecast developments is identified, as are required infrastructure improvements (e.g., addition of through lanes, turn lanes, traffic signals, roundabouts, etc.). The cost of the improvements is estimated and divided by the selected units (acres of development, building area, residential unit, etc.) and that charge is assessed against all future developments, whether it involves a lot split to add one home or a new subdivision.

4.4 Incremental Tax Financing

Incremental tax financing allocates property taxes that will be assessed for a new development over a specific time frame to fund infrastructure improvements. The taxes would not enter the city's general revenue stream but would be placed in a special fund to finance a project that was precipitated by a specific development.

4.5 User Fees

This generally passes the cost to the road user; examples that are seen in Canada include road tolls such as on Highway 407 in the Toronto area or the Coquihalla Highway in British Columbia. Other than these locations, it is not commonly used in Canada but has had wider use in the US and elsewhere.

4.6 Private/Public Partnerships

The public/private partnership (PPP) has most often been applied to large-scale infrastructure projects, although this mechanism has not been widely used in Manitoba. One example is the Moray Street/Charleswood Parkway river crossing over the Assiniboine River in west Winnipeg. This was built as a design/build/finance/operate project. The private project partners retain ownership and are responsible for all maintenance, except for snow and street cleaning. The City leases the facility, with ownership transferred to the City after a set time period.

There are a variety of PPP models that have been used in Canada and elsewhere, including design build and concession arrangements. Within each of these general arrangements there are a variety of models that have been applied. For design build, options include:

- Design build by a partnership of contractors and design professionals, the road authority pays the costs as they are incurred; the project is turned over to the road authority upon completion of construction

- Design build finance, similar to the above option, however, the partnership will include a financier who covers the cost; the project is then "leased" back to the road authority; the project is turned over to the road authority upon completion of construction

- Design build finance operate, similar to the above option, however, the partnership also operates and maintains the facility for a set time frame until turnover to the road authority (e.g., Moray Street/Charleswood Parkway in Winnipeg)

- Design build own operate transfer by a partnership, the road authority pays the costs as they are incurred during construction and pays a yearly fee for maintenance, equivalent to a longer warranty for the length of the operation period; the facility is turned over to the road authority after an agreed upon timeframe (e.g., a current LRT project in Ottawa)

For concession arrangements, options include:

- Design build own operate in which a partnership owns and operates the facility for a set time frame; the partnership generates revenues from the facility to pay for the construction and on-going operation and maintenance costs, with transfer to the road authority after a set timeframe (e.g., Highway 407 toll facility in Toronto)

- Buy build operate in which a partnership buys an existing facility, possibly expanding it, and then operating it; costs are covered by revenues that are collected, with transfer to the road authority after a set timeframe

It should be noted that the concession arrangements are less typical for roadwork, and are more typically applied to municipal facilities such as water distribution, water treatment, etc.

Table E.4 provides a comparative review of the alternative funding options discussed above.

Table E.4: Comparison of Funding Options

Alternative Funding Option	Pros	Cons
Off-site Development Improvements	Commonly applied, familiar to development community. Transfers off-site infrastructure costs to the developer. Criteria can be established to assist in consistent cost allocation.	Often subject to negotiation, political input. Not always consistent on a site-by-site basis. Can result in 'last in' paying a disproportionate amount towards off-site works.
Transportation Assessments	Assessments are established and therefore know to all in advance. Reduces the need for negotiations on what a specific development must pay. Does not absolve developments from paying for development-specific off-site infrastructure.	Some developments may overpay, others may underpay their 'fair' share. City may have to front end infrastructure improvements until additional developments contribute.
Impact Fees	All parties know fees in advance. Fees are allocated for specific projects. Fees can be applied citywide or by area. Applies to all development, irrespective of size.	City must identify infrastructure needs in advance, estimate implementation costs, and set fees accordingly. Fees must be monitored and adjusted over time. Area fees may make some areas more expense to develop in than others.
Incremental Tax Financing	Development-specific taxes are allocated to a special infrastructure fund. Allows City to fund improvements without using existing revenues.	Taxes from new developments do not enter the general revenue fund for a certain period of time.
User Fees	Costs are passed on the benefiting users only. Revenues can be used to finance the initial construction within using existing revenues.	Fees can affect travel demand, which can impact forecast revenues. Not commonly used in Canada. Requires collection and monitoring system.
Public/Private Partnerships	Allows large projects to be implemented sooner than may otherwise be possible. Maintenance can also be included in the project. Fewer staff resources are needed to implement a project.	Typically applied to larger projects. Less control over day-to-day activities by the road authority.

APPENDIX F

ROADWAY STANDARDS BY CLASSIFICATION

Hwy 14 and Hwy 7 Realignment
Design Criteria

Item	Hwy 7 Rural	Hwy 14 Rural	Direct Ramps	Loops	Access/Service Roadways	
					Rural	Urban
ROADWAY CLASS	**Rural Freeway Divided**	**Rural Freeway Divided**	**Rural Undivided**	**Rural Undivided**	**Rural Undivided**	**Urban Undivided**
NUMBER OF LANES	4	4	1 or 2	1	2	2
TERRAIN	Flat	Flat	Flat	Flat	Flat	Flat
DESIGN SPEED (kmh)	110	90	80	50	60	60
POSTED/OPERATING SPEED	100	70			50	50
Horizontal Alignment						
Min. Radius (e=0.06)	600	340	190	80	130	130
Min. Recommended Radius	800	500	250	90	-	-
Design Vehicle	WB 20	WB 20	WB 20	WB 20	WB 20	WB 20
Vertical Alignment						
Max. Gradient	3%	3%	4%	4%	3%	3%
Min. Stoping Sight Distance	181-259	134-180	97-120	46	130	130
Min. Crest K	60-110	32-53	16-23	6-7	10	10
Min. Sag K (Headlight Control)	43-62	30-40	20-25	11-12	15	15
Max Superelevation	0.06	0.06	0.06	0.06	0.06	0.06
Rotation of Superelevation	CL of 2 lanes	CL of 4 lanes	Inside Edge (White Line)	Inside Edge (White Line)	CL of 2 lanes	CL of 2 lanes
VERTICAL CLEARANCE	5.5	5.5				
CROSS SECTION ELEMENTS						
Travelled Lanes						
Surface Type	Asphalt	Asphalt	Asphalt	Asphalt	Asphalt	Asphalt
Width	3.7	3.6	4.0	5.0	3.6	4
Min. Cross Slope	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Min. Height Above Prairie	0.8	0.8	0.8	0.8	0.8	-
Min. Longitudinal Drainage	-	-	-	-	-	0.5%
Desirable Longitudinal Drainage	-	-	-	-	-	0.6% - 0.8%
Outside Shoulders						
Surface Type	Asphalt	Asphalt	Asphalt	Asphalt	Asphalt	-
Width	3.0	2.5	2.5	2.5	1.5	-
Cross Slope	4%	4%	4%	4%	2.5%	-
Inside Shoulders						
Surface Type	Asphalt	Asphalt	Asphalt	Asphalt	-	-
Width	2.5	1.0	1.0	1.0	-	-
Cross Slope	4%	4%	2.5%	2.5%	-	-
Outside Ditches						
Front Slope - Min.	4:1	4:1	4:1	4:1	3:1	-
- Desirable	6:1	6:1	6:1	6:1	4:1	
Back Slope - Min.	3:1	3.1	3:1	3:1	3:1	-
- Desirable	4:1	4:1	4:1	4:1	4:1	
Width of Ditch - Min.	3.0	3.0	3	3	1	-
- Desirable	6.0	6.0	6	6	3	
Bottom Cross Slope	3%	3%	3%	3%	3%	-
Min. Long. Grade	0.1%	0.5%	0.1%	0.1%	0.1%	-
Min. Depth of Ditch Bottom	1.0	1.0	1.0	1.0	1.0	-
Median Ditches						
Front Slope	4:1	4:1	-	-	-	-
Width of Ditch	2.0	2:0	-	-	-	-
Bottom Cross Slope	3% - 6%	3%-6%	-	-	-	-
Min. Long. Grade	0.1%	0.1%	-	-	-	-
Min. Depth of Ditch Bottom	0.5	0.5	-	-	-	-
Min. Culvert Size	0.6	0.6	0.6	0.6	0.6	-
Minimum Pipe Slope	0.10%	0.1				
Subdrain Size	0.15	0.15				
Centre Median Width (from edge of travelled lane)	17.9	17.9	-	-	-	-
Centre Median Cross Slope	-		-	-	-	-
Offset From Travelled Lane to Curb	-		-	-	-	0.25
Boulevard Cross Slope	-		-	-	-	3%
Sidewalk Cross Slope	-		-	-	-	3%

APPENDIX G

DESIGN STANDARDS INFORMATION

1.0 BRANDON ROADWAY DESIGN STANDARDS

Table G.1: Brandon Roadway Design Standards

Roadway Design Item	Arterial	Collector
Basic Lane Width	3.7 m (4.25 m if designated as a bike route)	3.7 m
Turning Lane Width	3.5 m	3.5 m
Raised Median Width (to face of curb)	5.4 m	5.4 m
Gutter Pan Width	0.3 m	0.3 m
Sidewalk Width:		
Residential	1.5 m	1.5 m
Commercial	1.5 m (min)	1.5 m (min)
Combined Sidewalk / Bikepath	3.0 m	3.0 m
Paraplegic Ramps	All Sidewalk / Curb Crossings	All Sidewalk / Curb Crossings
Intersection Operational Requirement	Level of Service C (desirable); Level of Service D (acceptable)	Level of Service B (desirable); Level of Service C (acceptable)
Intersection Traffic Control	Stop Signs, Roundabouts, Traffic Signals	Stop Signs, Roundabouts

In detailing of road geometry, all measurements are to face of curb. On collectors, arterials and expressways where traffic runs in the lane adjacent to the curb, the basic lane width is measured to the lip of gutter, with the gutter pan serving as the 'shy' distance to the curb. No shy distance is used on local roads and turning lanes. Where Brandon-specific standards are not available TAC guidelines can supplement the City's standards.

The focus, as per the study mandate, is to examine collector and arterial roadways, although it is understood that the City is interested in alternative design guidelines for local streets as well. The primary issue in residential street standards relates to pavement width. Some cities allow for two travel lanes plus parking on both sides for all residential local streets, with pavement widths of around 12 m; others allow for two travel lanes plus parking on one side with widths of around 10 m; others allow for two 'tight' lanes plus parking with road widths of 7 – 9 m.

As pavement width decreases, right-of-way can also decrease, thereby reducing the proportion of a development allocated to roads, increasing development densities, and hence municipal taxes. Narrower road widths also have the benefit of reducing maintenance costs, and providing some passive traffic calming features. However, on

higher volume local streets, narrower widths can increase traffic conflicts and potentially cause parking issues if on-street parking is needed (most often occurs where multi-family sites have insufficient parking or where rear lanes exist and homeowners may choose to park on the street).

Currently, Brandon allows for two full travel lanes plus parking on one side, with a 10.36 m pavement width. One option the City could consider is varying the required local street based on volume. As an example, for streets forecast to carry 600 – 1,000 vpd, or with higher density residential uses or rear lanes, the current standard would be appropriate. Where single family development with front drives, and forecast volumes of 250 – 600 vpd, a 7.5 m pavement could be used. In the case of forecast volumes of fewer than 250 vpd, a pavement width 6 – 7 m could be considered, with parking on one side, but no parking within 15 m of an intersection. This last option would most often be found with cul-de-sacs, or the 'end' of a street.

Another way of implementing passive traffic calming with the wider streets is to alternate the side of the street with parking in the case of parking on one side only. The level of service (LOS) criteria is identified for planning purposes, however, it is not necessarily achievable in a cost-effective manner in all instances. In such a case, post development LOS should meet or exceed pre development conditions (e.g., if an intersection currently operates at LOS E, a new development that impacts the intersection would need to achieve LOS E or better after adding development trips to the intersection. As well, LOS guidelines can vary by location in the City. As an example, in a new neighbourhood, the guidelines noted in Table 7.3 should be achievable, however, in the case of infill development in built up neighbourhoods, it may be more difficult. In downtown areas, LOS E is oftentimes accepted during peak period conditions.

2.0 DESIGN STANDARDS COMPARISON

Table G.2: Comparison of Roadway Standards by Classification

	Criteria	City of Brandon*	City of Winnipeg	City of Saskatoon	City of Regina	City of St. Albert	City of Lethbridge	Municipality of Wood Buffalo	City of Thunder Bay	City of Fargo	TAC	ITE
MINOR AND MAJOR ARTERIALS	Traffic Function		Through Traffic and land access	Through Traffic	Traffic Movement		Traffic Movement	Through Traffic	Traffic Movement		Traffic Movement	
	Traffic Volumes (vpd)		>20,000	5,000 - 30,000	20,000 - 40,000		>15,000	5,000 - 30,000	5 - 15,000 (minor); 10 - 30,000 (major)	10,000 - 20,000	5,000 - 30,000	
	Design Speed (kph)		70 - 90	20 kph above posted limit	50 - 100	70	60 - 90	70 - 80	70 - 80	65-80 (40 - 50 mph)	50 - 100	30 - 40 mph (50-65 kph)
	Basic Lane (No.)	2 to 4	4 to 6	4		4	2 to 6	4	2 to 4	4 to 5		4 to 6
	Street Width (m)	varies	2 at 8	7.7 - 14.9	13.4 - 22	15	22	15.8 - 21.5	15	15 (48 ft.)		
	Access Control		No access	Prohibited or Strictly Controlled	Direct access not desirable		No Direct Access		restrictions on location & spacing (minor); only if no alternatives (major)	Prohibited	Rigid access control	Limited access
	Intersection Spacing (m)		min. 400	min. of 250, 450 is desired	min. 200 - 400		min. 400				min. 200 - 400	660-1,320 ft (200-400 m)
	Right-of-way (m)	varies	40	32	22 - 30	37	75	48.3 - 54	20 - 30 (minor); 24 - 36 (major)	30-46 (100 - 150 ft.)	20 - 45	
	Parking		Permitted w/ restrictions	Prohibited			Prohibited	Prohibited	Permitted		Prohibited or peak hour restrictions	On Access Roadway
	Traveled Lanes (m)			3.6		3.75	8.5	3.7			3.5 - 3.7	
	Cycle Path Provision						Regional pathway		0.5 m curb lane widening (if required)	As determined by City Engineer	Lane widening or separate facilities desirable	Bike Lanes or Parallel Route
	Sidewalks		1.5 m - Permitted on either side	1.5 m separated	Provided for both sides	1.5 m separate	Regional pathway on one side	Separate, 1 or 2 sides (3.0 m)	1.5 m on both sides (if required)		May be provided, separation for traffic lanes preferred	Yes
	Transit Service		express and local service				Permitted	Restricted	Permitted		Express and local buses permitted	Express and Local
COLLECTOR	Traffic Function		Through Traffic and Land Access	Through Traffic and Land Acess	Traffic movement between local and arterial streets with direct access to abutting properties		Provide access to arterials and abutting neighborhoods	Through Traffic and Access	Traffic movement and land access		Traffic movement and land access of equal importance	
	Traffic Volumes (vpd)		up to 9,000	1,000 - 15,000	7,500 - 20,000		2,000 - 15,000	1,000 - 5,000	3,000 - 5,000	5,000 - 10,000	<8,000 - 12,000	
	Design Speed (kph)		60	70	50 - 80	50	50 - 60	60	60	60 (35 mph)	50 - 80	30 - 35 mph (50-55 kph)
	Basic Lane (No.)		2 to 4	4 (2 travelling, 2 parking)			2 to 4	2	2	2 to 3		2 to 4
	Street Width (m)	10.36 - 12.8	10	14	13.4-14.8	11 or 12	13.6 - 19.9	11.5 - 14	12.5	11-12 (36 - 40 ft.)		
	Access Control		Permitted	Access w/some restrictions	Permitted		Permitted				Traffic movement and land access of equal importance	
	Intersection Spacing (m)			min. 60	min. 60		120 - 200 (min.)				min. 60	300 - 660 ft. (90-200 m)
	Right-of-way (m)	varies	22 - 32	22	22	22	20 - 30	20 - 24	20 - 24	24-37 (80 - 120 ft.)	20 - 24	
	Parking		Permitted w/ restrictions	Allowed			Permitted unless deemed "super collector"	Permitted	Permitted		Few restrictions other than peak hour	Yes
	Cycle Path Provision						To be determined			As determined by City Engineer	No restrictions or special facilities	Bike Lanes or Parallel Route
	Sidewalks	1.5 m	1.5 m - Permitted on either side		Provided for both sides (1.5 m)	1.5 m separated	Provided on both sides	Provided both sides (1.5 - 3.0 m)	1.5 m, one or both sides		Provided where required. Min. of 1.5 m, 1.8 desired	Yes
	Transit Service		Local service				Permitted	Permitted	Permitted		Permitted	Local Service

***Note:** The City of Brandon utilizes TAC standards for the above criteria unless otherwise listed.

	Criteria	City of Brandon*	City of Winnipeg	City of Saskatoon	City of Regina	City of St. Albert	City of Lethbridge	Municipality of Wood Buffalo	City of Thunder Bay	City of Fargo	TAC	ITE
LOCAL	Traffic Function	Land Access	Land Access	Land Access	Provide access to abutting property		Provide access to abutting properties	Land Access	Land access		Traffic Movement Secondary Consideration	
	Traffic Volumes (vpd)		1,000		0 - 1,000		<2,000	<1,000	<3,000	<2,500	<1000 - <3000	
	Design Speed (kph)	50	50		30 - 50	50	50	50	40 - 50	50 (30 mph)	30 - 50	30 mph (50 kph)
	Basic Lane (No.)		2				2		2	1 to 2		2
	Street Width (m)	10.36	7.5	9.0 - 10.0	8.7 - 11.0	9	10	9.5	10	10-12 (32 - 40 ft.)		
	Access Control		Permitted	Full			Permitted with some restrictions		Permitted		Land access primary function	
	Intersection Spacing (m)				min. 60		min. 60				min. 60	300 - 660 ft. (90-200 m)
	Right-of-way (m)	varies	18	15 - 18	15 - 18	20	16.5	18	20	21-24 (70 - 80 ft.)	15 - 22	
	Parking		Permitted on one side	Allowed			Permitted	Permitted	Permitted		No restrictions or restrictions one side only	Yes
	Cycle Path Provision						To be determined			As determined by City Engineer	No restrictions or special facilities	Bike Lanes or Parallel Route
	Sidewalks	1.5 m	Unrestricted - May be provided on one side if warranted	Provided with parking	If >240 m, one side (1.2 m wide); <240 m, none provided	1.5 m separated	Combined sidewalk, curb and gutter on both sides	Provided on 1 or 2 sides (1.5 m)	1.5 m (if requried)		Provided where required	Yes
	Transit Service						Avoided	Prohibited			Generally Avoided	Local
ACCESS LANE	Traffic Function		Land Access		Provide vehicular access to side or rear of properties		Provide rear access to adjacent properties				Traffic Movement Not a consideration	
	Traffic Volumes (vpd)		350 - 650								<500 - <1000	
	Design Speed (kph)		N/A		30 - 40						30 - 40	10 mph (16 kph)
	Basic Lane (No.)											1
	Street Width (m)		6.25 - 7.25	6			7				6 - 10	
	Access Control		Permitted				Permitted				Land access only function	
	Intersection Spacing (m)		N/A		As needed						As needed	Not applicable
	Parking		Prohibited				Prohibited				Some restrictions	No
	Cycle Path Provision						No				No restrictions or special facilities	Shared
	Sidewalks		Unrestricted				No				Permitted, no special facilities	Shared
	Transit Service						No				Not permitted	None

***Note:** The City of Brandon utilizes TAC standards for the above criteria unless otherwise listed.

Smart Code Manual v7.5 (New Urban News)

Design Speed	Travel Lane Width	Road Classification					
		T1	T2	T3	T4	T5	T6
		Local	Minor Arterial	Major Arterial	Minor Collector	Major Collector	Expressway
Below 20 mph (Below 30 kph)	8 ft. (2.4 m)	permitted	permitted	permitted	by exception		
20-25 mph (30-40 kph)	9 ft. (2.7 m)	permitted	permitted	permitted	permitted	by exception	by exception
25-35 mph (40-56 kph)	10 ft. (3.0 m)	permitted	permitted	permitted	permitted	permitted	permitted
25-35 mph (40-56 kph)	11 ft. (3.4 m)	permitted	permitted			permitted	permitted
Above 35 mph (Above 56 kph)	12 ft. (3.7 m)	permitted	permitted			permitted	permitted
No Parking 300 VPD 20-30 MPH		x	x	x			
No Parking 600 VPD Below20 MPH		x	x	x			
No Parking 2,500 VPD 20-25 MPH		x	x	x			
No Parking 22,000 VPD		x	x				
No Parking 36,000 VPD 35 MPH & Above		x	x				

2.1 Modifications to Current Parking Standards

The consultant team suggests the following modifications for consideration:

1. Identification of the number of queue spaces required for uses such as drive-thru bank machines, car washes, drive-thru restaurant windows, etc. In most circumstances space for five vehicles can be adequate; however, for certain uses (e.g., drive-thru donut stores) additional space is generally required, oftentimes as high as 15 to 20 vehicles during peak conditions. Queue measurements at existing facilities in Brandon are suggested to confirm an appropriate number; space for five vehicles per bay per lane is recommended as the minimum.

2. Section 3.6.3 of the Landscape Design Regulations notes that internal landscape islands shall have a length no less than the length of the adjacent parking spaces. It is suggested that a more appropriate standard would be to set the length at 5.0 metres from the front of the parking space compared to the City standard stall length of 6.1 metres. The shorter island will result in less difficult parking manoeuvres for drivers entering or exiting the end space.

3. Table 6 in By-law No. 6642 sets out stall dimensions, with the minimum stall width at 2.7 metres, or 3.9 metres for accessible spaces. It is suggested that stalls adjacent to a wall or fence have a width of 3.0 metres, which will result in less difficult parking manoeuvres for drivers entering or exiting the space.

4. Table 6 in By-law No. 6642 should have an additional note indicating that designated small car spaces may be provided, but up to a specified maximum of the total spaces, perhaps in the order of 10 percent. Small spaces can have a width of 2.5 metres and a length of 5.25 metres. Landscape islands would have a length of 4.75 metres.

5. Table 6 in By-law No. 6642 identifies parking for commercial establishments, but not specifically for retail uses. A rate of 4.3 spaces per 100 square metres of retail space for retail spaces less than 10,000 square metres, increasing to 5.4 spaces for retail uses over 10,000 square metres, should be considered.

Figure G.1 graphically illustrates the proposed parking dimensions.

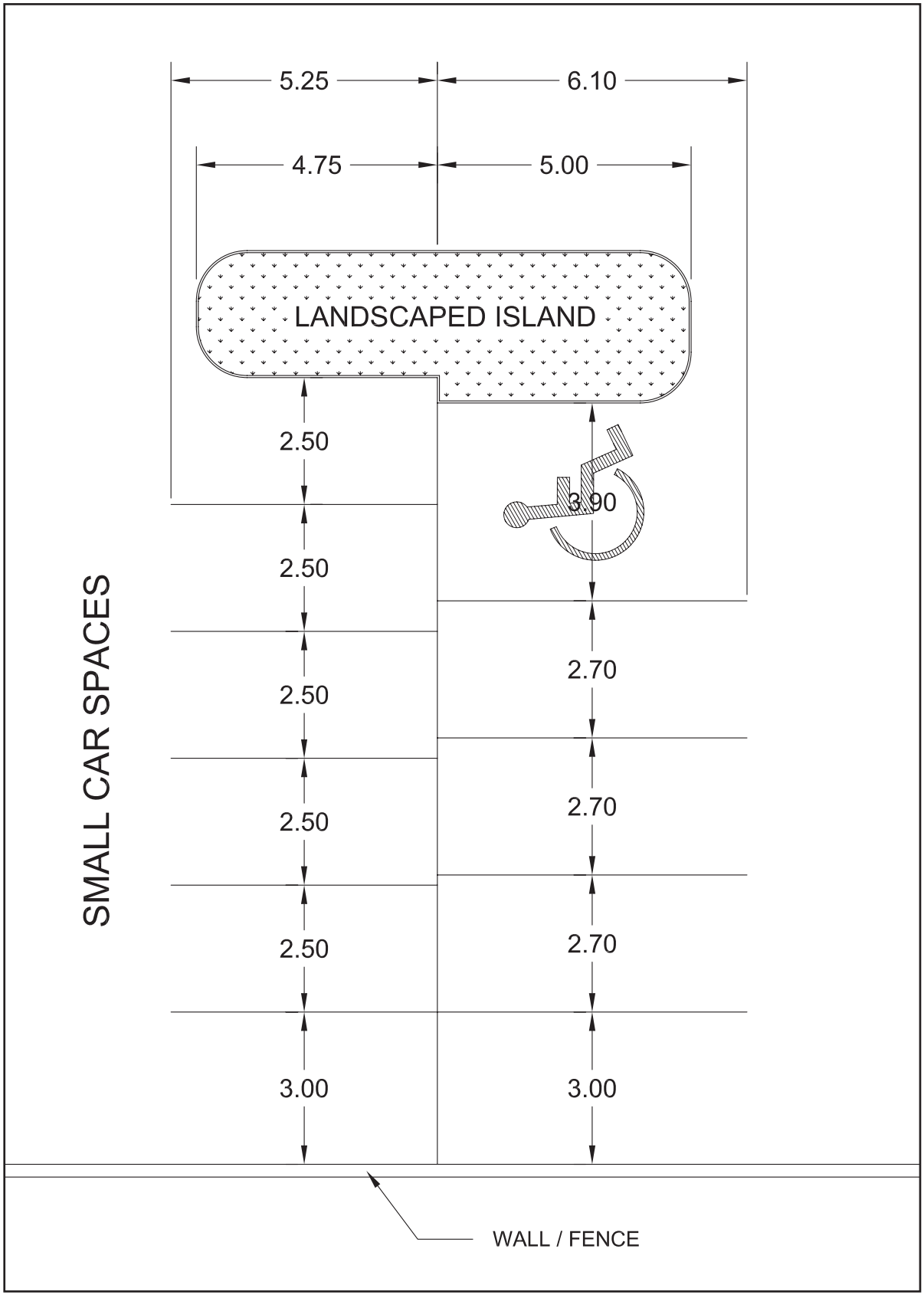


FIGURE G.1:
PROPOSED PARKING
STALL DIMENSIONS

3.0 MIT TRANSPORTATION PLANNING POLICY TP 1/98

Policy / Standard: **TP 1 / 98**	Page **1** of **4**	Date: **February 2, 1998**

Subject: **RURAL HIGHWAYS FUNCTIONAL CLASSIFICATION**

Approved:

Deputy Minister

POLICY

Provincial Highways are classified as **Expressways, Arterials (Primary and Secondary) and Collectors** on the basis of both traffic and land service functions.

PURPOSE

To classify the highways in the Province into groups on the basis of their function serving through traffic and providing access to land.

To provide guidance in the development of appropriate and practical policies, standards and procedures for:

- Assigning statutory and departmental responsibilities;
- Establishing work priority;
- Developing budgets and programs according to priority;
- Planning, Design; Construction and Maintenance of road system within each class.

The Highway Functional Classifications of the Province's Road Network are shown in the enclosed Exhibit A - Provincial Highways Functional Classification Map.

The methodology and reasoning behind the development of this policy is explained in Appendix A of the Transportation Planning Manual.

DEFINITIONS

Expressway:
These are generally multi-lane, divided highways (or highways that may/should be multi-laned in the next 30 years) that carry large traffic volumes at high speed under close to free flow conditions. They connect (and sometimes bypass) cities and larger towns and serve industrial, recreational, international and interprovincial traffic. To maintain the flow and safety of through traffic, direct property access is normally eliminated.

DEFINITIONS CONTD.

Important crossroads may require grade separated interchanges. The relationship between Provincial Trunk Highway (PTH) and the functional classification is that all Expressway routes are defined as existing or future PTHs.

Note: A Freeway is an Expressway with all crossroads and railway crossings grade separated

Rural Arterial:
These are generally a two-lane or, in some cases, multi-lane highways that carry large traffic volumes at high speeds. In conjunction with an expressways, they connect major economic regions and centres of the Province such as cities and towns, industrial concentrations, agricultural areas and major recreational areas. To maintain the flow and safety of through traffic, direct access to abutting land may be restricted or eliminated. This applies particularly in undeveloped areas where lack of other road service may encourage strip development. There are two classes of Arterial highways:

Primary Arterial - these routes provide inter-provincial and international connections and direct service to the most important and larger population centres.

Secondary Arterial - these routes connects other important population centres.

Note: All arterial routes are defined as existing or potential future PTHs.

Rural Collector:
These collect traffic from local roads and feed it to Arterials, or distribute it from Arterials to local roads. They provide direct service for developments such as tourist attractions, mines, small towns and villages. Collectors serve equally, the function of movement and land access. Collectors are subdivided into categories A, B and C, based on the importance of the resource area, recreation centre, or population node they serve.

Note: Collector routes are generally defined as Provincial Roads. Only in exceptional circumstances would a Collector highway be considered for PTH status. Resource roads may be classified under the

DEFINITIONS CONTD.

Collector classification. These roads serve resource nodes including mining areas, hydro power sites, oil drilling sites, forestry operations, and major fisheries centres. In cases where the prime purpose of the highway is to connect the resource area to the highway system, the road is classified under the Collector classification.

Special Categories within Functional Class:

To accommodate the unique and specialised characteristics of certain highway routes and their subsequent design and operation, three ***Special Categories*** have been identified. The design standards for any route that falls under the following three special categories must be obtained through, or developed in conjunction with, the Department's Engineering and Technical Services Division:

National Highway:

A national highway is any existing primary route that provides for interprovincial and international trade and travel by connecting, as directly as possible, a capital city, major provincial population and/or commercial centre in Canada with:

- another capital city, major provincial population or commercial centre;
- a major port of entry or exit to the US highway network; and
- another transportation mode served directly by the highway mode.

Parkway:

A Parkway category is one which limits the construction of the highway to a required special standard due to its scenic, historic, cultural, recreational, archeological or environmental values.

To qualify as a Parkway, a highway has to meet at least one of the following criteria:

- It passes through a national or provincial park, or a recreational area,
- It passes through an environmentally sensitive area,

DEFINITIONS CONTD.

- It has historic value,
- It is located in rugged or other major terrain constraint area,
- It serves significant cyclist and pedestrian traffic, and
- It passes through significantly developed areas.

Suburban Highway:

These are highways (two or multi-lane) typically located in a suburban community either leading to an urban centre or connecting two or more urban centres. Characteristics of a Suburban Highway typically include:

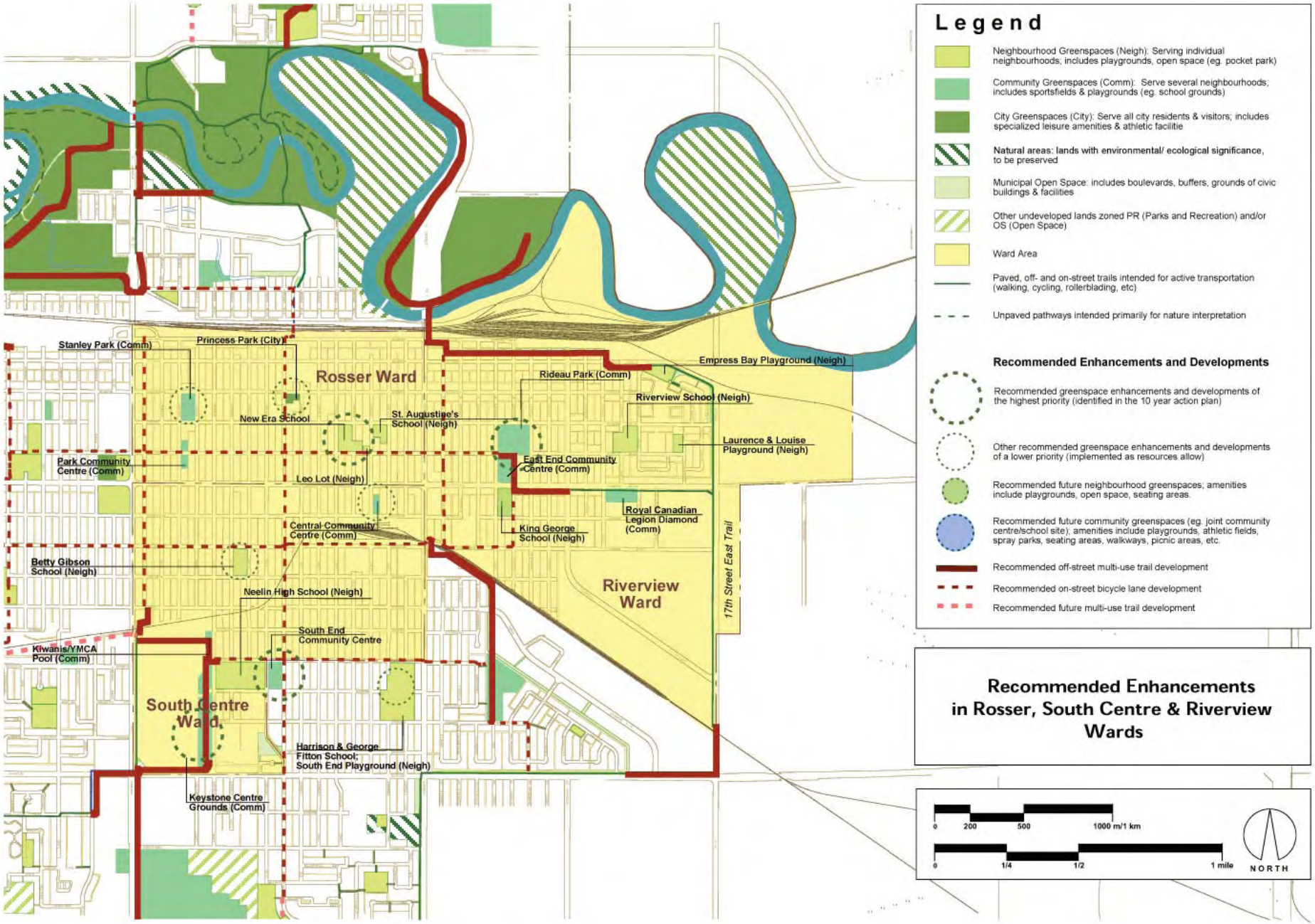
- The visual setting and amount of developed frontage along with the density of both intersections and direct property accesses will fall between that of a rural highway and an urban arterial street.
- Because of the combination of traffic volumes, density of intersections and direct property accesses, the speed limit will typically be in the 70 - 80 km/h range.
- Traffic signals may be installed, but the route will lack the regularity of spacing found on an urban arterial street.

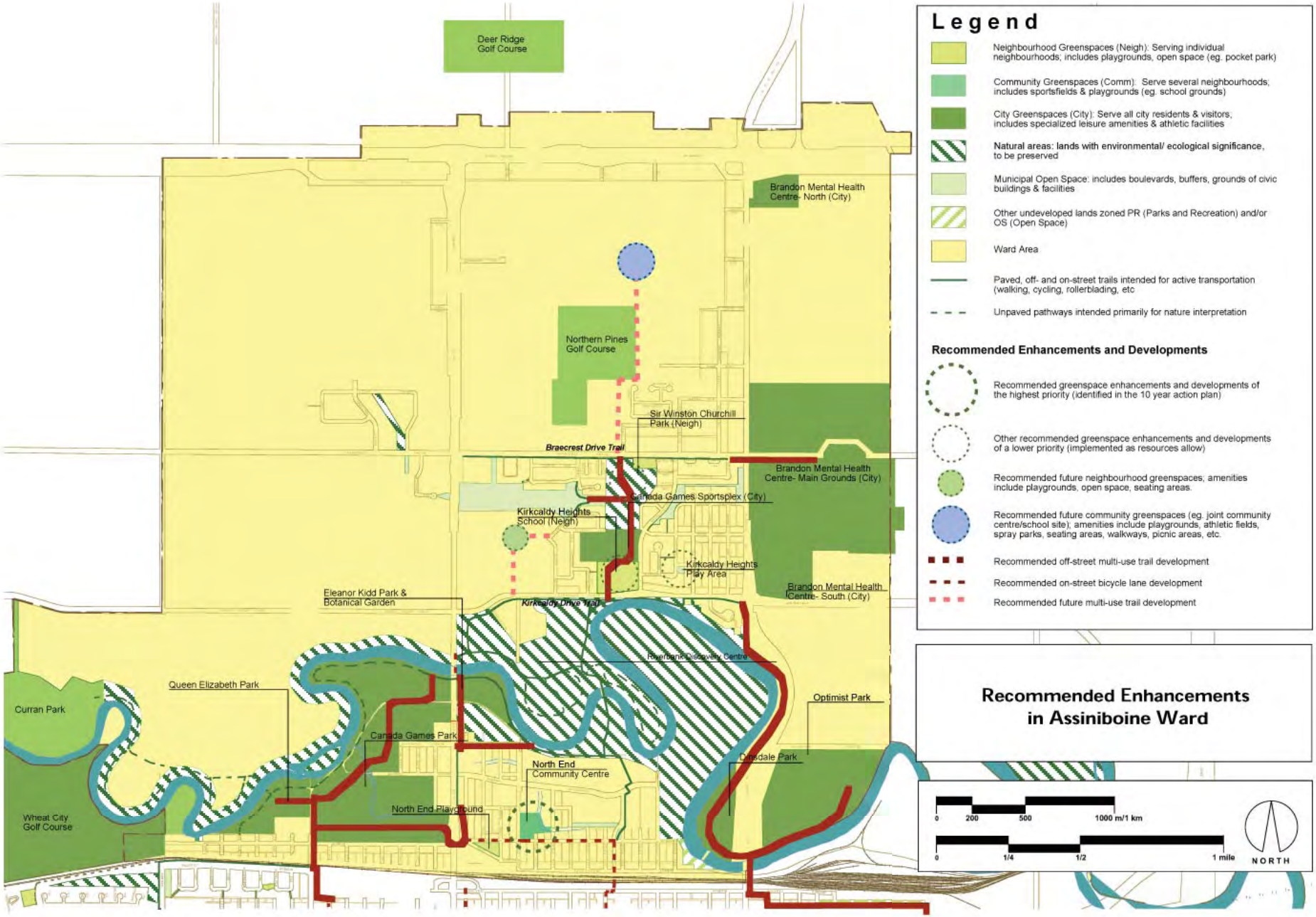
PROCEDURE

The work priority, budgets, programs, planning, design, construction, maintenance and operation of provincial highways must be developed taking in consideration the functional classification of highways.

APPENDIX H

GREENSPACE MASTER PLAN RECOMMENDED ENHANCEMENTS (JANUARY 2002)


Legend
Neighbourhood Greenspaces (Neigh): Serving individual neighbourhoods; includes playgrounds, open space (eg. pocket park)
Community Greenspaces (Comm): Serve several neighbourhoods; includes sportsfields & playgrounds (eg. school grounds)
City Greenspaces (City): Serve all city residents & visitors; includes specialized leisure amenities & athletic facilitie
Natural areas: lands with environmental/ ecological significance, to be preserved
Municipal Open Space: includes boulevards, buffers, grounds of civic buildings & facilities
Other undeveloped lands zoned PR (Parks and Recreation) and/or OS (Open Space)
Ward Area
Paved, off- and on-street trails intended for active transportation (walking, cycling, rollerblading, etc)
Unpaved pathways intended primarily for nature interpretation
Recommended Enhancements and Developments
Recommended greenspace enhancements and developments of the highest priority (identified in the 10 year action plan)
Other recommended greenspace enhancements and developments of a lower priority (implemented as resources allow)
Recommended future neighbourhood greenspaces; amenities include playgrounds, open space, seating areas.
Recommended future community greenspaces (eg. joint community centre/school site); amenities include playgrounds, athletic fields, spray parks, seating areas, walkways, picnic areas, etc.
Recommended off-street multi-use trail development
Recommended on-street bicycle lane development
Recommended future multi-use trail development
Stanley Park (Comm)
Princess Park (City)
Rosser Ward
Empress Bay Playground (Neigh)
Rideau Park (Comm)
Riverview School (Neigh)
New Era School
St. Augustine's School (Neigh)
Laurence & Louise Playground (Neigh)
Park Community Centre (Comm)
East End Community Centre (Comm)
Leo Lot (Neigh)
Royal Canadian Legion Diamond (Comm)
Central Community Centre (Comm)
King George School (Neigh)
17th Street East Trail
Betty Gibson School (Neigh)
Riverview Ward
Neelin High School (Neigh)
South End Community Centre
Kiwanis/YMCA Pool (Comm)
South Centre Ward
Harrison & George Fitton School; South End Playground (Neigh)
Keystone Centre Grounds (Comm)
Recommended Enhancements in Rosser, South Centre & Riverview Wards
0 200 500 1000 m/1 km
0 1/4 1/2 1 mile
NORTH


Deer Ridge Golf Course
Brandon Mental Health Centre- North (City)
Northern Pines Golf Course
Sir Winston Churchill Park (Neigh)
Braecrest Drive Trail
Brandon Mental Health Centre- Main Grounds (City)
Canada Games Sportsplex (City)
Kirkcaldy Heights School (Neigh)
Kirkcaldy Heights Play Area
Brandon Mental Health Centre- South (City)
Eleanor Kidd Park & Botanical Garden
Kirkcaldy Drive Trail
Riverbank Discovery Centre
Queen Elizabeth Park
Curran Park
Optimist Park
Canada Games Park
North End Community Centre
Dinsdale Park
North End Playground
Wheat City Golf Course
Legend
Neighbourhood Greenspaces (Neigh): Serving individual neighbourhoods; includes playgrounds, open space (eg. pocket park)
Community Greenspaces (Comm): Serve several neighbourhoods; includes sportsfields & playgrounds (eg. school grounds)
City Greenspaces (City): Serve all city residents & visitors; includes specialized leisure amenities & athletic facilities
Natural areas: lands with environmental/ ecological significance, to be preserved
Municipal Open Space: includes boulevards, buffers, grounds of civic buildings & facilities
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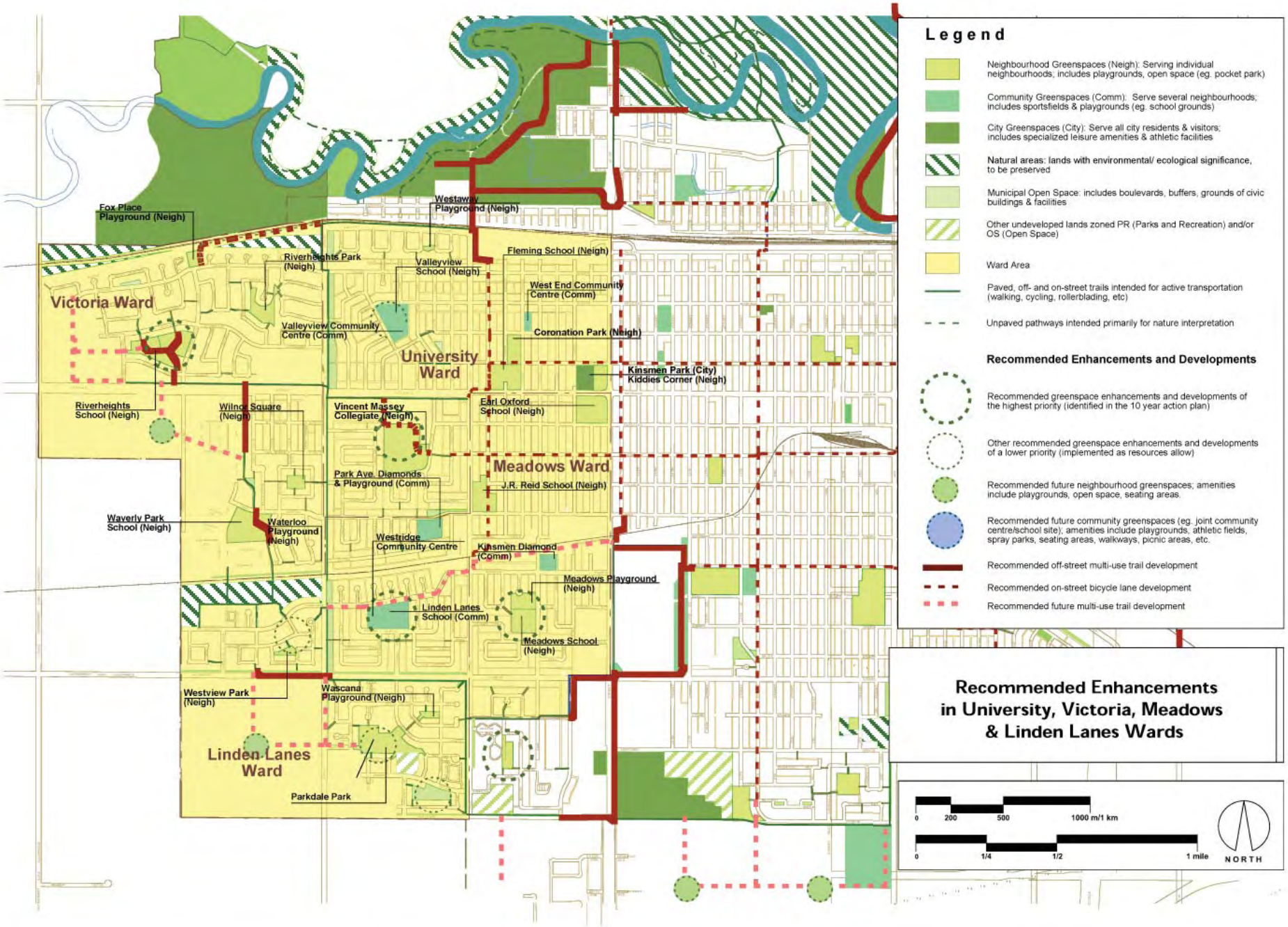
Recommended on-street bicycle lane development
Recommended future multi-use trail development
Recommended Enhancements in Assiniboine Ward
0 200 500 1000 m/1 km
0 1/4 1/2 1 mile
NORTH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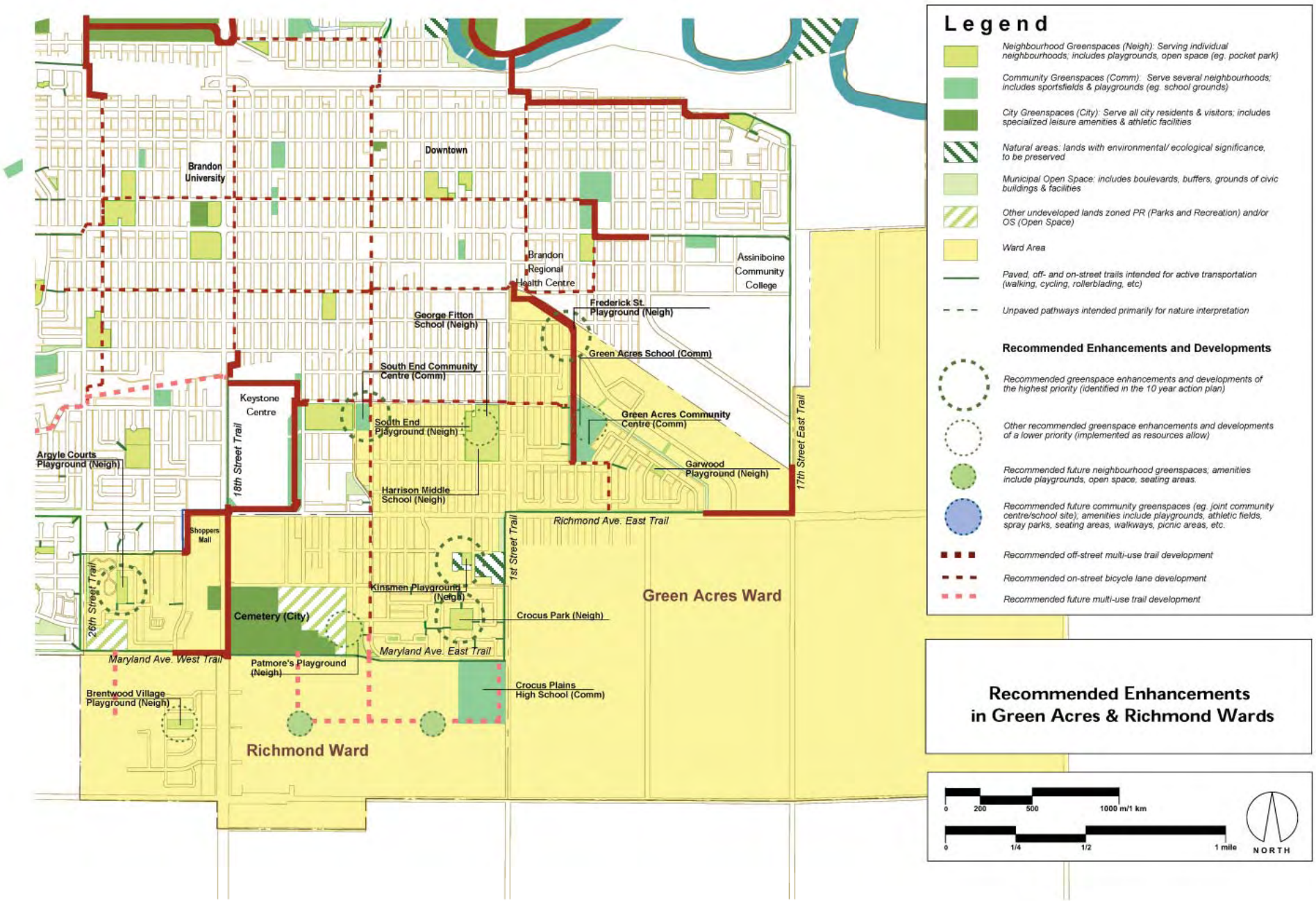
Recommended off-street multi-use trail development
Recommended on-street bicycle lane development
Recommended future multi-use trail development
Recommended Enhancements in University, Victoria, Meadows & Linden Lanes Wards
0 200 500 1000 m/1 km
0 1/4 1/2 1 mile
NORTH
Fox Place Playground (Neigh)
Westaway Playground (Neigh)
Riverheights Park (Neigh)
Valleyview School (Neigh)
Fleming School (Neigh)
West End Community Centre (Comm)
Victoria Ward
Valleyview Community Centre (Comm)
Coronation Park (Neigh)
University Ward
Kinsmen Park (City) Kiddies Corner (Neigh)
Riverheights School (Neigh)
Wilno Square (Neigh)
Vincent Massey Collegiate (Neigh)
Earl Oxford School (Neigh)
Meadows Ward
Park Ave. Diamonds & Playground (Comm)
J.R. Reid School (Neigh)
Waverly Park School (Neigh)
Waterloo Playground (Neigh)
Westridge Community Centre
Kinsmen Diamond (Comm)
Meadows Playground (Neigh)
Linden Lanes School (Comm)
Meadows School (Neigh)
Westview Park (Neigh)
Wascana Playground (Neigh)
Linden Lanes Ward
Parkdale Park


Brandon University
Downtown
Brandon Regional Health Centre
Assiniboine Community College
George Fitton School (Neigh)
Frederick St. Playground (Neigh)
Green Acres School (Comm)
South End Community Centre (Comm)
Keystone Centre
South End Playground (Neigh)
Green Acres Community Centre (Comm)
Garwood Playground (Neigh)
Argyle Courts Playground (Neigh)
18th Street Trail
17th Street East Trail
Harrison Middle School (Neigh)
Richmond Ave. East Trail
Shoppers Mall
1st Street Trail
26th Street Trail
Kinsmen Playground (Neigh)
Green Acres Ward
Cemetery (City)
Crocus Park (Neigh)
Maryland Ave. East Trail
Maryland Ave. West Trail
Patmore's Playground (Neigh)
Crocus Plains High School (Comm)
Brentwood Village Playground (Neigh)
Richmond Ward
Legend
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Recommended on-street bicycle lane development
Recommended future multi-use trail development
Recommended Enhancements in Green Acres & Richmond Wards
0 200 500 1000 m/1 km
0 1/4 1/2 1 mile
NORTH