ATTACHMENT #1

Report

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

City of Medicine Hat

Roadway Systems Master Plan
Road Network Plan Update

April 2013

Table of Contents

List of Tables

List of Figures

1 Background

1.1 STUDY CONTEXT

Medicine Hat (City) is located in the southeastern part of the province of Alberta. The City is situated on the Trans-Canada Highway, the eastern terminus of the Crowsnest Highway, and the South Saskatchewan River. Historically, Medicine Hat has large natural gas fields, and as a result is known as The Gas City. In the 2011 Census, Medicine Hat had a population of 60,005 an increase of 5.3% over that recorded in 2006.

The City's landscape is dominated by the South Saskatchewan River Valley, which transcends the centre of the City. In addition to this major river, both Seven Persons Creek and Ross Creek empty into the South Saskatchewan River within the City of Medicine Hat boundary. The presence of these water bodies provides for a dramatic valley landscape with numerous cliffs, and finger coulees throughout the City. Beyond the City and river valley, the land is flat to slightly rolling and is characterized by short-grass vegetation. Medicine Hat is also known as one of Canada's sunniest cities.

The City of Medicine Hat's current Roadway Systems Master Plan (RSMP) was prepared by Earthtech in 2005. In 2007, the City commissioned Associated Engineering (AE) in partnership with Terry Partridge & Associates to convert its City Transportation network model to the EMME platform. This model conversion did not include any updates to the road network forecasts or the land use forecasts but it did include an update to the base existing year, referred to as the 2007 scenario.

The 2005 RSMP was based on land use plans that have become outdated. The City's plans to update their municipal development plan triggered a need to update the RSMP. In 2010, the City retained Associated Engineering (AE) to undertake this assignment, resulting in the development of this 2010 RSMP. This project included updating the City Transportation network model (EMME) with the growth projections provided in the updated Municipal Development Plan. These growth projections were used to develop the roadway network needs for the current, 75,000 (75K) and 95,000 (95K) population horizons. This 2010 update to the RSMP will also provide the City with roadway system needs that are fully aligned with Alberta Transportations plans for upgrading Highway 1 and the growth plans defined in the City's 2011 MDP.

As part of the assignment, a number of other studies were completed and were provided in separate reports:

- Cycling Master Plan
- Downtown Parking Study
- Conversion of One Way Streets to Two Way Streets (Downtown)
- Traffic Signage Guidelines
- Assessment of Alberta Transportation (AT) Highway 1 and 3 Proposed Improvements
- South West Connector Route Options.

1.1.1 Road Network Plan

The scope of the "Road Network Plan" component of the 2010 RSMP included:

- Providing the City with a high-level Roadway System Network Plan that will assist the City in identifying and prioritizing roadway, traffic management and operational improvements within the roadway network today and at the forecast, 75K and 95K population horizons.
- Updating the EMME travel demand model for the current (2010) population horizon by incorporating new land use data and road network changes that have occurred since the 2007 EMME model development.
- Updating EMME for the 75K and 95K land use forecast developed in the 2011 Municipal Development Plan.
- Identifying the importance, timing and triggers for each recommended network upgrade.
- Providing updated cost estimates for the 10 Year Capital Plan included in the 2010 RSMP.
- Identifying and prioritizing roadway network capital plans to assist the City with the development of the Capital Works Program for 2011-2020.
- Evaluating potential locations for a roadway connection from South Boundary Road to Highway 3. (This SW Connector Study was completed as a separate report).
- Evaluating the sequencing of the AT proposed improvements between 1st Street SW to 16th Avenue SW and identify any other short-term improvements that could be implemented to improve existing traffic congestion along this segment of Highway 1. (This AT Highway 1 Improvement Sequencing Study was completed as a separate report).

This report covers the RSMP as a whole, and draws key information from the separate reports mentioned above.

1.2 SUSTAINABLE TRANSPORTATION PRINCIPLES

Transportation is linked to all aspects of life in Medicine Hat. The community's economic and social wellbeing depends on the transportation system to be safe, clean and able to efficiently move people and goods. The Transportation Association of Canada (TAC) published a briefing in May 2007 entitled Strategies for Sustainable Transportation Planning that provides guiding principles that municipalities can use for planning their transportation systems. The guiding principles of this document suggest that more than capacity should guide decisions on when to expand the transportation system. Some sustainable transportation principles utilized in this project include:

- Integrate transportation and land use planning
- Support economic development
- Plan projects that are cost effective and affordable
- Consider all modes
- Manage transportation demand
- Manage transportation supply.

A guiding principle for sustainable communities is to integrate land use planning with transportation planning. In this case, land use was a key input to the model and it was important to incorporate the most current land use planning that was occurring as part of the MDP Update. This was an ideal opportunity to align the draft MDP Growth strategy with the RSMP and use the EMME model to analyze the corresponding road network needed to support growth. AE met with the City and planningAlliance (the City's consultant responsible for the MDP Update), to discuss a strategy to align the two plans. The City then provided the land use input (population and employment forecasts by traffic zone) to be used in the transportation model. This information corresponded with the draft land use forecast generated from the MDP Update.

1.3 PREVIOUS STUDIES

AE reviewed several existing planning studies during preparation of the 2010 RSMP.

- 2005 RSMP by Earth Tech
- EMME Model Conversion and Traffic Analysis Report, December 2007 by AE
- Several Area Structure Plans (ASP) for planned areas of the City including Cimarron, Box Springs Business Park, Hamptons, and Southlands
- Airport ASP was ongoing at the time of the study
- Highways 1 & 3 Existing Route Improvements Functional Planning Study, 2006 by Stantec for Alberta Infrastructure and Transportation.

The City's travel demand model was originally developed in 2005, using the TModel2 software. This model was used for the 2005 RSMP completed by Earth Tech. At this time, recommended improvements were made for forecast scenarios 65,000 and 75,000 population. In October of 2005, Earth Tech completed two additional reports called City of Medicine Hat Alternative Growth Scenario Analysis 75K Population Horizon and City of Medicine Hat Alternative Growth Scenario Analysis 95K Population Horizon, which considered the addition of the Box Springs Business Park. These reports made additional recommendations for the road network in future horizons.

The current travel demand model was converted from TModel2 travel demand model to an EMME platform by AE in December 2007. The converted model included a 2003 base network and a 2007 network. This conversion is described in the EMME Model Conversion and Traffic Analysis Report by AE dated December 2007. This report details uses of the EMME model as well as descriptions of EMME concepts, components and operations. This report also serves as a manual for operating the program. Once the model was converted to the EMME platform in 2007, a calibration was completed along with the refinement of two forecast population horizons (75K and 95K).

Current City's Area Structure Plans (ASPs) provided the land use framework, demographic information, and skeletal roadway network for the undeveloped areas including connections to the adjacent road network. These ASP's were used to help determine the population and employment forecast for the model as well as the road network linkages. The Airport ASP was ongoing when the 2010 model was updated and the forecast land use from this ASP was included in the 75K and 95K population horizons. AT's long range

plan to realign of Highway 1 to the south and west of the City was not included in the 2010 model.

AT has developed a recommended plan for upgrading the existing Highway 1 through the City. This plan includes the following upgrades:

- Upgrades to Highway 1 from 1st Street SW to 16th Street SW. These upgrades include closing the 16th Street SW and 6th Street SW intersections at Highway 1 and completing an interchange at the 1st Street SW intersection with Highway 1. Currently there is no timeline identified by AT to complete these upgrades. The upgrades were reviewed as a part of this study in order to determine their effects on the City's road network at both the 75K and 95K population horizons.
- Construction of Dunmore Road / Highway 1 Interchange. The current plan is to construct a diamond interchange with grade separation. AT is in the process of constructing this interchange. This interchange was included in the 75K and 95K population horizons with the assumption that construction would be complete before the City's population reaches 75,000.

1.4 MUNICIPAL DEVELOPMENT PLAN UPDATE

Concurrent to this study, the City was updating their municipal development plan called the Medicine Hat Plan (MDP) and Growth Strategy. The MDP is a long-term comprehensive planning document that guides development and growth in the City. The MDP was adopted by City Council on June 18, 2012. Traffic growth is closely related to population and employment growth so it is important that the RSMP be aligned with the MDP. As the update to the MDP was in its early stages when we were completing the 2010 RSMP, we aligned the RSMP with the Draft MDP which when checked against the final MDP was determined to be sufficient for the level of planning contained in the 2010 RSMP.

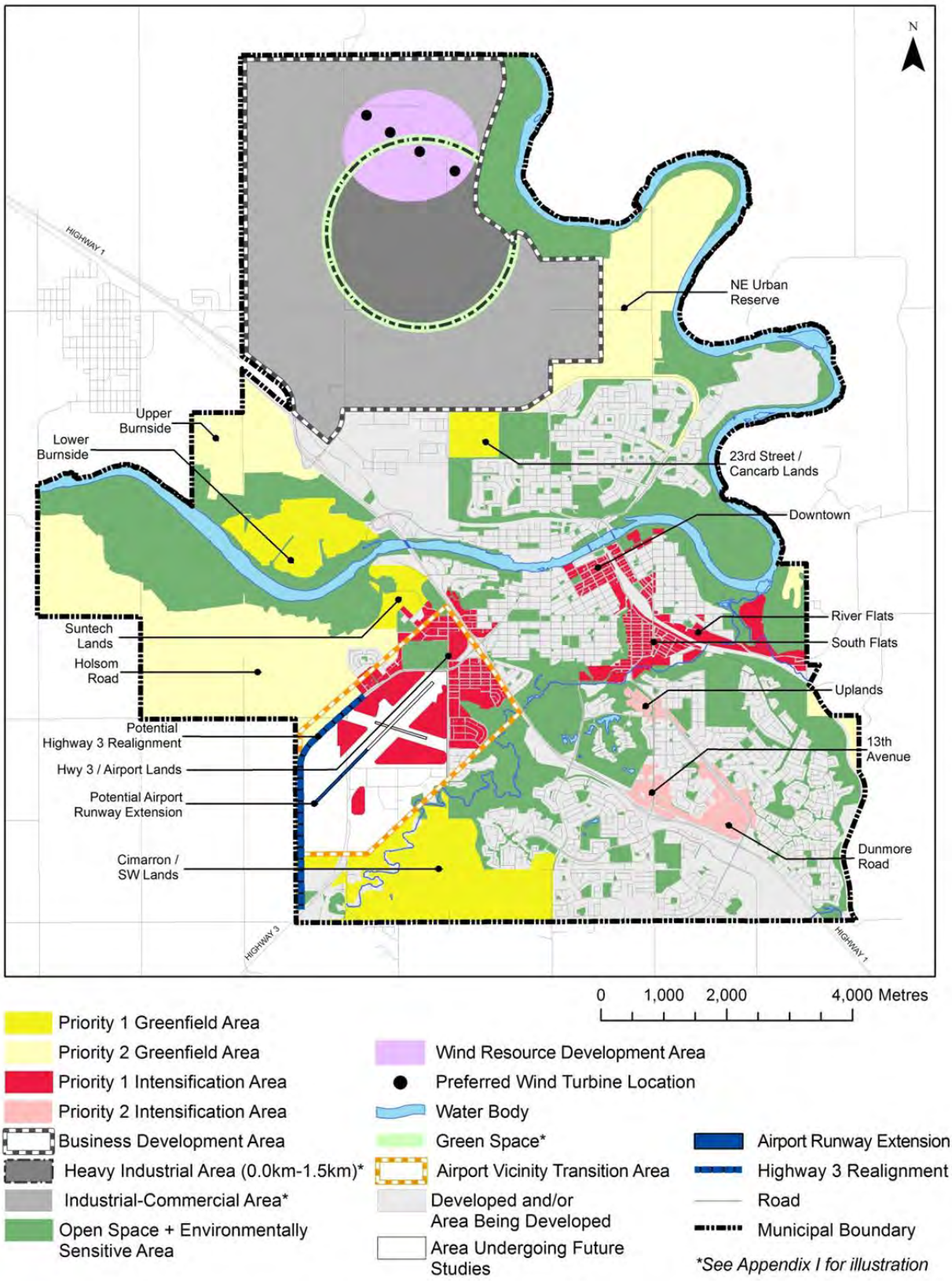
The MDP includes a section called Growth Management Policies that predicts the amount of growth that is expected and guides where it will occur. It is forecasting Medicine Hat to reach a population between 71,000 and 78,500 by the year 2025 and a population between 81,500 and 95,000 by 2040. The Priority One Greenfield Areas are the lands anticipated to develop first and these lands have some level of planning approvals and servicing in place and encourage contiguous growth. These lands are expected to develop first, by the year 2025. Priority Two lands are anticipated for future development by 2040. The Growth Management Strategy identified a mix of greenfield development and intensification areas within the boundaries of the City.

Figure 1-1 shows the Greenfield and Intensification Area Prioritization Summary for Priority One and Priority Two lands combined.

1.5 TRI-AREA INTERMUNICIPAL DEVELEOPMENT PLAN

The Tri-Area Intermunicipal Development Plan (IDP), May 13, 2009 by Cypress County, Town of Redcliff and City of Medicine Hat establishes a regional framework for managing land use and development in the IDP area. The IDP identifies the growth potential for Redcliff, Dunmore and the surrounding Cypress County all of which are included in the EMME model as these communities are within commuting distance

of Medicine Hat and development of these areas affects traffic in Medicine Hat. The establishment of the IDP has a significant impact on the land use forecasts in the model because the 2005 and 2007 models had included 16,000 population in residential areas south of South Boundary Road that are no longer being planned for.



Associated Engineering

Figure 1-1
ROADWAY SYSTEMS MASTER PLAN
Greenfield and Intensification Area Prioritization Summary
(source, Medicine Hat Municipal Development Plan, June 18, 2012)

2 Transportation Model (EMME) Update

The Transportation Model (EMME) Update included updates to the land use data and road network forecasts for the existing and forecast horizons. It also included some restructuring of the traffic analysis zones to improve the forecast in localized areas of the model.

2.1 CHANGES TO TRAFFIC ANALYSIS ZONES

Traffic Analysis Zones (TAZs) are areas that are used to compile population and employment data, which is what generates the traffic on the road network. These zones are generally grouped by land use type and typically do not exceed more than 3000 residents or 3000 employees. They can be as small as a building or as large as a community. TAZs are generally separated by roads with substantial traffic volume or naturally occurring topography and contain local and collector streets. The TAZ had not been updated for several years and some of them either crossed major roadways or did not accurately represent existing or planned land use. The TAZs were updated to represent the changes in land use, new development within the City and to improve overall model accuracy. The criteria used for splitting or adding TAZs included:

- Combining due to low trip generation
- Splitting due to high trip generation
- Reshaping to match development that had occurred
- Reshaping to match approved ASP's and other proposed development
- Splitting when a major roadway passed through it.

The majority of the changes occurred in the downtown, new development areas (e.g. south of Highway 1) and the Box Springs Business Park. **Appendix A** shows the initial overall and downtown TAZ as well as the revised overall and downtown TAZ network.

2.2 2010 HORIZON UPDATE AND CALIBRATION

The previous model used 2007 as the base existing year. The base year was updated to reflect the year with the most current data that was available at the start of the study. This was established to be for the year 2010. Land use within Medicine Hat and region, and the road network are key inputs to the model. These are used to calculate the amount of traffic on collector and arterial roads using the four step modelling process. Highway traffic going into and through Medicine Hat and region, called external trips, are added to the model using traffic volume as the input. Once all the key inputs are updated, the model results are checked by comparing the results with measured traffic volume counts.

2.2.1 Land Use

The population and employment data used for the 2010 existing scenario was derived from the 2010 Census for the Medicine Hat, Redcliff, Dunmore and the portions of Cypress County that are

within the model area. The detailed listing of the demographic data for each traffic analysis zone is provided in **Appendix B**.

2.2.2 Road Network

The road network was updated to reflect current (2010) conditions. These updates included changes to infrastructure that can be modelled within EMME, such as new four way stops and traffic signals, new travel lanes and other geometric road changes that affect road capacity. Upgrades that do not change capacity, such as paving a road or adding a sidewalk were not included. The current 2010 roadway network is shown in **Figure 2-1**. The upgrades that have occurred since the 2005 RSMP are listed in **Table 2-1**.

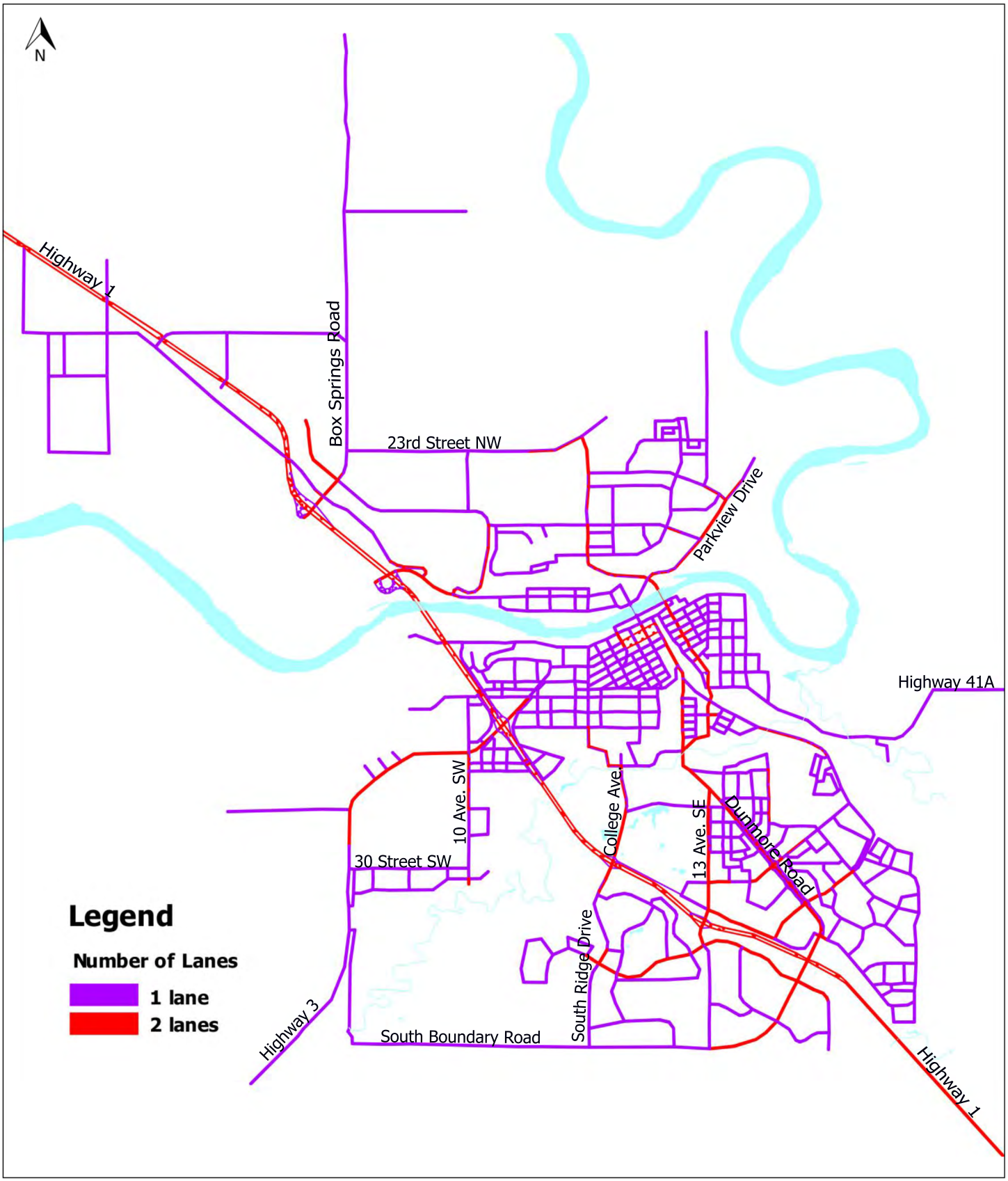
Table 2-1
Completed Upgrades since 2005 RSMP

Location	Description
College Avenue and Kipling Street	Added NB right turn lane
13th Avenue SE Corridor	Construct 2 to 4 lane transition 200 m north of South Boundary Road
South Ridge Drive Corridor	Construct 4 lane cross section from South Boundary Road to Vista Drive
South Boundary Road	Upgrade to a 4 lane urban arterial between Strachan Road and Southlands Drive. Upgrade from Southlands Drive to South Ridge Drive to 2 lanes of an ultimate 4 lane arterial
Box Springs Road and Brier Park Road	Signalize, provide dual channelized EBR, channelized SBR
Black and White Trail	Upgrade to 2 lanes of the ultimate 4 lane arterial between Cornerstone access and City limits
Parkview Drive and 20th Street NE	Signalize, and construct channelized turn lanes
Strachan Road and 13th Avenue SE	Channelize SBR lane
Division Avenue and 3rd Street S	Provide 85 m EBL storage lane
TCH & 13th Avenue SE	Construct interchange at intersection of TCH and 13th Avenue SE
Hwy 3 & 10th Avenue SW	Signalize intersection
South Ridge Drive & Strachan Road	Signalize intersection
Stratton Way and Strachan Road	Signalize intersection
South Boundary Road & Strachan Road	Signalize intersection
Division Avenue and 3rd Street S	Install 4-way stop

The roadway improvement projects that were in progress but not complete at the time of the EMME model update and were not included in the 2010 base year network are shown in **Table 2-2**. These improvements were included in the 75K and 95K forecast networks.

Table 2-2
Imminent Projects Not Included in 2010 Model

Location	Description
Parkview Drive Extension	Construct Parkview Drive to ultimate 4 lane arterial between Division Avenue and 20th Street NE.
South Ridge Drive Upgrades	Upgrade to 4 lane arterial between Highway 1 and just south of Strachan Road and construct 2 lanes of an ultimate 4 lane roadway from south of Strachan Road to Vista Drive.
Range Road 62 from South Boundary Road to Highway 3	Construct new bridge.
Northlands Way and Division Avenue.	Traffic Signal Installation
Strachan Road and Sprague Way	Traffic Signal Installation



Associated Engineering

Figure 2-1
ROADWAY SYSTEMS MASTER PLAN
Current (2010) Road Network

2.2.3 External Trips

External trips are all traffic that accesses or egresses the model area on one of the highways connecting to the City of Medicine Hat. For the 2010 network, the external trip table was updated based on existing traffic counts from Alberta Transportation. These trips assist in building a realistic model that accounts for the internal Medicine Hat and area traffic as well as the highway traffic.

Current traffic volumes on Highways 1, 3 and 41 were assigned to four zones (205, 206, 210 and 211) then distributed through Medicine Hat and region based on the following three categories:

1. External to internal trips include vehicles entering the City that make at least one stop within the model area
2. Internal to external trips originate within the model area and leave the model area
3. External to external trips are vehicles passing through the model area without stopping.

The distribution of trips was allocated proportionate to the 2007 model, which had been based on a roadside survey and household survey completed for the 2005 RSMP. The roadside survey determined how much traffic on each highway is travelling through Medicine Hat and area. The remainder are internal to external and external to internal trips and are distributed within the community proportionate to the amount of population and employment in each internal TAZ.

2.3 CALIBRATION

The 2007 model conversion involved an extensive calibration involving developing the model structure, formulas and macros based on household and roadside travel surveys that had been completed as part of the 2005 RSMP. The main indicator of the calibration accuracy was screen lines. These are lines that extend across natural barriers to see if the total number of the trips crossing the screenline are consistent for the model, actual traffic counts and travel surveys. Travel patterns can vary as much as 15% from day to day and by season. It is desirable to achieve an 80% or better level of consistency between the model traffic volumes and actual traffic count at screen line crossing locations. This is common industry practice that considers the variation in traffic volume and the level of accuracy of the land use data.

In 2007 the variation between the model and the traffic counts ranged between 81% and 100% on individual screenlines, with the overall consistency of 98% between the model and the traffic counts.

The 2010 Model Update involved updates to land use, road network and external trips but not the model structure. This is typical as model structure updates are only needed once every ten or more years and some cities have successfully gone thirty years between major updates. For the 2010 Model Update a sampling of the screenlines was checked to confirm if the calibration was still in line with the 2007 calibration. This was completed by comparing current traffic counts to modelled traffic volumes in the base year (2010) scenario. Link counts and intersection counts in select areas were supplied by the City and Alberta Transportation. In addition, AE completed additional counts in key locations where no traffic count

data was available. After calibration, the screenline review indicated that the overall 2010 Base Year Horizon scenario was within 97% of the actual count data. At individual screenlines we found the volumes to be within 82% to 100% of actual count data. A model is typically considered accurate if it is within 20% of actual count data. A comparison of model and actual screenline counts is provided in **Appendix C**.

2.4 FORECAST HORIZON UPDATES

2.4.1 Land Use

The land use data used in the transportation model includes population and employment from the neighbouring towns of Dunmore and Redcliff, as well as the land use within the City. The population and employment forecasts used in the 2010 RSMP were developed by the City based on the "Draft" Growth Management Strategy of the MDP and the IDP. The population forecasts are generally similar to the final MDP, where the 75,000 population horizon is within the range of growth to occur by 2025. The 95,000 population horizon is expected to be reached by the year 2040. **Table 2-3** summarizes the population and employment we included in our model for the 2010, 75K and 95K population horizons by community.

Table 2-3
Population and Employment by Horizon for Communities Included in EMME

Community	Population			Number of Employees		
	2010	75K	95K	2010	75K	95K
Medicine Hat	60,997	74,090	96,252	25,893	32,575	39,999
Dunmore and Surrounding Area	1,225	2,620	3,580	211	352	542
Redcliff and Surrounding Area	5,096	6,720	8,180	1,970	2,772	3,280
TOTAL	67,318	83,430	108,012	28,074	35,699	43,821

Growth projections in the City have become less aggressive in recent years and since 2007, population and employment forecasts have declined. **Table 2-4** summarizes the changes in population and employment since the 2005 RSMP. The main differences from the previous forecast are in the 75K employment and both the 95K population and employment.

Table 2-4
Changes in Population and Employment Forecasts - 2005 to 2010

Population Horizon	Population		Employment	
	2005 Forecast	2011 Forecast	2005 Forecast	2011 Forecast
75K	84,320	83,430	40,256	35,699
95K	130,009	108,012	61,404	43,821

Most of the reduction in population and employment was specific to certain areas of the City, specifically 16,000 population south of South Boundary Road and another 5,000 north of Ranchlands and north of

Parkview Drive. For employment, most of the reduction was in the Box Springs Business Park and surrounding areas.

Typically, growth in population and employment should be relatively equal. Percent growth from horizon to horizon is provided in **Table 2-5**. The population and employment grows at close to the same rate for both the 75K and 95K horizons for the 2010 forecast, indicating a relatively balanced growth model. This is an improvement over the 2005 forecast, which included considerably more employment growth relative to population growth for the 75K and 95K horizons.

Table 2-5
Percent Population and Employment Growth

	Horizon	Population	% Growth	Employment	% Growth
2011 Forecast	2010	67,318	n/a	28,074	n/a
	75K	83,430	24%	35,699	27%
	95K	108,012	60%	43,821	56%
2005 Forecast	2003	59,356	n/a	25,552	n/a
	75K	84,320	42.1%	40,256	57.5%
	95K	130,009	119%	61,404	140.3%

A detailed listing of the population and employment data for each traffic zone is provided in **Appendix B**. Because of the way the traffic zone boundaries were determined there are minor differences between what's in the EMME model and what's represented in **Figure 2-2** and **2-3**. **Figure 2-2** shows where moderate to significant increases in population and employment are forecast to occur at the 75K horizon, and these correspond with the first phases of Priority One growth areas in the MDP. These areas include a mix of intensification within built-up areas and greenfield areas.

Areas with greatest population increases include:

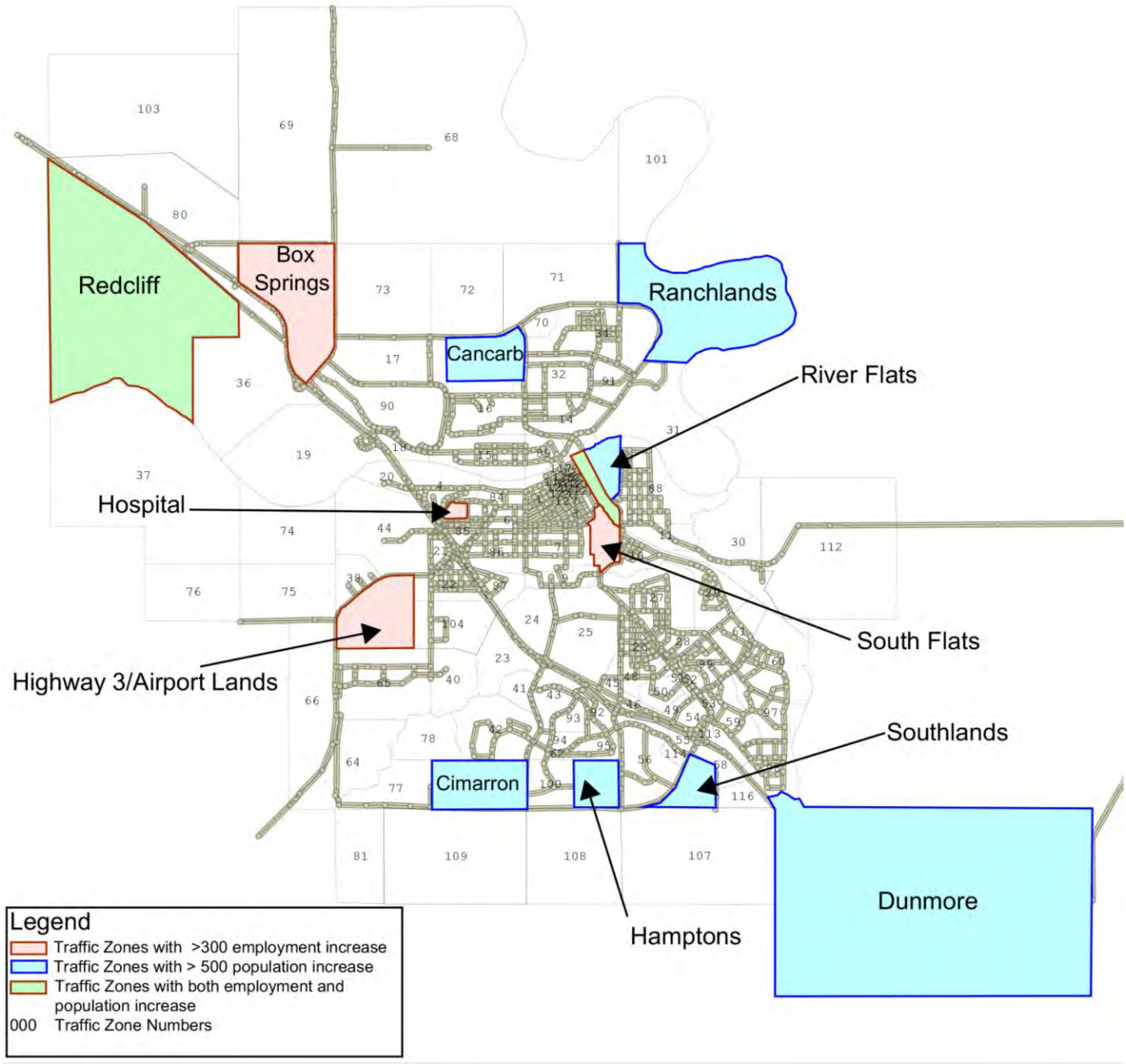
- Cimarron and Hampton's
- Lower Burnside
- River Flats
- Ranchlands in the northeast
- Suntech Lands
- Cypress County, both north and south of Medicine Hat.

Areas with greatest employment increases include:

- Southlands and portions of Cimarron
- Box Springs Business Park
- Highway 3 / Airport Lands

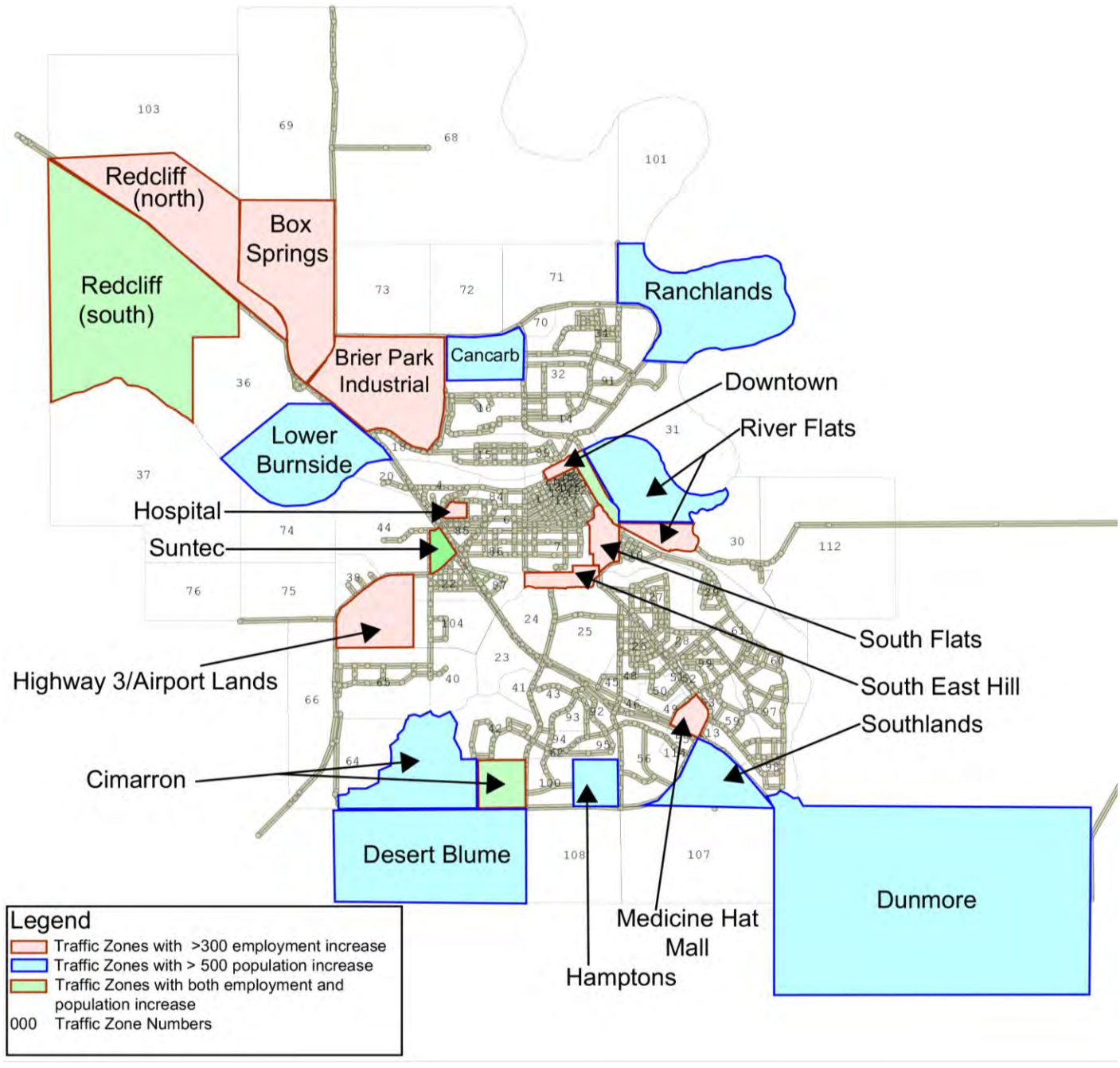
- Hospital
- Cypress County.

Figure 2-3 shows where moderate to significant increases in population and employment are forecast to occur at the 95K horizon. The growth continues along the same pattern as the 75K horizon with a mix of new development in greenfield areas and infill development. The undeveloped areas in Southwest Medicine Hat are mostly completed in the 95K horizon and Burnside Estates (lower) is developed.



Associated Engineering

Figure 2-2
ROADWAY SYSTEMS MASTER PLAN
75K Population Horizon Land Use



Associated Engineering

Figure 2-3
ROADWAY SYSTEMS MASTER PLAN
95K Population Horizon Land Use

2.4.2 External Trips

External trips for 75K and 95K population horizons are calculated by applying a growth rate to the current volume, for the number of years between the current year and forecast year. The City identified that the 75K population horizon is to occur in 11 years from the year 2010 (2021) and the 95K population horizon is to occur in 29 years from the year 2010 (2039).

Table 2-6 shows the growth rate assumptions used for each highway. These were provided by Alberta Transportation (AT) for the 2007 model conversion and assumed to be the same for the 2010 model update

Table 2-6
External Trips - Growth Assumptions

External Zone	Highway Name	Annual Growth Rate
205	Highway 41	2%
206	Highway 1 East	3%
210	Highway 3	2%
211	Highway 1 West	2%

2.4.3 Transportation Model Trip Results

As discussed in Section 2.4.1 the forecast land use for the 2010 model is considerably lower than the 2007 model. The resulting trips from the model are also lower as shown in Table 2-7.

Table 2-7
Summary of Total Auto Driver Trips by Model Horizon

Horizon	2010 Forecast	2005 Forecast	% Difference
2003	n/a	17,454	n/a
2010	18,937	n/a	n/a
75K	23,777	26,480	11%
95K	30,500	40,085	31%

The total number of trips in the 75K population horizon is 11% lower using the land use in the 2010 Forecast than in the 2005 Forecast. There is a greater reduction in generated trips for the 95K population horizon, with the total trips being 31% lower for the 2010 Forecast than in the 2005 Forecast. This has a significant impact on the RSMP because fewer trips means less demand on the roadway system and the need for fewer road network improvements than previously anticipated.

2.5 NETWORK UPDATES FOR FORECAST HORIZONS

The 2007 model included scenarios for the 75K and 95K population horizons and the corresponding road network plans based on the 2005 RSMP which is listed in **Appendix D**. Some of the plans have become outdated because of more detailed plans that have been completed since 2005, specifically ASP's and the proposed Highway 1 improvements between 1st Street SW and 16th Street SW. The planned streets that are part of an ASP were updated and treated as plans that are not changeable because they are established by bylaw. In addition, an all directional traffic flow interchange at the Dunmore Road and Highway 1 intersection was included in the 75K Base and 95K Base models implying that it will be constructed before reaching the 75K population horizon.

2.6 PROPOSED HIGHWAY 1 IMPROVEMENTS

The proposed AT improvements on Highway 1 between 16th Street SW and 1st Street SW are kept in separate scenarios so that analysis could be completed with and without planned AT improvements. A description of the proposed AT improvements is as follows:

- All-directional traffic flow at the interchange on Highway 1 and 1st Street SW
- Close 6th Street SW and 16th Street SW intersections at Highway 1
- Closure of southeast bound and northwest bound slip ramps off Highway 3
- Possibly convert Bomford Crescent to one-way in the westbound direction
- Improve Highway 3 and Highway 1 interchange including installation of traffic signals at the on and off ramps where they connect to Highway 3
- Removal of the right in / right out access on the SE exit ramp from Highway 1 to Highway 3
- Upgrade Highway 3 from 10th Avenue SW to Highway 1 and open 8th Avenue SW Intersection at Highway 3 to an all turns intersection.

The proposed AT improvements were analyzed in a separate report to determine the need for the improvements from a City of Medicine perspective and to determine a proposed phasing strategy for the improvements.

Section 3 of this report addresses the evaluation of these updated 75K and 95K scenarios and identifies what roadway improvements are needed to serve the 2010 traffic forecasts described in Section 2.4.3

3 Roadway Network Analysis

3.1 INTRODUCTION

The roadway network analysis included a review of the transportation model results, local knowledge of traffic operations, review of previous and ongoing functional planning studies, and a qualitative review of the land use and transportation plans prepared by other transportation specialists.

The EMME model is a high-level roadway system analysis tool that is suited to network analysis and identifying the need for corridor level improvements. It has limited capability to perform a detailed analysis of intersections. It can identify intersections that are approaching capacity and may require upgrade. A limitation is that it cannot accurately identify the specific improvements that are needed at an intersection, like turn lanes and traffic operations improvements. A micro-level traffic operations software such as Synchro is more suited to this type of analysis.

3.1.1 EMME Analysis

The City of Medicine Hat's EMME model assigns traffic to roadway links based on the number of lanes along a link, speed limit, and the number of auxiliary lanes and the traffic control at the end of a link. It predicts the volume of traffic using a four step modeling process and a number of variables such as land use, trip generation, travel time, and travel time savings. The model provides a means to evaluate the network using volume to capacity ratio(VCR).

VCR identifies the amount of congestion on a roadway link which can be comprised of a number of lanes. A VCR of 1.0 or greater indicates that the roadway may be over capacity and a VCR greater than 0.85 indicates a level of congestion that may trigger a roadway improvement. VCR plots showing all roadways that are nearing or over the VCR thresholds was one of the tools used in the analysis.

We use this information to identify roads that are "at" or "near" capacity and this assists in developing the 10 year capital plan.

3.1.2 Local Knowledge

Traffic volume and traffic capacity are measured in EMME on a pm peak hour basis. Since the City of Medicine Hat has a short peak, a roadway corridor may appear to be congested from the perspective of a local driver and not show up in EMME. Local drivers may also interpret that a delay at a traffic signal is worse than what is defined as a delay from a traffic engineering perspective. The definition of a roadway that is congested is one that has significant delays over an extended period.

EMME may not identify all areas of capacity concern on a road network. This is to be expected with a macro-level model, as it may not pick up all concerns at a micro or intersection level. Additionally, the City's model is for the pm peak, which has a high proportion of employment related trips. Some intersections could have congestion related to other travel patterns such as morning peak hours, mid-day shopping or highway commercial activity, or roadway geometry not evaluated in a macro level model. Issues like proximity of accesses, and spacing of intersections are not typically identified in a macro land model. In these cases, local knowledge of capacity concerns, delays and congestion are considered and identified to be monitored or added to the capital improvement recommendations.

3.2 CURRENT HORIZON (2010) NETWORKS

Figure 3-1 shows a traffic volume plot for the modeled 2010 base year scenario on the City's road network. The line thickness identifies the order of magnitude traffic volumes on the roadway links: the wider the lines, the higher the traffic volume. Line thicknesses increase when a roadway link has an increase of 500 vehicles per hour in each direction of travel. The north-south corridors with the greatest volume include Highway 1 through the City, and the north south route comprising Dunmore Road, Allowance Avenue, Maple Avenue and Parkview Drive. The traffic on the east-west corridors are less pronounced and function more as connectors between local areas and the N-S corridors.

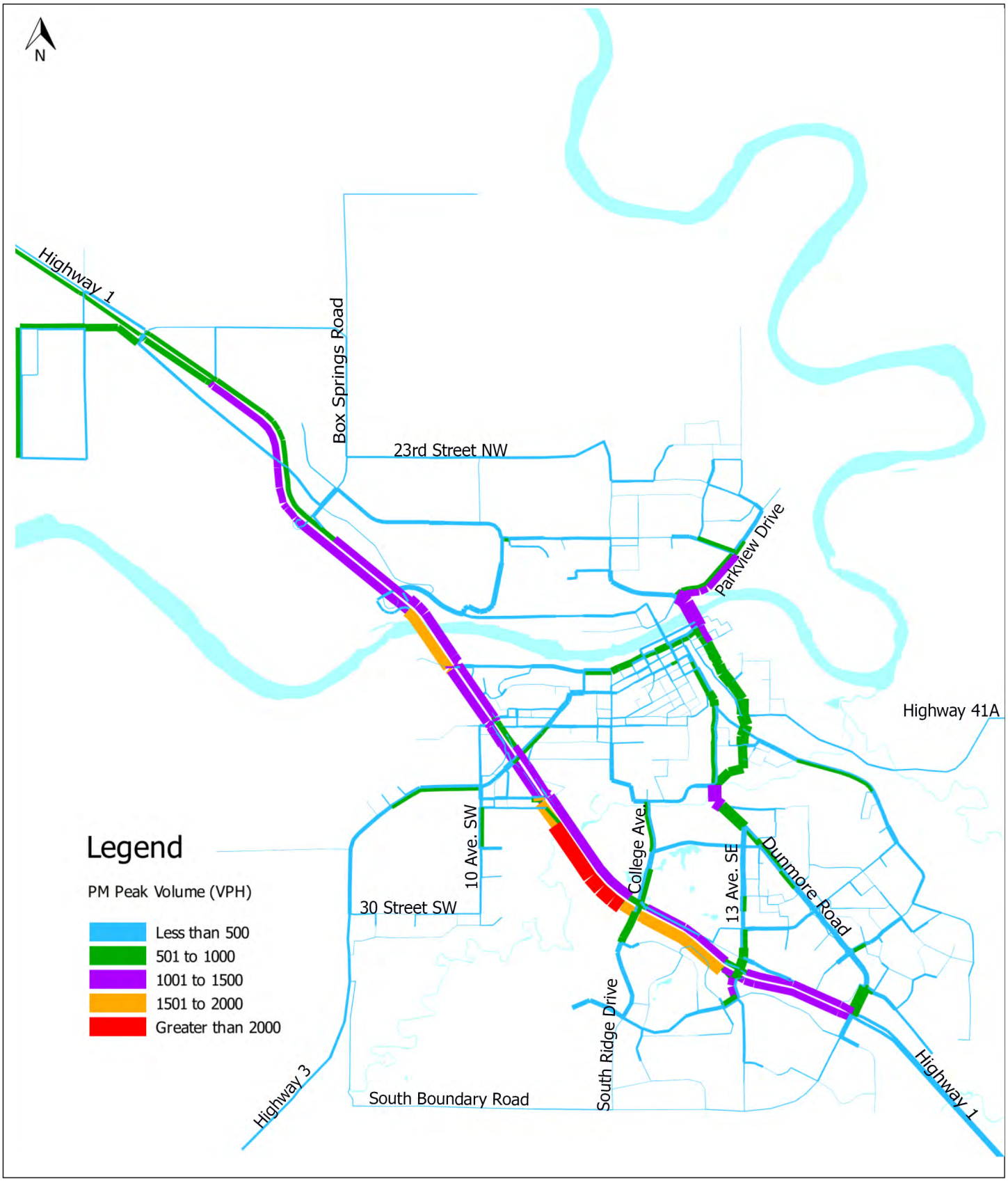
An EMME model plot of the VCR results for the 2010 base year scenario is shown in **Figure 3-2**. Overall, the results show the majority of the roads operating well within capacity as indicated by a VCR of less than 0.6. Locations that are at or nearing capacity as evidenced by a VCR >0.85 include:

- Highway 1 - Westbound approach at 16th Street SW (AT jurisdiction)
- Highway 1 off-ramp at 3rd Street NW (AT Jurisdiction)
- South Ridge Drive - Southbound approach at Sprague Way.

The City has just completed widening improvements on South Ridge Drive (SRD). These improvements will alleviate capacity concerns at the South Ridge Drive and Sprague Way intersection.

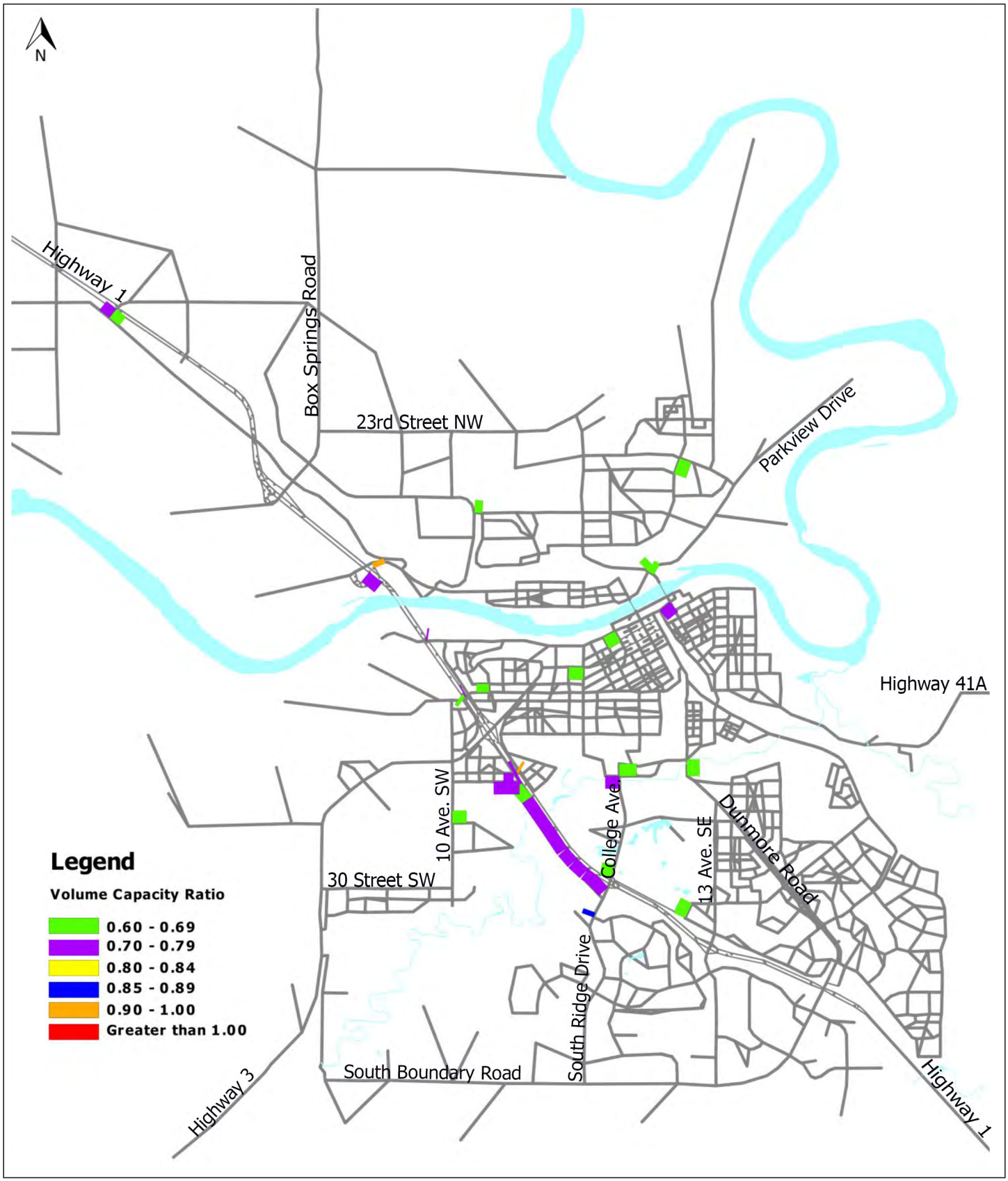
Although not indicated in EMME, there are other locations within the City roadway network that show signs of congestion and should be monitored. These are based on local knowledge and / or recent functional planning studies. The following locations have been identified by the City as a concern:

- Northbound 13th Avenue SE at Trans Canada Way
- Northbound left turn on Dunmore Road at Trans Canada Way
- Division Avenue between 6th and 7th Streets S
- Highway 1 and 6th / 7th Street SW Intersection (AT jurisdiction)
- South Ridge Drive and Highway 1 Interchange - SW exit ramp and NW entrance ramp (AT Jurisdiction). As part of the South Ridge Drive (SRD) upgrade project, AECOM identified capacity issues at the ramp terminals at the Highway 1 / SRD interchange. Potential improvements at this interchange are currently being assessed by the City.



Associated Engineering

Figure 3-1
ROADWAY SYSTEMS MASTER PLAN
2010 Modeled Traffic Volume



Associated Engineering

Figure 3-2
ROADWAY SYSTEMS MASTER PLAN
Volume Capacity Ratio for the 2010 Base Year Scenario

3.3 75,000 POPULATION HORIZON NETWORK

3.3.1 75K Do Nothing Scenario

A “Do Nothing” scenario was evaluated for the 2010 network and it included connections needed to accommodate access to new developments. It was analyzed to identify where capacity concerns would develop if no improvements were made to the road network in consideration of the population and employment growth for the 75K horizon. Figure 3-3 shows the traffic volume for the 75K “Do Nothing” Scenario. Traffic increases throughout the City with more concentrated growth where the land use growth occurs. Specifically, as follows:

- Highway 1
- Highway 3
- South Ridge Drive / College Avenue / Kipling Street / Spencer Street / Allowance Avenue / Maple Avenue route
- South Boundary Road.

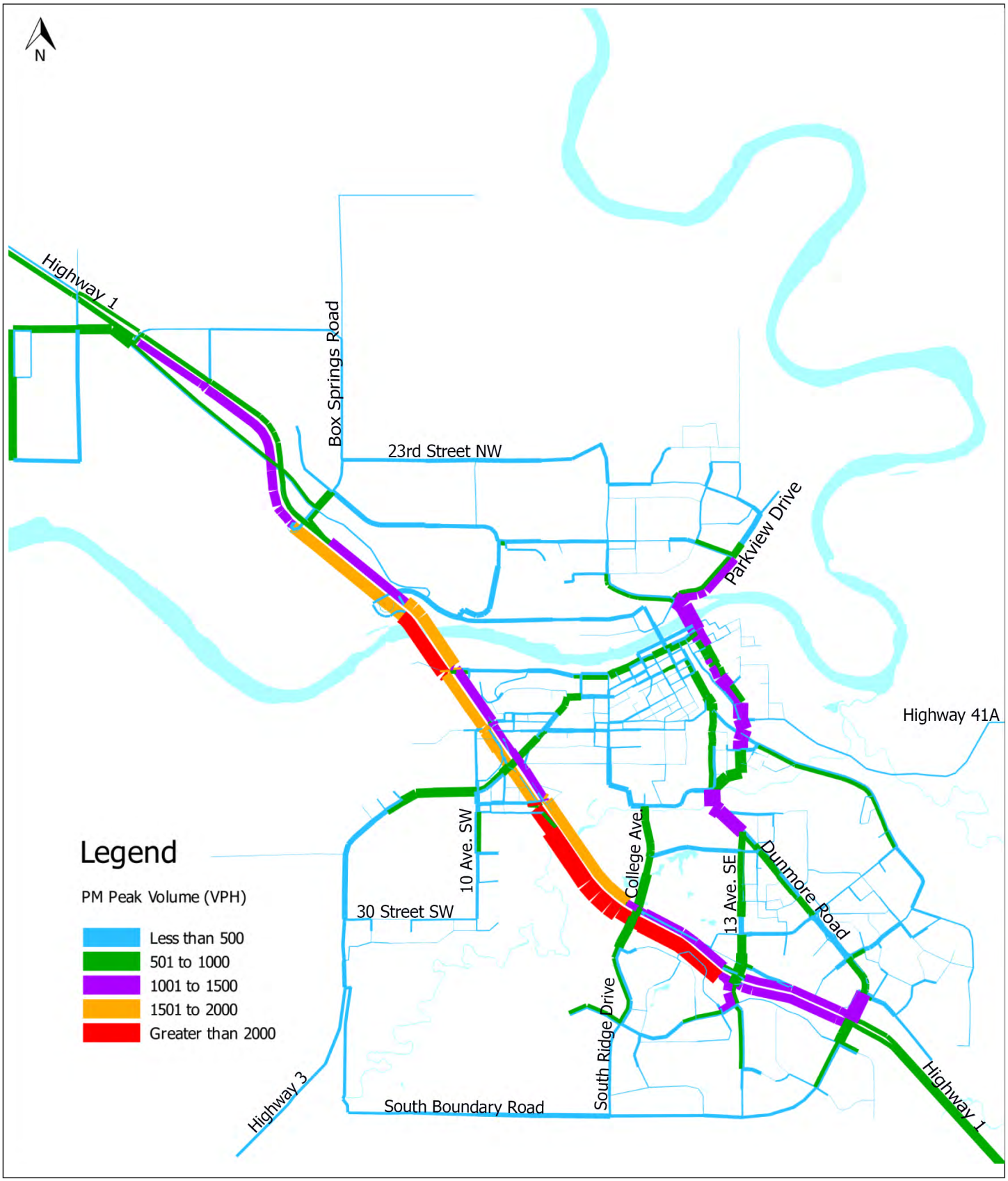
Figure 3-4 shows the VCR for 75K Do Nothing Scenario. Highway 1 has increasing capacity concerns for a greater amount of the corridor. Locations that are at or nearing capacity include:

- South Ridge Drive at Sprague Way - Southbound approach
- College Avenue at Kipling Street - Westbound approach
- Maple Avenue at 1st Street SE - Eastbound approach.

As was noted previously, the upgrades to South Ridge Drive will alleviate the congestion at the South Ridge Drive / Sprague Way intersection. The other three locations are discussed in more detail in Section 4 of this report.

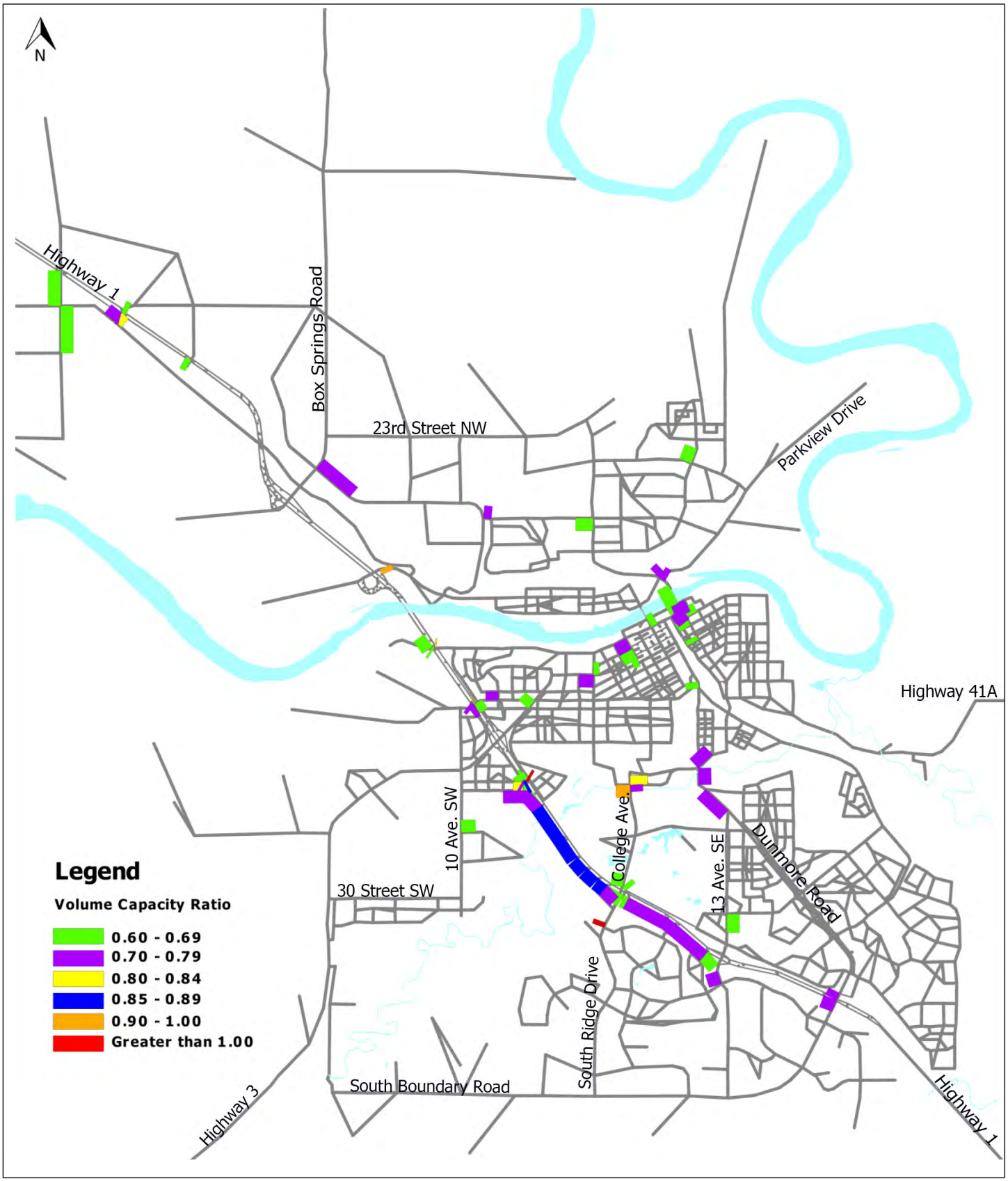
Other locations with a VCR of 0.85 or higher and that are within AT jurisdiction include:

- Westbound off-ramp on Highway 1 at 3rd Street NW
- Northwest approach on Highway 1 at 16th Street SW (also noted in the 2010 horizon scenario)
- Highway 1 Southeast bound corridor between 17th Street SW on ramp and South Ridge Drive exit ramp.



Associated Engineering

Figure 3-3
ROADWAY SYSTEMS MASTER PLAN
75K Do Nothing Forecast Traffic Volume



Associated Engineering

Figure 3-4
ROADWAY SYSTEMS MASTER PLAN
Volume Capacity Ratio for 75K Do Nothing Scenario

3.4 95,000 POPULATION HORIZON NETWORK

3.4.1 95K Do Nothing Scenario

A “Do Nothing” scenario was also evaluated for the 2010 network and it included the connections needed to accommodate access to new developments. It was analyzed to identify where capacity concerns would develop if no improvements were made to road network in consideration of the population and employment growth for the 95K population horizon. **Figure 3-5** shows the traffic volume for the 95K “Do Nothing” Scenario. Traffic increases throughout the City with more concentrated growth where the land use growth is planned to occur. Specifically the following experience the most growth:

- Highway 1
- Highway 3
- The South Ridge Drive / College Avenue / Kipling Street / Spencer Street / Allowance Avenue / Maple Avenue / Altawana Drive route
- The 13th Avenue / Dunmore Road / Kingsway Avenue route
- The Saamis Drive NW / 3rd Street NW / Finlay Bridge route
- Range Road 62 / South Boundary Road.

Figure 3-6 shows the VCR for the 95K “Do Nothing” scenario. A number of locations within City of Medicine Hat jurisdiction have a VCR of 0.85 or higher. Locations with capacity concerns from the 75K population horizon that reappear in the 95K population horizon include:

- Southbound approach at South Ridge Drive and Sprague Way (has been rectified by SRD updates)
- East, north and westbound approach at College Avenue and Kipling Street
- Eastbound approach at 1st Street SE and River Road / 4th Avenue SE
- North approach at Kingsway Avenue and Spencer Street.

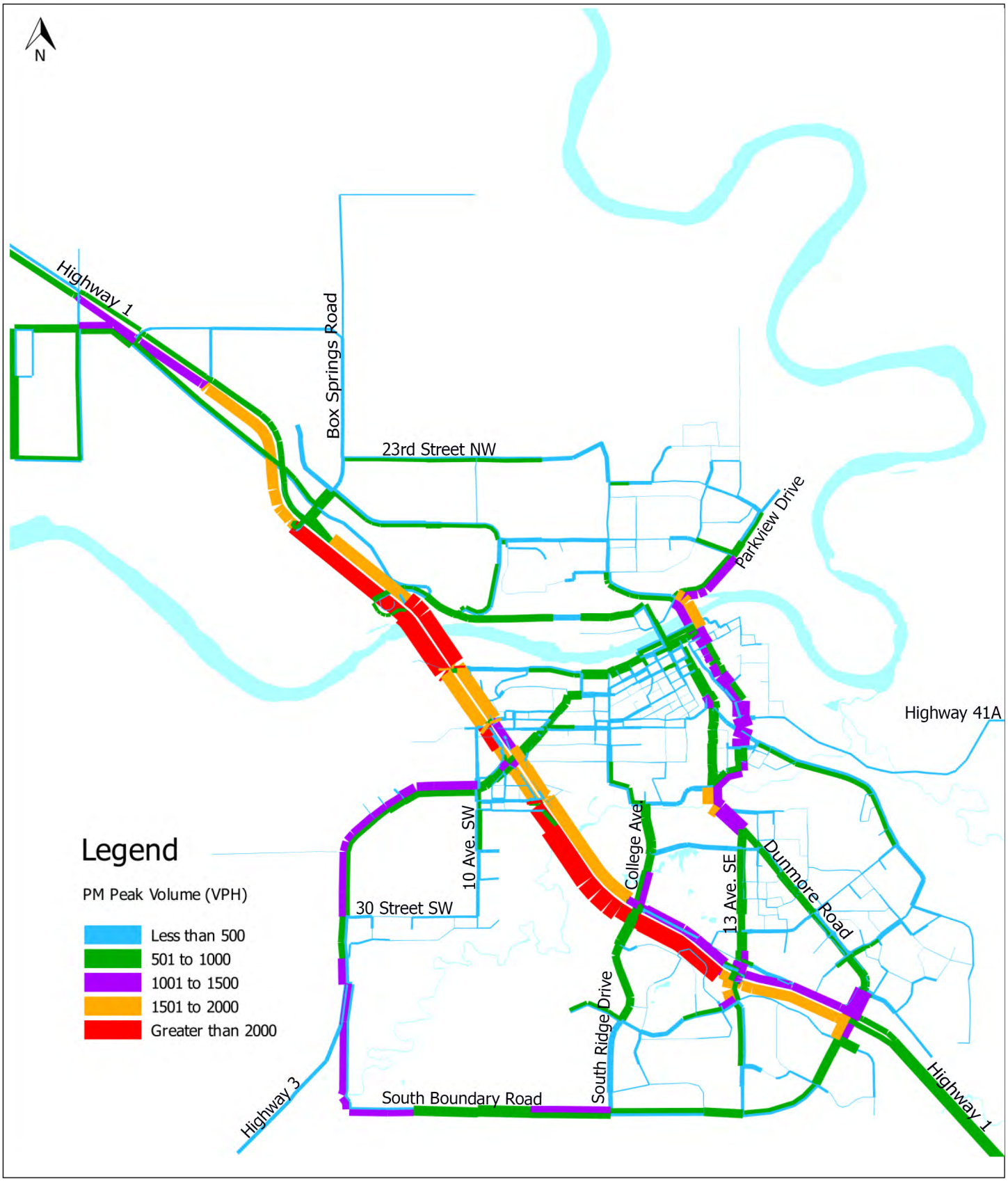
As mentioned previously, the South Ridge Drive capacity concerns have been addressed with recently completed upgrades. The College Avenue / Kipling Street SE and Kingsway Avenue / Spencer Street SE intersections have been analyzed in more detail in Section 4.

The intersection at 1st Street SE and River Road is signalized and in the core of the downtown. This intersection will show signs of traffic congestion as the City approaches the 95K population horizon. As this intersection is in a full built-out area, it may be difficult and costly to upgrade. Furthermore, detailed analysis would be needed to explore the options and related costs.

It should be noted that some of the public and Heritage Resources Committee comments that raised concerns about the traffic increase and widening of 1st street SE would be assessed. In discussions with the City, the City will be dealing with Heritage aspects as a separate issue.

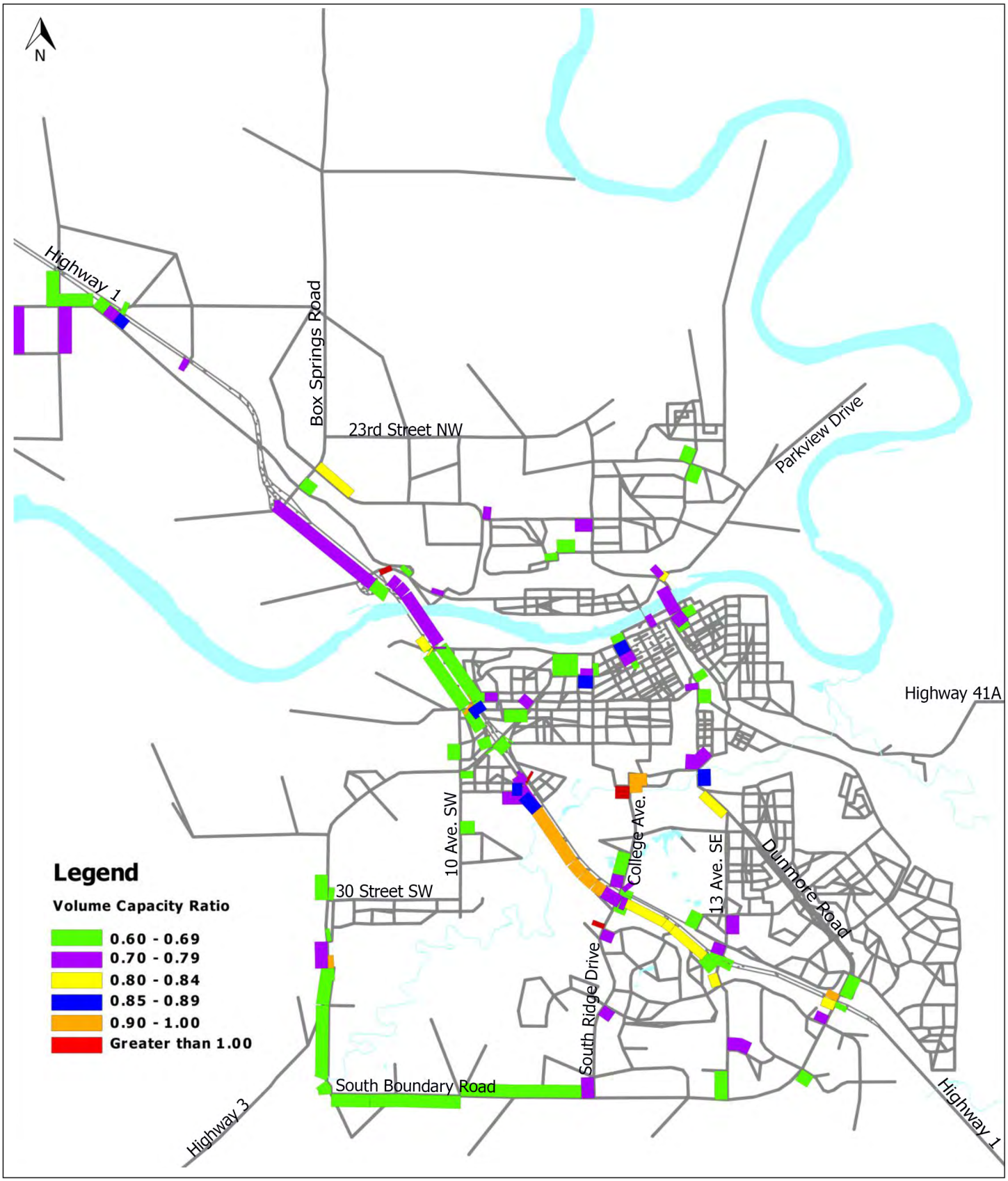
Other locations with a VCR of 0.85 or higher that are within AT jurisdiction include:

- Northwest bound off-ramp on Highway 1 at 3rd Street NW (also noted in the 75K population horizon)
- 1st Street SW westbound approach on Highway 1
- All approaches at the Highway 1 and 6th / 7th Street SW intersection
- Red Cliff Drive and 6th Street SW intersection southeast bound and northwest bound approaches
- Highway 1 and 16th Street SW intersection northwest bound and southeast bound approaches (also noted in the 75K population horizon)
- Southeast bound approach on Bomford Crescent at 16th Street SW
- Highway 1 eastbound off ramp at South Ridge Drive (also noted in the 75K population horizon)
- Highway 1 southbound approach at Dunmore Road.



Associated Engineering

Figure 3-5
ROADWAY SYSTEMS MASTER PLAN
95K Do Nothing Forecast Traffic Volume



Associated Engineering

Figure 3-6
ROADWAY SYSTEMS MASTER PLAN
Volume Capacity Ratio for 95K Do Nothing Scenario

4 Location Specific Improvements

4.1 INTRODUCTION

The 2005 RSMP, current Area Structure Plans and previous functional planning studies identified several roadway improvements that will be required within the City. Most of them are in new development areas, and will be triggered by new development. Three locations identified in Section 3 needed analysis at a micro level because of the forecast traffic volume increases. This section provides a description of all planned improvements related to development and an analysis for these key locations.

4.2 PLANNED IMPROVEMENTS RELATED TO DEVELOPMENT

Developers are responsible for the construction of all collector and local roadways within a development so these are not planned by the City. The City is responsible for the construction of arterial roadways because they often serve more than one development. When development-driven roads need to be constructed is dependent on when the development occurs. This section describes all planned development-driven roads even if they are currently forecast to occur beyond the 95K population horizon. This is because the planning for some of these roads is already complete and the timing of development can change quickly, necessitating the City to be ready should the need arise.

4.2.1 South Boundary Road - South Ridge Drive to Range Road 61

South Boundary Road between Range Road 61 and South Ridge Drive is currently a two-lane roadway with a rural cross section. This existing roadway geometry with a rural cross section could not serve future development in the Cimarron area in the long term. It is expected to serve as a major east-west arterial in southwest Medicine Hat. Cimarron development will progress from east to west starting at South Ridge Drive. An estimated 2,600 population will live in Cimarron as part of the 75K population horizon and this goes up to 10,300 for the 95K population horizon. This added population will result in the need to upgrade South Boundary Road west of South Ridge Drive around 75K population horizon subject to Cimarron development.

The forecast volume on South Boundary Road immediately west of South Ridge Drive is 7,000 vehicles per day (vpd) for the 75K population horizon and 18,000 vpd for the 95K population horizon. Commonly accepted road capacity guidelines suggest that the ultimate daily design volume for a four lane roadway is 10,000 to 30,000 vpd depending on traffic control and number of turn lanes at the intersections. South Boundary Road could operate with an acceptable level of service as a two lane roadway initially; however, it will need to be a four-lane facility when Cimarron is fully developed.

4.2.2 Southwest Medicine Hat Connector (previously described as the 10th Avenue Connector)

South Boundary Road currently connects into Range Road 62 and Cactus Coulee Road, which is a rural road through the Seven Persons Creek Valley that ultimately connects with Highway 3 to the northwest. As part of the RSMP, we prepared a South West Connector Route Options Report to look at alternative routes for a west connection in the South West, from 10th Avenue SW and / or South Boundary Road to Highway 3. The forecast volume for a west connection is 15,000 vehicles per day (vpd) at the 95K population horizon. Without this connection 14,000 vpd use Cactus Coulee Road and an additional 5,000 vpd would use South Ridge Drive. The forecast volume on South Ridge Drive immediately south of Highway 1 is 27,000 vpd without a South West connection and 22,000 vpd with a South West Connection. These are very high traffic volumes for these roadways and as such the road network would benefit from construction of a better SW Connector route.

In addition, a South West Connection will be needed from the perspective of travel demand, proper spacing of arterial roadways, and for emergency service access. This link would need to have two lanes of a four lane roadway for the 75K population horizon and ultimately four lanes when Cimarron is fully built-out.

The SW Connector report has been submitted to the City, and it outlines the various options considered, the assumptions made and more detail on the evaluation process. All three options are viable and have varying pros and cons so the decision on which option best suits the City of Medicine Hat and the community will be largely based on the perspectives arising from, land ownership, environmental, impact to existing areas and communities, and road connectivity.

4.2.3 Burnside Drive

This roadway will serve the Burnside Estates residential development, which is expected to develop close to the 95K population horizon. The first 3200 population will generate 6,000 vpd. The south connection, which will likely be constructed first, will be at the 3rd Street intersection, with Highway 1 and the north connection will be at 23rd Street. The alignment will be determined as part of a future area structure plan. Burnside Drive should be planned as a two-lane facility initially until a four-lane divided roadway is required to handle capacity or for emergency services. The upgrade to four lanes is not required until area development intensifies.

4.2.4 13th Avenue SE - Strachan Road to South Boundary Road

Thirteenth Avenue SE between Strachan Road and South Boundary Road is currently a two lane rural cross section. This existing roadway geometry with a rural cross section could not serve future development in the Hamptons and Southlands for the long term. For the 75K population horizon, the forecast volume ranges from 1,700 vpd north of South Boundary Road to 8,000 vpd

just south of Strachan Road. This volume will increase to 2,000 vpd north of South Boundary Road and 11,000 vpd just south of Strachan Road at 95K population horizon.

The road is planned to ultimately be a four-lane urban cross section with improved pavement structure. The City may stage this by constructing two lanes with geometric upgrades at intersections initially however, depending on the increased traffic demands, the four lane section may be constructed prior to the 7**5K** population horizon.

4.2.5 11th Avenue SW - 7th Street SW North toward Power House Road

This section of roadway currently has a two lane rural cross section and is not connected to the Power House Road. The existing roadway is not capable of handling future traffic volumes that will be generated from the future Suntec Area and it is unlikely that it is on the correct alignment to service all the needs of the area. This existing roadway should be redesigned and extended to provide a connection to Power House Road near Highway 1, and to provide access to commercial development to the south. When developing a new alignment it will be important to address dangerous goods route needs for access to the City's Water Treatment Plant on Power House Road. It is envisaged that the new alignment will be determined as part of a future area structure plan for the area.

This new alignment will also help with access to the businesses that are affected by the removal of 7th Street access to Highway 1. Therefore the alignment could be developed through consultation with businesses and AT, so issues like guide signage and access can be addressed to the satisfaction of businesses in the area.

4.2.6 Box Springs Road NW

This section of roadway currently has a two lane rural cross section. The road is ultimately planned to have a four-lane urban cross section with an upgraded pavement structure. A detailed functional planning study has been completed and can be referred to for more detail. The City may stage this roadway upgrade to an urban cross section by constructing two lanes with geometric improvements at intersections initially, as the forecast traffic volume is less than 10,000 vpd. Upgrades are not triggered by typical pm peak hour commuting traffic, however other developments and/or an Event Centre in the area may trigger roadway upgrades sooner. The stages may include the following:

- Intersection of Box Springs Road and 23rd Street
- Box Springs Road - Brier Park Road to 23rd Street (4 Lane Arterial)
- Box Springs Road - 23rd Street to Box Springs Street (4 Lane Arterial).

4.2.7 West Boundary Road from Highway 1 to Broadway Avenue

This section of roadway currently has a two lane rural cross section. The road is ultimately planned to have a four-lane urban cross section with an upgraded pavement structure. A detailed functional

planning study has been completed and can be referred to for more details. In discussions with City staff, a draft Event Center TIA recommends West Boundary Road be upgraded to four lanes from Highway 1 to Broadway Avenue in conjunction with development in the Box Springs Business Park.

4.3 DETAILED ANALYSIS OF KEY INTERSECTIONS

The Network Analysis identified the need for improvements at the following three intersections:

- Dunmore Road / Kingsway Avenue and Spencer Street
- Maple Avenue and 1st Street SE
- College Avenue and Kipling Street.

This section describes the analysis used to determine concepts for the types of improvements that would be required to improve traffic conditions in the p.m. peak hour only. Before adopting these as recommended plans, we see a benefit in completing a small functional study in the future for each of these intersections to address both the 75K and 95K populations traffic volumes (a.m. and p.m. peak hour volumes), as well as other critical issues like geometric design, property acquisition and utility impacts to mention a few.

4.3.1 Traffic Volume Forecasts

The turning movement counts that are generated by the EMME Model provide an approximate value on turning volumes at intersections. EMME is a macro level traffic modeling tool that is not detailed enough to accurately forecast the turning movement volumes at particular intersections. To more accurately forecast the traffic volumes at these key intersections, we compared the current traffic volumes with the 2010 EMME model forecasts to identify where the model is not accurate. We then made adjustments to the forecast turning movement counts. The adjusted turning movement counts are provided in **Appendix E**.

4.3.2 Traffic Analysis

Synchro 7.0 was used to complete the capacity analysis of the study intersections. This software applies the methodology established by the Highway Capacity Manual to output a level of service for a study intersection, given the lane configuration, vehicular volumes and heavy vehicle percentages. Synchro settings for the City of Medicine Hat were used to analyze the traffic at the intersections mentioned above. The analysis of each intersection was completed for p.m. peak hour volumes only. **Appendix E** presents the Synchro parameters and their corresponding values.

The operational capability of the study intersections was assessed using capacity. The critical measures used in the assessment were:

- Volume to capacity (v / c) ratio provides the amount of congestion for each turning movement and for each lane group for signalized intersections. A v / c value over 1 indicates that the movement or lane group is over capacity.
- Control delay is the amount of delay a vehicle experiences in seconds.
- Level of service (LOS) is a qualitative measure describing operational conditions within a traffic stream and is based on service measures such as delay and congestion.

Synchro outputs are also included in **Appendix E**.

4.3.3 College Avenue and Kipling Street

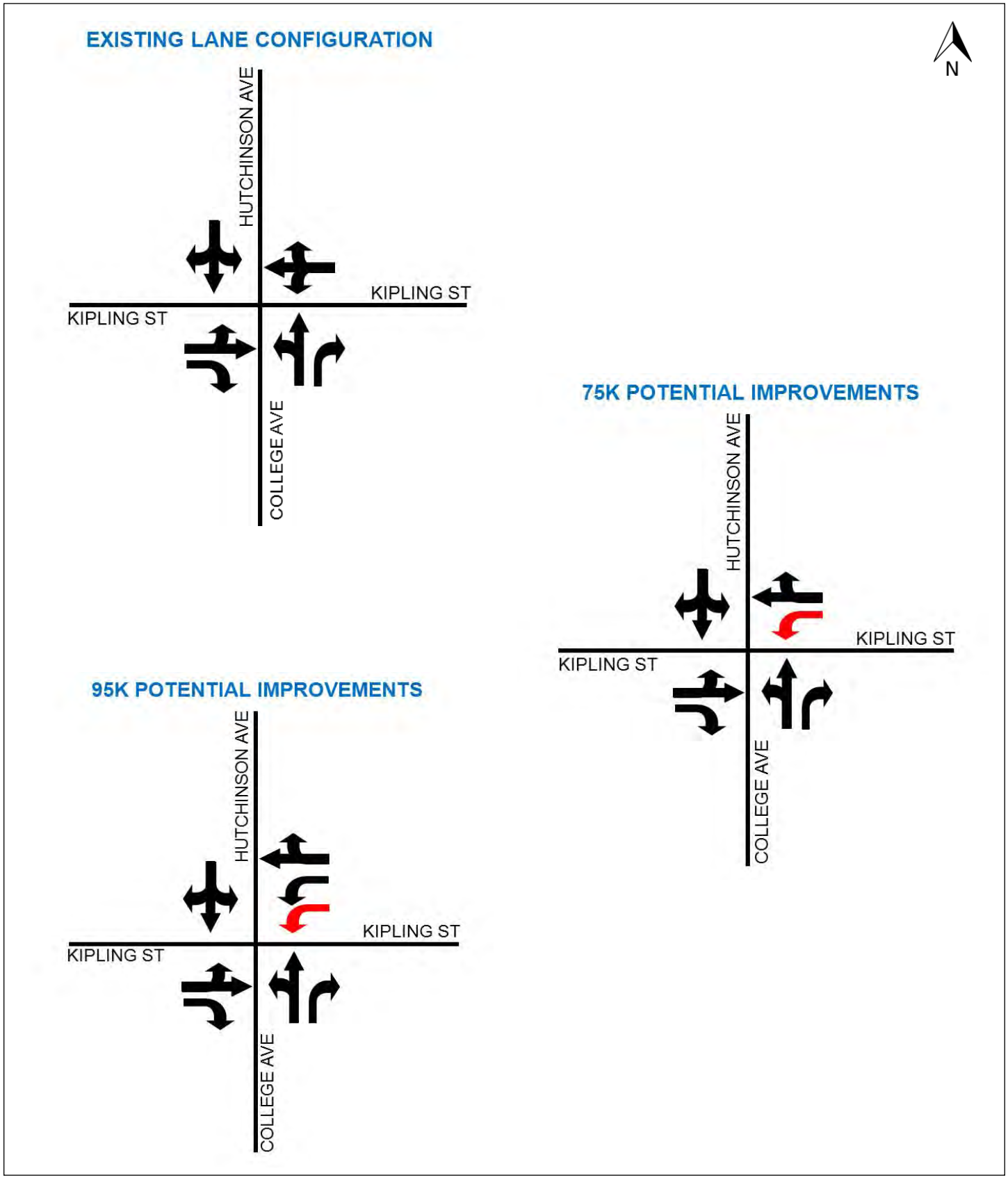
College Avenue is a four lane undivided roadway that serves as a primary route between south Medicine Hat and central areas of Medicine Hat including the downtown. It connects directly into Hutchinson Avenue which is a low volume local street that also intersects with Kipling Street. Kipling Street is a two lane undivided roadway. The intersection currently has a four way stop and channelized right turn lanes onto and off College Avenue.

The centrally located intersection will be the primary route for residents living south of Highway 1 and using South Ridge Drive and College Avenue to access downtown. Forecast increases in traffic volumes and the corresponding intersection improvements are related to new development south of Highway 1 and overall population and employment growth throughout the City.

At the 75K population horizon, the intersection is expected to operate at LOS ‘F’ with high average delays. The westbound left / through / right movement is expected to operate at LOS ‘F’, with v / c ratio of 1.26 and delay of 148.9 seconds. Potential improvements that need to be addressed to improve p.m. peak hour traffic volumes include; signalizing the intersection and providing a dedicated westbound left turn lane.

At the 95K population horizon with the 75K population horizon improvements completed, the intersection is expected to operate at LOS ‘E’ with high average delays. The westbound left turn movement is expected to operate at LOS ‘F’, with v / c ratio of 1.16 and a delay of 109.7 seconds. This can be mitigated by providing a second westbound left turn lane to make this movement a dual left turn.

Figure 4-1 presents the existing and potential lane configurations solutions for the College Avenue and Kipling Street intersection to accommodate the 75K and 95K population horizon traffic volumes (based on p.m. peak hour volumes only). These potential improvements are based solely on a level of service analysis and we suggest further investigation is needed to determine the cost and feasibility to implement the physical improvements.



Associated Engineering

Figure 4-1
Existing and Potential Lane Configuration at College Avenue and Kipling Street Intersection

4.3.4 Maple Avenue & 1st Street SE

The intersection of Maple Avenue and 1st Street SE is a major intersection on the east side of Medicine Hat's downtown. Traffic through the intersection is controlled by traffic signals. Maple Avenue is a four lane divided roadway with right in and right out driveways south of 1st Street SE. 1st Street SE is an undivided roadway with no access control.

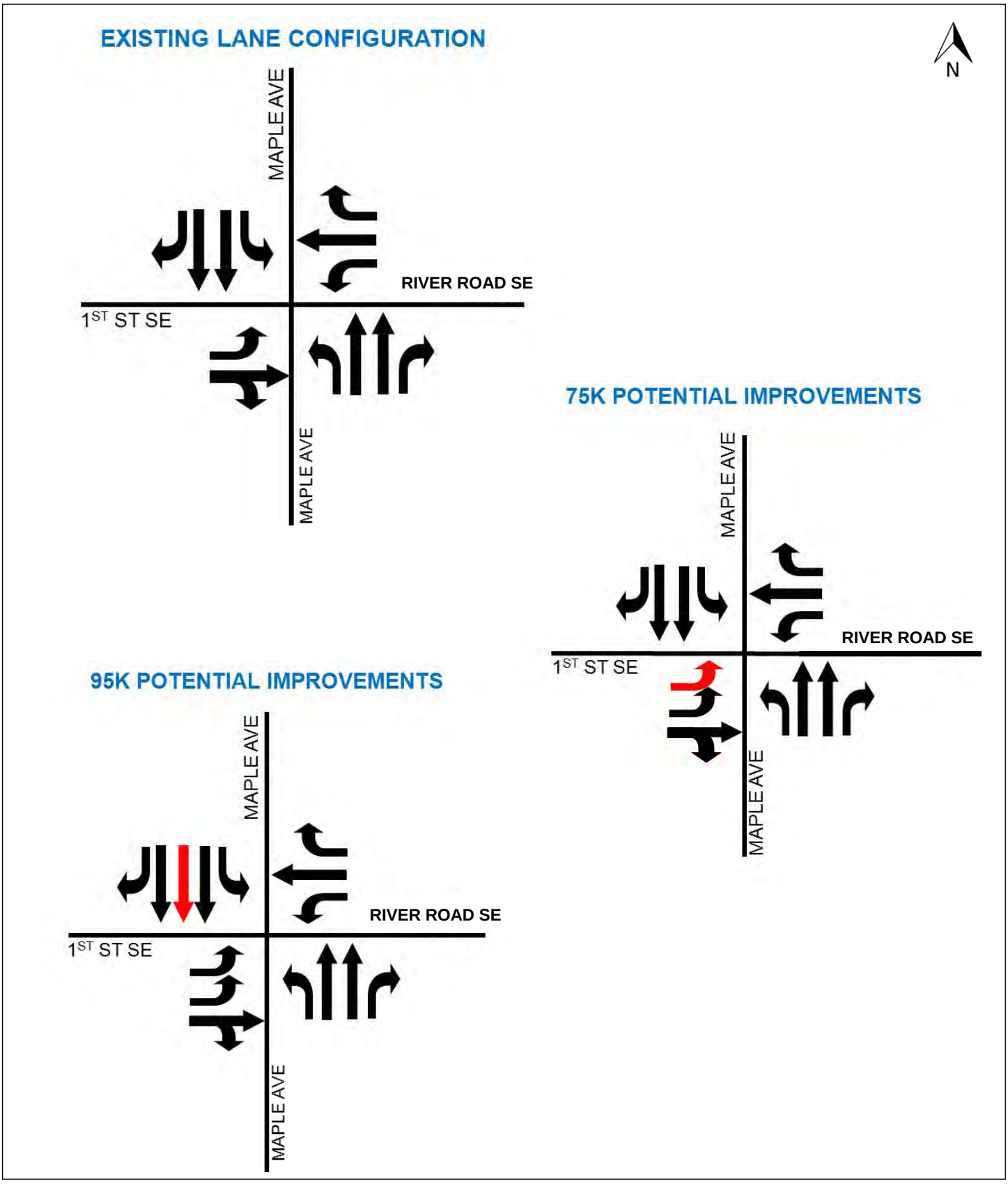
In 2008 a conceptual plan recommended intersection widening based on the 2005 EMME model. Since that time the volume forecasts have reduced.

We anticipate that this intersection will still require improvements to handle increases in traffic flow in the north / southbound and eastbound directions, however, we analyzed options based on the current forecasts. These upgrades will be triggered by overall City growth.

At the 75K population horizon, during the p.m. peak hour, the intersection is expected to operate at LOS 'E' with high average delays. The eastbound to northbound left turn movement is expected to operate at LOS 'F', with v / c ratio of 1.16 and delay of 142.1 seconds. To improve the LOS, our analysis suggests adding a second eastbound to northbound left turn lane.

At the 95K population horizon, with the 75K population horizon recommended improvements completed, and during the p.m. peak hour, the intersection is expected to operate at LOS 'D'. The southbound through movement is expected to operate at LOS 'D', with v / c ratio of 0.95 and a delay of 47.9 seconds. Based on the p.m. peak hour analysis, this can be mitigated by adding a third southbound through lane at the intersection.

Figure 4-2 presents the existing and potential lane configuration solutions for the Maple Avenue and 1st Street SE intersection to accommodate the 75K and 95K population horizon traffic volumes (based on p.m. peak hour volumes only). These potential improvements are based solely on a level of service analysis and we suggest further investigation is needed to determine the cost and feasibility to implement the physical improvements.



Associated Engineering

Figure 4-2
Existing and Potential Lane Configuration at Maple Avenue and 1st Street SE Intersection

4.3.5 Dunmore Road / Kingsway Avenue & Spencer Street

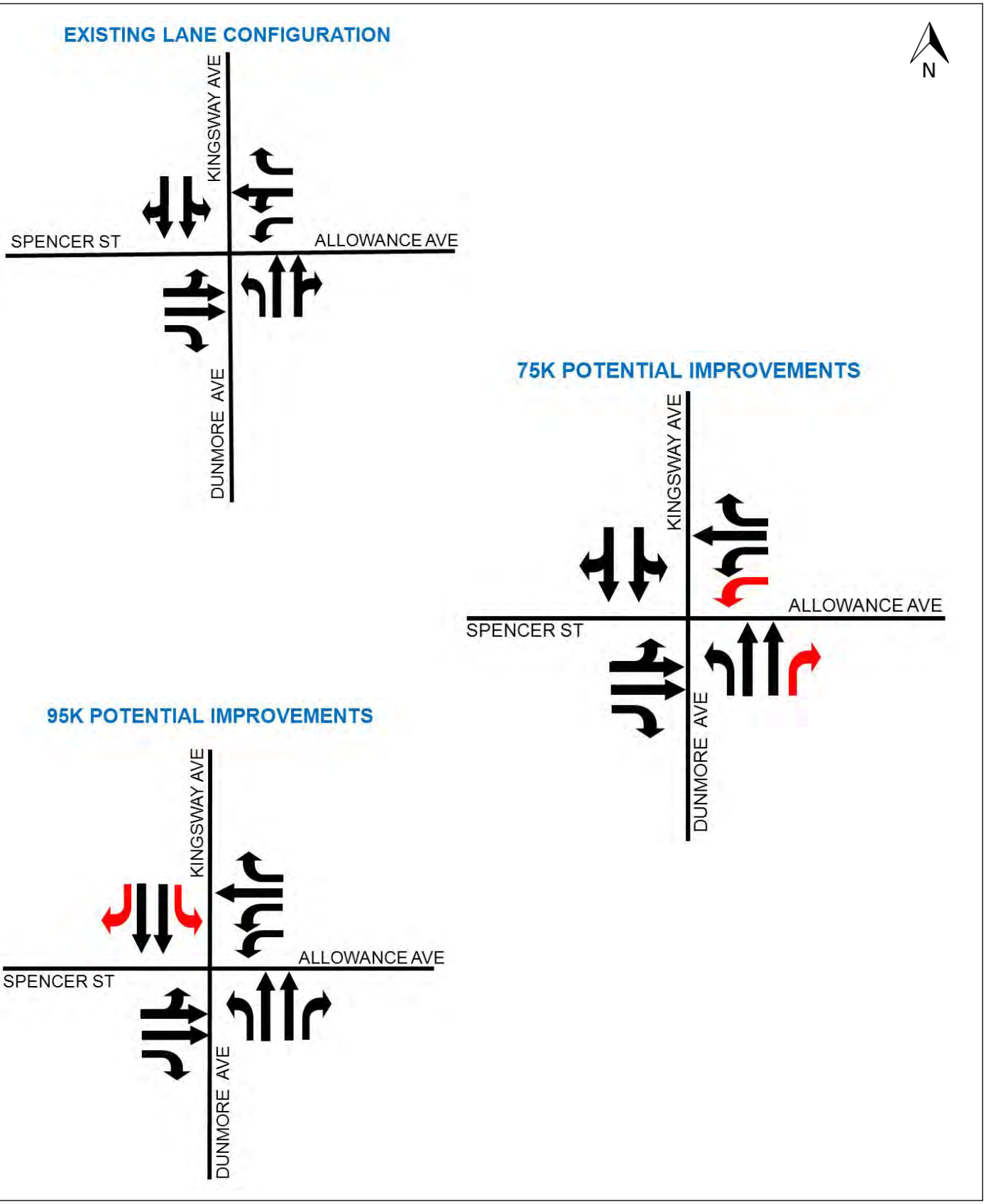
The intersection of Dunmore Road / Kingsway Avenue and Spencer Street is located south of the downtown and is a critical intersection in the core of the community. Each leg of this signalized intersection has a minimum of four lanes at the intersection. The northbound and westbound left turn lanes are the only dedicated left turn lanes at the intersection. The lack of turn lanes results in the need for the traffic signals to operate with split phasing to accommodate the high demand for turn movements. The intersection has a number of constraints like the railway tracks along the south side of Spencer Street, the existing commercial developments flanking the intersection in the NW, NE and SE corners and the bridge over Seven Persons Creek on the south side of Spencer Street.

This centrally located intersection is on a primary north-south route in the City of Medicine Hat. The increase in traffic at this intersection is a result of development in south Medicine Hat, as well as overall population and employment growth throughout the city.

At the 75K population horizon, during the p.m. peak hour, the intersection is expected to operate at LOS 'E' with high average delays. The westbound to southbound left turn movement is expected to operate at LOS 'F', with v / c ratio of 1.34 and delay of 197.7 seconds. This can be mitigated by adding a second westbound to southbound left turn lane and channelizing the northbound to eastbound right turn lane.

At the 95K population horizon with the 75K population horizon improvements completed and during the p.m. peak hour, the intersection is expected to operate at LOS 'E' with high average delays. The southbound movement is expected to operate at LOS 'F', with v / c ratio of 1.05 and a delay of 81.1 seconds. During the p.m. peak hour this can be mitigated by adding a southbound to eastbound left turn lane, as well as a southbound to westbound right turn lane at the intersection.

Figure 4-3 presents the existing and a potential lane configuration solution for the Kingsway Avenue/Spencer Street intersection to accommodate the 75K and 95K population horizons traffic volumes. These potential improvements are based solely on a level of service analysis and we suggest further investigation is needed to determine the cost and feasibility to implement the physical improvements.



Associated Engineering

Figure 4-3
Existing and Potential Lane Configuration at Dunmore Road / Kingsway Avenue and Spencer Street Intersection

4.4 OTHER POTENTIAL IMPROVEMENTS

As discussed in Section 3.2 several roadways are a local concern at an operational level more so than a capacity level. Additionally some locations are starting to near capacity that should be monitored as growth occurs. The following locations should be further reviewed at a functional planning level:

- 13th Avenue SE at Trans Canada Way
- Dunmore Road just north of Highway 1 to Spencer Street
- Division Avenue between 3rd Street SW and 7th Street SW
- Altawana Drive and Parkview Drive
- Gershaw Drive and 7th Street SW.

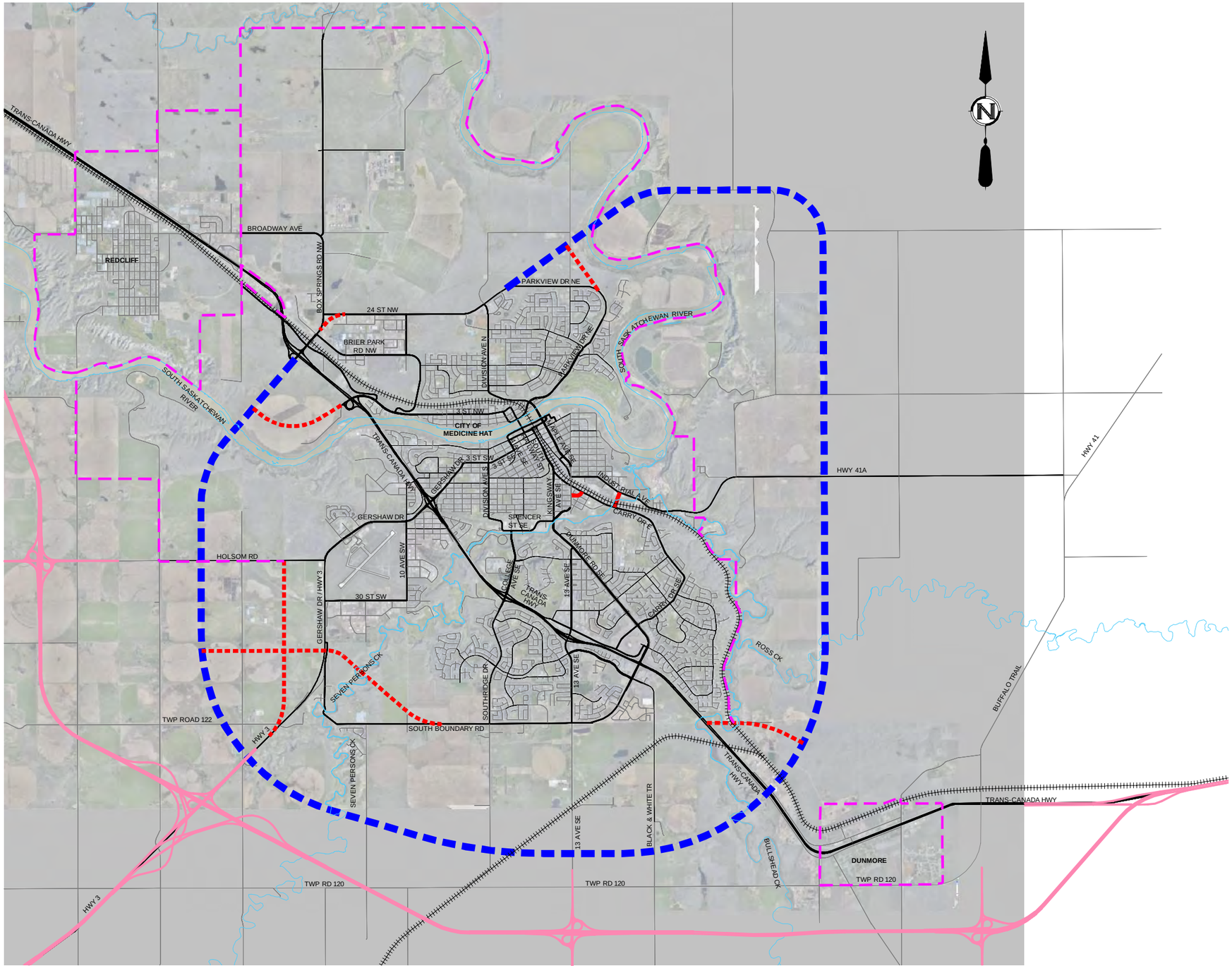
5 Skeletal Road Network

We took a very cursory look at what the Cities road network might look like 50 to 100 years into the future. This type of long-term planning can be useful in terms of protecting road right-of-way as development occurs in and around the City. The intent of this high level and very conceptual work was to get the City and the neighboring communities thinking about long range roadway connectivity irrespective of City, Town or County Boundaries. A very conceptual ring road alignment was developed to initiate discussions on longer term roadway network planning. This plan was not included as part of the RSMP public process because it would benefit from the input of other City departments and the Inter-municipal Development Team before being presented to the public.

We have attached **Figure 5-1** to show the ring road concept that was developed as part of the RSMP to initiate discussions. This alignment is not fixed. It is just a concept to be used for future discussions and planning associated with future ASPs and Inter-municipal Development Planning.

Moving forward it would be important to identify the classification, intersection spacing and typical cross-section criteria to be used for this type of road so you are prepared if faced with the need to establish access conditions and road right-of-way requirements. It is also important to understand topography conditions for this type of roadway as side slopes and backslopes in fill and cut areas can affect road right-of-way requirements.

This hi level skeletal roadway network will aid in decision making as the City and neighboring communities grow.



LEGEND

- ALBERTA TRANSPORTATION HWY 1 RE-ALIGNMEN
- RING ROAD CONCEPT
- EXISTING MAJOR ROADWAYS
- EXISTING MINOR ROADWAYS
- CITY/TOWN/HAMLET APPROXIMATE LIMITS
- POTENTIAL INTER CITY CONNECTORS
- CPR RAILWAY
- WATERCOURSE

Associated Engineering

Figure 5-1
ROADWAY SYSTEMS MASTER PLAN
Conceptual Skeletal Roadway Network

6 Conclusions and Recommendations

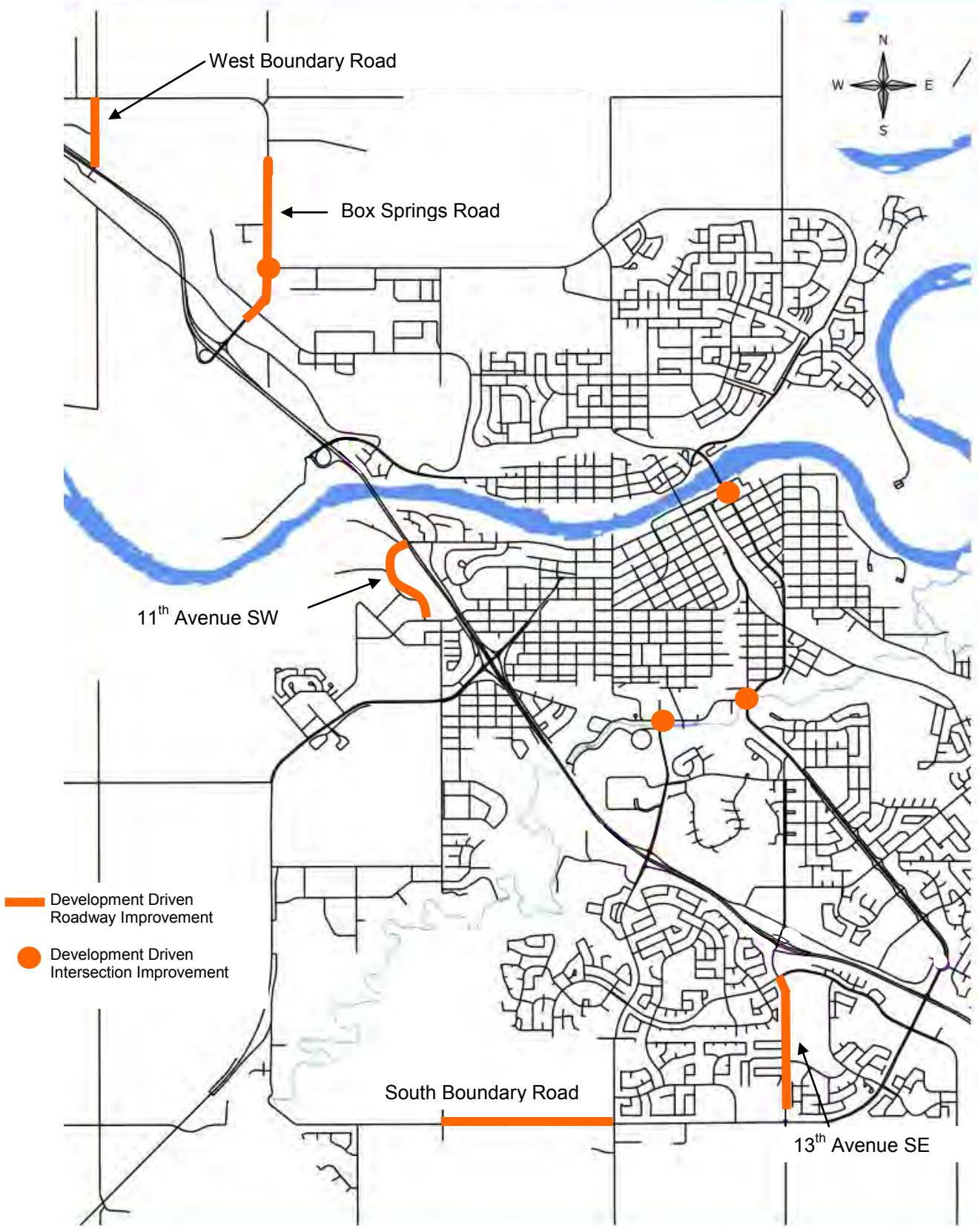
The 2010 roadway network analysis reviewed existing conditions, local knowledge, the planned improvements from the 2005 RSMP, the Highway 1 Improvements being proposed by AT, and the network demand based on the draft Growth Management Strategy of the MDP and IDP. The population forecasts we used are similar to the final MDP. This review indicated that many of the roadway improvements in the 2005 RSMP may be deferred to beyond the 95K population horizon or may not be required at all. This is due to the travel demand being 30% less at the 95K population horizon than previously forecast. The proposed 75K population horizon and 95K population horizon scenarios were being developed to determine the roadway improvements that are needed to serve the increased travel demand when the City reaches a 75,000 population and 95,000 population, respectively.

6.1 ROAD NETWORK PLAN

A map showing the 2010 potential improvements is provided in **Figure 6-1**. These are summarized in the following sections.

6.2 75K NETWORK RECOMMENDATIONS

The 75K population horizon potential improvements and what triggers these improvements are summarized in **Table 6-1**.



Associated Engineering

Figure 6-1
ROADWAY SYSTEMS MASTER PLAN
10 Year Capital Plan
Roadway Upgrades

Table 6-1
75K Population Horizon Potential Improvements

Location	Description	Trigger
South Boundary Road	Upgrade existing 2 lanes between RR 61 and South Ridge Drive.	Construct in conjunction with development of Cimarron neighbourhood.
College Avenue and Kipling Street	Signalization Construct dedicated WBL turn lane.	Install signals in near term, monitor annually. Provide turn lane as you approach 75K population.
Maple Avenue and 1st Street SE	Construct Free-Flow WBR turn lane. EBR turn channelization and construct second EBL turn lane. Review potential for adding lanes in southbound direction as you approach 95K population.	Currently needed. City-wide growth will dictate implementation. Implement as you approach 75K population. Monitor annually.
Dunmore Road / Kingsway Avenue at Spencer Street	Construct second WBL turn lane, add NBR turn lane.	Provide turn lanes as you approach 75K population.

6.3 95K NETWORK RECOMMENDATIONS

The 95K population horizon recommended improvements and what triggers those improvements are summarized in **Table 6-2**.

Table 6-2
95K Population Horizon Primary Potential Improvements

Location	Description	Trigger
Dunmore Road / Kingsway Avenue and Spencer Street	Preliminary functional review and analysis needed related to constructing SBR and SBL turn lanes.	City-wide growth will dictate implementation. Complete as you approach 95K population.
Maple Avenue and 1st Street SE	Preliminary functional review and analysis needed related to constructing a third SBT lane between the bridge and 1st Street SE.	City-wide growth will dictate implementation. Complete as you approach 95K population.
College Avenue and Kipling Street	Preliminary functional review and analysis needed related to constructing a second dedicated WBL turn lane.	City-wide growth will dictate implementation. Complete as you approach 95K population.
Division Avenue and 3rd Street S	Add traffic signals.	Monitor and install when warranted.
Burnside Drive	Construct a 4 lane arterial providing access to the Burnside development and connecting to 3rd Street NW.	Construct 2 lanes of a 4 lane urban arterial road in conjunction with Burnside development. Add final 2 lanes when warranted or upon full build-out of Burnside.

6.4 10 YEAR CAPITAL PLAN

The timing for completion of the recommended improvements for the 75K population horizon is 11 years. We have assumed that all of the improvements identified in the 75K population horizon should be included in the 10 year capital plan.

The 10 year capital plan includes a variety of roadway improvement projects related to capacity, large scale system improvements, intersection improvements, and new roadways related to future development. The 10 year capital plan roadway improvement projects and their estimated costs based on 2012 dollars are listed in **Table 6-3**.

Some of the development-driven roads are listed in Table 6-3 even though they are not included on the list of 75K Recommended Improvements. This is because they are development driven and new information indicates they may be advanced because of area development. The roadways that are development driven include:

- West Boundary Road - Highway 1 to Box Springs Boulevard
- Box Springs Road - Brier Park Road to 23rd Street NW

- Box Springs Road - 23rd Street NW to north of Box Springs Street NW
- Box Springs Road NW and 23rd Street NW Intersection Upgrades
- 13th Avenue SE - Strachan Road to South Boundary Road
- 11th Avenue SW – extension to Highway 1
- South Boundary Road - South Ridge Drive to Range Road 61
- Burnside Drive - Highway 1 to Redcliff Way Road
- South West Medicine Hat Connector

Table 6-3
10 Year Capital Improvement Plan

Project Name	Timeframe	Cost
Maple Avenue & 1st Street SE intersection upgrades	2014	$1,000,000
College Avenue & Kipling Street intersection upgrades	2015	$2,000,000
Kingsway Avenue & Spencer Street intersection upgrades	2016	$2,500,000
West Boundary Road NW – 4 lane road upgrades from TCH to Box Springs Blvd, including signal installation at Box Springs Blvd	2016	$2,500,000
Box Springs Road NW – 4 lane road upgrades from Brier Park Road to 23rd Street NW (approx. 0.45 km)	2017	$3,000,000
Box Springs Road NW – 4 lane road upgrades from 23rd Street NW to just north of Box Springs Street NW (approx. 0.9 km)	2017	$5,800,000
Box Springs Road & 23rd Street NW intersection upgrades	2014	$2,000,000
13th Avenue SE – 4 lane road upgrades from Strachan Road to South Boundary Road (1.35 km), includes 13th Avenue SE / Strachan Road & 13th Avenue SE / Vista Drive intersection upgrades	2015	$9,000,000
11th Avenue SW - extension of 11th Avenue SW to TCH (TBD)	2021	$3,000,000
South Boundary Road Phase 2 - two lane road upgrades from South Ridge Drive to Range Road 61	2023	$10,750,000

Source: City of Medicine Hat Municipal Works Department

Table 6-4 shows projects that are planned beyond the 10 year window and that may or may not get completed depending on the amount of development that occurs in these areas.

Table 6-4
Projects Planned Beyond 10 Years

Project Name	Timeframe	Cost
South West Medicine Hat Connector - two lane roadway initially	2025	$27,000,000
Burnside Drive - four lane road between TCH and Redcliff Way (TBD)	2030	$10,000,000

6.5 PUBLIC CONSULTATION

This section describes the public consultation process used on the 2010 RSMP only. Descriptions of the public process used on other components of this project like the Cycling Master Plan are provided in separate reports.

The information presented to the public for the 2010 RSMP was separated in three different sections. These were:

1. The Roadway System Master Plan
2. The proposed sequencing strategy for implementing the Alberta Transportation proposed Highway 1 improvements between Seven Persons Creek and the South Saskatchewan River
3. Alignment options for a South West Medicine Hat Connector between South Boundary Road and Highway 3.

The public consultation process was performed in the following ways to ensure all interested parties had an opportunity to comment on the plan:

- The City received assistance from the Chamber of Commerce to draw land owners and businesses from within the SW Industrial Area of the city to a public meeting. This meeting was held on January 15, 2013 at the Best Western Inn on Redcliff Drive. Details on the 2010 RSMP were shared with this key segment of the community.

- The City of Medicine Hat contacted individual land owners that would be impacted by the proposed options for the SW Connector. Contact was made through meetings and or phone calls and results of these discussions were documented.

- The City held an open house specifically for residents who fronted on or resided adjacent to 1st Street SW. This open house was held on January 16, 2013 from 3pm to 8pm at the Studio Theater in the Esplanade.

- A public open house was also held on January 23, 2013 at Higdon Hall on the exhibition grounds from 3pm - 8pm. This was a citywide open house that was well advertised on the radio, TV stations, newspapers and on street sign boards.

We received many valuable comments through the public process and many of them can be incorporated into future planning for changes to the roadway network. Some examples are:

- Add a RI/RO on the Highway 3 to Highway 1 (westbound) on ramp for better access to businesses on the east side of Highway 1

- Property ownership issues associated with converting Bomford Crescent to one way.

A binder containing a summary of the comments received from the three events together with sign in sheets, all the actual comment forms, email responses and responses fed through the Chamber of Commerce is available for viewing at the City of Medicine Hat Municipal Works Department.

A summary of the comments received at the two Open Houses and the Public Meeting are enclosed in **Appendix G** for information.

We have also enclosed a copy of the Presentation Boards used at the Public Open Houses. These are provided in **Appendix F**.

In general terms, the public appeared to be supportive of the direction the City is taking on the RSMP. There were a number of positive comments asking the City to get moving on improvements as soon as possible especially those along Highway 1. An example of some of the concerns raised by the public are presented as follows:

Highway 1 Improvement Comments

- 1st Street SW residents were concerned about traffic conditions that exist closer to the downtown between Division Avenue and 4th Avenue SE. Speeding and perceived high traffic volumes were their big concerns.

- The businesses in the area were concerned about access once 7th Street SW connection to Highway 1 is closed. They asked that the west service road connecting Power House Road to the business area be in place before closing 7th Street SW at Highway 1. They also asked to be consulted in the alignment design for the service road and they asked that good guide signage be provided.

- There was concern raised regarding business access on the NE side of Highway 1 between Highway 3 and 6th Street SW. One suggestion was to provide a RI/RO access off the NE ramp of the Highway 1/3 Interchange to provide access to businesses along this side of Highway 1.

- The SW Light Industrial group seemed to be concerned about access to and from this area off Highway 1 and Highway 3 when 16th Avenue SW closes at Highway 1. They were also concerned about it being more difficult to get to the area so the general public may not decide to go to their businesses if it's made more difficult. Those businesses located directly on 16th Avenue SW were concerned about a reduction in drive-by traffic that potentially stops at their business and who likely wouldn't stop with the 16th Avenue connection to Highway 1 closed.

- Residents in the Kensington Area were concerned about a single road access in and out of their neighborhood and the challenging route they would have to use to get in and out of the neighborhood to go north and south. They requested further investigation be conducted on their access before closing Bullivant Crescent at Highway 1 and that they be consulted on any potential solutions before implementation.

SW Connector Comments

- The land owners affected by the SW Connector alignments had either no concerns or concerns related to the impact the alignments might have on their property from a future development perspective.
- Some concern was raised that Option 2 will compromise the Cimarron Area Structure Plan
- Discussions with the owner of the Cottonwood Coulee Golf Course did not identify major concerns although the owner did mention Option 1 would have pretty significant environmental impacts on the Seven Person Creek Valley
- The land owner east of Seven Persons Creek did not express any major concerns with any of the Options presented
- The land owner west of Seven Persons Creek expressed concerns with Option 2 in that it severed his parcel of land; however, he indicated he would be fine if the acceptable financial terms could be negotiated
- Some support was shown for Option 2 considering there was no impact on already built-up areas of the City and there is less impact on the environment. Some members of the public also supported the lower cost of Option 2. There was some support for Option 1 particularly for those residents who live south of Highway 1 and work in the SW Industrial or SW Agro Areas. One land owner west of Seven Persons Creek objected to Option 2 because it severed his land which he believes makes it less attractive to future development.

6.6 CITY OF MEDICINE HAT - TECHNICAL COORDINATING COMMITTEE (TCC) COMMENTS

The City circulated the SW Connector Report and the AT Highway 1 and 3 Proposed Improvements Report through a number of departments within the City. Most of the comments received would be mitigated through recommendations presented in this report or through normal processes used on typical roadway projects, or roadway functional planning studies.

City Planning had a comment on the SW Connector Report regarding whether the Option 2 alignment would fit into the current City Growth Management Strategy (GMS). Should the City decide to pursue SW Connector Option 2, they may want to complete an assessment of the impact this option will have on their current and future planning.

6.7 OTHER OBSERVATIONS FROM WORKING ON THE RSMP

We stepped back and took a big picture look at the City of Medicine Hat roadway system and what we identified is the following:

- In general terms, the City's roadway network is capable of handling forecast traffic volumes with only a few internal roadway improvements as noted in Sections 4 and 5. Congestion on Highway 1 at both the 16th Street SW and 6th / 7th Street SW intersections are the locations of most concern within the City. These intersections are having difficulty meeting today's traffic demands and they will just get worse as the City continues to grow. Some improvements being recommended in the Alberta Transportation Proposed Improvement Sequencing Report for Highway 1 could be implemented immediately and we would recommend discussion with Alberta Transportation commence in the near future to develop a plan for completing these.

- The traffic flow in the City of Medicine Hat functions quite efficiently for traffic traveling in an east-west or west-east direction. This is not the same for traffic traveling north to south or south to north. There are big challenges to improving the north-south traffic movements within the City because of many factors like the South Saskatchewan River, Seven Persons Creek, CP Rail, fully built-out areas of the City and numerous roadway connections to the existing primary links to name a few. It may be of some value for the City to take a long term look at how a north south route in the eastern part of the City could either be improved or possibly where a new link could be added to improve traffic flow in this part of the City. One option would be to do a functional study for the Dunmore Road, Spencer Street, Allowance Avenue, Maple Avenue, Parkview Drive corridor and a second option would be to investigate some other north south corridor.

- The proposed Highway 1 improvements provide an overall benefit to traffic operations in Medicine Hat. Of all of the various upgrades examined, the closure of 16th Street SW and 6th / 7th Street SW intersections coupled with the proposed upgrades to the Gershaw/Highway 1 interchange allowing for free flow along Highway 1 and the proposed upgrades to Gershaw Drive, provides for the greatest improvement to how the various corridors and adjacent roadways function. However, it was recognized that there may be funding and time constraints surrounding the implementation of all the Highway improvements, and on that basis there are interim phasing solutions that can be undertaken to ultimately complete the full upgrades proposed by AT. These are outlined in a separate report. The first phase involves constructing an all turns intersection on Highway 3 at 8th Avenue SW, upgrading Highway 3 by adding signals at the SE exit ramp off Highway 1, and making other changes within the SW Industrial area that are needed to support this added access. These other items need to be determined through a future traffic study of the SW Industrial Area. Two examples of the type of improvements that could be beneficial are:

    - Converting a segment or segments of Bomford Crescent to one way
    - Reorient traffic control signage with SW Industrial Area.

- Taking a very long-term look at what the City's road network might look like 50 to 100 years into the future is another area where the City could invest some thinking. This type of planning can be useful in terms of protecting road right of way as development occurs in and around the City. Alignments for ring roads and/or protected north-south and east-west corridors can pay dividends when planned far in advance. These alignments often extend past the current City Limits and can

involve discussions with neighboring counties and bordering communities. The Skeletal Road Network in Figure 5-1 illustrates a potential long term roadway plan. This should be further considered as part of the next IDP update.

- If we take a more micro level look at the City's roadway network we can see some advantage to completing a few functional design studies for critical roadways within the City roadway network. These roadways could benefit from improvements to access management, level of service, vehicle to capacity ratios, safety, geometric design improvements and signal timing changes to name a few. Examples of some roadways that could benefit from functional design studies are as follows:

    - 13th Avenue SE - Strachan Road to Dunmore Road
    - Dunmore Road - Just north of Highway 1 to Spencer Street
    - Maple Avenue - Altawana Drive / Parkview Drive - south of 1st Street SE
    - College Avenue & Kipling Street
    - Access to the Kensington Area
    - South West Connector
    - 11th Avenue SW / Service Road access to Highway 1

- Another issue we identified through work on this project is the route solid waste vehicles pass through the City to the City landfill. This route passes through the North Flats and right past an elementary school. Finding a more a suitable route for hauling solid waste through the City would be beneficial to the community.

- It is important that the City use the information provided in both the roadway system master plan and cycling master plan to integrate road network planning with cycle network planning.

- Having a regular "traffic counting" program in place creates a comprehensive database of information that can prove very beneficial to the City in many areas. It supports TIA's, allows for monitoring of changes in the City's traffic patterns and provides data to support the assessment of future roadway improvements. Having comprehensive and up to date traffic count data allows for better management of the roadway network.

- Another item that is important to support the management of a roadway network is collision data. Having collision details over a number of years and having current information allows you to assess the need for improvements not related to capacity. This data allows you to identify areas where a safety audit may be appropriate or where an immediate improvement may be required.

- We are aware that the city has a procedure in place to complete TIA's for new developments within built-up areas and for areas of new development. We encourage the City to continue this practice.

- We would suggest that the City update the Base Year Scenario in the model annually and land use data in the model following census years.

- The City should monitor the progress of the next update to the Municipal Development Plan and align the next RSMP update with the future update to the MDP.

Those items that were not in the scope of the Roadway System Master Plan included the following:

- The dangerous goods route assessments
- Transit Master Plan
- Minor upgrades to intersections that are handled through the City's annual operating work.

REPORT

Certification Page

City of Medicine Hat, Roadway Systems Master Plan, Road Network Plan Update

The Services provided by Associated Engineering in the preparation of this report were conducted in a manner consistent with the skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

April 10, 2013

Monique Kealey, P.Eng.
Transportation Engineer

for Randy Stevenson
Manager, Transportation Infrastructure

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature:
Date: 2013-4-10

APEGA Permit to Practice P 3979

A Appendix A - Traffic Analysis Zone Changes

PROJECT No.	20103999
DATE:	AUGUST 2011
APPROVED:	S. HEMENWAY
SCALE:	NTS
DWG. No.	FIGURE A-1

Associated Engineering

ROADWAY SYSTEMS MASTER PLAN

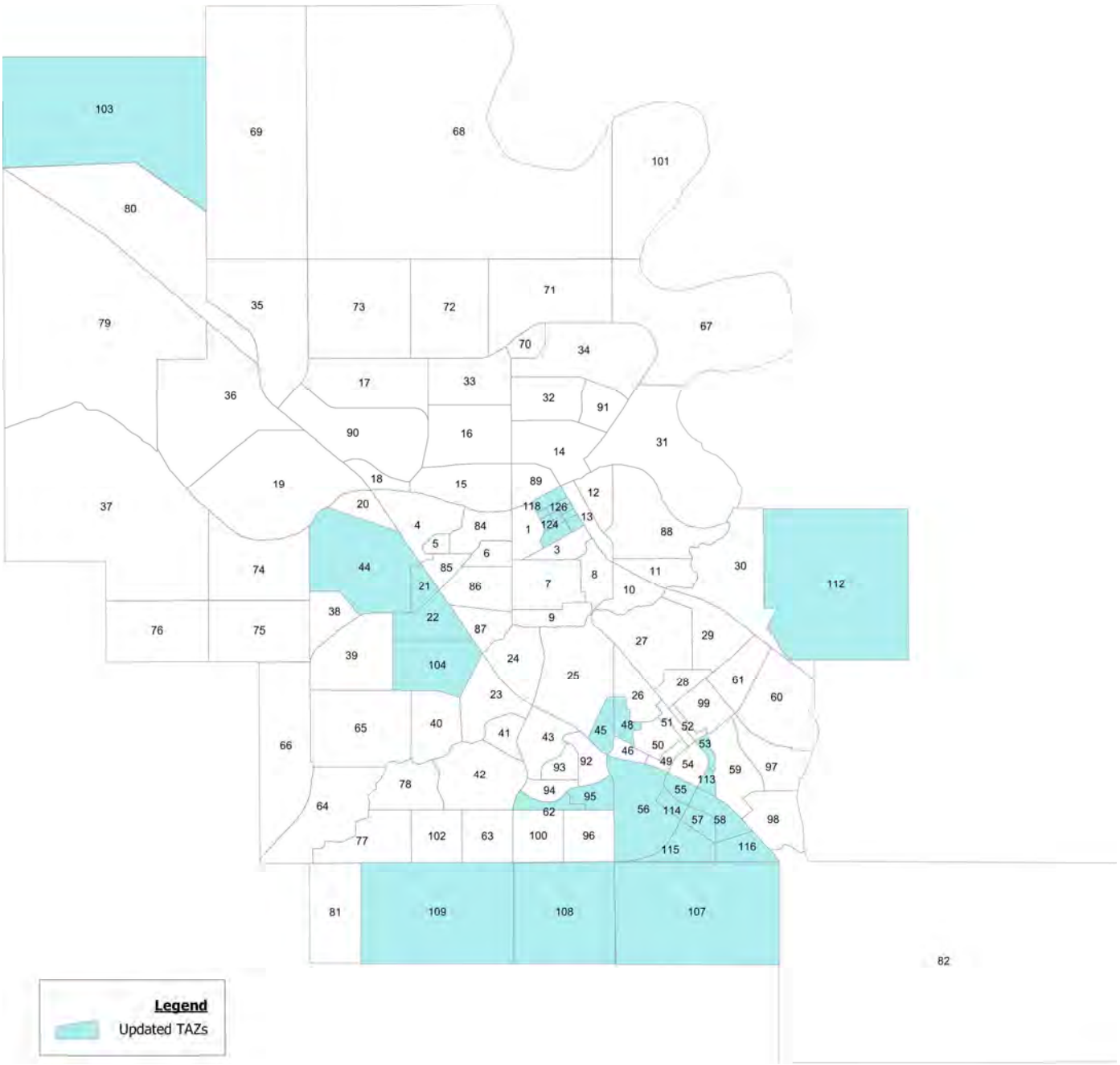
PREVIOUS (2007) MODEL TRAFFIC ANALYSIS ZONES

PROJECT No.	20103999
DATE:	SEPTEMBER 2011
APPROVED:	S. HEMENWAY
SCALE:	NTS
DWG. No.	FIGURE A-2

Associated Engineering

ROADWAY SYSTEMS MASTER PLAN

PREVIOUS (2007) MODEL
OLD TRAFFIC ANALYSIS ZONES
DOWNTOWN AREA



PROJECT No.	20103999
DATE:	AUGUST 2011
APPROVED:	S. HEMENWAY
SCALE:	NTS
DWG. No.	FIGURE A-3

Associated Engineering

ROADWAY SYSTEMS MASTER PLAN

NEW TRAFFIC ANALYSIS ZONES

PROJECT No.	20103999
DATE:	AUGUST 2011
APPROVED:	S. HEMENWAY
SCALE:	NTS
DWG. No.	FIGURE A-4

Associated Engineering

ROADWAY SYSTEMS MASTER PLAN

NEW TRAFFIC ANALYSIS ZONES DOWNTOWN AREA

B Appendix B - Detailed Demographic Data

2010 Employment Data

Traffic Zone	mo28 potot	mo29 empcom	mo30 empind	mo31 empins	mo32 empoff	mo33 emphos	mo34 empcol	mo35 emphom	mo36 emptot
1	900	105	0	265	120	0	0	32	522
3	620	61	0	0	8	0	0	16	85
4	1245	109	0	0	91	0	0	19	219
5	320	0	0	0	0	1600	0	0	1600
6	286	69	0	180	15	0	0	10	274
7	1741	193	0	69	75	0	0	61	398
8	519	735	0	0	72	0	0	3	810
9	26	125	4	335	0		0	0	464
10	107	379	56	0	11	0	0	4	450
11	220	69	25	0	0	0	0	3	97
12	667	36	0	247	30	0	0	10	323
13	130	736	0	45	16	0	0	2	799
14	1154	22	0	108	0	0	0	25	155
15	1181	10	0	48	2	0	0	35	95
16	2696	201	0	112	24	0	0	71	408
17	0	288	1040	0	210	0	0	0	1538
18	475	30	0	40	10	0	0	0	80
19	0	0	0	0	0	0	0	0	0
20	0	0	80	0	0	0	0	0	80
21	213	461	0	14	0	0	0	3	478
22	0	920	160	43	140	0	0	0	1263
23	0	30	0	0	0	0	0	0	30
24	60	0	0	20	0	0	607	0	627
25	1516	147	0	0	20	0	0	32	199
26	1056	58	0	10	20	0	0	16	104
27	1593	412	0	102	79	0	0	39	632
28	1090	22	0	20	0	0	0	16	58
29	1212	24	0	0	0	0	0	23	47
30	17	12	150	0	0	0	0	0	162
31	1111	65	0	0	0	0	0	19	84
32	2113	26	0	94	0	0	0	57	177
33	0	0	0	50	0	0	0	0	50
34	4050	0	0	0	0	0	0	48	48
35	0	240	0	0	0	0	0	0	240
36	0	0	0	0	0	0	0	0	0
37	20	0	0	10	0	0	0	0	10
38	919	85	0	165	0	0	0	19	269
39	0	31	0	30	10	0	0	0	71
40	368	60	0	0	0	0	0	4	64
41	535	10	0	0	0	0	0	10	20
42	2850	16	0	8	0	0	0	10	34
43	1868	52	0	39	0	0	0	44	135
44	10	130	0	0	0	0	0	0	130
45	440	626	0	0	106	0	0	0	732
46	0	297	0	0	0	0	0	0	297
48	840	227	0	0	55	0	0	0	282
49	0	427	0	0	29	0	0	0	456
50	980	4	0	80	0	0	0	8	92
51	0	564	0	0	23	0	0	0	587
52	0	320	0	16	67	0	0	0	403
53	0	440	0	0	160	0	0	0	600
54	7	1444	0	0	37	0	0	0	1481
55	0	122	0	0	0	0	0	0	122
56	1400	90	0	22	0	0	0	14	126
57	0	325	0	0	10	0	0	0	335
58	0	346	0	0	30	0	0	0	376
59	1870	6	0	0	0	0	0	45	51

75K Employment Data

	mo58 poptot	mo59 empcom	mo60 empind	mo61 empins	mo62 empoff	mo63 emphos	mo64 empcol	mo65 emphom	mo66 emptot
1	903	133	0	310	310	0	0	31	784
3	661	82	0	0	8	0	0	19	109
4	1025	169	0	40	40	8	0	22	279
5	360	0	0	0	80	1850	0	0	1930
6	310	109	0	180	15	0	0	13	317
7	1910	193	0	69	75	0	0	71	408
8	474	1115	20	0	0	0	0	3	1138
9	45	145	14	505	0	0	0	0	664
10	101	436	96	0	15	0	0	4	551
11	240	189	65	20	20	0	0	3	297
12	1200	56	0	260	60	0	0	13	389
13	800	936	0	105	105	0	0	2	1148
14	1178	26	0	128	0	0	0	30	184
15	1347	10	0	52	19	0	0	38	119
16	2804	201	0	122	24	0	0	78	425
17	0	348	1200	0	250	0	0	0	1798
18	615	60	0	40	30	0	0	0	130
19	0	0	0	0	0	0	0	0	0
20	0	0	82	0	0	0	0	0	82
21	125	400	0	90	90	0	0	0	580
22	0	1116	249	55	38	0	0	0	1458
23	0	30	0	0	0	0	0	0	30
24	100	60	0	22	22	0	680	0	784
25	1655	247	0	0	20	0	0	37	304
26	1159	78	0	10	20	0	0	21	129
27	1610	479	0	102	90	0	0	44	715
28	1119	32	0	20	0	0	0	21	73
29	1289	30	0	0	0	0	0	28	58
30	14	0		10	0	0	0	0	10
31	979	65	0	0	0	0	0	24	89
32	2207	26	0	102	0	0	0	67	195
33	400	0	0	130	130	0	0	0	260
34	4117	60	0	0	0	0	0	73	133
35	0	440	290	0	0	0	0	0	730
36	0	0	0	0	0	0	0	0	0
37	20	0	0	10	0	0	0	0	10
38	1202	155	0	175	0	0	0	29	359
39	0	91	0	220	80	0	0	0	391
40	368	60	0	0	0	0	0	9	69
41	535	10	0	0	0	0	0	12	22
42	3150	30	0	8	0	0	0	16	54
43	1959	52	0	39	0	0	0	49	140
44	0	140	0	90	90	0	0	0	320
45	560	710	0	0	120	0	0	0	830
46	0	347	0	0	0	0	0	0	347
48	940	269	0	0	60	0	0	0	328.51
49	0	467	0	0	35	0	0	0	502
50	1028	4	0	84	0	0	0	13	101
51	0	584	0	0	23	0	0	0	607
52	0	320	0	20	74	0	0	0	414
53	0	460	0	0	180	0	0	0	640
54	0	1554	0	0	44	0	0	0	1598
55	0	140	0	0	0	0	0	0	140
56	2700	130	0	40	10	0	0	24	204
57	600	360	0	0	30	0	0	55	445
58	400	400	0	0	60	0	0	60	520
59	2030	36	0	0	0	0	0	50	86

95K Employment Data

	mo94 poptot	mo74 empcom	mo75 empind	mo76 empins	mo77 empoff	mo78 emphos	mo79 empcol	mo80 emphom	mo81 emptot
1	921	153	0	340	110	0	0	31	634
3	715	90	0	0	20	0	0	19	129
4	1025	199	0	80	171	8	0	22	480
5	600	0	0	0	110	1900	0	0	2010
6	316	149	0	180	15	0	0	13	357
7	1948	193	0	69	75	0	0	71	408
8	474	1365	20	0	142	0	0	3	1530
9	45	145	114	555	0	0	0	0	814
10	101	460	102	0	16	0	0	4	582
11	650	249	145	60	40	0	0	3	497
12	1300	76	0	280	120	0	0	13	489
13	1950	1036	0	105	120	0	0	2	1263
14	1190	62	0	128	0	0	0	30	220
15	2174	10	0	52	2	0	0	38	102
16	3032	201	0	148	24	0	0	80	453
17	0	388	1327	170	280	0	0	0	2165
18	815	60	0	40	30	0	0	0	130
19	2400	60	0	0	0	0	0	10	70
20	0	0	86	0	0	0	0	0	86
21	0	440	0	340	400	0	0	0	1180
22	0	1145	297	61	203	0	0	0	1706
23	0	30	0	0	0	0	0	0	30
24	100	60	0	22	22	0	750	0	854
25	1880	267	0	0	20	0	0	37	324
26	1482	90	0	12	20	0	0	21	143
27	1642	499	0	102	102	0	0	44	747
28	1141	32	0	20	0	0	0	21	73
29	1315	36	0	0	0	0	0	28	64
30	0	0	0	10	0	0	0	0	10
31	979	65	0	0	0	0	0	24	89
32	2207	26	0	108	0	0	0	67	201
33	1000	0	0	160	130	0	0	0	290
34	4200	60	0	0	0	0	0	73	133
35	0	800	540	0	20	0	0	0	1360
36	800	100	0	0	0	0	0	0	100
37	20	0	0	10	0	0	0	0	10
38	1252	305	0	175	0	0	0	29	509
39	0	91	0	240	85	0	0	0	416
40	368	60	0	0	0	0	0	9	69
41	535	10	0	0	0	0	0	12	22
42	3150	0	0	8	0	0	0	16	24
43	1959	52	0	39	0	0	0	49	140
44	0	150	0	130	130	0	0	0	410
45	580	740	0		160	0	0	0	900
46	0	427	0	0	0	0	0	0	427
48	975	280	0	0	80	0	0	0	360
49	0	497	0	0	45	0	0	0	542
50	1028	6	0	84	0	0	0	15	105
51	0	784	0	0	23	0	0	0	807
52	0	320	0	22	76	0	0	0	418
53	0	480	0	0	190	0	0	0	670
54	0	1804	0	0	44	0	0	0	1848
55	0	160	0	0	10	0	0	0	170
56	3100	270	0	48	30	0	0	34	382
57	1040	430	0	0	50	0	0	80	560
58	600	440	0	0	80	0	0	90	610
59	2030	36	0	0	0	0	0	50	86

60	2152	0	0	0	0	0	0	39	39	2283	0	0	0	0	0	0	49	49	2383	0	0	0	0	0	0	49	49
61	1570	29	0	0	0	0	0	11	40	1682	29	0	0	0	0	0	16	45	1682	29	0	0	0	0	0	16	45
62	582	6	0	0	0	0	0	6	12	582	8	0	0	0	0	0	11	19	525	10	0	0	0	0	0	11	21
63	4	2	0	0	0	0	0	0	2	600	40	0	0	20	0	0	80	140	1800	200	0	60	80	0	0	30	370
64	27	0	0	0	0	0	0	0	0	60	5	0	0	0	0	0	0	5	100	5	0	0	0	0	0	0	5
65	22	122	682	0	0	0	0	0	804	22	260	914	40	80	0	0	0	1294	0	410	1034	80	120	0	0	0	1644
66	15	13	65	0	0	0	0	0	78	14	15	65	0	0	0	0	0	80	14	15	65	0	0	0	0	0	80
67	300	0	0	0	0	0	0	4	4	1250	20	0	0	0	0	0	30	50	1850	25	0	0	0	0	0	35	60
68	0	0	230	0	0	0	0	0	230	0	0	285	0	0	0	0	0	285	0	0	330	0	0	0	0	0	330
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	120	0	0	0	0	0	230
70	712	155	0	0	0	0	0	20	175	720	170	0	0	0	0	0	25	195	740	180	0	0	0	0	0	30	210
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	14	0	0	0	0	0	14	0	0	16	0	0	0	0	0	16	0	0	18	0	0	0	0	0	18
74	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
75	8	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	11	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
77	0	6	0	0	0	0	0	0	6	0	6	0	0	0	0	0	0	6	3400	6	0	60	0	0	0	0	66
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3400	14	0	0	0	0	0	14	28
79	5096	250	620	150	130	0	0	0	1150	6720	350	812	210	210	0	0	0	1582	8180	400	928	240	192	0	0	0	1760
80	0	100	670	0	50	0	0	0	820	0	140	910	0	60	0	0	0	1110	0	160	1040	0	80	0	0	0	1280
81	180	4	0	0	0	0	0	4	8	380	4	0	0	0	0	0	8	12	470	4	0	0	0	0	0	8	12
82	875	60	85	40	18	0	0	0	203	1800	120	60	80	80	0	0	0	340	2400	150	75	100	25	0	0	0	350
84	596	8	0	38	3	0	0	8	57	631	12	0	42	28	0	0	11	93	644	14	0	44	28	0	0	11	97
85	557	109	0	0	19	0	0	11	139	533	159	0	0	0	0	0	14	173	544	189	0	0	49	0	0	14	252
86	1320	87	0	88	20	0	0	33	228	1445	87	0	94	22	0	0	38	241	1474	87	0	94	22	0	0	38	241
87	327	10	0	0	0	0	0	18	28	340	10	0	0	0	0	0	21	31	340	10	0	0	0	0	0	21	31
88	2375	31	0	29	0	0	0	38	98	2850	31	0	29	29	0	0	48	137	3650	31	0	29	0	0	0	48	108
89	729	35	0	18	0	0	0	13	66	690	35	0	18	0	0	0	18	71	704	35	0	18	0	0	0	18	71
90	480	224	421	0	110	0	0	0	755	530	260	641	0	140	0	0	0	1041	600	285	791	0	160	0	0	0	1236
91	827	55	0	13	0	0	0	20	88	884	55	0	13	0	0	0	25	93	884	55	0	13	0	0	0	25	93
92	887	50	0	0	27	0	0	19	96	900	50	0	0	27	0	0	24	101	900	50	0	0	27	0	0	24	101
93	527	0	0	0	0	0	0	13	13	560	0	0	0	0	0	0	18	18	560	0	0	0	0	0	0	18	18
94	554	10	0	60	0	0	0	12	82	554	10	0	62	0	0	0	12	84	554	10	0	64	0	0	0	12	86
95	542	7	0	0	0	0	0	7	14	465	7	0	0	0	0	0	7	14	465	7	0	0	0	0	0	7	14
96	586	7	0	0	0	0	0	2	9	1429	12	0	40	0	0	0	52	104	1750	12	0	42	0	0	0	72	126
97	1474	87	0	76	0	0	0	41	204	1655	87	0	82	0	0	0	46	215	1705	87	0	92	0	0	0	46	225
98	1698	0	0	22	0	0	0	45	67	1777	0	0	24	0	0	0	50	74	1777	0	0	26	0	0	0	50	76
99	1406	10	0	56	0	0	0	39	105	1521	14	0	60	0	0	0	44	118	1521	24	0	62	0	0	0	44	130
100	1480	12	0	0	0	0	0	4	16	1687	30	0	0	0	0	0	44	74	1687	30	0	0	0	0	0	54	84
101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	1950	60	0	20	0	0	0	20	100	2800	40	0	40	0	0	0	20	100
103	0	0	0	0	0	0	0	0	0	0	40	40	0	0	0	0	0	80	0	120	120	0	0	0	0	0	240
104	0	640	80	0	60	0	0	0	780		775	125	0	17	0	0	0	917	0	796	147	0	87	0	0	0	1030
107	40	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	60	0	20	0	30	0	0	0	50
108	10	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	10	0	20	0	20	0	0	0	40
109	120	0	0	0	0	0	0	0	0	380	0	0	0	0	0	0	0	0	640	0	60	0	30	0	0	0	90
112	240	0	30	0	0	0	0	0	30	240	0	30	0	0	0	0	0	30	240	0	30	0	0	0	0	0	30
113	0	189	0	0	0	0	0	0	189	0	200	0	0	0	0	0	0	200	0	220	0	0	0	0	0	0	220
114	0	83	0	0	0	0	0	0	83	0	90	0	0	0	0	0	0	90	0	90	0	0	0	0	0	0	90
115	0	0	0	0	0	0	0	0	0	1200	0	0	0	0	0	0	10	10	1450	0	0	0	0	0	0	14	14
116	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1350	0	0	0	0	0	0	0	0
117	0	0	0	167	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0	0	0	499	0	0	0	0	499.15
118	0	0	0	8	41	0	0	0	49	10	0	0	0	0	0	0	0	0	100	0	0	24	151	0	0	0	174.79
119	0	30	0	6	49	0	0	0	85	0	0	0	0	0	0	0	0	0	100	45	0	18	180	0	0	0	243.01
120	14	42	0	0	22	0	0	0	64	14	52	0	0	22	0	0	0	74	100	70	0	0	22	0	0	0	92
121	0	112	0	0	0	0	0	0	112		124	0	0	0	0	0	0	124	100	156	0	0	0	0	0	0	156
122	6	226	0	0	80	0	0	0	306	40	240	0	0	90	0	0	0	330	100	280	0	0	130	0	0	0	410
123	27	210	0	0	58	0	0	0	268	60	220	0	0	64	0	0	0	284	140	260	0	0	80	0	0	0	340
124	18	202	0	0	26	0	0	0	228	60	202	0	0	40	0	0	0	242	162	10	0	0	40	0	0	13	63
125	22	244	0	0	67	0	0	0	311	28	288	0	0	78	0	0	0	366	132	340	0	0	90	0	0	13	443

	126	0	174	0	0	92	0	0	0	266	0	188	0	0	96	0	0	0	284	0	192	0	0	240	0	0	13	445
	127	429	70	0	0	24	0	0	8	102	440	80	0	0	30	0	0	0	110	640	100	0	0	40	0	0	13	153
	128	42	0	0	0	113	0	0	2	115	120	0	0	0	120	0	0	0	120	140	0	0	0	130	0	0	13	143
TOTAL		67318	14918	4412	2943	2479	1600	607	1115	28074	83430	18174.51	5914	3872	3520	1858	680	1680	35699	108012	21250.76	7429	5403	5248.2	1908	750	1832	43821

C Appendix C - Detailed Screen Line Data

Screenline Calibration Report - Page 1

No	SCN#	STA#	Screenline Name	Station Name	DIR	NodeFM	NodeTo	Model Scen2010	Survey Vol2010	Model/ Surv
1	1	1	Hwy1 - North Side	Saamis Drive	NB	1076	1093	289	481	
2	1	2	Hwy1 - North Side	Box Springs Road	NB	1136	1128	397	586	
3	1	3	Hwy1 - North Side	3 Street NW	NB	1226	1227	409	482	
4	1	4	Hwy1 - North Side	1 Street SW	NB	2,308	2,304	341	378	
5	1	5	Hwy1 - North Side	7 Street SW	NB	2306	1516	287	289	
6	1	6	Hwy1 - North Side	Gershaw Drive	NB	1599	1570	527	594	
7	1	7	Hwy1 - North Side	16 Street SW	NB	2,312	1,695	114	92	
8	1	8	Hwy1 - North Side	College Avenue	NB	1860	1798	717	572	
9	1	9	Hwy1 - North Side	13 Avenue SE	NB	1996	1981	800	924	
10	1	10	Hwy1 - North Side	Dunmore Road	NB	2075	2200	980	1206	
11	1		Hwy1 - North Side	Sub	NB			4861.00	5604.00	0.87
12										
13	1	1	Hwy1 - North Side	Saamis Drive	SB	1093	1076	139	160	
14	1	2	Hwy1 - North Side	Box Springs Road	SB	1128	1136	244	326	
15	1	3	Hwy1 - North Side	3 Street NW	SB	**1227**	1226	356	166	
16	1	4	Hwy1 - North Side	1 Street SW	SB	2304	2308	285	241	
17	1	5	Hwy1 - North Side	7 Street SW	SB	1516	2306	604	531	
18	1	6	Hwy1 - North Side	Gershaw Drive	SB	1570	1599	364	410	
19	1	7	Hwy1 - North Side	16 Street SW	SB	1695	2312	225	63	
20	1	8	Hwy1 - North Side	College Avenue	SB	1798	1860	486	707	
21	1	9	Hwy1 - North Side	13 Avenue SE	SB	1981	1996	774	831	
22	1	10	Hwy1 - North Side	Dunmore Road	SB	2200	2075	863	876	
23	1		Hwy1 - North Side	Sub	SB			4340.00	4311.00	1.01
24										
25	2	1	Hwy1 - South Side	Saamis Drive	NB	1076	1093	289	481	
26	2	4	Hwy1 - South Side	1 Street SW	NB	2305	2308	25	17	
27	2	5	Hwy1 - South Side	7 Street SW	NB	1546	2306	444	231	
28	2	6	Hwy1 - South Side	Gershaw Drive	NB	1622	1623	447	720	
29	2	7	Hwy1 - South Side	16 Street SW	NB	1689	2312	423	155	
30	2	8	Hwy1 - South Side	College Avenue	NB	1914	1880	511	497	
31	2	9	Hwy1 - South Side	13 Avenue SE	NB	2005	1996	424	792	
32	2	10	Hwy1 - South Side	Dunmore Road	NB	2087	2200	436	778	
33	2		Hwy1 - South Side	Sub	NB			2999.00	3671.00	0.82
34										
35	2	1	Hwy1 - South Side	Saamis Drive	SB	1093	1076	139	160	
36	2	4	Hwy1 - South Side	1 Street SW	SB	2308	2305	13	7	
37	2	5	Hwy1 - South Side	7 Street SW	SB	2306	1546	344	375	
38	2	6	Hwy1 - South Side	Gershaw Drive	SB	1623	1622	485	503	
39	2	7	Hwy1 - South Side	16 Street SW	SB	2312	1689	415	414	
40	2	8	Hwy1 - South Side	College Avenue	SB	1880	1914	715	1,101	
41	2	9	Hwy1 - South Side	13 Avenue SE	SB	1996	2005	1043	717	
42	2	10	Hwy1 - South Side	Dunmore Road	SB	2200	2087	353	717	
43	2		Hwy1 - South Side	Sub	SB			3507.00	3994.00	0.88
44										
45	3	1	South Sask Riv	Hwy 1	NB	1379	1294	1458	1,296	
46	3	2	South Sask Riv	2 Av NE/6 Av SE	NB	1350	2345	272	248	
47	3	3	South Sask Riv	Altawana /Maple	NB	1335	1284	1344	1,665	
48	3		South Sask Riv	Sub	NB			3,074	3,209	0.96

Screenline Calibration Report - Page 2

No	SCN#	STA#	Screenline Name	Station Name	DIR	NodeFM	NodeTo	Model Scen2010	Survey Vol2010	Model/ Surv
49										
50	3	1	South Sask Riv	Hwy 1	SB	1293	1360	1637	1,419	
51	3	2	South Sask Riv	2 Av NE/6 Av SE	SB	2345	1350	198	171	
52	3	3	South Sask Riv	Altawana /Maple	SB	1284	1335	1019	1,000	
53	3		South Sask Riv	Sub	SB			2,854	2,590	1.10
54										
55	4	1	Seven Person Cr	South Boundary Rd	NB	2,163	2,157	35	20	
56	4	2	Seven Person Cr	Hwy 1	NB	1774	1694	1450	1,228	
57	4	3	Seven Person Cr	College Avenue	NB	1714	1699	412	565	
58	4	4	Seven Person Cr	Kingsway /Dunmore	NB	1704	1663	1010	1,062	
59	4	5	Seven Person Cr	Carry Drive	NB	1647	1617	232	248	
60	4	6	Seven Person Cr	Industrial Avenue	NB	1605	1593	148	150	
61	4		Seven Person Cr	Sub	NB			3,287	3,273	1.00
62										
63	4	1	Seven Person Cr	South Boundary Rd	SB	2,157	2,163	59	25	
64	4	2	Seven Person Cr	Hwy 1	SB	1734	1773	2261	1,889	
65	4	3	Seven Person Cr	College Avenue	SB	1699	1714	505	766	
66	4	4	Seven Person Cr	Kingsway /Dunmore	SB	1663	1704	1122	1,310	
67	4	5	Seven Person Cr	Carry Drive	SB	1617	1647	501	264	
68	4	6	Seven Person Cr	Industrial Avenue	SB	1593	1605	117	105	
69	4		Seven Person Cr	Sub	SB			4,565	4,359	1.05
70										
71	5	1	CP Rail	Box Springs Road	NB	1128	1113	389	292	
72	5	2	CP Rail	Brier Park Road	NB	1255	1196	352	238	
73	5	3	CP Rail	Altawana Avenue	NB	1316	1283	96	166	
74	5	4	CP Rail	River Road	NB	1341	1334	194	267	
75	5	5	CP Rail	1 Street SE	NB	1342	1343	694	753	
76	5	6	CP Rail	Maple /Allowance	NB	1562	1538	949	675	
77	5		CP Rail	Sub	NB			2,674	2,391	1.12
78										
79	5	1	CP Rail	Box Springs Road	SB	1113	1128	408	441	
80	5	2	CP Rail	Brier Park Road	SB	1196	1255	412	125	
81	5	3	CP Rail	Altawana Avenue	SB	1283	1316	45	140	
82	5	4	CP Rail	River Road	SB	1334	1341	162	101	
83	5	5	CP Rail	1 Street SE	SB	1343	1342	445	436	
84	5	6	CP Rail	Maple /Allowance	SB	1538	1562	917	858	
85	5		CP Rail	Sub	SB			2,389	2,101	1.14
86										
87	6	1	E of Dunmore Rd	Hwy 1	NB	2392	2116	462	616	
88	6	1	E of Dunmore Rd	Hwy 1	SB	2116	2392	469	620	
89										
90	7	1	W of Seven Persons	Hwy 3	EB	2176	2184	181	190	
91	7	1	W of Seven Persons	Hwy 3	WB	2184	2176	161	157	
92										
93	8	1	N of 41 & 41A	Hwy 41	NB	2428	2432	72	73	
94	8	1	N of 41 & 41A	Hwy 41	SB	2432	2428	127	135	
95										
96	9	1	W of 41 & 41A	Hwy 41A	EB	2429	2428	43	45	
97	9	1	W of 41 & 41A	Hwy 41A	WB	2428	2429	67	62	
			Total					36132	37401	0.97

D Appendix D - Previously Approved 75K Base and 95K Scenarios

2005 RSMP 75,000 Population Horizon Improvements

Location	Description
13th Avenue SE Corridor	Extend to north of Southland access with upgraded 4 lane cross section.
Kingsway Avenue and Spencer Street	2 WBL turning lanes and channelized NBR with acceleration lane.
Parkview Drive Corridor 20th Street extension	Construct Parkview drive as 2 lanes of a 4 lane(ultimate) between Division and 20th Street NW.
South Ridge Drive Corridor	Reconstruct to 4 travel lanes with a center median from TCH to south of Strachan.
South Boundary Road	Upgrade existing 2 lanes between edge of Seven Persons Creek and South Ridge Drive.
Strachan Road Reconstruction, West Section	Upgrade to 4 lane urban divided arterial between 13th Avenue SE and the South Ridge Drive with intersection upgrades.
Kingsway Avenue and Spencer Street	Either add a protected / permitted WBL for 2 lanes or widen Seven Persons Creek Structure to accommodate 7 lanes across.
23rd Street NW Corridor	Upgrade to 4 lane urban arterial between 10th Avenue NW and Division Avenue. Include intersection upgrades.
Box Springs Road	Construct 2 lanes of future 4 lane urban divided arterial from Brier Park Road to Broadway Avenue with intersection upgrades.
Saamis and 3rd Street	Signalize and complete geometric upgrades at 3 legs.
Upgrade 13th Avenue SE between Southland Access to South Boundary Road	Complete upgrade to 4 lane cross section between Southlands access and South Boundary Road. Upgrade intersections.
Altawana Drive /Maple Avenue and 1st Street SE	Add lanes in NB and SB directions. Also add NBL lane with 90 m of storage.
Kingsway Avenue and Spencer Street	Channelize SBR and NBR with 100 m of storage. Increase WBR storage to 100 m. Add acceleration lane for NBR, WBL exclusive lane and add an additional southbound lane.
Division Avenue and 3rd Street S	Signalize, channelize EBR and SBR.
Parkview Drive Corridor and 11th Street NE	Create intersection.
Parkview Drive and Division Avenue	Create intersection.
South Boundary Road and 13th Avenue SE	Signalize South Boundary Road and 13th Avenue SE.
South Boundary Road and South Ridge Drive	Signalize South Boundary Road and South Ridge Drive.
Box Springs Road and 23rd Street NW	Provide NBR and SBL channelization and complete warrant for 3 way stop.

Location	Description
Trans Canada Way and 13th Avenue SE	Channelize WBR with 50 m storage and channelize SBR with 100 m storage.
Strachan Road Miscellaneous Projects	Signalize church access if warranted.
Box Springs Road and Saamis Road	Provide NBL, SBL, SBR channelization.
Brier Park Road and 10th Avenue NW	Provide EBL channelization.
Brier Park Road and 12th Street NE	Complete warrant for 3 way stop, provide NBR channelization.
Brier Park Road and 3rd Street SE	Signalize if warranted.
West Boundary Road and Broadway Avenue	Signalize if warranted, provide channelized EBL,WBL,WBR, EBR
Box Springs Road and Brier Park Road	Signalize and channelize NWBR, NBL and SBL lanes.
Box Springs Road and 23rd Street NW	Install 50 m SBL storage lane. Complete warrant for 3 way stop.
6th Avenue SE and 1st Street SE	Change 25 m NBR storage lane to full length thru-right lane.
4th Avenue SE and 3rd Street SE	Change 15 m EBR storage lane to full length thru-right lane.
Parkview Drive and 12th Street NE	Signalize intersection.
Box Springs Road and Broadway Avenue	Provide NBL, EBL SBR channelization.
23rd Street NW and 10th Avenue NW	Provide WBL channelization.
Brier Park Road and 12th Street NW	Signalize Intersection with WBR channelization.
Carry Drive and Trans Canada Way	Signalize intersection.

2005 RSMP 95,000 Population Horizon Improvements

Location	Description
West Boundary Road	Upgrade to 2 of 4 lane divided urban arterial.
Gershaw Drive	Upgrade between 3rd Street SW and 7th Avenue SW to an urban arterial section. Included dividing segments and channelization.
1st Street SW	Reconstruct to a 4 lane divided roadway.
Maple Avenue Bridge	Widen to 3 southbound.
Finlay Bridge	Reconstruct new 4 lane structure.
South Boundary Road Option 1	Construct Stage 3 of South Boundary Road between Highway 3 and County Road 61A. This is the extension of SBR from Highway 3 to County Road 61A.
South Boundary Road Option 2	Extend 10th Avenue N to cross Seven Persons Creek and connect with 10th Avenue.
Dunmore Road	Add third lane between Spencer Street and 13th Avenue SE.
College Avenue / Kipling Street Intersection	Expand approaches and departures on Old Cemetery Road, College Avenue and Kipling Street to 2 lanes each.
Broadway Avenue Corridor	Construct 2 lanes of 4 lane arterial cross section between western city limits and Box Springs Road.
Burnside Arterial	Construct 4 lane arterial connecting Box Springs Road and 3rd Street NW.
Box Springs Corridor	Create 4 lane urban divided arterial.
23 Street NW Corridor	Construct 4 lane urban divided arterial from Division to Box Springs Road?
Brier Park Road Corridor	Construct 4 lane roadway.
West Boundary Road Corridor	Construct 4 lane urban arterial roadway.
Broadway Avenue Corridor	Construct 4 lane urban arterial roadway.
SBR and Desert Blume Access	Signalize, add WB and EB left turn lanes with 80 m storage. EBR and WBR channelization with 30 m storage. NB and SB left turn lanes with 50 m storage.
South Boundary Rd and Hamptons Access - add Hamptons Access	Construct Vista Drive intersection, signalize intersection, add EBL and channelize WBR.
Division Avenue North	Introduce parking restrictions to allow for 4 lane flow between 12th Street N and 20th Street N.
Carry Drive SE and Southview Drive	Signalize intersection.
Parkview Drive and 11th Avenue NE	Signalize intersection, add EB and WB left turn lanes with 50 m storage.
Dunmore Road and Ross Glen Drive	Channelize EBR and WBR with 50 m storage. Convert WB approach to exclusive dual left turns. and 1 thru

Location	Description
	lane. 3 thru lanes for NB and SB movements.
South Railway Street and 1st Street SE	Signalize intersection.
Box Springs Road and Broadway Avenue	Signalize intersection, provide channelized EBR,NBL,SBL,SBR.
Box Springs Road and 23rd Street NW	Signalize intersection, provide channelized NBR,SBL(2).
Box Springs Road and Brier Park Road	Signalize intersection, provide channelized EBL,EBR,WBL,NBL(2),NBR,SBL(2),SBR.
Box Springs Road and Saamis Drive	Signalize intersection, provide channelized EBL,EBR,WBL,WBR,NBL(2),NBR,SBL(2),SBR.
23rd Street and 10th Avenue NW	Signalize intersection, provide channelized EBR,WBL.
23rd Street and Division Avenue	Signalize intersection, provide channelized EBR,WBL,NBL.
Brier Park Road and 10th Avenue	Signalize intersection.
Brier Park Road and 12th Street	Signalize intersection, provide channelized WBR,NBR,SBL.
Brier Park Road and 3rd Street	Signalize intersection, provide channelized EBL,WBR,SBR.
West Boundary Road and Broadway Avenue	Signalize intersection, provide channelization EBL,EBR,WBL,WBR.

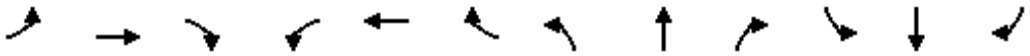
E Appendix E - Location Specific Traffic Analysis

Synchro Intersection Evaluation Criteria

Intersection	Control Type	Parameter	Value
Dunmore Road / Kingsway Avenue & Spencer Street	Signal	Ideal Sat. Flow Rate for turning movement	1800
		Ideal Sat. Flow Rate for through movement	1850
		Detector Settings (Based on City's Synchro Settings)	0.5 m (Leading Detector) 30 m for left turns 20 m for through movements
		SB Left Turn Phase (based on existing signal timing plan)	Perm Phase with shared left / through lane
		All Red (based on existing signal timing plan)	0.8 sec
		Pedestrian Timing (based on existing signal timing plan)	Walk time = 8 sec; flash don't walk = varies
Maple Avenue & 1st Street SE	Signal	Ideal Sat. Flow Rate for turning movement	1800
		Ideal Sat. Flow Rate for through movement	1850
		Detector Settings (Based on City's Synchro Settings)	0.5 m (Leading Detector) 30 m for left turns 20 m for through movements
		EB Left Turn Phase (based on existing signal timing plan)	Split Phase
		Pedestrian Timing (based on existing signal timing plan)	Walk Time = 10 & 7 Flash don't walk time = 15 sec
College Avenue & Kipling Street	Four Way Stop	Ideal Sat. Flow Rate for turning movement	1800
		Ideal Sat. Flow Rate for through movement	1850

HCM Unsignalized Intersection Capacity Analysis
College Ave & Kipling St

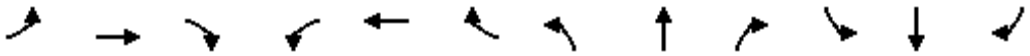
02/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	145	405	346	116	6	244	7	314	12	15	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	158	440	376	126	7	265	8	341	13	16	8

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	162	440	509	273	341	37
Volume Left (vph)	4	0	376	265	0	13
Volume Right (vph)	0	440	7	0	341	8
Hadj (s)	0.04	-0.57	0.17	0.23	-0.57	-0.02
Departure Headway (s)	5.7	3.2	5.3	6.0	3.2	6.4
Degree Utilization, x	0.26	0.39	0.75	0.46	0.30	0.07
Capacity (veh/h)	572	1114	655	550	1113	481
Control Delay (s)	10.7	8.2	22.9	14.1	7.6	9.8
Approach Delay (s)	8.9		22.9	10.5		9.8
Approach LOS	A		C	B		A

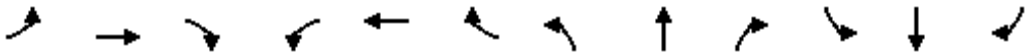
Intersection Summary				
Delay	13.5			
HCM Level of Service	B			
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	8	198	509	569	121	7	277	12	417	14	40	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	215	553	618	132	8	301	13	453	15	43	20

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	224	553	758	314	453	78
Volume Left (vph)	9	0	618	301	0	15
Volume Right (vph)	0	553	8	0	453	20
Hadj (s)	0.04	-0.57	0.19	0.23	-0.57	-0.08
Departure Headway (s)	6.5	3.2	6.0	6.8	3.2	7.2
Degree Utilization, x	0.40	0.49	1.26	0.59	0.40	0.16
Capacity (veh/h)	527	1116	602	514	1115	449
Control Delay (s)	13.8	9.3	148.9	19.0	8.3	11.6
Approach Delay (s)	10.6		148.9	12.7		11.6
Approach LOS	B		F	B		B

Intersection Summary				
Delay	55.3			
HCM Level of Service	F			
Intersection Capacity Utilization	86.7%	ICU Level of Service	E	
Analysis Period (min)	15			

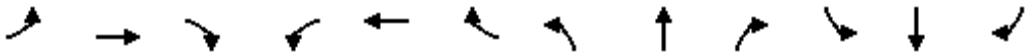


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	198	509	569	121	7	277	12	417	14	40	18
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		0.0	100.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (m)	7.6		7.6	7.6		7.6	7.6		7.6	7.6		7.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.991				0.850		0.965	
Flt Protected		0.998		0.950				0.954			0.990	
Satd. Flow (prot)	0	1830	1517	1695	1817	0	0	1750	1517	0	1752	0
Flt Permitted		0.988		0.418				0.739			0.919	
Satd. Flow (perm)	0	1812	1517	746	1817	0	0	1355	1517	0	1626	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			533		7				453		20	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		214.0			209.7			310.1			190.5	
Travel Time (s)		15.4			15.1			22.3			13.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	215	553	618	132	8	301	13	453	15	43	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	224	553	618	140	0	0	314	453	0	78	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2		1	2	2	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0		6.1	20.0	20.0	6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5		0.0	0.5	0.5	0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5		0.0	0.5	0.5	0.0	0.5	
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8		6.1	1.8	6.1	6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2			18.2	18.2		18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8			1.8	1.8		1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Turn Type	Perm		Perm	pm+pt			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8			2		2	6		
Detector Phase	4	4	4	3	8		2	2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	7.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	23.8	23.8	23.8	10.0	22.3		23.8	23.8	23.8	23.8	23.8	
Total Split (s)	24.0	24.0	24.0	25.0	49.0	0.0	26.0	26.0	26.0	26.0	26.0	0.0
Total Split (%)	32.0%	32.0%	32.0%	33.3%	65.3%	0.0%	34.7%	34.7%	34.7%	34.7%	34.7%	0.0%
Maximum Green (s)	19.7	19.7	19.7	22.0	44.7		21.7	21.7	21.7	21.7	21.7	
Yellow Time (s)	3.5	3.5	3.5	3.0	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.8	0.8	0.8	0.0	0.8		0.8	0.8	0.8	0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3	4.3	3.0	4.3	4.0	4.3	4.3	4.3	4.3	4.3	4.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)	10.0	10.0	10.0		10.0		10.0	10.0	10.0	10.0	10.0	
Flash Dont Walk (s)	9.5	9.5	9.5		6.0		9.5	9.5	9.5	9.5	9.5	
Pedestrian Calls (#/hr)	5	5	5		5		5	5	5	5	5	
Act Effct Green (s)		14.9	14.9	38.9	37.5			19.0	19.0		19.0	
Actuated g/C Ratio		0.23	0.23	0.59	0.57			0.29	0.29		0.29	
v/c Ratio		0.54	0.73	0.85	0.13			0.80	0.59		0.16	
Control Delay		29.0	9.5	22.5	6.8			40.3	6.1		16.0	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		29.0	9.5	22.5	6.8			40.3	6.1		16.0	
LOS		C	A	C	A			D	A		B	
Approach Delay		15.1			19.6			20.1			16.0	
Approach LOS		B			B			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 65.4			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 18.2		Intersection LOS: B	
Intersection Capacity Utilization 85.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: Kipling St &

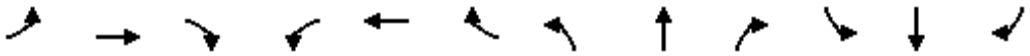


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	255	643	766	188	8	338	19	540	15	63	29
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		0.0	100.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (m)	7.6		7.6	7.6		7.6	7.6		7.6	7.6		7.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.994				0.850		0.963	
Flt Protected		0.997		0.950				0.955			0.993	
Satd. Flow (prot)	0	1828	1517	1695	1823	0	0	1751	1517	0	1754	0
Flt Permitted		0.974		0.282				0.644			0.913	
Satd. Flow (perm)	0	1786	1517	503	1823	0	0	1181	1517	0	1612	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			433		4				587		20	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		214.0			209.7			310.1			190.5	
Travel Time (s)		15.4			15.1			22.3			13.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	277	699	833	204	9	367	21	587	16	68	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	295	699	833	213	0	0	388	587	0	116	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2		1	2	2	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0		6.1	20.0	20.0	6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5		0.0	0.5	0.5	0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5		0.0	0.5	0.5	0.0	0.5	
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8		6.1	1.8	6.1	6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2			18.2	18.2		18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8			1.8	1.8		1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Turn Type	Perm		Perm	pm+pt			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8			2		2	6		
Detector Phase	4	4	4	3	8		2	2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	7.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	23.8	23.8	23.8	10.0	22.3		23.8	23.8	23.8	23.8	23.8	
Total Split (s)	27.9	27.9	27.9	37.0	64.9	0.0	35.1	35.1	35.1	35.1	35.1	0.0
Total Split (%)	27.9%	27.9%	27.9%	37.0%	64.9%	0.0%	35.1%	35.1%	35.1%	35.1%	35.1%	0.0%
Maximum Green (s)	23.6	23.6	23.6	34.0	60.6		30.8	30.8	30.8	30.8	30.8	
Yellow Time (s)	3.5	3.5	3.5	3.0	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.8	0.8	0.8	0.0	0.8		0.8	0.8	0.8	0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3	4.3	3.0	4.3	4.0	4.3	4.3	4.3	4.3	4.3	4.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)	10.0	10.0	10.0		10.0		10.0	10.0	10.0	10.0	10.0	
Flash Dont Walk (s)	9.5	9.5	9.5		6.0		9.5	9.5	9.5	9.5	9.5	
Pedestrian Calls (#/hr)	5	5	5		5		5	5	5	5	5	
Act Effct Green (s)		23.6	23.6	61.9	60.6			30.8	30.8		30.8	
Actuated g/C Ratio		0.24	0.24	0.62	0.61			0.31	0.31		0.31	
v/c Ratio		0.70	1.01	1.16	0.19			1.07	0.67		0.23	
Control Delay		45.1	53.9	109.7	9.2			100.9	6.7		22.6	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		45.1	53.9	109.7	9.2			100.9	6.7		22.6	
LOS		D	D	F	A			F	A		C	
Approach Delay		51.3			89.2			44.2			22.6	
Approach LOS		D			F			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.16			
Intersection Signal Delay: 60.7		Intersection LOS: E	
Intersection Capacity Utilization 105.9%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 3: Kipling St &

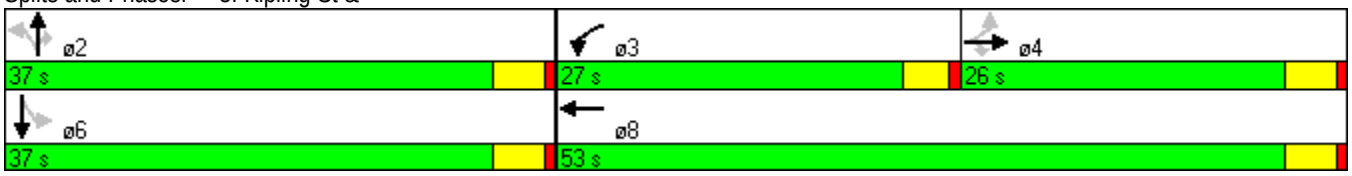


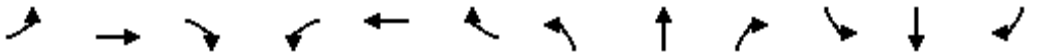
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	255	643	766	188	8	338	19	540	15	63	29
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Lane Width (m)	3.7	3.7	4.0	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Storage Length (m)	0.0		0.0	110.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	2		0	0		1	0		0
Taper Length (m)	7.6		7.6	7.6		7.6	7.6		7.6	7.6		7.6
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.994				0.850		0.963	
Flt Protected		0.997		0.950				0.955			0.993	
Satd. Flow (prot)	0	1828	1567	3288	1823	0	0	1751	1517	0	1754	0
Flt Permitted		0.974		0.950				0.670			0.934	
Satd. Flow (perm)	0	1786	1567	3288	1823	0	0	1229	1517	0	1649	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			509		4				587		24	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		214.0			209.7			310.1			190.5	
Travel Time (s)		15.4			15.1			22.3			13.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	277	699	833	204	9	367	21	587	16	68	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	295	699	833	213	0	0	388	587	0	116	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.01	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2		2	2	2	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0		30.0	20.0	20.0	6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.0	0.5	
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8		6.1	1.8	6.1	6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2		28.2	18.2	18.2		18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8		1.8	1.8	1.8		1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	3	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	7.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	25.3	25.3	25.3	10.8	25.3		26.8	26.8	26.8	25.3	25.3	
Total Split (s)	26.0	26.0	26.0	27.0	53.0	0.0	37.0	37.0	37.0	37.0	37.0	0.0
Total Split (%)	28.9%	28.9%	28.9%	30.0%	58.9%	0.0%	41.1%	41.1%	41.1%	41.1%	41.1%	0.0%
Maximum Green (s)	21.7	21.7	21.7	23.2	48.7		32.7	32.7	32.7	32.7	32.7	
Yellow Time (s)	3.5	3.5	3.5	3.0	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.3	4.3	4.3	3.8	4.3	4.0	4.3	4.3	4.3	4.3	4.3	4.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)	10.0	10.0	10.0		10.0		10.0	10.0	10.0	10.0	10.0	
Flash Dont Walk (s)	9.5	9.5	9.5		6.0		12.5	12.5	12.5	9.5	9.5	
Pedestrian Calls (#/hr)	5	5	5		5		5	5	5	5	5	
Act Effct Green (s)		19.4	19.4	23.4	46.7			30.2	30.2		30.2	
Actuated g/C Ratio		0.23	0.23	0.27	0.55			0.35	0.35		0.35	
v/c Ratio		0.73	0.93	0.92	0.21			0.89	0.64		0.19	
Control Delay		42.6	30.8	49.3	11.0			51.7	5.5		16.6	
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay		42.6	30.8	49.3	11.0			51.7	5.5		16.6	
LOS		D	C	D	B			D	A		B	
Approach Delay		34.3			41.5			23.9			16.6	
Approach LOS		C			D			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 85.6			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 32.8		Intersection LOS: C	
Intersection Capacity Utilization 84.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: Kipling St &



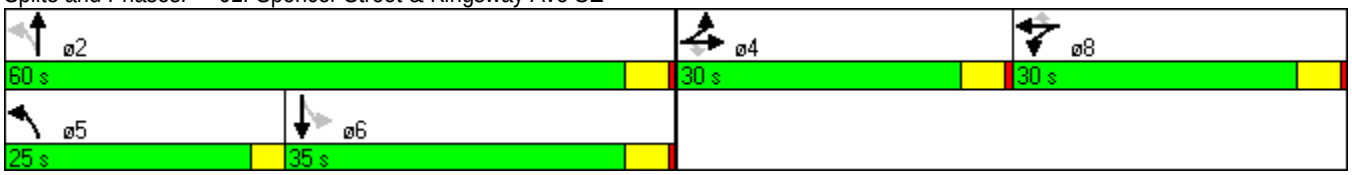


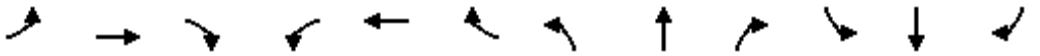
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	81	168	114	610	246	2	102	460	500	7	586	86
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		20.0	0.0		30.0	50.0		0.0	0.0		0.0
Storage Lanes	0		1	1		1	1		0	0		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt			0.850			0.850		0.922			0.981	
Flt Protected		0.984		0.950	0.979		0.950				0.999	
Satd. Flow (prot)	0	3429	1517	1610	1706	1517	1695	3213	0	0	3415	0
Flt Permitted		0.984		0.950	0.979		0.161				0.941	
Satd. Flow (perm)	0	3429	1517	1610	1706	1517	287	3213	0	0	3216	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			120			1		303			13	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		99.8			254.3			76.7			307.9	
Travel Time (s)		7.2			18.3			5.5			22.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	183	124	663	267	2	111	500	543	8	637	93
Shared Lane Traffic (%)				31%								
Lane Group Flow (vph)	0	271	124	457	473	2	111	1043	0	0	738	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2	2	2	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0	20.0	30.0	20.0		6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0	0.5	
Detector 1 Size(m)	6.1	7.5	3.5	7.5	7.5	3.5	7.5	3.5		6.1	7.5	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2	18.2	28.2	18.2			18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8	1.8	1.8	1.8			1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Turn Type	Split		Perm	Split		Perm	pm+pt			Perm		
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8	2			6		
Detector Phase	4	4	4	8	8	8	5	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	27.6	27.6	27.6	22.6	22.6	22.6	11.0	28.6		28.6	28.6	
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	25.0	60.0	0.0	35.0	35.0	0.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	20.8%	50.0%	0.0%	29.2%	29.2%	0.0%
Maximum Green (s)	25.4	25.4	25.4	25.4	25.4	25.4	22.0	55.4		30.4	30.4	
Yellow Time (s)	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.8		3.8	3.8	
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.8		0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.0	4.6	4.0	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	Min		Min	Min	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0	8.0		8.0		8.0	8.0	
Flash Dont Walk (s)	15.0	15.0	15.0	10.0	10.0	10.0		16.0		16.0	16.0	
Pedestrian Calls (#/hr)	5	5	5	5	5	5		5		5	5	
Act Effct Green (s)		13.8	13.8	25.7	25.7	25.7	41.3	39.7			26.4	
Actuated g/C Ratio		0.15	0.15	0.28	0.28	0.28	0.44	0.43			0.28	
v/c Ratio		0.53	0.38	1.03	1.00	0.00	0.39	0.68			0.80	
Control Delay		41.3	11.1	86.6	79.5	25.5	20.3	17.4			38.5	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Total Delay		41.3	11.1	86.6	79.5	25.5	20.3	17.4			38.5	
LOS		D	B	F	E	C	C	B			D	
Approach Delay		31.8			82.9			17.7			38.5	
Approach LOS		C			F			B			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 93.1			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.03			
Intersection Signal Delay: 43.1		Intersection LOS: D	
Intersection Capacity Utilization 95.7%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 61: Spencer Street & Kingsway Ave SE



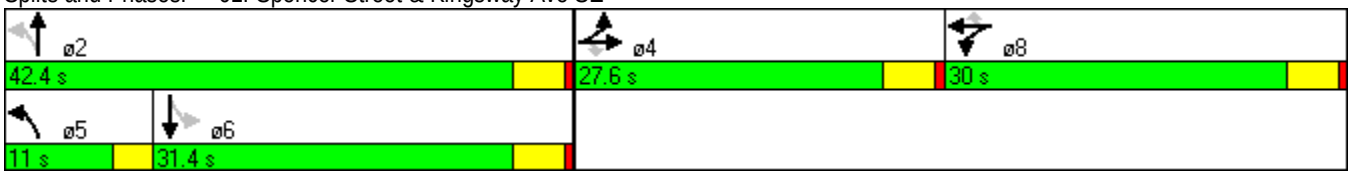


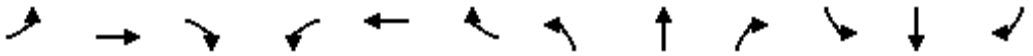
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	223	179	759	345	2	147	523	687	7	648	77
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		20.0	0.0		30.0	50.0		0.0	0.0		0.0
Storage Lanes	0		1	1		1	1		0	0		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt			0.850			0.850		0.915			0.984	
Flt Protected		0.986		0.950	0.981		0.950				0.999	
Satd. Flow (prot)	0	3436	1517	1610	1709	1517	1695	3188	0	0	3425	0
Flt Permitted		0.986		0.950	0.981		0.136				0.889	
Satd. Flow (perm)	0	3436	1517	1610	1709	1517	243	3188	0	0	3048	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			164			1		383			12	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		99.8			254.3			76.7			307.9	
Travel Time (s)		7.2			18.3			5.5			22.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	242	195	825	375	2	160	568	747	8	704	84
Shared Lane Traffic (%)				28%								
Lane Group Flow (vph)	0	341	195	594	606	2	160	1315	0	0	796	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2	2	2	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0	20.0	30.0	20.0		6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.0	0.5	
Detector 1 Size(m)	6.1	7.5	3.5	7.5	7.5	3.5	7.5	3.5		6.1	7.5	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2	18.2	28.2	18.2			18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8	1.8	1.8	1.8			1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Turn Type	Split		Perm	Split		Perm	pm+pt			Perm		
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8	2			6		
Detector Phase	4	4	4	8	8	8	5	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	27.6	27.6	27.6	22.6	22.6	22.6	11.0	28.6		28.6	28.6	
Total Split (s)	27.6	27.6	27.6	30.0	30.0	30.0	11.0	42.4	0.0	31.4	31.4	0.0
Total Split (%)	27.6%	27.6%	27.6%	30.0%	30.0%	30.0%	11.0%	42.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	23.0	23.0	23.0	25.4	25.4	25.4	8.0	37.8		26.8	26.8	
Yellow Time (s)	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.8		3.8	3.8	
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.8		0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.0	4.6	4.0	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None		None	None	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0	8.0		8.0		8.0	8.0	
Flash Dont Walk (s)	15.0	15.0	15.0	10.0	10.0	10.0		16.0		16.0	16.0	
Pedestrian Calls (#/hr)	5	5	5	5	5	5		5		5	5	
Act Effct Green (s)		15.2	15.2	25.5	25.5	25.5	39.5	37.9			26.9	
Actuated g/C Ratio		0.16	0.16	0.28	0.28	0.28	0.43	0.41			0.29	
v/c Ratio		0.60	0.50	1.34	1.29	0.00	0.70	0.86			0.89	
Control Delay		40.2	13.0	197.7	175.7	23.0	36.3	24.8			45.3	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Total Delay		40.2	13.0	197.7	175.7	23.0	36.3	24.8			45.3	
LOS		D	B	F	F	C	D	C			D	
Approach Delay		30.3			186.3			26.1			45.3	
Approach LOS		C			F			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 92.4			
Natural Cycle: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.34			
Intersection Signal Delay: 78.5		Intersection LOS: E	
Intersection Capacity Utilization 114.0%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 61: Spencer Street & Kingsway Ave SE



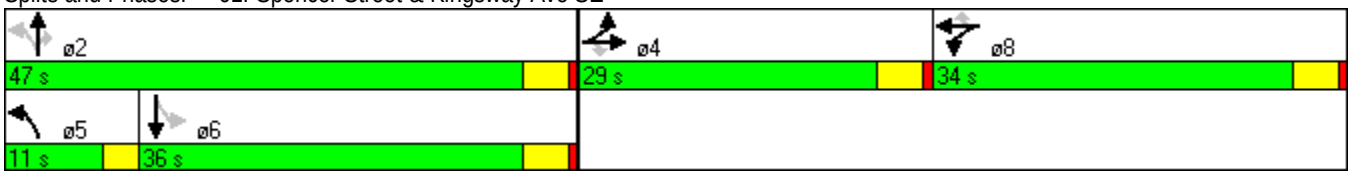


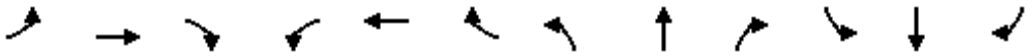
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	223	179	759	345	2	147	523	687	7	648	77
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		20.0	120.0		30.0	50.0		35.0	0.0		0.0
Storage Lanes	0		1	1		1	1		1	0		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.95	0.95	0.95
Frt			0.850			0.850			0.850		0.984	
Flt Protected		0.986		0.950			0.950				0.999	
Satd. Flow (prot)	0	3436	1517	3288	1834	1517	1695	3484	1517	0	3425	0
Flt Permitted		0.986		0.950			0.133				0.948	
Satd. Flow (perm)	0	3436	1517	3288	1834	1517	237	3484	1517	0	3250	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			152			1			716		11	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		99.8			254.3			76.7			307.9	
Travel Time (s)		7.2			18.3			5.5			22.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	242	195	825	375	2	160	568	747	8	704	84
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	341	195	825	375	2	160	568	747	0	796	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2	2	2	2	2	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0	6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.5	
Detector 1 Size(m)	6.1	7.5	3.5	7.5	7.5	3.5	7.5	3.5	6.1	6.1	7.5	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2		18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8		1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	Perm		
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8	2		2	6		
Detector Phase	4	4	4	8	8	8	5	2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	28.1	28.1	28.1	28.1	28.1	28.1	11.0	28.6	28.6	28.6	28.6	
Total Split (s)	29.0	29.0	29.0	34.0	34.0	34.0	11.0	47.0	47.0	36.0	36.0	0.0
Total Split (%)	26.4%	26.4%	26.4%	30.9%	30.9%	30.9%	10.0%	42.7%	42.7%	32.7%	32.7%	0.0%
Maximum Green (s)	24.4	24.4	24.4	29.4	29.4	29.4	8.0	42.4	42.4	31.4	31.4	
Yellow Time (s)	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.8	3.8	3.8	3.8	
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.8	0.8	0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.0	4.6	4.6	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	8.0	8.0	
Flash Dont Walk (s)	15.5	15.5	15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5	
Pedestrian Calls (#/hr)	5	5	5	5	5	5		5	5	5	5	
Act Effct Green (s)		15.9	15.9	28.8	28.8	28.8	41.1	39.5	39.5		28.4	
Actuated g/C Ratio		0.16	0.16	0.29	0.29	0.29	0.42	0.40	0.40		0.29	
v/c Ratio		0.61	0.52	0.85	0.70	0.00	0.73	0.40	0.72		0.84	
Control Delay		43.6	16.0	44.0	40.3	24.0	41.1	22.5	6.9		41.9	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Total Delay		43.6	16.0	44.0	40.3	24.0	41.1	22.5	6.9		41.9	
LOS		D	B	D	D	C	D	C	A		D	
Approach Delay		33.6			42.8			16.6			41.9	
Approach LOS		C			D			B			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 98			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 31.8		Intersection LOS: C	
Intersection Capacity Utilization 86.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 61: Spencer Street & Kingsway Ave SE



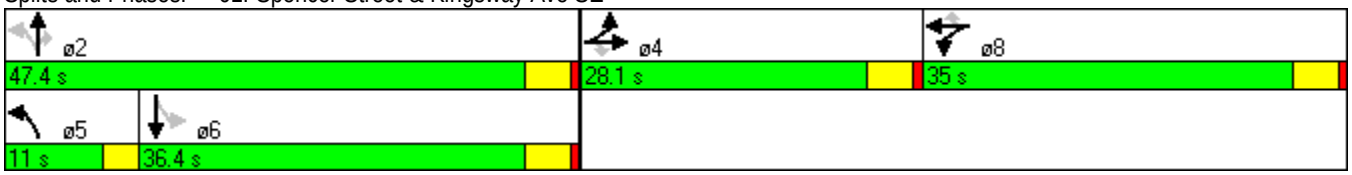


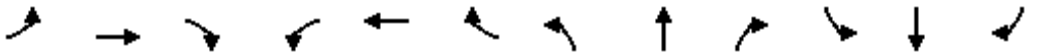
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	154	326	188	869	469	2	190	667	657	7	790	136
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		20.0	120.0		30.0	50.0		35.0	0.0		0.0
Storage Lanes	0		1	1		1	1		1	0		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.95	0.95	0.95
Frt			0.850			0.850			0.850		0.978	
Flt Protected		0.984		0.950			0.950					
Satd. Flow (prot)	0	3429	1517	3288	1834	1517	1695	3484	1517	0	3408	0
Flt Permitted		0.984		0.950			0.115				0.948	
Satd. Flow (perm)	0	3429	1517	3288	1834	1517	205	3484	1517	0	3231	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			112			1			557		18	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		99.8			254.3			76.7			307.9	
Travel Time (s)		7.2			18.3			5.5			22.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	167	354	204	945	510	2	207	725	714	8	859	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	521	204	945	510	2	207	725	714	0	1015	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	2	2	2	2	2	2	2	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0	6.1	20.0	
Trailing Detector (m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.5	
Detector 1 Position(m)	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.5	
Detector 1 Size(m)	6.1	7.5	3.5	7.5	7.5	3.5	7.5	3.5	6.1	6.1	7.5	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2		18.2	
Detector 2 Size(m)		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8		1.8	
Detector 2 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	Perm		
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8	2		2	6		
Detector Phase	4	4	4	8	8	8	5	2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	28.1	28.1	28.1	28.1	28.1	28.1	11.0	28.6	28.6	28.6	28.6	
Total Split (s)	28.1	28.1	28.1	35.0	35.0	35.0	11.0	47.4	47.4	36.4	36.4	0.0
Total Split (%)	25.4%	25.4%	25.4%	31.7%	31.7%	31.7%	10.0%	42.9%	42.9%	32.9%	32.9%	0.0%
Maximum Green (s)	23.5	23.5	23.5	30.4	30.4	30.4	8.0	42.8	42.8	31.8	31.8	
Yellow Time (s)	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.8	3.8	3.8	3.8	
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.8	0.8	0.8	0.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.0	4.6	4.6	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	8.0	8.0	
Flash Dont Walk (s)	15.5	15.5	15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5	
Pedestrian Calls (#/hr)	5	5	5	5	5	5		5	5	5	5	
Act Effct Green (s)		21.0	21.0	30.4	30.4	30.4	44.4	42.8	42.8		31.8	
Actuated g/C Ratio		0.19	0.19	0.28	0.28	0.28	0.41	0.40	0.40		0.29	
v/c Ratio		0.78	0.53	1.02	0.99	0.00	1.07	0.52	0.76		1.05	
Control Delay		50.3	23.0	74.2	76.7	25.0	109.9	26.9	12.4		81.1	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Total Delay		50.3	23.0	74.2	76.7	25.0	109.9	26.9	12.4		81.1	
LOS		D	C	E	E	C	F	C	B		F	
Approach Delay		42.6			75.0			31.1			81.1	
Approach LOS		D			E			C			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110.5			
Actuated Cycle Length: 108.1			
Natural Cycle: 130			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.07			
Intersection Signal Delay: 56.5		Intersection LOS: E	
Intersection Capacity Utilization 101.4%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 61: Spencer Street & Kingsway Ave SE



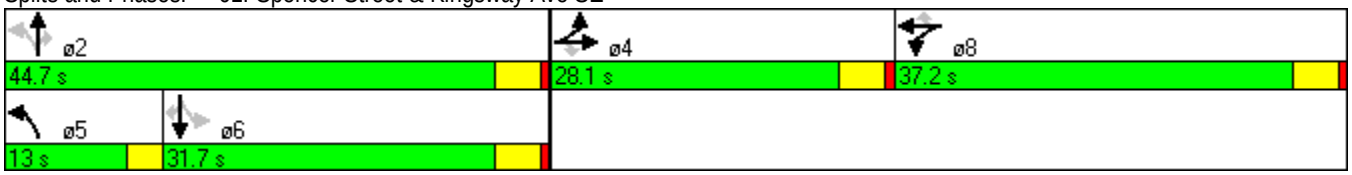


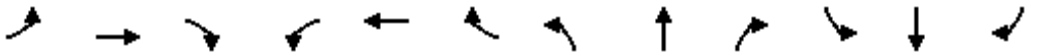
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	154	326	188	869	469	2	190	667	657	7	790	136
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	60.0		20.0	120.0		30.0	50.0		30.0	60.0		30.0
Storage Lanes	0		1	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.984		0.950			0.950			0.950		
Satd. Flow (prot)	0	3429	1517	3288	1834	1517	1695	3484	1517	1695	3484	1517
Flt Permitted		0.984		0.950			0.133			0.369		
Satd. Flow (perm)	0	3429	1517	3288	1834	1517	237	3484	1517	658	3484	1517
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			113			1			476			70
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		99.8			254.3			76.7			307.9	
Travel Time (s)		7.2			18.3			5.5			22.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	167	354	204	945	510	2	207	725	714	8	859	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	521	204	945	510	2	207	725	714	8	859	148
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2	2	2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0	20.0	30.0	20.0	20.0	20.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.5	0.5	0.5
Detector 1 Size(m)	6.1	7.5	3.5	7.5	7.5	3.5	7.5	3.5	6.1	6.1	7.5	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2	18.2	28.2	18.2	18.2	18.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	Perm		Perm
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	6	6	6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.1	28.1	28.1	31.1	31.1	31.1	11.0	28.1	28.1	28.1	28.1	28.1
Total Split (s)	28.1	28.1	28.1	37.2	37.2	37.2	13.0	44.7	44.7	31.7	31.7	31.7
Total Split (%)	25.5%	25.5%	25.5%	33.8%	33.8%	33.8%	11.8%	40.6%	40.6%	28.8%	28.8%	28.8%
Maximum Green (s)	23.5	23.5	23.5	32.6	32.6	32.6	10.0	40.1	40.1	27.1	27.1	27.1
Yellow Time (s)	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.8	0.8	0.8	0.8	0.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.0	4.6	4.6	4.6	4.6	4.6
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	15.5	15.5	15.5	18.5	18.5	18.5		15.5	15.5	15.5	15.5	15.5
Pedestrian Calls (#/hr)	5	5	5	5	5	5		5	5	5	5	5
Act Effct Green (s)		20.9	20.9	32.6	32.6	32.6	41.7	40.1	40.1	27.1	27.1	27.1
Actuated g/C Ratio		0.19	0.19	0.30	0.30	0.30	0.39	0.37	0.37	0.25	0.25	0.25
v/c Ratio		0.78	0.53	0.95	0.92	0.00	0.91	0.56	0.83	0.05	0.98	0.34
Control Delay		49.9	22.6	55.9	59.9	23.5	67.6	29.1	19.5	32.7	66.2	20.6
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		49.9	22.6	55.9	59.9	23.5	67.6	29.1	19.5	32.7	66.2	20.6
LOS		D	C	E	E	C	E	C	B	C	E	C
Approach Delay		42.2			57.3			29.8			59.3	
Approach LOS		D			E			C			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 107.5			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.98			
Intersection Signal Delay: 46.1		Intersection LOS: D	
Intersection Capacity Utilization 88.4%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 61: Spencer Street & Kingsway Ave SE



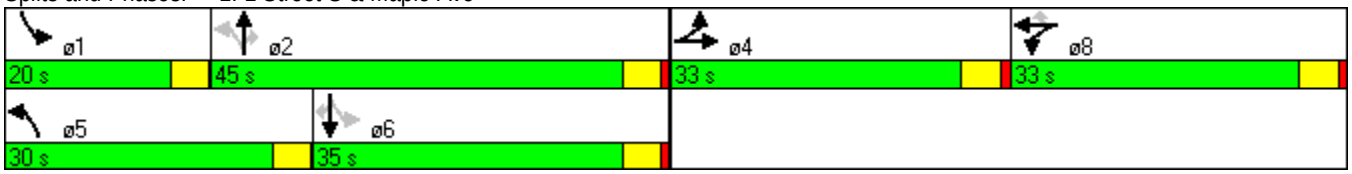


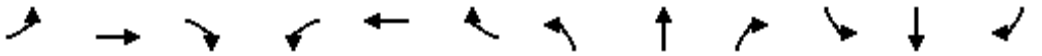
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	558	54	109	65	32	373	160	734	27	79	650	271
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		0.0	65.0		20.0	75.0		50.0	75.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98			0.95	0.99		0.97
Frt		0.954				0.850			0.850			0.850
Flt Protected	0.950	0.974		0.950			0.950			0.950		
Satd. Flow (prot)	1626	1614	0	1729	1871	1547	1712	3519	1517	1729	3519	1532
Flt Permitted	0.950	0.974		0.950			0.145			0.209		
Satd. Flow (perm)	1617	1609	0	1719	1871	1511	261	3519	1438	378	3519	1481
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				240			21			215
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		79.2			138.0			154.6			310.5	
Travel Time (s)		5.7			9.9			11.1			22.4	
Confl. Peds. (#/hr)	4		6	6		4	2		10	10		2
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	1%	1%	2%	0%	1%	1%
Adj. Flow (vph)	607	59	118	71	35	405	174	798	29	86	707	295
Shared Lane Traffic (%)	34%											
Lane Group Flow (vph)	401	383	0	71	35	405	174	798	29	86	707	295
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2		2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0		30.0	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Size(m)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2		28.2	18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Split			Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	29.8	29.8		29.8	29.8	29.8	13.0	31.8	31.8	13.0	31.8	31.8
Total Split (s)	33.0	33.0	0.0	33.0	33.0	33.0	30.0	45.0	45.0	20.0	35.0	35.0
Total Split (%)	25.2%	25.2%	0.0%	25.2%	25.2%	25.2%	22.9%	34.4%	34.4%	15.3%	26.7%	26.7%
Maximum Green (s)	28.2	28.2		28.2	28.2	28.2	26.1	40.2	40.2	16.1	30.2	30.2
Yellow Time (s)	3.8	3.8		3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	0.1	1.0	1.0	0.1	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8	4.0	4.8	4.8	4.8	3.9	4.8	4.8	3.9	4.8	4.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	Min
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0
Flash Dont Walk (s)	15.0	15.0		15.0	15.0	15.0		15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)	5	5		5	5	5		5	5		5	5
Act Effct Green (s)	28.8	28.8		19.7	19.7	19.7	45.8	34.7	34.7	37.4	27.5	27.5
Actuated g/C Ratio	0.27	0.27		0.18	0.18	0.18	0.42	0.32	0.32	0.35	0.25	0.25
v/c Ratio	0.93	0.87		0.23	0.10	0.86	0.60	0.71	0.06	0.35	0.79	0.55
Control Delay	70.0	59.8		40.7	38.7	36.0	29.7	37.9	15.3	24.5	45.9	15.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.0	59.8		40.7	38.7	36.0	29.7	37.9	15.3	24.5	45.9	15.2
LOS	E	E		D	D	D	C	D	B	C	D	B
Approach Delay		65.0			36.8			35.8			35.9	
Approach LOS		E			D			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 131			
Actuated Cycle Length: 108.1			
Natural Cycle: 105			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 42.8		Intersection LOS: D	
Intersection Capacity Utilization 78.5%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: 1 Street S & Maple Ave





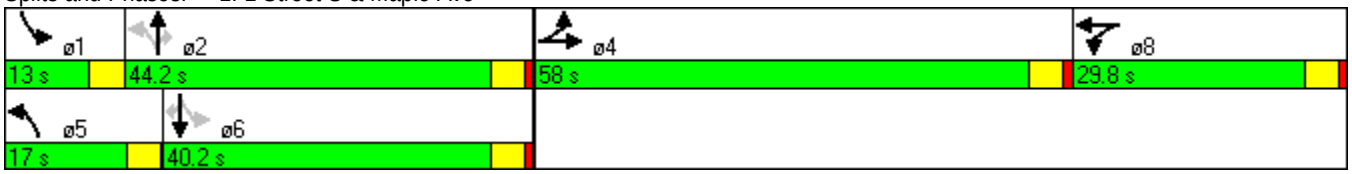
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	790	73	325	41	32	337	246	745	31	102	806	284
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	0.0		0.0	65.0		20.0	75.0		50.0	75.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.98		1.00		0.99			0.94	1.00		0.97
Frt		0.916				0.850			0.850			0.850
Flt Protected	0.950	0.985		0.950			0.950			0.950		
Satd. Flow (prot)	1626	1550	0	1729	1871	1547	1712	3519	1517	1729	3519	1532
Flt Permitted	0.950	0.985		0.950			0.101			0.161		
Satd. Flow (perm)	1616	1547	0	1721	1871	1525	182	3519	1433	292	3519	1481
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50				328			21			167
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		79.2			138.0			154.6			101.0	
Travel Time (s)		5.7			9.9			11.1			7.3	
Confl. Peds. (#/hr)	4		6	6		4	2		10	10		2
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	1%	1%	2%	0%	1%	1%
Adj. Flow (vph)	859	79	353	45	35	366	267	810	34	111	876	309
Shared Lane Traffic (%)	23%											
Lane Group Flow (vph)	661	630	0	45	35	366	267	810	34	111	876	309
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2		2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0		30.0	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Size(m)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2		28.2	18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

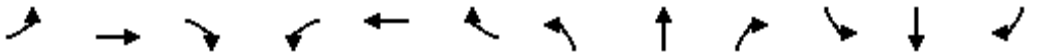
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Split			Split		Free	pm+pt		Perm	pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						Free	2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	29.8	29.8		29.8	29.8		13.0	31.8	31.8	13.0	31.8	31.8
Total Split (s)	58.0	58.0	0.0	29.8	29.8	0.0	17.0	44.2	44.2	13.0	40.2	40.2
Total Split (%)	40.0%	40.0%	0.0%	20.6%	20.6%	0.0%	11.7%	30.5%	30.5%	9.0%	27.7%	27.7%
Maximum Green (s)	53.2	53.2		25.0	25.0		13.1	39.4	39.4	9.1	35.4	35.4
Yellow Time (s)	3.8	3.8		3.8	3.8		3.8	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0		1.0	1.0		0.1	1.0	1.0	0.1	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8	4.0	4.8	4.8	4.0	3.9	4.8	4.8	3.9	4.8	4.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)	10.0	10.0		10.0	10.0			10.0	10.0		10.0	10.0
Flash Dont Walk (s)	15.0	15.0		15.0	15.0			15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)	5	5		5	5			5	5		5	5
Act Effct Green (s)	53.5	53.5		12.7	12.7	130.0	53.6	40.0	40.0	45.2	35.6	35.6
Actuated g/C Ratio	0.41	0.41		0.10	0.10	1.00	0.41	0.31	0.31	0.35	0.27	0.27
v/c Ratio	0.99	0.94		0.27	0.19	0.24	1.16	0.75	0.07	0.56	0.91	0.59
Control Delay	71.2	58.9		59.0	56.8	0.4	142.1	46.9	19.6	38.5	60.5	24.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.2	58.9		59.0	56.8	0.4	142.1	46.9	19.6	38.5	60.5	24.4
LOS	E	E		E	E	A	F	D	B	D	E	C
Approach Delay		65.2			10.7			69.0			50.0	
Approach LOS		E			B			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 130
Natural Cycle: 145
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.16
Intersection Signal Delay: 55.6 Intersection LOS: E
Intersection Capacity Utilization 90.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: 1 Street S & Maple Ave





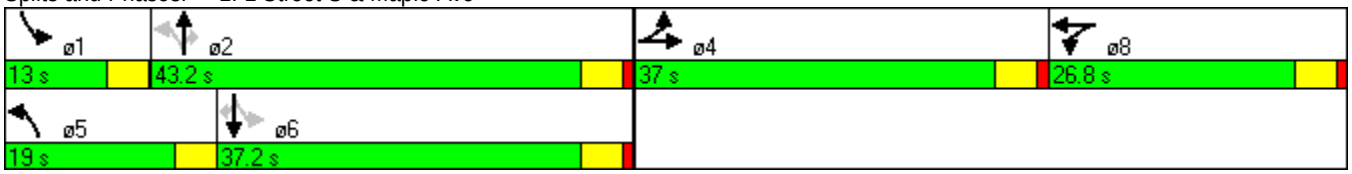
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	790	73	325	41	32	337	246	745	31	102	806	284
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	60.0		0.0	65.0		20.0	75.0		50.0	75.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.98		1.00		0.99			0.95	0.99		0.97
Frt		0.877				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	1569	0	1729	1871	1547	1712	3519	1517	1729	3519	1532
Flt Permitted	0.950			0.950			0.115			0.239		
Satd. Flow (perm)	3300	1569	0	1721	1871	1525	207	3519	1442	433	3519	1483
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		183				363			27			209
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		121.0			138.0			154.6			102.9	
Travel Time (s)		8.7			9.9			11.1			7.4	
Confl. Peds. (#/hr)	4		6	6		4	2		10	10		2
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	1%	1%	2%	0%	1%	1%
Adj. Flow (vph)	859	79	353	45	35	366	267	810	34	111	876	309
Shared Lane Traffic (%)												
Lane Group Flow (vph)	859	432	0	45	35	366	267	810	34	111	876	309
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2		2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0		30.0	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Size(m)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2		28.2	18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

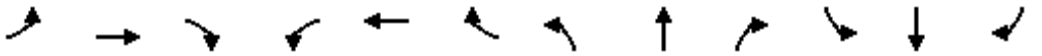
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Split			Split		Free	pm+pt		Perm	pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						Free	2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	29.8	29.8		26.8	26.8		10.9	29.8	29.8	13.0	31.8	31.8
Total Split (s)	37.0	37.0	0.0	26.8	26.8	0.0	19.0	43.2	43.2	13.0	37.2	37.2
Total Split (%)	30.8%	30.8%	0.0%	22.3%	22.3%	0.0%	15.8%	36.0%	36.0%	10.8%	31.0%	31.0%
Maximum Green (s)	32.2	32.2		22.0	22.0		15.1	38.4	38.4	9.1	32.4	32.4
Yellow Time (s)	3.8	3.8		3.8	3.8		3.8	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0		1.0	1.0		0.1	1.0	1.0	0.1	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8	4.0	4.8	4.8	4.0	3.9	4.8	4.8	3.9	4.8	4.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)	10.0	10.0		7.0	7.0			10.0	10.0		10.0	10.0
Flash Dont Walk (s)	15.0	15.0		15.0	15.0			15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)	5	5		5	5			5	5		5	5
Act Effct Green (s)	31.9	31.9		12.3	12.3	105.1	51.1	37.7	37.7	40.3	30.8	30.8
Actuated g/C Ratio	0.30	0.30		0.12	0.12	1.00	0.49	0.36	0.36	0.38	0.29	0.29
v/c Ratio	0.85	0.72		0.22	0.16	0.24	0.83	0.64	0.06	0.41	0.85	0.53
Control Delay	45.6	27.6		46.9	45.4	0.4	48.5	32.4	12.1	22.4	45.0	14.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.6	27.6		46.9	45.4	0.4	48.5	32.4	12.1	22.4	45.0	14.9
LOS	D	C		D	D	A	D	C	B	C	D	B
Approach Delay		39.6			8.6			35.6			35.9	
Approach LOS		D			A			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 105.1
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 34.0 Intersection LOS: C
Intersection Capacity Utilization 84.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: 1 Street S & Maple Ave





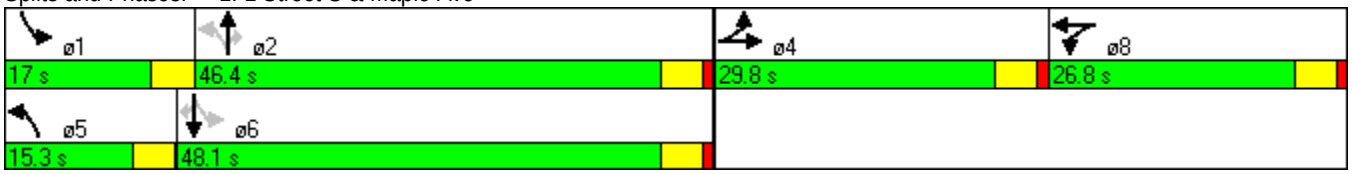
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	598	110	154	109	32	358	205	910	55	193	1185	256
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	60.0		0.0	65.0		20.0	75.0		50.0	75.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.99			0.95			0.97
Frt		0.913				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	1653	0	1729	1871	1547	1712	3519	1517	1729	3519	1532
Flt Permitted	0.950			0.950			0.094			0.128		
Satd. Flow (perm)	3300	1653	0	1719	1871	1525	169	3519	1443	233	3519	1486
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53				377			40			146
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		121.0			138.0			154.6			103.8	
Travel Time (s)		8.7			9.9			11.1			7.5	
Confl. Peds. (#/hr)	4		6	6		4	2		10	10		2
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	1%	1%	2%	0%	1%	1%
Adj. Flow (vph)	650	120	167	118	35	389	223	989	60	210	1288	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	650	287	0	118	35	389	223	989	60	210	1288	278
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2		2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0		30.0	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Size(m)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2		28.2	18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Split			Split		Free	pm+pt		Perm	pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						Free	2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	29.8	29.8		26.8	26.8		10.9	29.8	29.8	13.0	31.8	31.8
Total Split (s)	29.8	29.8	0.0	26.8	26.8	0.0	15.3	46.4	46.4	17.0	48.1	48.1
Total Split (%)	24.8%	24.8%	0.0%	22.3%	22.3%	0.0%	12.8%	38.7%	38.7%	14.2%	40.1%	40.1%
Maximum Green (s)	25.0	25.0		22.0	22.0		11.4	41.6	41.6	13.1	43.3	43.3
Yellow Time (s)	3.8	3.8		3.8	3.8		3.8	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0		1.0	1.0		0.1	1.0	1.0	0.1	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8	4.0	4.8	4.8	4.0	3.9	4.8	4.8	3.9	4.8	4.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)	10.0	10.0		7.0	7.0			10.0	10.0		10.0	10.0
Flash Dont Walk (s)	15.0	15.0		15.0	15.0			15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)	5	5		5	5			5	5		5	5
Act Effct Green (s)	24.7	24.7		13.9	13.9	111.7	54.8	42.5	42.5	56.6	43.4	43.4
Actuated g/C Ratio	0.22	0.22		0.12	0.12	1.00	0.49	0.38	0.38	0.51	0.39	0.39
v/c Ratio	0.89	0.71		0.55	0.15	0.26	0.93	0.74	0.10	0.74	0.94	0.42
Control Delay	57.9	43.8		55.6	44.4	0.4	70.8	34.8	12.0	35.5	47.9	14.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.9	43.8		55.6	44.4	0.4	70.8	34.8	12.0	35.5	47.9	14.1
LOS	E	D		E	D	A	E	C	B	D	D	B
Approach Delay		53.6			15.3			40.0			41.1	
Approach LOS		D			B			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 111.7
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 40.3 Intersection LOS: D
Intersection Capacity Utilization 88.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: 1 Street S & Maple Ave



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1883	0	0	1883	0	0
Flt Permitted						
Satd. Flow (perm)	1883	0	0	1883	0	0
Link Speed (k/h)	48			48	48	
Link Distance (m)	108.1			98.8	78.6	
Travel Time (s)	8.1			7.4	5.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Free	

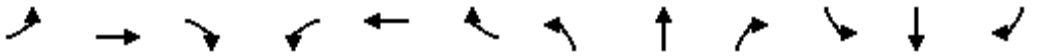
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Volume (vph)	0	0	0	562	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1883	0	0	1883	0	1883
Flt Permitted						
Satd. Flow (perm)	1883	0	0	1883	0	1883
Link Speed (k/h)	48			48	48	
Link Distance (m)	98.8			121.0	152.2	
Travel Time (s)	7.4			9.1	11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	611	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	611	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	0	1883	0	0	0	1883
Flt Permitted						
Satd. Flow (perm)	0	1883	0	0	0	1883
Link Speed (k/h)		48	48		48	
Link Distance (m)		78.7	152.2		78.6	
Travel Time (s)		5.9	11.4		5.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		0.0	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 0.0%		ICU Level of Service A	
Analysis Period (min) 15			

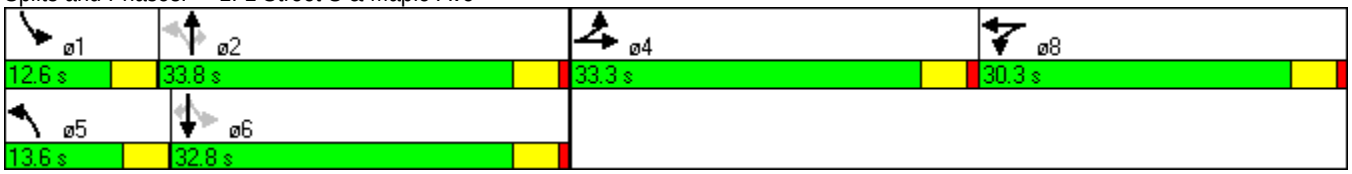


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	598	110	154	109	32	358	205	910	55	193	1185	256
Ideal Flow (vphpl)	1800	1850	1800	1800	1850	1800	1800	1850	1800	1800	1850	1800
Storage Length (m)	60.0		0.0	65.0		20.0	75.0		50.0	75.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	1.00	0.99		1.00		0.99			0.95			0.97
Frt		0.913				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	1656	0	1729	1871	1547	1712	3519	1517	1729	5056	1532
Flt Permitted	0.950			0.950			0.137			0.141		
Satd. Flow (perm)	3305	1656	0	1721	1871	1525	247	3519	1443	257	5056	1483
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61				389			39			196
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		158.6			138.0			127.7			99.6	
Travel Time (s)		11.4			9.9			9.2			7.2	
Confl. Peds. (#/hr)	4		6	6		4	2		10	10		2
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	1%	1%	2%	0%	1%	1%
Adj. Flow (vph)	650	120	167	118	35	389	223	989	60	210	1288	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	650	287	0	118	35	389	223	989	60	210	1288	278
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06	1.06	1.02	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	2	2		2	2	2	2	2	2	2	2	2
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	30.0	20.0		30.0	20.0	20.0	30.0	20.0	20.0	30.0	20.0	20.0
Trailing Detector (m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Position(m)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detector 1 Size(m)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.2	18.2		28.2	18.2	18.2	28.2	18.2	18.2	28.2	18.2	18.2
Detector 2 Size(m)	1.8	1.8		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Split			Split		Free	pm+pt		Perm	pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						Free	2		2	6		6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	33.3	33.3		30.3	30.3		10.9	31.8	31.8	10.9	31.8	31.8
Total Split (s)	33.3	33.3	0.0	30.3	30.3	0.0	13.6	33.8	33.8	12.6	32.8	32.8
Total Split (%)	30.3%	30.3%	0.0%	27.5%	27.5%	0.0%	12.4%	30.7%	30.7%	11.5%	29.8%	29.8%
Maximum Green (s)	28.5	28.5		25.5	25.5		9.7	29.0	29.0	8.7	28.0	28.0
Yellow Time (s)	3.8	3.8		3.8	3.8		3.8	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0		1.0	1.0		0.1	1.0	1.0	0.1	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8	4.0	4.8	4.8	4.0	3.9	4.8	4.8	3.9	4.8	4.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)	10.0	10.0		7.0	7.0			10.0	10.0		10.0	10.0
Flash Dont Walk (s)	18.5	18.5		18.5	18.5			15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)	5	5		5	5			5	5		5	5
Act Effct Green (s)	24.6	24.6		13.8	13.8	94.9	40.0	29.3	29.3	38.0	28.3	28.3
Actuated g/C Ratio	0.26	0.26		0.15	0.15	1.00	0.42	0.31	0.31	0.40	0.30	0.30
v/c Ratio	0.76	0.61		0.47	0.13	0.26	0.87	0.91	0.13	0.88	0.86	0.48
Control Delay	39.2	30.6		43.9	36.5	0.4	55.1	46.5	14.4	57.6	39.5	12.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.2	30.6		43.9	36.5	0.4	55.1	46.5	14.4	57.6	39.5	12.9
LOS	D	C		D	D	A	E	D	B	E	D	B
Approach Delay		36.6			12.2			46.5			37.5	
Approach LOS		D			B			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 94.9			
Natural Cycle: 110			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 36.8		Intersection LOS: D	
Intersection Capacity Utilization 80.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: 1 Street S & Maple Ave



F Appendix F - Open House Presentation Boards

Medicine Hat
The Gas City

A Community of Choice




ROADWAY SYSTEM MASTER PLAN (RSMP) UPDATE

Public Open House - January 23, 2013

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

WHAT IS A ROADWAY SYSTEM MASTER PLAN?

- Roadway Network that aligns with the Municipal Development Plan
- Updates City of Medicine Hat Computer Traffic Model
- Identifies Roadway System Improvements (10 Year Capital Plan)
- Identifies Long Range Road Network Improvements
- Identifies Impacts of Highway Connections to the community
- Studies other critical aspects of the City Road Network (e.g. Downtown Parking Study)
- Reviews / Updates City of Medicine Hat Transportation Bylaw

WHAT'S IN THE CITY OF MEDICINE HAT'S ROADWAY SYSTEM PLAN?

- Downtown Parking Study (approved by Council)
- Cycling Master Plan (approved by Council)
- Assessment of converting Downtown one-way streets to two-way streets (approved by Council)
- Installation guidelines for traffic control devices (i.e. stop/yield, school & playground zone, pedestrian crossings, and parking restrictions)
- Preliminary assessment for the Southwest Medicine Hat connector
- Assessment of proposed AT upgrades along TCH corridor
- Assessment of interim measures/upgrades and phasing of AT's proposed upgrades along TCH corridor

RSMP UPDATE - KEY FINDINGS

The RSMP identified the following roadway upgrades, in support to projected MDP growth in the City.

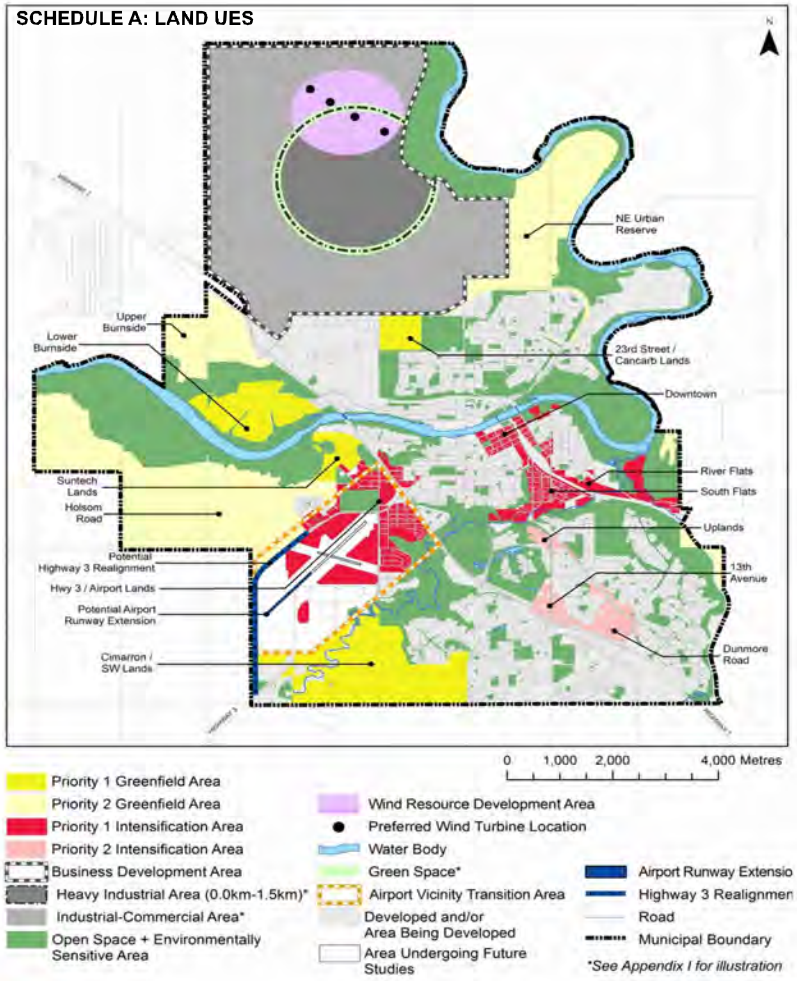
ROADS:

- West Boundary Road
  (TCH to Box Springs Blvd)
- Box Springs Road NW
  (Brier Park Road to 23rd Street NW)
- Box Springs Road NW
  (23rd Street NW to Box Springs Street NW)
- 13th Avenue SE
  (Strachan Road to South Boundary Road)
- 11th Avenue SW
  (extension to TCH)
- South Boundary Road
  (South Ridge Drive to Range Road 61)
- Southwest Connector
  (between South Boundary Road and Highway 3)
- Burnside Drive
  (TCH to Redcliff Way)

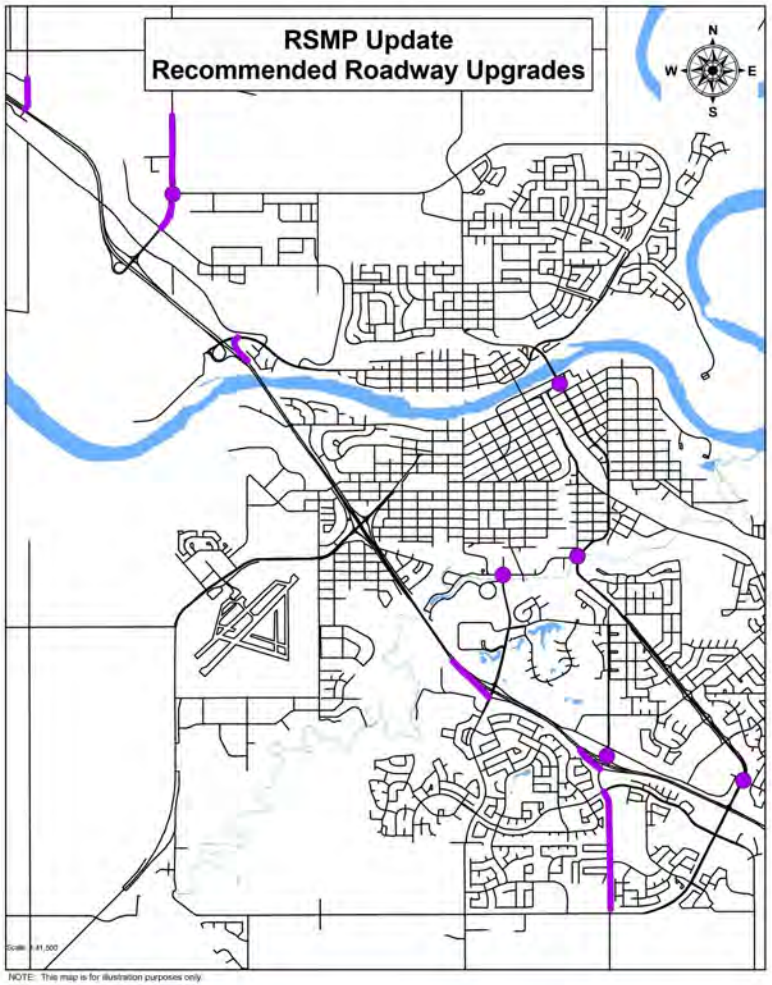
INTERSECTIONS:

- Maple Avenue and 1st Street SE
- College Avenue and Kipling Street
- 23rd Street and Box Springs Road NW
- Kingsway Avenue and Spencer Street SE
- 13th Ave and TransCanada Way
- Dunmore Road and TransCanada Way
- 3rd Street NW - Highway 1 off ramp
- TCH and 6th/7th Street SW
  (AT jurisdiction)
- TCH and 16th Street SW
  (AT jurisdiction)
- Eastbound TCH off-ramp at 13th Avenue SE
  (AT jurisdiction)
- Eastbound off-ramp at TCH & South Ridge Drive
  (AT jurisdiction)

City of Medicine Hat
Municipal Development Plan



City of Medicine Hat
Roadway System - 10 year Capital Improvement Plan



WHAT ARE ALBERTA TRANSPORTATIONS PROPOSED IMPROVEMENTS TO HIGHWAY 1?

- Close 16th Street, 6th Street and 7th Street SW intersections on Highway 1
- Upgrade the Highway 1 and Highway 3/Gershaw Drive interchange
- Construct an interchange at Highway 1 and 1st Street SW.

ALBERTA TRANSPORTATION PROPOSED UPGRADES

- Full interchange at Highway 1 and 1st Street SW
- Closing of 6/7th Street SW intersection on Highway 1

ALBERTA TRANSPORTATION PROPOSED UPGRADES

- Highway 1 and 3 interchange upgrades
- Closing of 16th Street SW Intersection on Highway 1

SEQUENCING OF ALBERTA TRANSPORTATION UPGRADES TO HIGHWAY 1

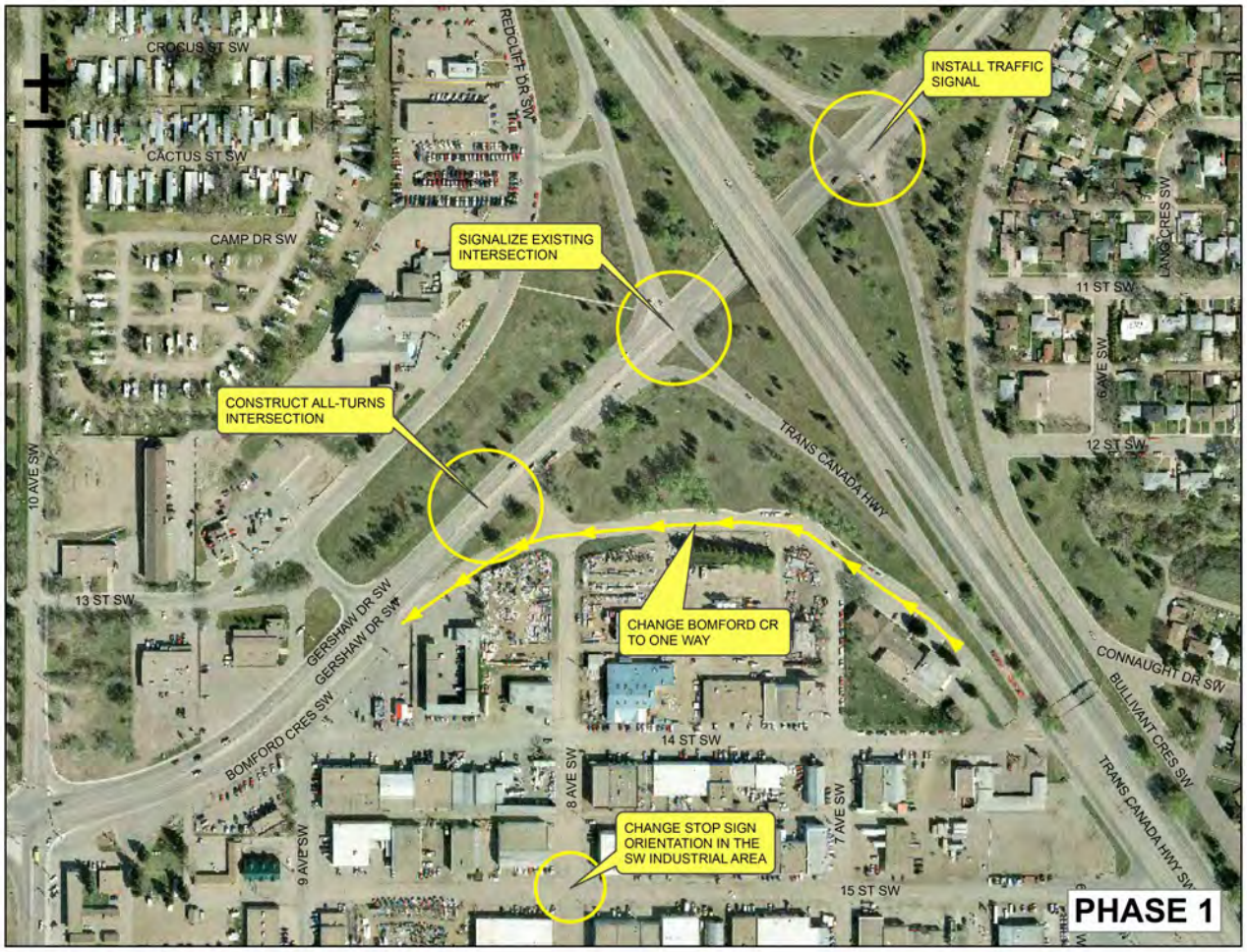
WHY:

- There may be funding constraints
- There's a need to make improvements along Highway 1 now
- Improved community access needs
- Intersections are currently congested & failing
- Improves safety
- Improvements will benefit city of Medicine Hat roadways
- Provides for the future growth of the City
- Community concerns

ARE THERE INTERIM MEASURES THAT CAN BE IMPLEMENTED? Yes

- Changes at Highway 1 & 3 Interchange
- All turns intersection at 8th Street SW & Highway 3
- Changes at 16th Street SW Intersection at Highway 1
- Changes at 1st Street SW Intersection at Highway 1
- Provision of a service road from 1st Street SW to Suntec area

Alberta Transportation Phasing Plan - Phase 1
Upgrades to Highway 1 & 3 Interchange

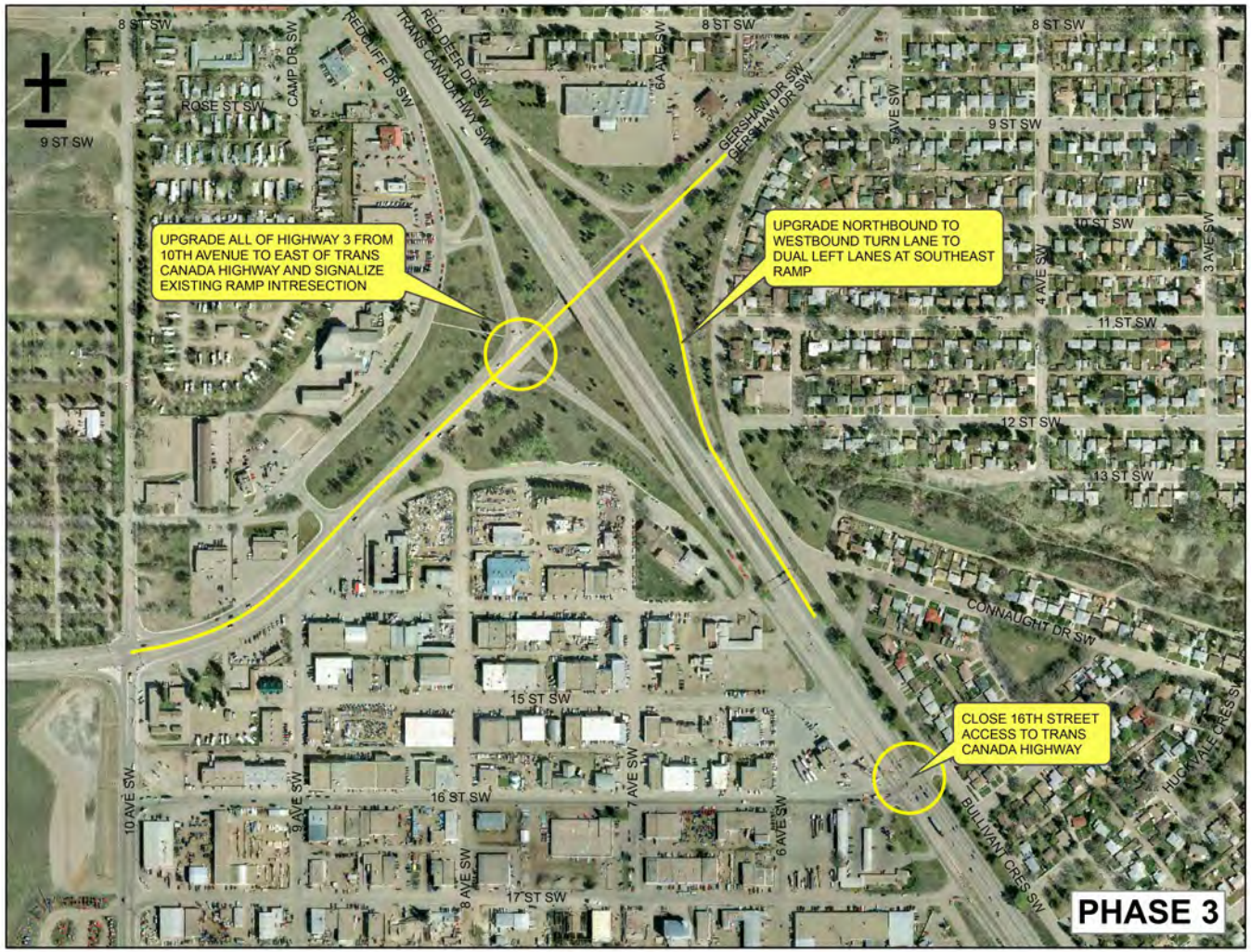


Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Medicine Hat The Gas City | A Community of Choice

Alberta Transportation Phasing Plan - Phase 2
Changes at 16th Street Intersection

Alberta Transportation Phasing Plan - Phase 3
Upgrades to Highway 1 & 3 Interchange & 16th Street Intersection



Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Medicine Hat The Gas City | A Community of Choice

Alberta Transportation Phasing Plan - Phase 4
Upgrades to Highway 1 & 3 Interchange & Close 6th and 7th Street Intersection

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Medicine Hat The Gas City | A Community of Choice

Alberta Transportation Phasing Plan - Phase 5
1st Street SW & Highway 1 intersection upgrades

INTERIM IMPROVEMENTS - 1 STREET SW

Why?

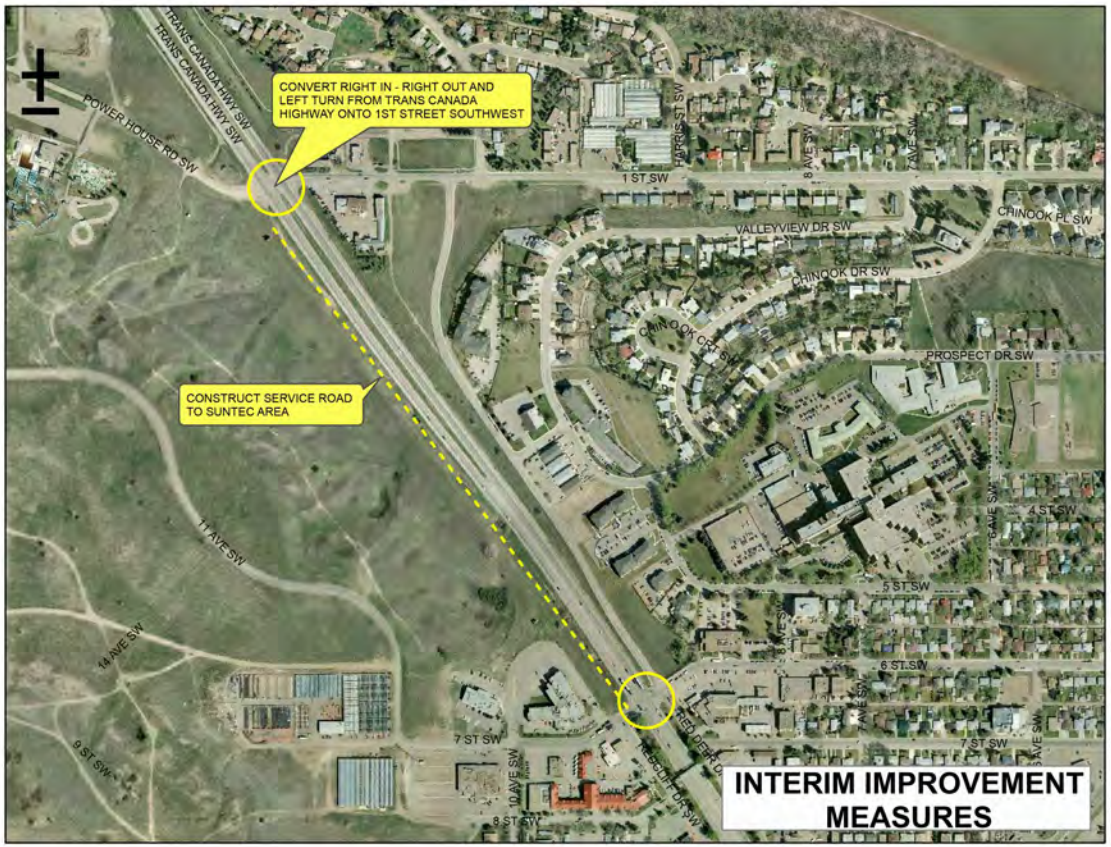
- Community concerns
- Left Turn Safety concerns from Highway 1

CONCEPTUAL DESIGN LAYOUT FOR LEFT TURN ACCESS FROM HIGHWAY 1

WHY DO WE NEED A SERVICE ROAD TO SUNTEC?

- Connectivity
- Facilitate a connection to future development
- Access to Suntec

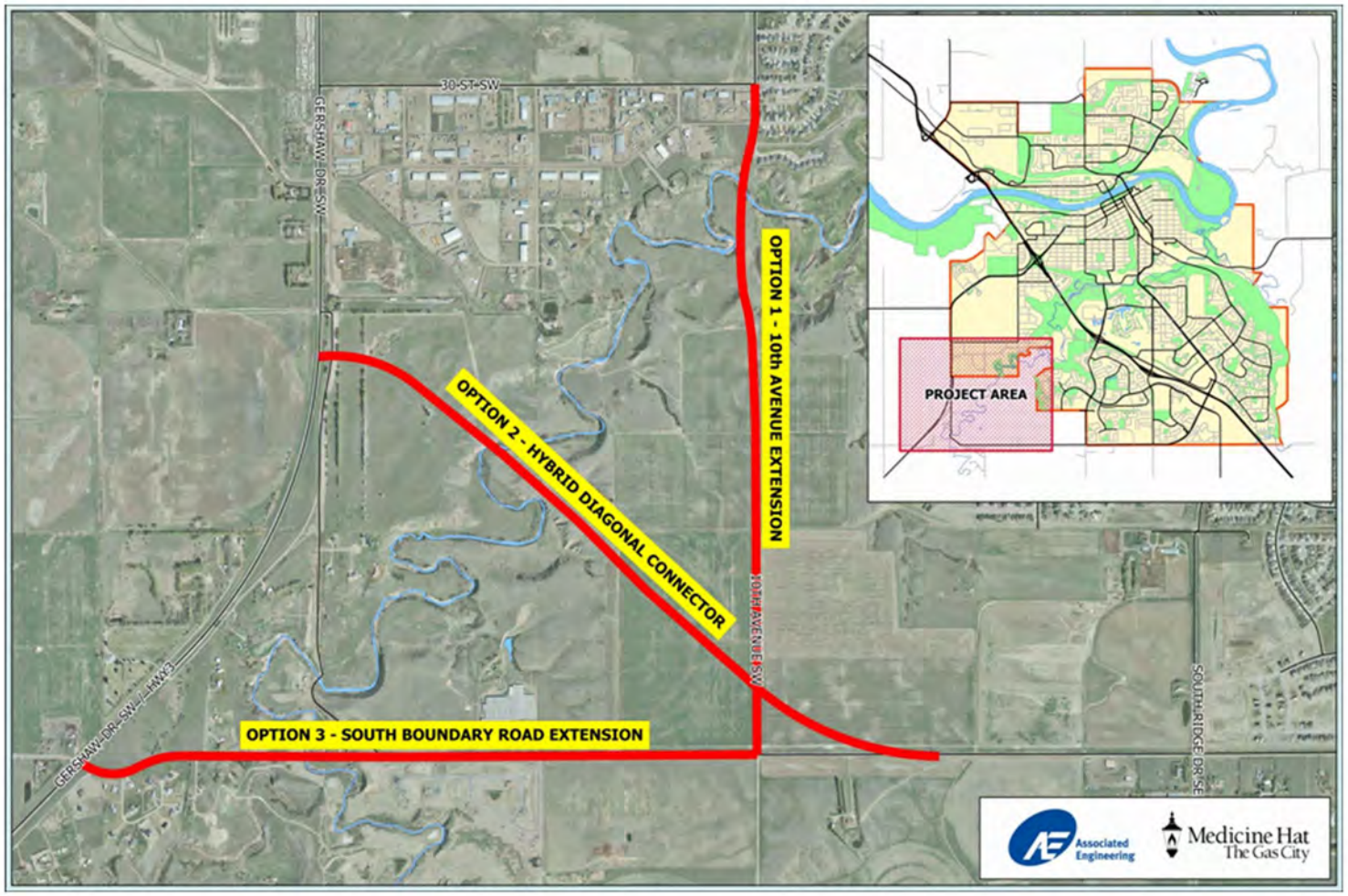
OTHER INTERIM IMPROVEMENTS



WHY THE NEED FOR THE SOUTH WEST CONNECTOR?

- Facilitate growth in the Southwest
- Improve roadway connectivity to the City
- Reduce traffic on existing roadways within the Southwest

SOUTHWEST CONNECTOR OPTIONS



SOUTHWEST CONNECTOR ANALYSIS

- Assessment of future preferred alignment for connecting South Boundary Road to Highway 3

- Transportation model suggests that the SW connector would not be required until Cimarron development is well underway (2025)

- Assessment included:
  - Analysis and identification of alternative alignments
  - Area Structure Plan/Neighbourhood/Property impacts
  - High level cost estimates
  - Environmental and geotechnical considerations
  - Travel time forecast and road network connections

- All three options are viable

SOUTHWEST CONNECTOR OPTIONS

Consultant evaluation of Impacts

Options Evaluation Criteria	Option 1	Option 2	Option 3
Impacts on Property	High	Low	Medium
Cost	High	Low	Medium
Social Impacts on Amenities	High	Low	Medium
Environmental Impacts	High	Low	Medium
Noise Impacts	High	Low	Medium
Safety Impacts	High	Low	Medium
Geotechnical	High	Low	Medium
Travel Time Savings	Low	Medium	High
Existing Road Network	High	Low	Medium
Network Connectivity	Medium	Low	High
Impacts on Cimarron ASP	Low	High	Low

NEXT STEPS

- Solicit Public Feedback (January 2013)
- Finalize Roadway System Master Plan Report (March 2013)
- Present Report to Council (April 2013)

G Appendix G - Public Comments Summary

Public Meeting - Chamber of Commerce
Location: Best Western Inn on Redcliff Drive
Date Jan. 15, 2013
Number of Participants 48
Participant Comments

AT Corridor	*Number of Responses*
More information requested for proposed options for hospital & 16 Street SW intersection.	1
Concerns on the lack of discussion and information on the Highway 1 and 6th Street SW intersection.	1
RSMP	*Number of Responses*
General positive feedback.	1

1st Street SW Open House
Location: Esplanade - Studio Theatre
Date Jan. 16, 2013
Number of Participants 72
Participant Comments

AT Corridor	*Number of Responses*
Concerns on the potential traffic volume on 1 Street SW.	10
Concerns on the speed limit on 1 Street SW. Feels that drivers are going too fast.	2
Concerns on the potential noise pollution on 1 Street SW.	2
Concerns on closing of 6 Street SW and Red Deer Drive access from Highway 1 which will negatively impact local businesses.	3
Concerns on the speed limit on 6 Street SW.	1
Concerns on the closing of highway 1 and 16 Street intersection.	1
Suggestion for a service road to the Power Plant on the west side of Highway 1.	1
Positive feedback on the interim changes to Highway 1 and 1st Interchange.	3
Positive feedback on the phasing of work with opportunity for input from the public.	3
RSMP	*Number of Responses*
Positive feedback on the 4 way stop implemented at Division Avenue.	1
Concerns on the timeline of the phasing and plan. Request more information on the estimated cost.	4
Concerns on the lack of a signal light at Redcliff Drive.	1
Suggests directing traffic from Highway 1 onto Township Road 120.	1
Suggests seeking alternative to direct crescent height traffic away from Highway 1.	1

RSMP Public Open House
Location: Exhibition Grounds - Higdon Hall
Date Jan. 23, 2013
Number of Participants 138
Participant Comments

AT Corridor	*Number of Responses*
Concerns on potential traffic volume on 1 Street SW as it is a historical road.	5
Concerns on the potential noise pollution on 1 Street SW.	1
Positive feedback on the overall Highway 1 and Highway 3 upgrades. Agrees with closure of 16 Street SW and 6 Street SW.	3
Concerns on the closure of the hospital exit ramp, and 6 Street SW exit as it is very highly used. Very concerned on the affect it will have on local businesses.	4
Suggestion on removing left turn lane concrete median on Highway 1.	1
Concerns on the timeline of the phasing of the plan. Taking way too long to implement.	3
RSMP	*Number of Responses*
Request more information on airport expansion, no additional comment.	1
Request more information on Crescent Heights area, no additional comment.	1
Request more information on estimated cost of the overall plan.	1
Positive feedback on overall plan. The sooner the better.	3

Post Public Meeting - Online Survey Comments Collected By Chamber of Commerse
Date "January 2013"
Number of Participants 9
Participant Comments

AT Corridor	*Number of Responses*
Concerns on the closure of the hospital exit ramp as it is very highly used. Concern on the affect it will have on local businesses.	3
Positive feedback on overall Highway 1 upgrades, concerns on timeline.	2
Suggests removing left hand turns and traffic lights at the intersection and adding off ramp from Highway 1 to Redcliff Drive SW.	1
SW Connector	*Number of Responses*
South Boundary Road to Highway 3 is a good idea, Option 2 (middle alignment) is the most ideal.	1

Email Information from Contact with the Public and Private Property Owners
Date "January 2013"
Number of Participants 4
Participant Comments

AT Corridor	*Number of Responses*
Concerns with making Bomford Crescent a one way (eastbound) access as it will take out the one and only street exit for businesses.	2
Safety concerns with respect to access for ambulance and fire services.	1
Concern on the 16 Street and Highway 1 intersection, suggest possibilty to divert large truck traffic onto Township Road 120.	1
Museum land property currently owned by new owners, portion associated with Bomford is no longer a roadway.	
SW Connector	*Number of Responses*
Unsure of the need for the 3 options for SW Connector.	1
A landowner west of Seven Persons Creek was concerned with Option 2 severing his parcel of land & making development difficult	