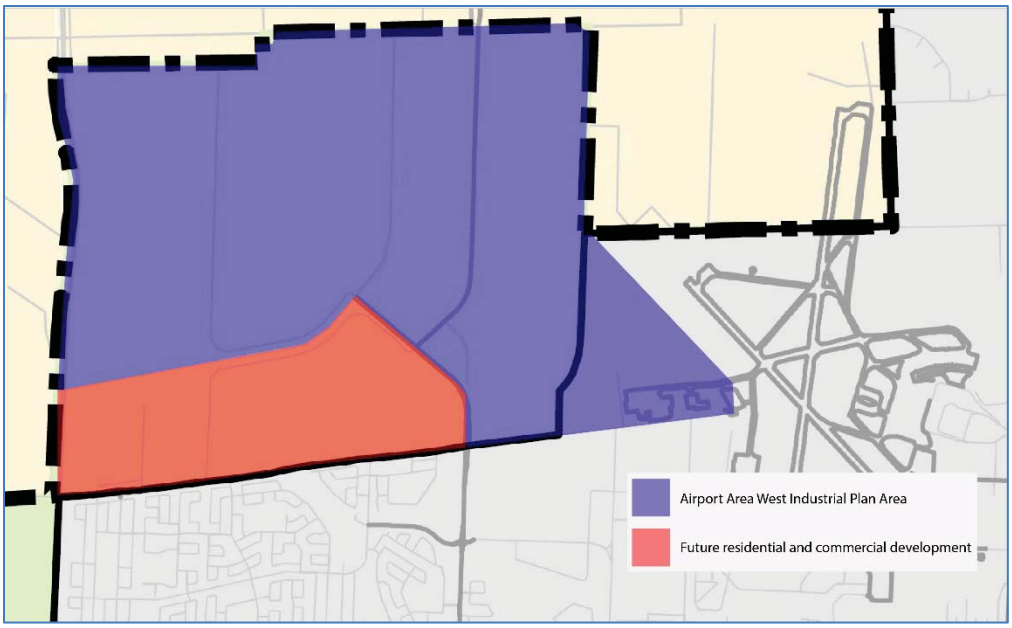
July 30, 2020

Zoning and Permits
Unit 31- 30 Fort St.
Winnipeg, MB
R3C 4X7

RE: SPA Application: Amendment to the Airport Area West Secondary Plan (By-law 8097/2002)

Dear Emmanuel Lao,

Thank you for receiving this secondary plan amendment (SPA) for the Airport Area West Secondary Plan (By-law 8097/2002). The process of preparing an amended secondary plan to govern industrial uses in the Airport Area West plan area has taken several years and has now come to fruition with the attached document. Drafts of this plan have received full Technical Advisory Committee (TAC) review with comments from City of Winnipeg departments reflected in the final version, as such we are confident this plan should meet the expectations of the City of Winnipeg Administration.



Map of general area

In the nearly two decades since the adoption of By-law8097/2002 there has been much change in Airport Area West including:

- the establishment of Centreport Canada inland port and the “special planning district”;
- the construction of Centreport Canada Way (PTH 190);
- the completion of the *City of Winnipeg Employment and Commercial Lands Study;*

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298 Waterfront Drive
Winnipeg, Manitoba R3B 0G5
Tel: 204.453.8008
E-mail: info@landmarkplanning.ca

- re-designation and forthcoming development of new residential communities north of Saskatchewan Avenue (south of PTH 190); and
- shifts in demand and availability of serviced employment lands in the City of Winnipeg.

Furthermore, the adoption of *OurWinnipeg* in 2011 ushered in changes in Winnipeg's long-range planning and policy directions and provides policy direction specific to the City's Employment Lands. The Plan Area sits within the "Employment Lands" designation of the *Ourwinnipeg* Complete Communities Direction Strategy, specifically within the "General Manufacturing" sub-category. As they are guided by policy directions including:

- Ensuring that employment areas are well-planned, sustainable over the long term and fit the community context; and
- To Provide ongoing stewardship of manufacturing areas.

Plan Overview

The proposed updates to the *Airport Area West Industrial (AAWI) Secondary Plan* provide a series of objectives and policies to guide the future development of industrial lands within the Plan Area. The Plan pays mind to the suggestions of the City of Winnipeg *Employment and Commercial Lands Study* and speaks to the policies of the *Ourwinnipeg Complete Communities Direction Strategy* providing direction for well-planned and competitive development of this large employment lands area.

The Airport Area West Industrial (AAWI) Secondary Plan is situated in the western portion of the

City of Winnipeg, comprising approximately 1,026 hectares (2,535 acres) of land, delineated as follows:

- 688 hectares (1,700 acres) for industrial development;
- 219 hectares (541 acres) for the closed Summit Landfill; and
- 119 hectares (294 acres) for the Winnipeg James Armstrong Richardson International Airport

The amended Plan proposed the following land use designations:

- Service-Oriented Industrial;
- Manufacturing and Logistics Industrial;
- Air Serviced Industrial;
- Business Park Industrial;
- Parks, Open Space and Municipal Works;
- Potential Commercial Nodes; and
- Un-serviced Development Overlay.

These designations present a more refined planning framework than those found in the existing plan. Key tenets of the amended plan include the Air Serviced Industrial designation which reserves lands adjacent to the airport for aeronautical and air-service dependent industries, provisions for certain uses without a full range of municipal services within the Un-serviced Development Overlay.

Furthermore, less intensive land use designations, such as the Business Park Industrial, are used to provide buffer between proposed new residential development at the south of the Plan Area and more intensive industrial uses, in order to protect the integrity of the City's Employment Lands.

Public Engagement Summary

Public and stakeholder engagement formed an important role in the preparation of the Plan. The input provided by participants significantly influenced the policies included in the Plan.

Preparation of this Plan was carried out with stakeholder meetings beginning in May 2015 and continuing through and beyond the submission of the intitial draft Plan to the City of Winnipeg for TAC review. A number of consultation mechanisms were employed including an extensive set of stakeholder group meetings, landowner meetings, and a public open house. The notification method was through public advertisements in local and area newspapers, and direct notification as warranted.

The Study Team has had discussions with the following stakeholder groups:

Government and Government Related Agencies

- Manitoba Infrastructure and Transportation;
- Manitoba Conservation and Water Stewardship;
- R.M. of Headingley;
- R.M. of Rosse;r
- Various City of Winnipeg Departments including Water and Waste, Planning, Property and Development, Winnipeg Transit, and Public Works;
- Manitoba Hydro;
- Canadian Pacific Railway;
- Economic Development Winnipeg; and
- Inland Port Special Planning Area.

Major Landowners and Related Entities

- Winnipeg Airport Lands Corporation;
- CentrePort Canada;
- Winnipeg Airports Authority;
- Ladco Company Limited;
- Qualico Communities;
- Genstar Development Company;
- Sturgeon Business Park; and
- Other area landowners.

Additionally, a public open house was held in April 2016 to present, discuss and assist in the development of this Plan. The Open House focused on what secondary/precinct plans are and how they may affect the community, the overall land use plan, infrastructure concepts, and related background information such as roadway and servicing considerations.

Closing

In order to assist with your evaluation of this application please find the following enclosures:

- Letter of intent (5 copies);
- AAWI Secondary Plan (5 copies);
- Transportation Study prepared by Stantec Consulting (1 copy);
- Servicing analysis prepared by Stantec Consulting (1 copy);
- Economic Analysis prepared by Manitoba Bureau of Statistics (1 copy); and
- Economic Overview prepared by WALC (1 copy).

Thank you for accepting these materials. If you have any further questions please contact me at (204) 453-8008 or jpratte@landmarkplanning.ca

Kind Regards,



Jeff Pratte RPP, MCIP

Airport Area West Secondary Plan Amendment Transportation Analysis

Airport Area West Secondary Plan Transportation Analysis

Stantec

Prepared for:
Winnipeg Airport Lands Corporation

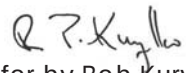
Prepared by:
Stantec Consulting Ltd.
500-311 Portage Avenue
Winnipeg, MB R3B 2B9



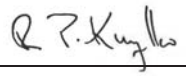
March 6, 2018
May 2020 Rev.

Sign-off Sheet

This document entitled Airport Area West Secondary Plan Amendment Transportation Analysis was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Winnipeg Airport Lands Corporation (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by  Signed for by Bob Kurylko, P.Eng.
(signature)

Steven Florko, EIT

Reviewed by 
(signature)

Robert (Bob) Kurylko, P. Eng.

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1.0 INTRODUCTION

The purpose of the Airport Area West (AAW) transportation analysis was to estimate the extent of development in AAW and surrounding areas that can be supported by various levels of transportation infrastructure development on Centreport Canada Way. Three scenarios were created:

- **Scenario 1** – A representation of the extent of development (approx. 30%) that can be supported by the existing intersections. Estimated build out by 2030.
- **Scenario 2** – A representation of the extent of development (approx. 50%) that can be supported with improvements to the existing intersections and the creation of a new intersection approximately halfway between the existing Centreport Canada Way (CCW) intersections. Estimated build out by 2040.
- **Scenario 3** – A representation of full build out conditions within the Centreport Precinct. Full build out estimated to be complete by 2066.

The selected Scenario timeframes were developed based on a conservative rate of development (16 acres per year) and an aggressive rate of development (24 acres per year). Development was assumed to begin in 2016. Furthermore, Scenario 3 (full build out) was assumed to occur within 50 years.

It is important to note that this transportation analysis is not a Transportation Impact Study (TIS). A TIS aims to identify how a new development will impact existing transportation infrastructure, and to determine what infrastructure modifications are required to accommodate the new development.

The AAW transportation analysis instead focuses on estimating the extent of development that can occur at several pre-selected levels of infrastructure development. Determination of infrastructure modifications required to accommodate full build out of AAW and surrounding lands was considered outside the scope of the AAW transportation analysis.

The geographic scope of analysis was limited to the following intersections, and the road segments connecting them:

1. Centreport Canada Way (CCW) at Sturgeon Road
2. Centreport Canada Way (CCW) at Sturgeon Access Road
3. Sturgeon Road/Sturgeon Access Road at Summit Road
4. A proposed new intersection on Centreport Canada Way (CCW) midway between the existing CCW intersections

Figure 1 shows the study intersections.

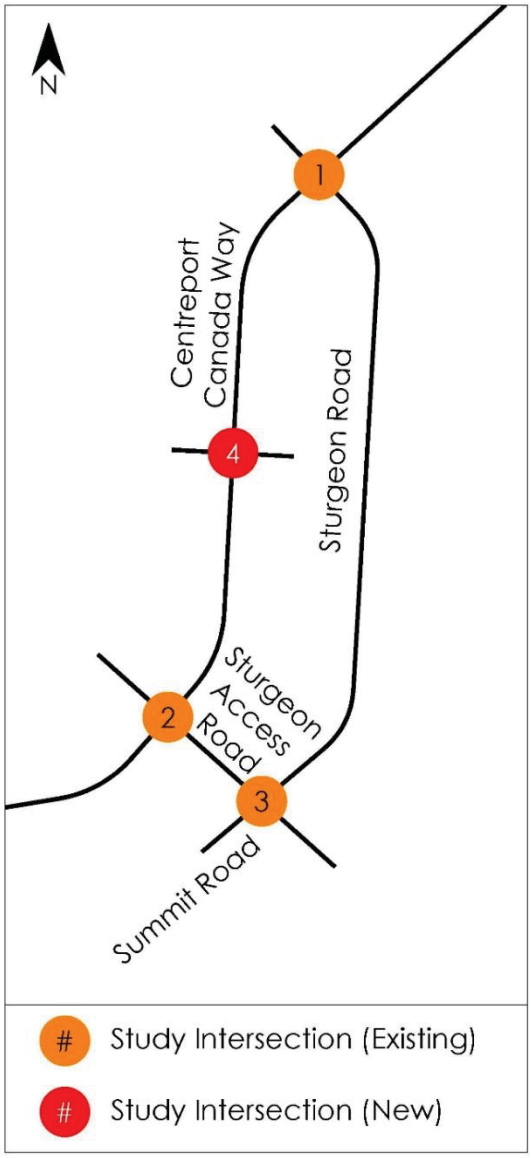


Figure 1: Study Intersections

In each of the analysis scenarios, the analyses focused on the weekday AM and PM peak hour, with consideration of weekday average daily traffic (ADT). Traffic signal warrant analyses were conducted for the intersection of Sturgeon Road/Sturgeon Access Road and Summit Road.

The following sections of this report include discussion on the development of traffic volumes, the analysis procedure, and the results of the analysis. Potential travel demand management measures are suggested, but no analysis was undertaken to determine how effective any of the measures may be.

2.0 TRAFFIC VOLUMES

Traffic volumes used for analysis included four components:

- Existing background traffic volumes;
- New traffic generated from the Airport Area West Lands;
- New traffic generated from residential and commercial development south of the Airport Area West Lands;
- New traffic generated from industrial development in the RM of Rosser.

The following sections discuss how each traffic component was developed.

2.1 BACKGROUND TRAFFIC

Background traffic consists of traffic that is currently on the facility. Under normal conditions, the background traffic grows at a rate reflective of generalized growth in a community over time. In Winnipeg, and surrounding areas, that growth has historically been in the 1% per year range in mature development areas. For the Centreport Canada Way traffic growth, it was assumed that after the initial surge in traffic due to opening and redistribution of traffic flows, a leveling off would occur. Longer-term growth in traffic was assumed to be based on new development with direct impact on the route only.

Background traffic at the intersection of CCW and Sturgeon Access Road and at the intersection of Sturgeon Road/Sturgeon Access Road and Summit Road was quantified using traffic counts conducted by MMM Group Ltd (now WSP) in 2015.

Traffic data for the intersection of CCW and Sturgeon Road was taken from Manitoba Highway Traffic Information System (MHTIS) traffic counts collected in 2014. This count data was organized into 14-hour (7:00 AM to 9:00 PM) segments. Conversion factors were then developed from Permanent Counting Stations (PCS) to create AM and PM peak hour traffic volumes from the 14-hour segments. PCS data includes historical annual average daily traffic (AADT) data, and temporal data by hour of day, day of week, and month of year. The following PCS were used to develop the conversion factors:

- Station 20 – PTH 101, 1.4 km East of PTH 8
- Station 55 – PTH 1, 3.9 km West of PR 334

Using the hourly traffic data from these PCS, the relationships between 14-hour volumes and the AM and PM peak hours was determined. The resulting conversion factors based on the average of the two PCS used resulted in the following relationship:

- AM Peak Hour Volume = 7.75% of 14-Hour Volume
- PM Peak Hour Volume = 10.50% of 14-Hour Volume

These relationships were used with the 14-hour traffic volumes to develop AM and PM peak hour volumes at the intersection of CCW and Sturgeon Road. Those volumes were balanced to match the WSP estimates at CCW and Sturgeon Access Road and at Sturgeon Road/Sturgeon Access Road and Summit Road.

Figure 2 shows existing AM and PM peak hour volumes at the study intersections. The volumes are either taken from or balanced to 2015 counts, and thus the volumes represent 2015 background traffic conditions.

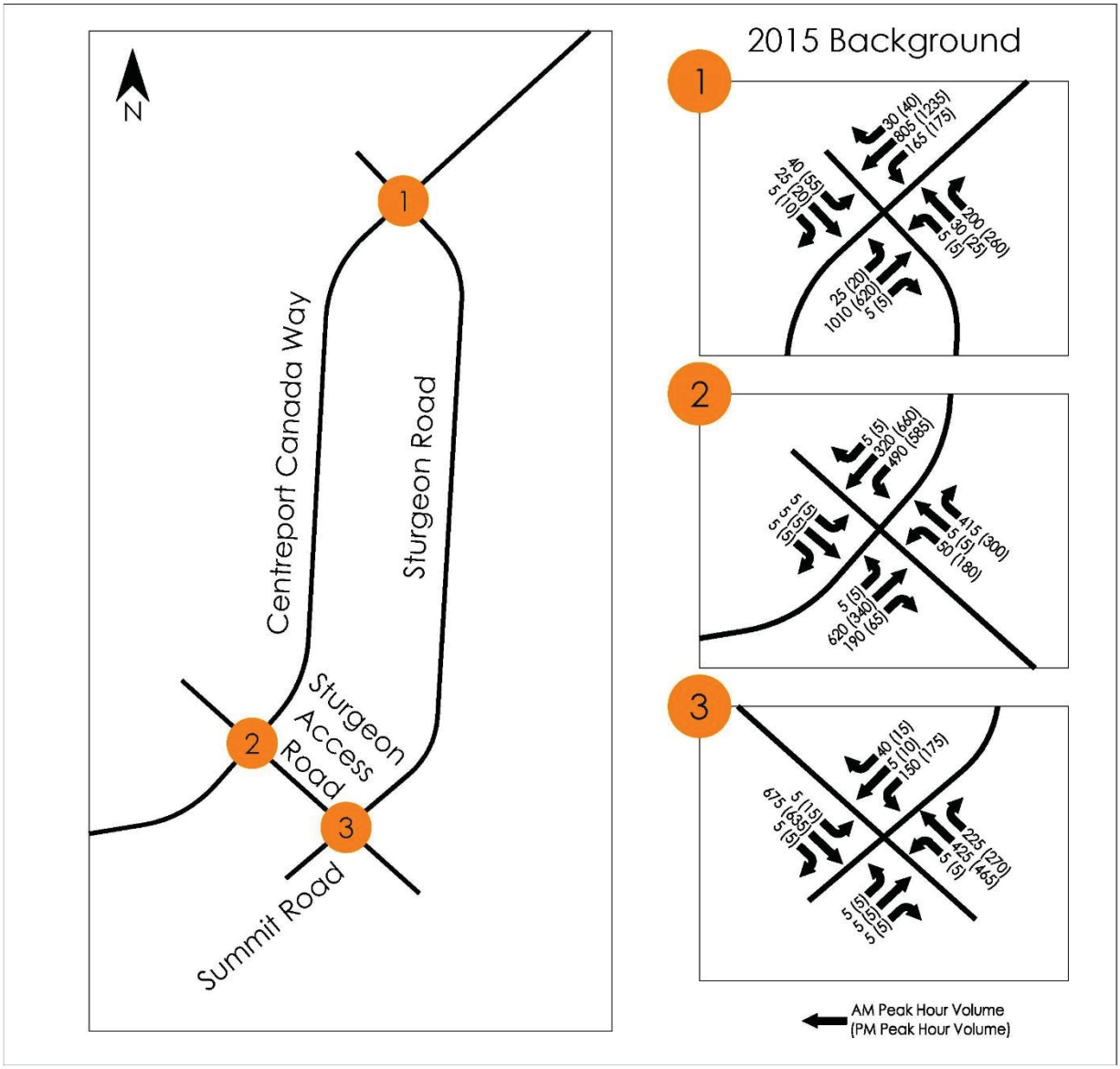


Figure 2: 2015 Background Traffic Volumes

In the 2030, 2040, and 2066 scenarios, all growth in traffic beyond 2015 levels was assumed to be as a result of traffic generated in the Airport Area West Lands and adjacent areas. Determination of generated traffic growth is described in the following sections.

2.2 NEW GENERATED TRAFFIC

New generated traffic was estimated for three distinct components:

- Industrial development in the Airport Area West Lands;

- Residential and commercial development south of the Airport Area West Lands; and
- Industrial development in the RM of Rosser.

Figure 3 shows the boundaries for each of the component areas.

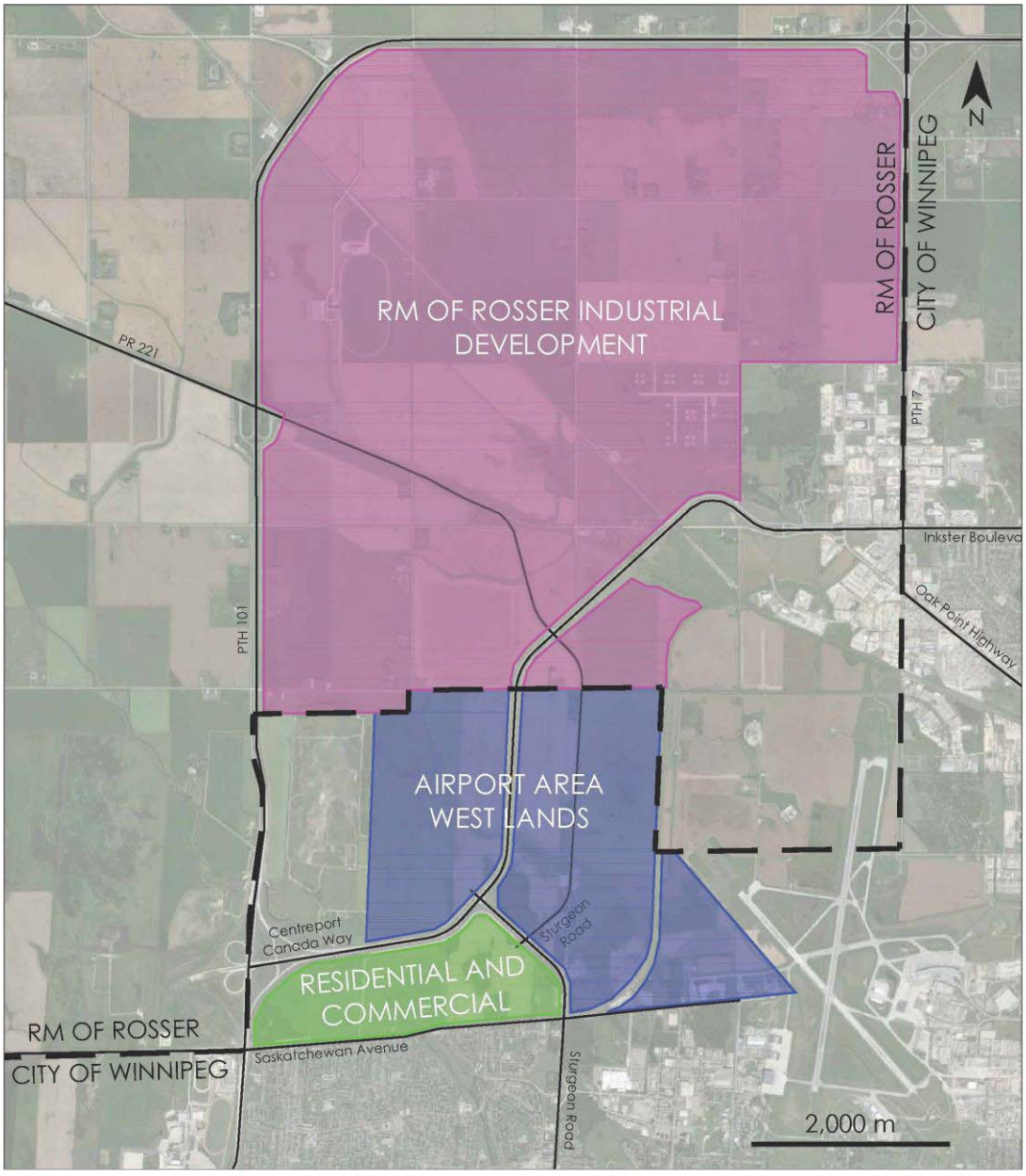


Figure 3: Development Areas

Traffic volumes for each component were estimated using a modified four-step transportation model. National Cooperative Highway Research Program (NCHRP) Report 365: *Travel Estimation*

Techniques for Urban Planning provides an outline of the conventional four-step transportation model, as summarized below:

1. **Trip generation**
   "How much demand for travel?"

2. **Trip distribution**
   "How is the travel demand spread between different origins and destinations?"

3. **Mode Choice**
   "How much of the travel demand will be served by each mode of travel considered?"

4. **Route Assignment**
   "What routes will trips take through the network?"

Landmark Planning and Design Inc. provided proportions and arrangements of various land uses within the Airport Area West Lands. Estimates of trip generation from the residential and commercial development were derived from the Airport Area West ASP Transportation Review conducted by WSP for Genstar Development Company. Trip generation for the RM of Rosser component was estimated from available documentation about land uses in the Centreport area in the RM of Rosser.

2.2.1 Trip Generation

Trip generation estimates were completed using data from the Institute of Transportation Engineers *Trip Generation Manual, 9th Edition*. Table 1 shows trip generation data for the three scenarios listed in Section 1.0, for each of the traffic components.

Traffic Volumes
March 6, 2018

Table 1: Trip Generation

		Scenario 1		Scenario 2		Scenario 3	
Land Use (ITE Code)	**Trip Gen. Rate per Unit (AM/PM/ADT)**	**Units**	**Trips Generated (AM/PM/ADT)**	**Units**	**Trips Generated (AM/PM/ADT)**	**Units**	**Trips Generated (AM/PM/ADT)**
Centreport Industrial		**169 ac**	**2,380 2,137 17,145**	**417 ac**	**5,380 4,896 38,741**	**1,499 ac**	**15,311 14,509 100,394**
Business Park (770)	18.86 16.84 149.79	84 ac	1,584 1,415 12,582	168 ac	3,168 2,829 25,164	250 ac	4,715 4,210 37,448
Industrial Park (130)	8.20 8.53 61.17	0 ac	-	38 ac	312 324 2,324	98 ac	804 836 5,995
Light Industrial (110)	7.51 7.26 51.80	8 ac	60 58 414	57 ac	428 414 2,953	281 ac	2,110 2,040 14,556
Warehousing (150)	10.03 8.69 57.23	63 ac	632 547 3,605	126 ac	1,264 1,095 7,211	467 ac	4,684 4,058 26,726
Manufacturing (140)	7.44 8.35 38.88	14 ac	104 117 544	28 ac	208 234 1,089	403 ac	2,998 3,365 15,669
Centreport Residential + Commercial		**1,714 du 170,000 sf**	**1,275 2,295 28,692**	**2,238 du 170,000 sf**	**1,621 2,677 32,783**	**2,729 du 170,000 sf**	**1,965 3,050 36,763**
Residential (SF – 210)	See Note 1	982 du	705 880 9,046	1,473 du	1,051 1,262 13,137	1,964 du	1,395 1,635 17,117
Residential (MF – 223)	See Note 1	765 du	290 345 7,469	765 du	290 345 7,469	765 du	290 345 7,469
Commercial (820)	See Note 1	170,000 sf	280 1,070 12,177	170,000 sf	280 1,070 12,177	170,000 sf	280 1,070 12,177

Traffic Volumes
March 6, 2018

RM of Rosser Industrial		**182 ac**	**1,335 1,222 13,611**	**364 ac**	**2,670 2,444 27,222**	**856 ac**	**7,532 7,013 59,079**
Light Industrial (110)	7.51 7.26 51.80	43 ac	323 312 2,227	86 ac	646 624 4,454	130 ac	976 944 6,734
Warehousing (150)	10.03 8.69 57.23	0 ac	-	0 ac	-	102 ac	1,023 886 5,837
Manufacturing (140)	7.44 8.35 38.88	0 ac	-	0 ac	-	102 ac	759 852 3,966
Research and Development Centre (760)	16.77 15.44 79.61	0 ac	-	0 ac	-	102 ac	1,716 1,580 8,144
Intermodal Truck Terminal (030)	7.28 6.55 81.90	139 ac	1,012 910 11,384	278 ac	2,024 1,820 22,768	420 ac	3,058 2,751 34,398
Total	**% Development (trips)**	**351 ac 1,714 du 170,000 sf**	**4,990 5,654 59,448 30%**	**781 ac 2,238 du 170,000 sf**	**9,671 10,017 98,746 50%**	**2,355 ac 2,729 du 170,000 sf**	**24,808 24,572 196,236 100%**

2.2.2 Directional Distribution

[1] Trip generation calculations from WSP Ltd Airport Area West ASP Transportation Review

Generated traffic was distributed by direction according to the distributions shown on Figures 16 through 20 in Appendix A. These distributions were developed using the 2007 Winnipeg Area Transportation Study. Broadly, the distribution was:

- To/From PR 221/Inkster Boulevard = 40%
- To/From Sturgeon Road / Moray Street / Saskatchewan Avenue = 35%
- To/From PTH 101 = 25%

2.2.3 Mode Split

In this analysis no modal split was used, so 100% of trips were assumed to be vehicle trips. This is a conservative assumption that will yield higher traffic volumes than would occur if some trips were made by transit or active modes (walking or cycling). Section 4.3 includes discussion on shifting trips from private vehicles to Transit.

2.2.4 Route Assignment

Route Assignment reflects the most likely routing from origin sub-region to destinations outside the study area. No consideration for capacity constraints were applied at this time. Return trips were assumed to follow the same route. 2030, 2040, and 2066 Volumes

Figure 4 shows the development generated AM and PM peak hour traffic volumes for the 2030, 2040, and 2066 scenarios.

Figure 5 shows the 2030, 2040, and 2066 AM and PM peak hour post-development traffic volumes. The post-development volumes include the existing (2015) background traffic, as well as the development generated traffic.

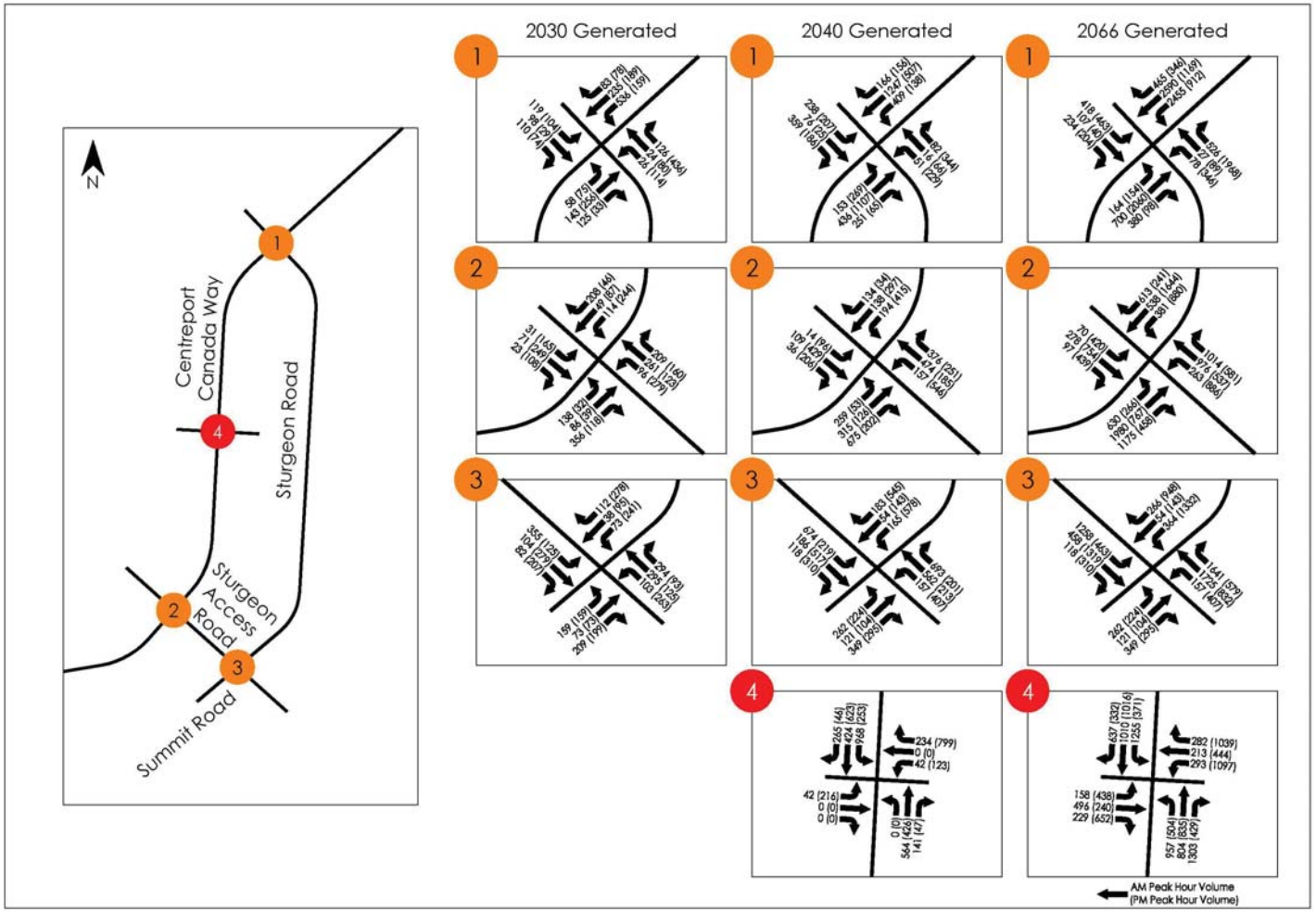


Figure 4: 2030, 2040, and 2066 Development Generated Traffic

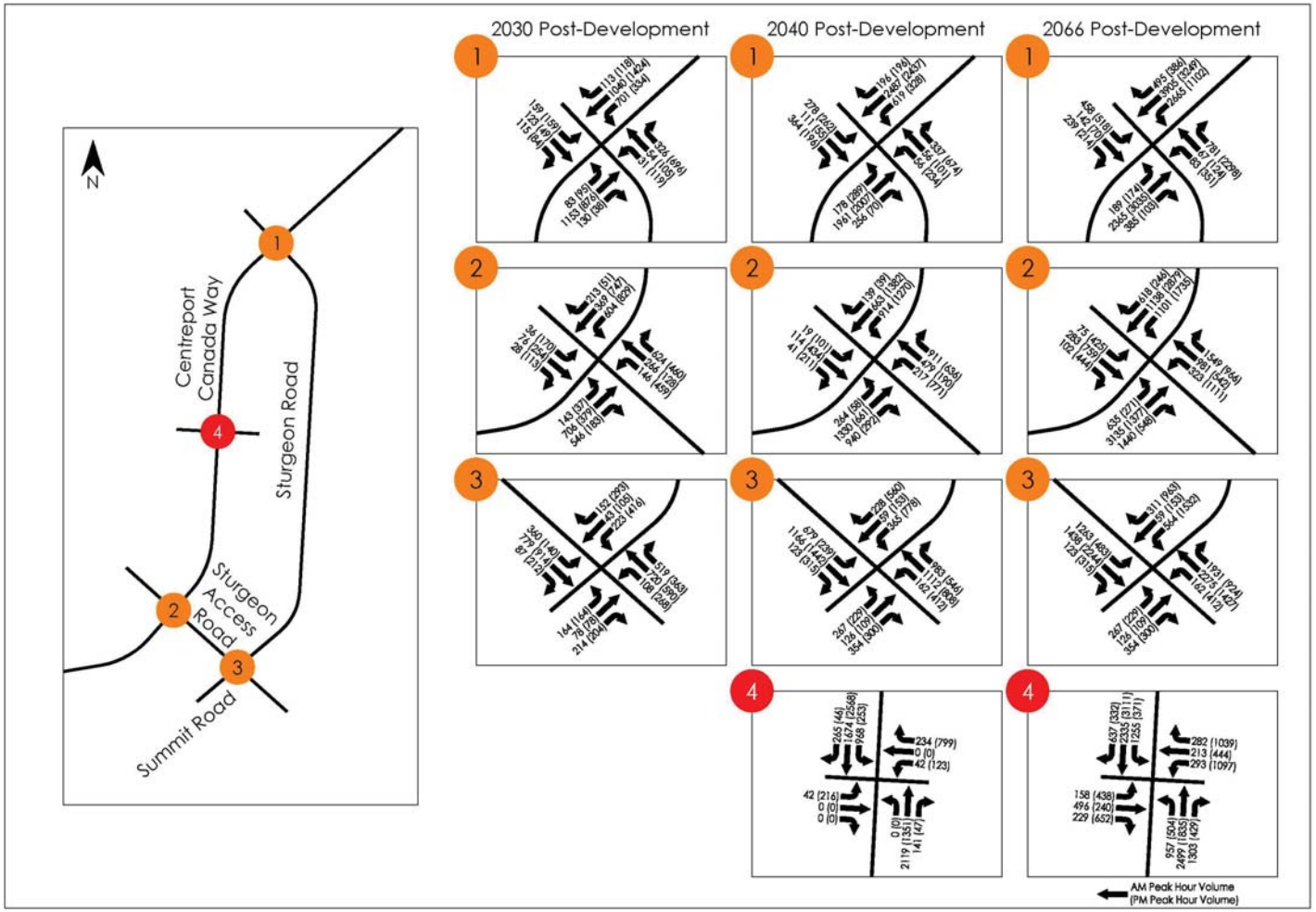


Figure 5: 2030, 2040, and 2066 Post-Development Traffic

3.0 ANALYSIS

This study includes peak hour traffic operations analyses, traffic signal warrant analyses, and consideration of average daily traffic volumes as a means to provide feedback on the appropriate number of traffic lanes for road segments.

The following sections describe the analysis process and results of each analysis.

3.1 PEAK HOUR TRAFFIC OPERATIONS ANALYSIS

This analysis was conducted using *Synchro 9.0* traffic analysis software. This analysis was completed for both the AM peak hour and the PM peak hour. Results are reported in terms of delay, level of service (LOS), volume to capacity (v/c), and intersection capacity utilization (ICU). These terms are discussed in Appendix B.

The analysis used the following assumptions:

- The analysis reports overall intersection performance, as well as performance for critical movements. Critical intersection movements were defined as movements that met at least one of the following conditions:
    - Level of Service E or worse.
    - Volume to capacity ratio of 0.85 or greater.
- Saturated flow rates were set to the Synchro default 1,900 vehicles per hour per lane.
- All legal intersection vehicle movements were modeled with volumes of at least five (5) vehicles per hour.
- Peak hour factors (PHFs) were set to 0.95
    - PHFs represent the fluctuation in traffic flow within the peak hour, with lower PHFs indicating greater "peaking" within the peak hour, and higher PHFs representing more consistent flow within the hour. Typically, analyses for future scenarios use PHFs from 0.85 to 0.92. A PHF of 0.95—as used in this study—represents consistent flow through the entire peak hour, with limited peaking within the hour. For this study the analysis was concerned with general accuracy, with less of a focus on precision. As such, the PHF was set to 0.95 as a simplifying assumption. Future analyses to inform detailed design should use PHFs based either on existing data or on more precise estimates.
- Heavy vehicle percentages (HV%) were set to 10% for all movements.
    - A 2017 traffic count on Inkster Boulevard west of Brookside Boulevard showed that Inkster Boulevard through movements had peak hour HV%s ranging from

approximately 5% to approximately 15%. Based on this data, 10% HV% for all movements is a reasonable approximation.

- All traffic signals were set to operate with 4 second amber intervals and 2 second all red intervals.
- Minimum initial splits were set at 5 seconds with minimum splits set at 11 seconds
- Intersections were analyzed without considering pedestrian crossing timings or pedestrian crossing volumes.
    - This was a simplifying assumption for this high-level analysis. Future analyses to inform detailed design should use realistic pedestrian crossing timings and volumes.
- Intersections were analyzed as part of a connected network, not independently.
    - Note that although the intersections were analyzed as part of a connected network, effects from adjacent intersections are only considered by Synchro were for intersections with the same cycle length (or half cycle length) as the intersection in question. Arrivals from adjacent intersections with different cycle lengths are treated as random arrivals.

The following sections show the analysis results.

3.1.1 Analysis Scenario 1

Analysis Scenario 1 assumes 30% of total projected trips generated and represents the extent of development that can occur without causing excessive peak hour traffic congestion at any of the existing intersections. This scenario used trip generation as shown in Table 1 and intersection volumes and extent of development are shown on Figure 12, included in Appendix A.

The intersection of CCW and Sturgeon Road was analyzed using the existing intersection geometry, as shown on Figure 6.

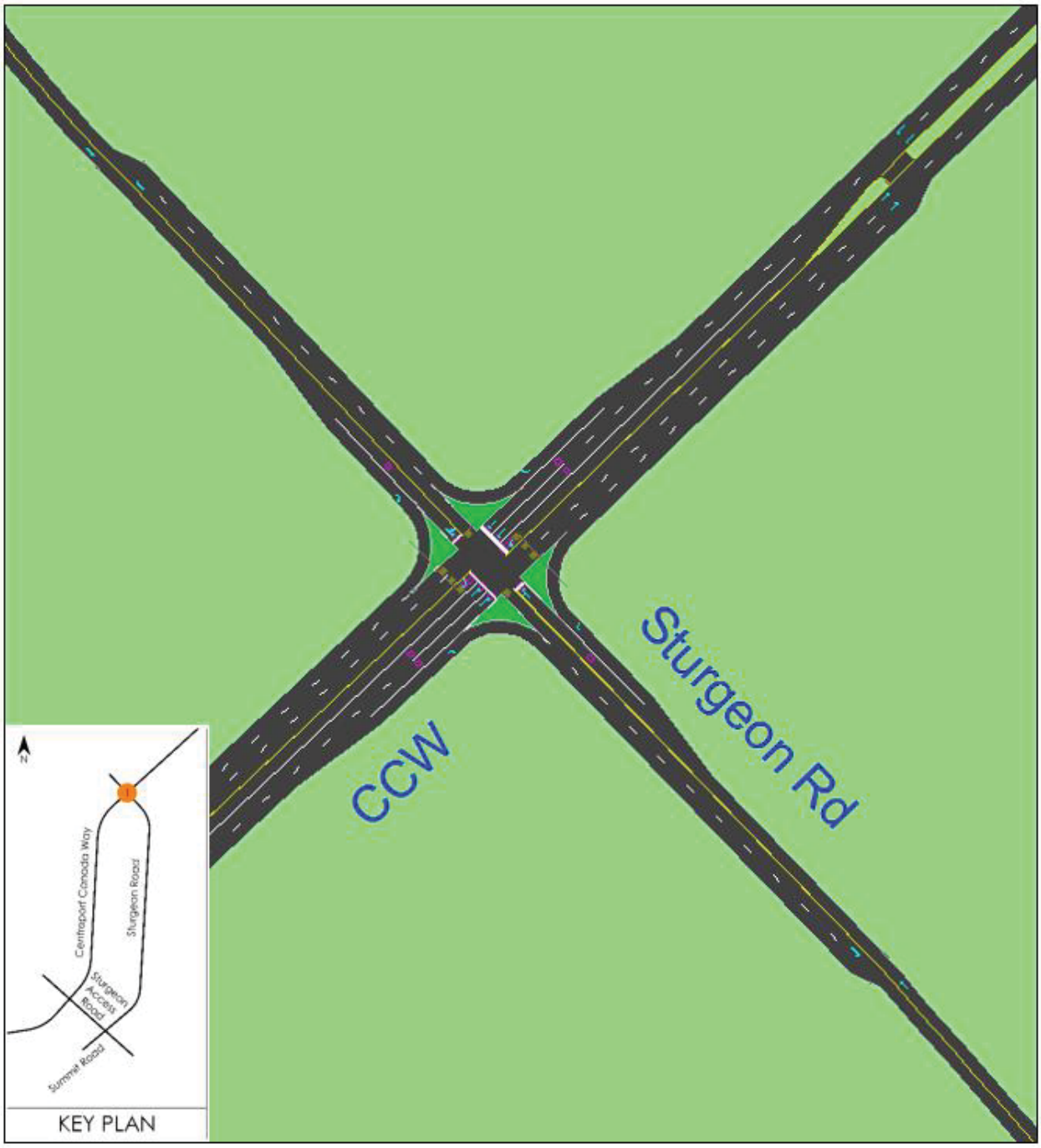


Figure 6: CCW & Sturgeon Rd Scenario 1 Intersection Configuration

At the intersection CCW has two lanes per direction plus single left-turn lanes and right-turn deceleration lanes with cut-offs. Sturgeon Road has one lane per direction plus right-turn lanes with cut-offs. Due to the speed limit (70 km/h) on CCW at the intersection, left-turn

accommodation on CCW was analyzed under protected-only operation. Left-turns on Sturgeon Road were analyzed under split phasing.

Figure 7 shows the intersection configuration used for the analysis at CCW and Sturgeon Access Road.

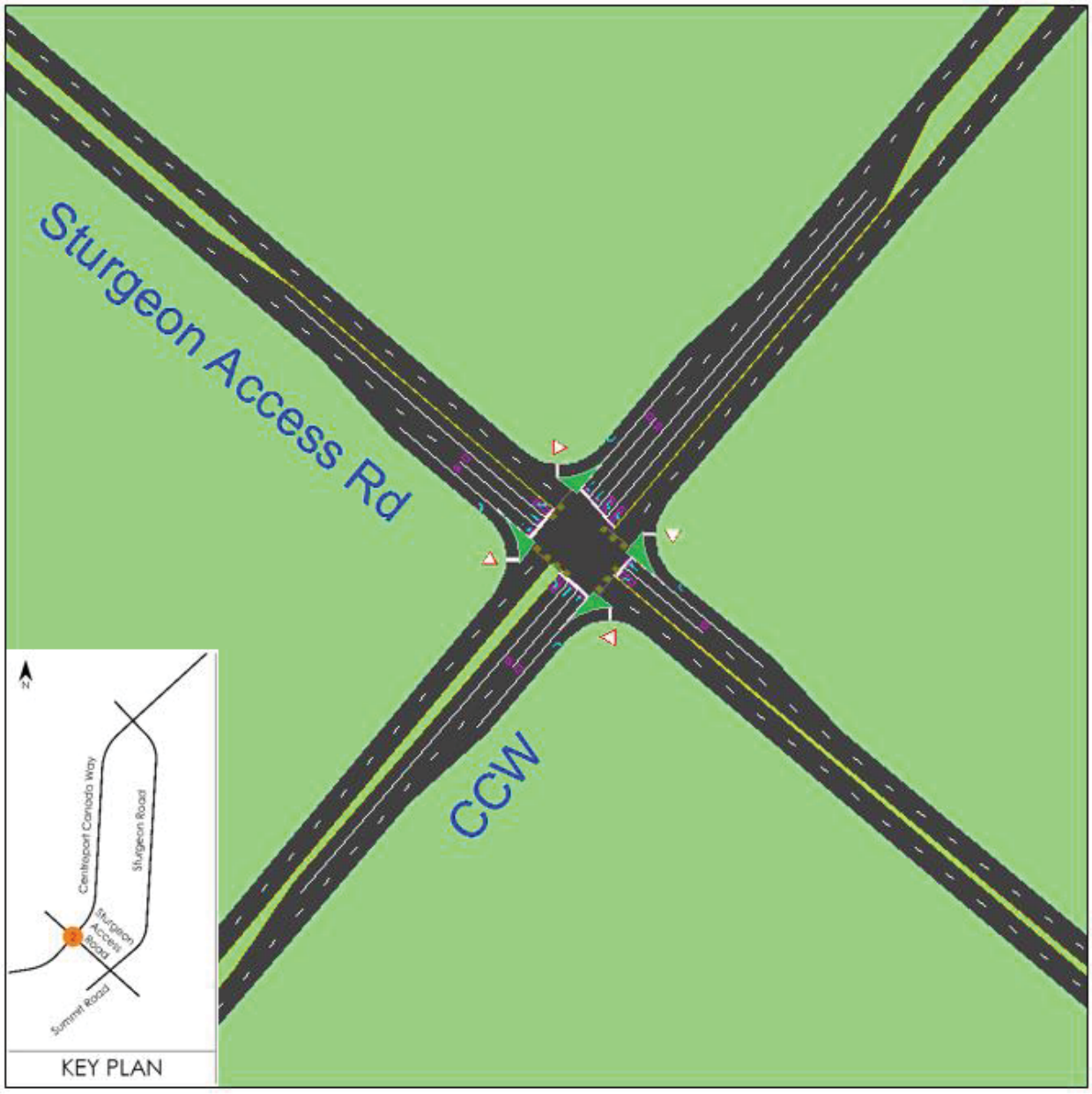


Figure 7: CCW & Sturgeon Access Road Scenario 1 Intersection Configuration

At the intersection CCW has two lanes per direction plus right-turn deceleration lanes with cut-offs, a single northbound left-turn lane, and dual southbound left-turn lanes. Sturgeon Access

Road has two lanes per direction plus right-turn lanes with cut-offs, and a southbound left-turn lane. The intersection is modified slightly from the existing intersection, to provide additional traffic lanes on the north leg, which currently exists as a service road access. Left-turns on all approaches were set to protected-only operation.

Figure 8 shows the intersection configuration used for the analysis at Sturgeon Access Road/Sturgeon Road and Summit Road.

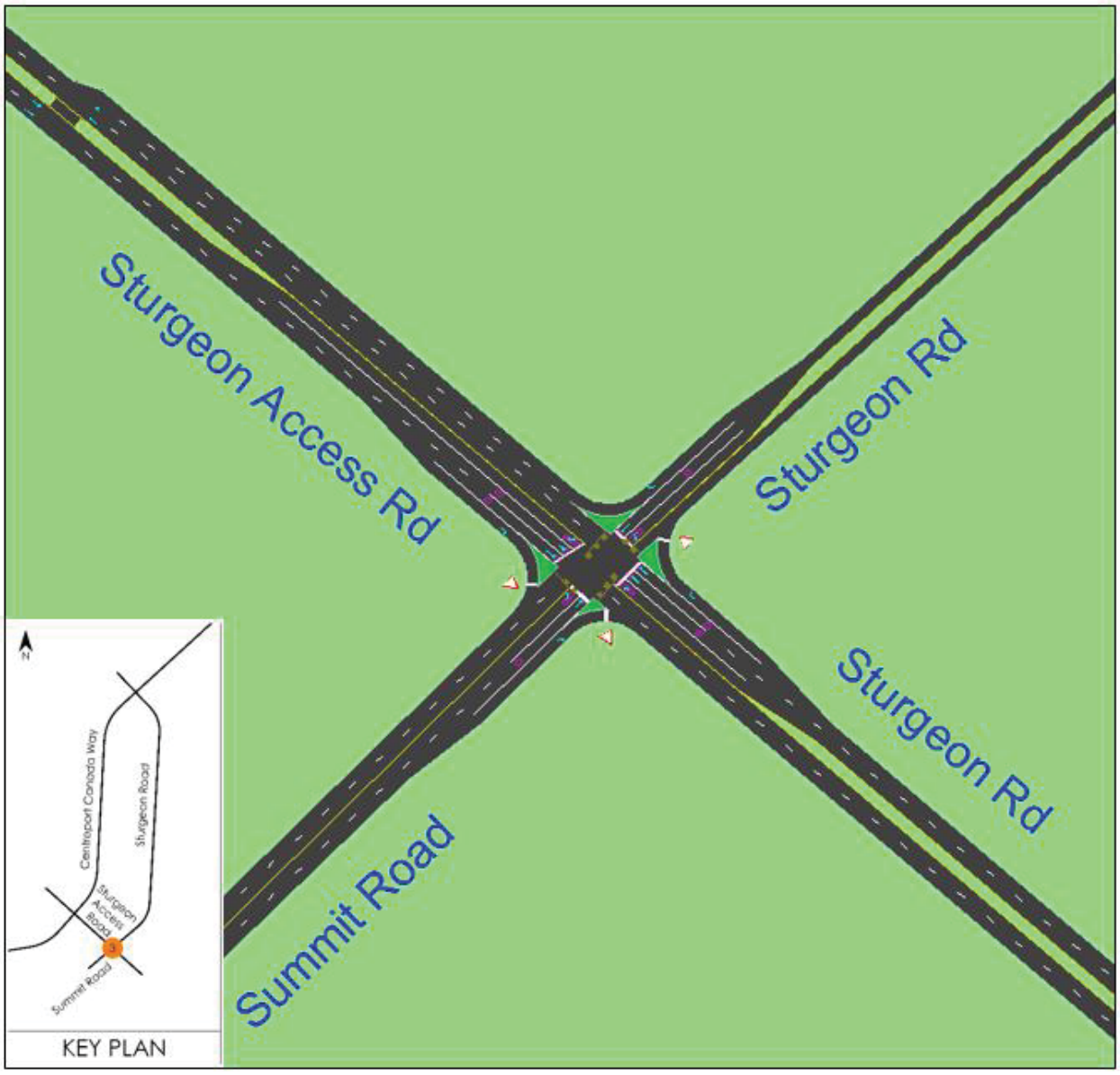


Figure 8: Sturgeon Access Road & Summit Road Scenario 1 Intersection Configuration

Sturgeon Road has two lanes per direction through the intersection, plus left-turn lanes and right-turn lanes with cut-offs. This is similar to the existing intersection, with the addition of a westbound left-turn lane and an eastbound right-turn lane. Sturgeon Road southbound is modified to a three-lane approach from the existing two-lane approach. This change converts the existing shared through-and left turn lane to an exclusive through lane plus an exclusive left-turn lane. The south leg (Summit Road) is modified from the existing two-lane service road access to a four-lane access. The intersection currently operates under two-way stop control, but in Scenario 1 it was analyzed under traffic signal control, with all left-turns were set to operate under protected phasing. Warrants for traffic signal control are discussed in Section 3.2.

Table 2 shows the results of the Scenario 1 analysis. Results are shown for overall intersection performance and for critical movements, as defined in 3.1. Results for the AM peak hour are shown first, with PM peak hour results following in parentheses.

Table 2: Scenario 1 Analysis Results

Intersection	Overall Intersection Performance (LOS / Delay / ICU)	Critical Movements (Movement / LOS / Delay / v/c)
CCW & Sturgeon Rd (1)	F / 105 / 110% (E / 58 / 78%)	SET / F / 153/ 1.31 NWT / F / 112 / 0.80 NEL / E / 87 / 0.64 NET / F / 175 / 1.28 SWL / F / 170/ 1.26 (SET / F / 74 / 0.96) (NWT / E / 75 / 0.85) (NEL / F / 153 / 1.02) (SWL / F / 65 / 1.03)
CCW & Sturgeon Access Rd (2)	D / 37 / 77% (D / 52 / 87%)	SEL / E / 64 / 0.45 NEL / E / 59 / 0.70 NET / E / 56 / 0.93 SWL / E / 63 / 0.94 (SEL / E / 77 / 0.85) (SET / E / 77 / 0.9) (NWL / E / 68 / 1.0) (NEL / E / 58 / 0.4) (NET / F / 91 / 1.00) (SWL / F / 80 / 1.04)
Sturgeon Rd / Sturgeon Access Rd & Summit Rd (3)	C / 32 / 74% (D / 40 / 85%)	SEL / E / 70 / 0.94 NWL / E / 60 / 0.81 NET / E / 65 / 0.62 SWL / E / 78 / 0.90 (SEL / E / 68 / 0.69) (NWL / F / 115 / 1.06) (NET / F / 131 / 0.95) (SWL / F / 98 / 1.06)

The worst performance was at CCW & Sturgeon Road in the AM peak hour, where the conflict between northwest bound (CCW) through movements and southwest bound (CCW) left-turns produced v/c ratios of up to 1.31 on those movements, and similar v/c ratios for southeast bound (Sturgeon Road) through movements. For all other movements at all three intersections v/c ratios were slightly above or below 1.00 in the AM and PM peak hours. This represents near-

capacity conditions at the three intersections, which could be partially mitigated with refinements to signal timing and with the caveat that the CCW & Sturgeon Road intersection has some movements significantly over-capacity in the AM peak hour.

3.1.2 Analysis Scenario 2

Analysis Scenario 2 assumes 50% of total trips generated and represents the extent of development that can occur if the existing intersections are improved to accommodate the expected traffic volumes, and a new intersection providing additional access to development areas is added on CCW approximately halfway between the existing CCW intersections. Figure 13 in Appendix A shows the development areas included in this scenario.

Figure 9 shows the improved configuration for the intersection of CCW and Sturgeon Road.

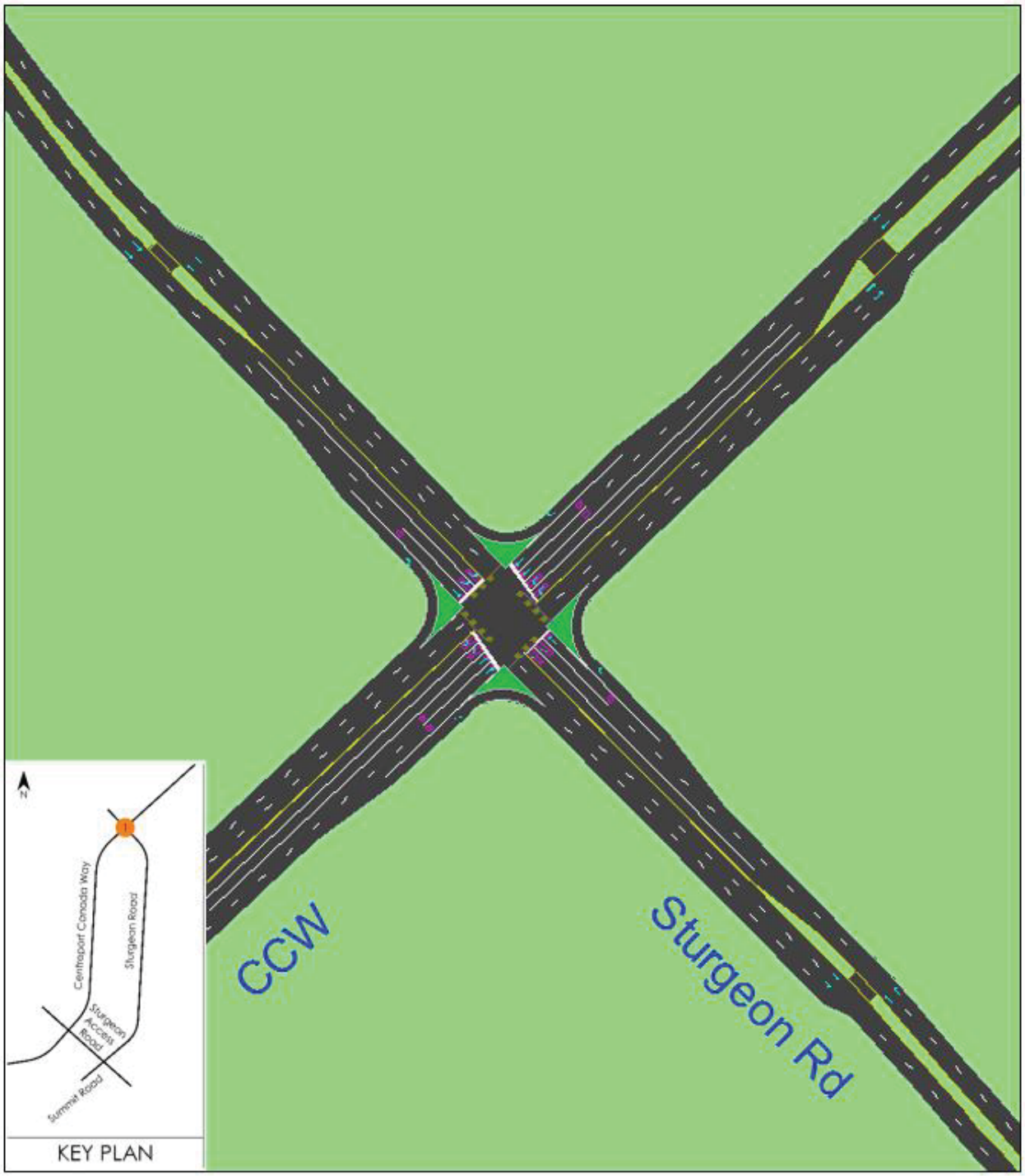


Figure 9: CCW & Sturgeon Rd Scenario 2 Intersection Configuration

The intersection was modified to include dual left-turn lanes on all approaches. This included widening Sturgeon Road southeast and northwest of the intersection to receive the dual left-turns from CCW.

Figure 10 shows the modified intersection configuration at CCW and Sturgeon Access Road.

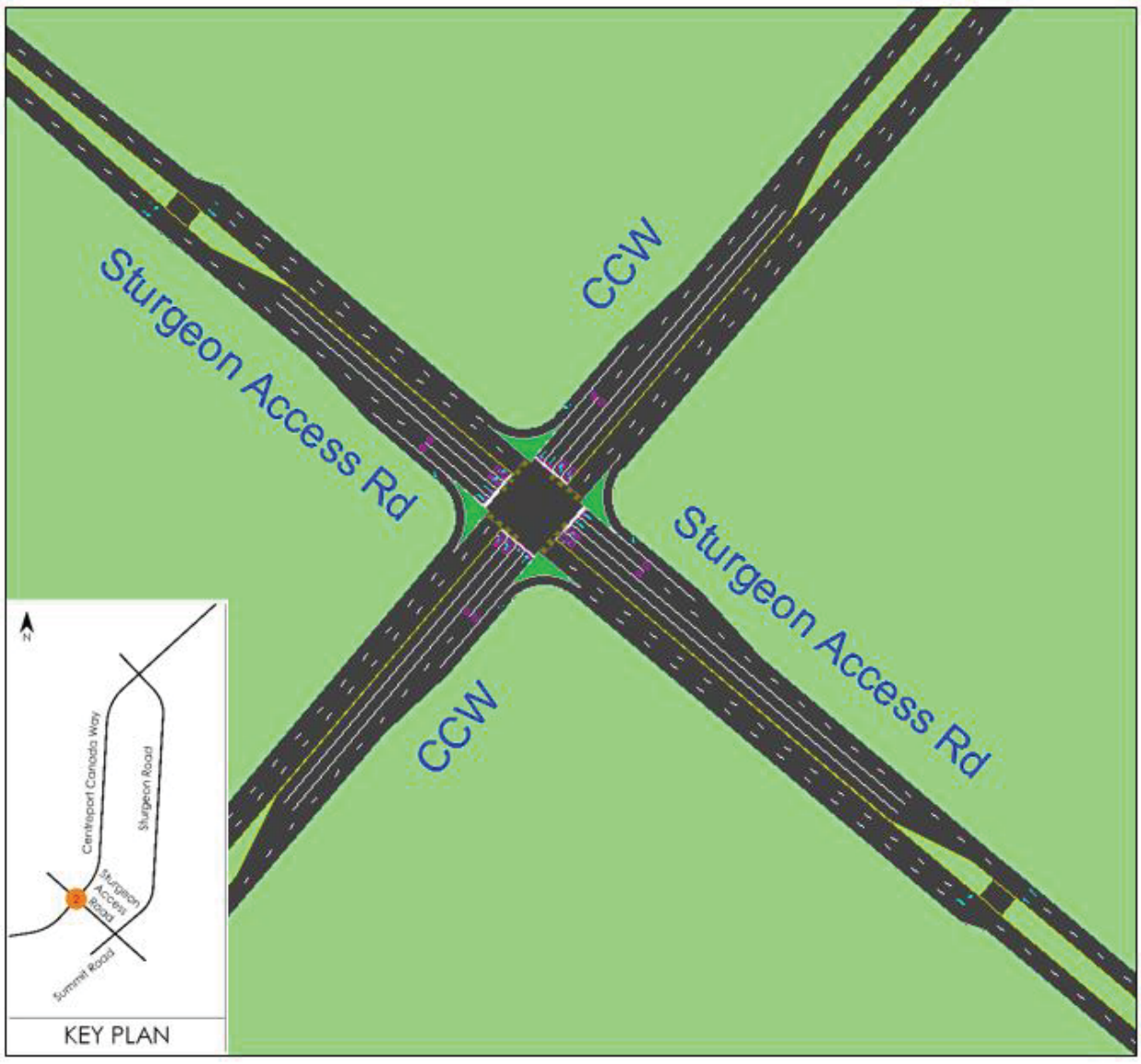


Figure 10: CCW & Sturgeon Access Road Scenario 2 Intersection Configuration

The intersection was modified to include a second northbound left-turn lane on CCW, plus an additional northwestbound through lane on Sturgeon Access Road, and second left-turn lanes in both directions on that road. In all directions right-turn lanes were modified to include acceleration lanes.

Figure 11 shows the modified intersection configuration at Sturgeon Access Road/Sturgeon Road and Summit Road.

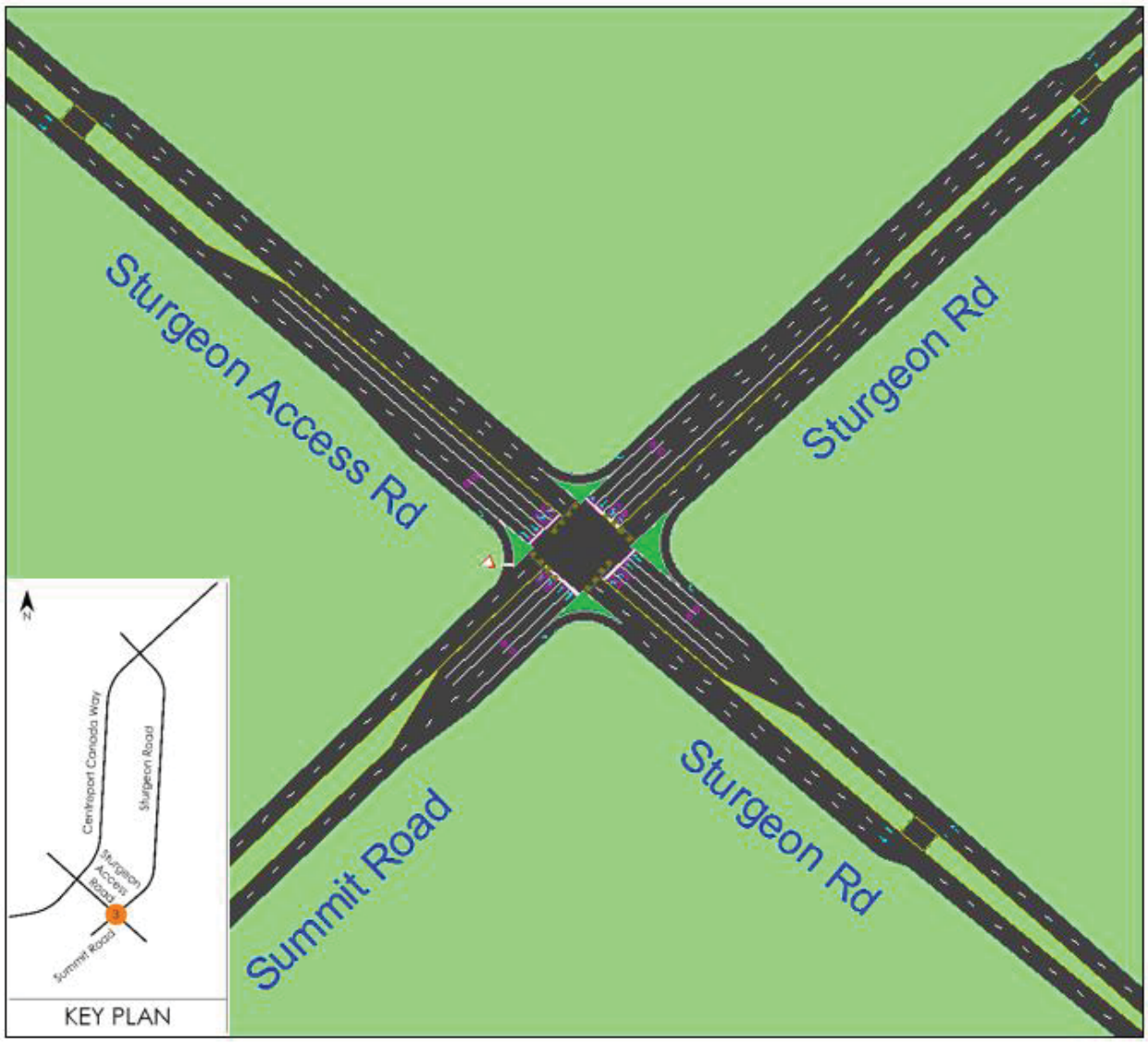


Figure 11: Sturgeon Access Road & Summit Road Scenario 2 Intersection Configuration

The intersection was modified to include two dual left-turn lanes in both directions on Sturgeon Access Road/Sturgeon Road, and to include two through lanes and dual left-turn lanes in each direction on Summit Road and Sturgeon Road southbound. Acceleration lanes were added for westbound and northbound right-turns.

Figure 12 shows the configuration of the new intersection on CCW midway between the two existing intersections.



Figure 12: New CCW Intersection Scenario 2 Configuration

The new intersection on CCW was analyzed with four basic lanes on CCW, plus dual left-turn lanes and right-turn deceleration lanes in both directions on CCW. The new access road was modelled with four basic lanes, plus left-turn and right-turn lanes in both directions. Right-turns onto CCW were modeled with acceleration lanes.

Table 3 shows the results of the Scenario 2 analysis. Results are shown for overall intersection performance and for critical movements, as defined in 3.1. Results for the AM peak hour are shown first, with PM peak hour results following in parentheses.

Table 3: Scenario 2 Analysis Results

Intersection	Overall Intersection Performance (LOS / Delay / ICU)	Critical Movements (Movement / LOS / Delay / v/c)
CCW & Sturgeon Rd (1)	E / 61 / 91% (E / 59 / 86%)	SEL / F / 132 / 1.11 SET / E / 76 / 0.75 NWT / E / 69 / 0.54 NEL / F / 99 / 0.94 SWL / F / 83 / 1.02 SWT / F / 82 / 1.11 (SEL / F / 117 / 1.05) (SET / E / 59 / 0.40) (NWL / E / 58 / 0.67) (NWT / E / 76 / 0.70) (NEL / F / 112 / 1.04) (NET / E / 65 / 1.05) (SWL / F / 105 / 1.02) (SWT / E / 61 / 1.05)
CCW & Sturgeon Access Rd (2)	C / 26 / 74% (E / 61 / 94%)	NET / E / 55 / 0.96 SWL / E / 66 / 0.97 (SEL / E / 60 / 0.53) (SET / F / 114 / 1.08) (NWL / F / 89 / 1.09) (NEL / E / 60 / 0.42) (NET / F / 113 / 1.09) (SWL / F / 94 / 1.09)
Sturgeon Rd / Sturgeon Access Rd & Summit Rd (3)	C / 26 / 79% (C / 35 / 88%)	NET / E / 72 / 0.74 SWL / E / 65 / 0.86 (NWL / F / 89 / 0.99) (NET / F / 84 / 0.77) (SWL / E / 75 / 1.00)
CCW & New Access (4)	D / 40 / 96% (C / 20 / 90%)	EBL / F / 96 / 0.64 EBT / E / 58 / 0.04 WBL / F / 96 / 0.64 WBT / E / 58 / 0.04 NBL / E / 58 / 0.04 SBL / F / 82 / 1.04 (EBL / E / 58 / 0.82)

All intersections except CCW and Sturgeon Rd and CCW and Sturgeon Access in the PM peak operated at LOS C or LOS D overall. ICU values as were as high as 96%. Some movements operated with v/c ratios as high as 1.09. This performance indicates that all intersections were nearing or at capacity in Scenario 2.

3.1.3 Analysis Scenario 3

Analysis scenario 3 assumes 100% of projected trips and represents full build out of the Airport Area West Lands, along with full build out of the residential and commercial development south of Centreport and the industrial component considered in the RM of Rosser. Intersection configurations were the same as in Analysis Scenario 2. Figure 14 in Appendix A shows the development areas included in this scenario.

Table 4 shows the results of the Scenario 3 analysis with the intersection configuration developed in Scenario 2. Results are shown for overall intersection performance and for critical movements, as defined in 3.1. Results for the AM peak hour are shown first, with PM peak hour results following in parentheses.

Table 4: Scenario 3 Analysis Results

Intersection	Overall Intersection Performance (LOS / Delay / ICU)	Critical Movements (Movement / LOS / Delay / v/c)
CCW & Sturgeon Rd (1)	F / 305 / 159% (F / 251 / 142%)	SEL / F / 299 / 1.53 SET / E / 76 / 0.56 NWL / F / 86 / 0.58 NWT / F / 82 / 0.45 NEL / F / 324 / 1.54 NET / F / 450 / 1.93 SWL / F / 464 / 1.97 SWT / F / 292 / 1.59 (SEL / F / 364 / 1.70) (SET / E / 76 / 0.45) (NWL / F / 103 / 0.98) (NWT / F / 109/ 0.85) (NWR / F / 278 / 1.58) (NEL / F / 172 / 1.14) (NET / F / 379 / 1.78) (SWL / F / 363 / 1.72) (SWT / F / 121 / 1.20)
CCW & Sturgeon Access Rd (2)	F / 188 / 148% (F / 253 / 144%)	SEL / F / 107 / 0.74 SET / E / 77 / 0.75 NWL / E / 75 / 0.96 NWT / F / 306 / 1.82 NEL / E / 71 / 0.89

Intersection	Overall Intersection Performance (LOS / Delay / ICU)	Critical Movements (Movement / LOS / Delay / v/c)
		NET / F / 399 / 1.82 SWL / F / 394/ 1.78 (SEL / F / 78 / 0.86) (SET / F / 279 / 1.51) (NWL / F / 370 / 1.74) (NWT / E / 58 /0.87) (NEL / F / 286 / 1.48) (NET / F / 357 / 1.70) (SWL / F / 376 / 1.75) (SWT / F / 365 / 1.74)
Sturgeon Rd / Sturgeon Access Rd & Summit Rd (3)	F / 179 / 133% (F / 157 / 132%)	SEL / F / 292 / 1.59 NWL / F / 83/ 0.70 NWT / F / 279 / 1.54 NWR / F / 161 / 1.32 NEL / E / 79 / 0.80 NET / F / 210 / 1.21 SWL / F / 276 / 1.49 SWT / F / 89 / 0.54 (SEL / F / 111 / 1.17) (SET / F / 237 / 1.48) (NWL / F / 311 / 1.56) (NWT / F / 106 / 1.11) (NEL / F / 80 / 0.78) (NET / F / 165 / 1.05) (SWL / F / 297/ 1.57)
CCW & New Access (4)	F / 171 / 129% (F / 160/ 135%)	EBL / F / 86 / 0.72 EBT / F / 274 / 1.48 WBL / F / 269 / 1.44 WBT / E / 67 / 0.60 NBL / F / 266 / 1.44 NBT / F / 225 / 1.39 NBR / A / 8 / 0.88 SBL / F / 270 / 1.46 SBT / F / 135 / 1.20 (EBL / F / 124 / 1.07) (EBT / F / 273 / 1.44) (WBL / F / 327 / 1.63) (WBT / F / 107 / 1.01) (NBL / F / 302 / 1.55) (NBT / E / 73 / 1.00)

Intersection	Overall Intersection Performance (LOS / Delay / ICU)	Critical Movements (Movement / LOS / Delay / v/c)
		(SBL / F / 129 / 1.07) (SBT / F / 287 / 1.56)

Based on the development scenarios analyzed, all existing at grade intersections will experience significant congestion under full development, with ICU results ranging from 129% to 159%. The options for development would be to limit development density to that supported by the infrastructure, expand the road infrastructure to support anticipated development density, or invest in alternate modes to bring workers to the development

3.2 TRAFFIC SIGNAL WARRANT ANALYSIS

An evaluation of the need for traffic signals at key intersections was conducted as part of this study. A traffic signal warrant analysis (TSWA) considers vehicular traffic and pedestrian activity approaching an intersection over the peak six hours of a typical weekday. The peak six hours include two hours in the morning, two hours at mid-day, and two hours in the afternoon. The warrant calculations are calibrated to return 100 or more "warrant points" where the vehicular and pedestrian volumes may warrant traffic signal control.

In addition to the warrant points, minor street left-turn and through volumes are also considered. Where minor street left-turn and through volumes average less than 75 vehicles per hour over the peak six hours, the minor street volumes are considered too low to warrant traffic signals, no matter the warrant points. Finally, distance to another traffic control is also a factor, where a minimum distance of 200m is desirable for the proper operation of traffic signals that minimizes the impacts of unmet demand (build-up of queueing) along the roadway.

Traffic signal warrant analyses were conducted at the intersection of Sturgeon Road/Sturgeon Access Road and Summit Road using the existing 2015 Background traffic volumes and the volumes for the 2030, 2040, and 2066 Post-Development scenarios. Volumes were converted from AM and PM peak hour volumes to peak six-hour volumes using the following relationships:

- AM peak 2-hour volume equal to 1.95 X AM peak hour volume
- Mid-day peak 2-hour volume equal to 1.80 X AM peak hour volume
- PM peak 2-hour volume equal to 1.95 X AM peak hour volume

These relationships were approximated from traffic counts in Winnipeg.

Analyses began with the 2015 Background volumes and continued through the subsequent scenarios until the warrant points exceeded 100. Since CCW is an expressway in a rural/industrial context, pedestrian volumes will need to be considered as development proceeds and signal timing and intersection improvements are contemplated and developed.

Table 5 shows the results of the analyses. Warrant points are shown first, with minor street volumes following in parenthesis.

Table 5: Traffic Signal Warrant Analyses

Scenario	Warrant Points (Minor Street Volume)
2015 Background	62 (151)
2030 Scenario 1	> 200 (336)
2040 Scenario 2	Warranted
2066 Scenario 3	Warranted

The TSWA returned 62 warrant points for the 2015 background scenario, indicating that traffic signals were not warranted. In 2030 Scenario 1 the TSWA returned more than 200 warrant points, indicating that traffic signals were warranted in that scenario.

3.3 AVERAGE DAILY TRAFFIC CONSIDERATIONS

Average daily traffic (ADT) provides one criterium for the consideration to add extra capacity along a roadway, say from a two-lane road to a four-lane road. City of Winnipeg convention is to consider widening to a four-lane divided cross-section where ADT exceeds 5,000 vehicles per day (vpd).

Road segments between study intersections are four-lane divided under existing conditions, except for Sturgeon Road north of Sturgeon Access Road, and Sturgeon Road south of Summit Road.

Table 6 shows 2015 background and future scenario ADT volumes on those road segments.

Table 6: Average Daily Traffic Volumes

Scenario	Sturgeon Road North of Sturgeon Access Road	Sturgeon Road South of Summit Road
2015 Background	11,500	15,200
2030 Scenario 1	23,600	28,500
2040 Scenario 2	31,100	37,300
2066 Scenario 3	43,300	52,600

In all scenarios—including the 2015 background scenario—the ADT volumes on the existing two-lane roads exceeded the 5,000 vpd threshold where widening to four-lane divided sections is required by the City of Winnipeg Design Standards Manual.

4.0 DISCUSSION

4.1 TRAFFIC ANALYSIS HIGHLIGHTS

Scenario 1 illustrates the extent of development that can occur with minor changes to the existing intersections. Scenario 2 illustrates the extent of development that can occur with significant operation improvements to the existing intersections, and a new intersection on CCW. Analysis of Scenario 3 showed that to facilitate full build-out of the Airport Area West Lands and surrounding areas, further upgrades to the transportation network are needed.

Development strategies designed to reduce the reliance on single occupancy vehicles are needed to provide solutions to accommodate full build out traffic. The following sections give brief analysis of some of these options. Further study is required to fully develop these solutions.

4.2 TRAVEL DEMAND MANAGEMENT

Travel demand management (TDM) refers to strategies aimed to more efficiently use existing transportation infrastructure. These strategies can incentivize shorter trips, can reduce overall vehicular trips but allowing people to choose other modes of transportation, or can help reduce peak hour demand by spreading the demand through other times of the day. The *Victoria Transport Policy Institute* gives the following examples of TDM strategies which can reduce traffic congestion:

- **Commute Trip Reduction Programs** encourage the use of alternative (non-automobile) modes for trips during peak hours. Practically, these programs can involve improvements to transit service, ridesharing programs, and increased pricing for parking.
- **Flexible Work Schedules** stagger work shift start and end times. For example, instead of having all employees begin work at 8:00 AM and finish work at 4:30 PM, some employees can work from 7:00 AM to 3:30 PM, some can work from 7:30 AM to 4:00 PM, and some can remain on the 8:00 AM to 4:30 PM schedule. This shifts the time of trips, “spreading out” travel demand peaks.
- **Telework** allows employees to occasionally work from home, reducing the need for commutes to work.

These or other TDM strategies would aim to reduce the peak hour traffic volumes and thus decrease the required transportation infrastructure, allowing more development with the same infrastructure investment.

4.3 TRANSIT

An emphasis on increasing the use of transit could result in decreased peak hour traffic volumes. This would shift emphasis from creating more road infrastructure to providing transit infrastructure

and service improvements. Transit accommodation could begin with enhanced, and possibly subsidized transit service to the Airport Area West Lands and could continue with the construction of exclusive transit facilities that support other rapid transit initiatives.

Increased transit accommodation could occur through establishing policies where developer fees are directed towards transit infrastructure and transit operations in addition to or instead of general traffic infrastructure.

4.4 GRADE SEPARATION

The construction of grade separations will allow through traffic on CCW to freely move through the Centreport area. To fully develop the Airport Area West Lands and maintain CCW free from congestion, interchange construction will likely be needed. Interchanges would provide an immediate benefit in keeping through traffic on CCW free flowing. Interchanges require a significant investment that could be deferred if transit accommodation and TDM measures are implemented instead of an auto-oriented development strategy.

Diverging diamond interchanges were briefly analyzed under the full development scenario and were found to be effective in serving high left-turning volumes to and from the development areas east and west of CCW. These interchanges could provide high traffic capacity with less right-of-way requirements than partial or full cloverleaf interchanges.

4.5 PROTECTED RIGHTS-OF-WAY

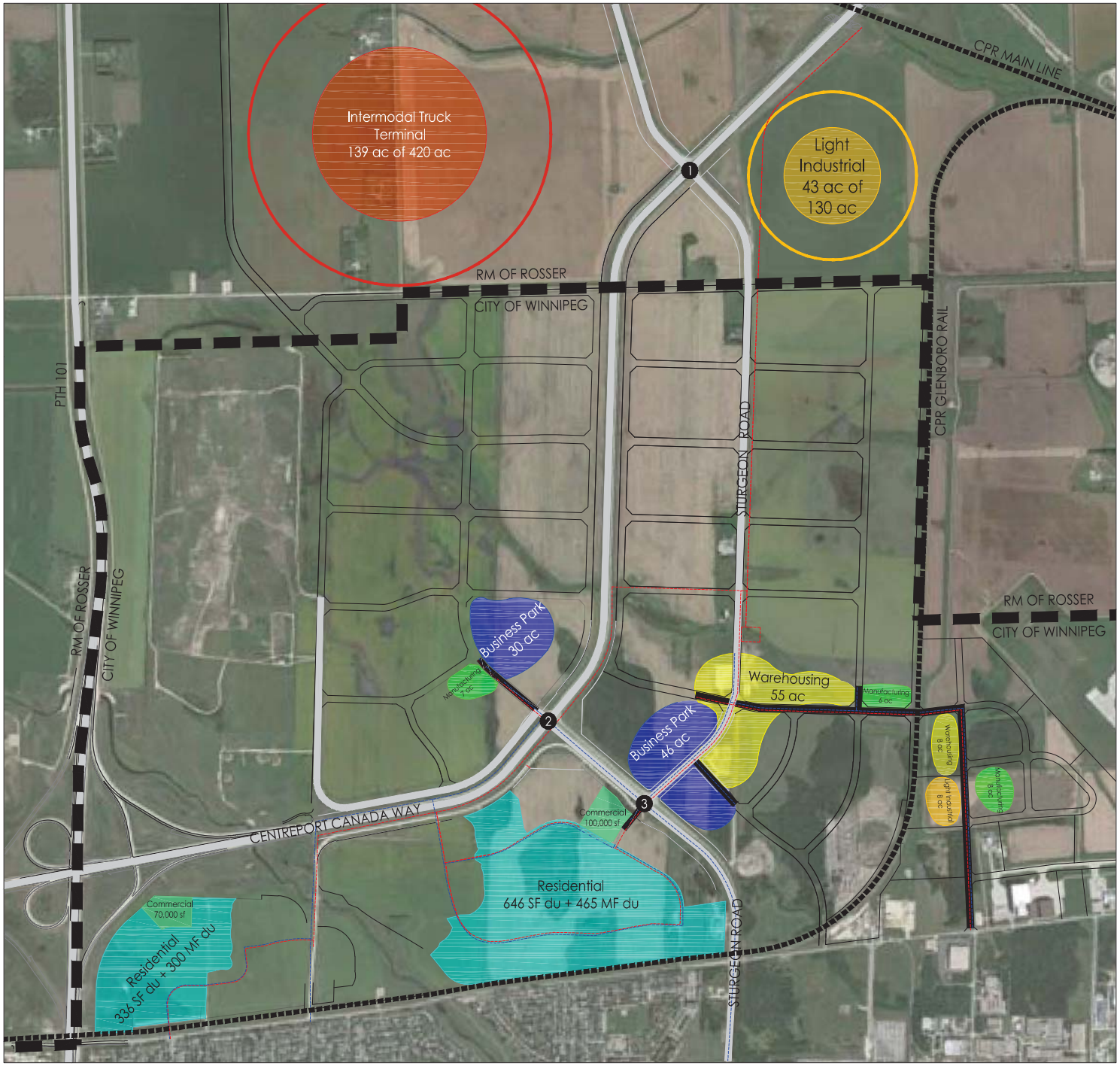
To accommodate potential road improvements that may be required under full development, it was determined additional land near the existing intersections should be reserved and limited in allowable development or designated public reserve or Right-of-Way. Allowing development on these designated lands would limit opportunities to accommodate future traffic needs; which could impose a significant economic cost to industry and users if those opportunities are lost.

Figure 21 shows potential protected right-of-way along Centreport Canada Way (CCW). The protected right-of-way includes a control zone offset 37 m (120 ft) from the edge of the CCW right of way, and 305 m (1,000 ft) control circles at the two existing CCW intersections and the proposed CCW intersection.

APPENDIX A
FIGURES

FOR DISCUSSION ONLY

SCENARIO 1 - EXISTING INTERSECTIONS



LEGEND

- City of Winnipeg Boundary
- New Road
- Existing Rail
- New WM
- Existing Road
- New Pump Station
- New WWS

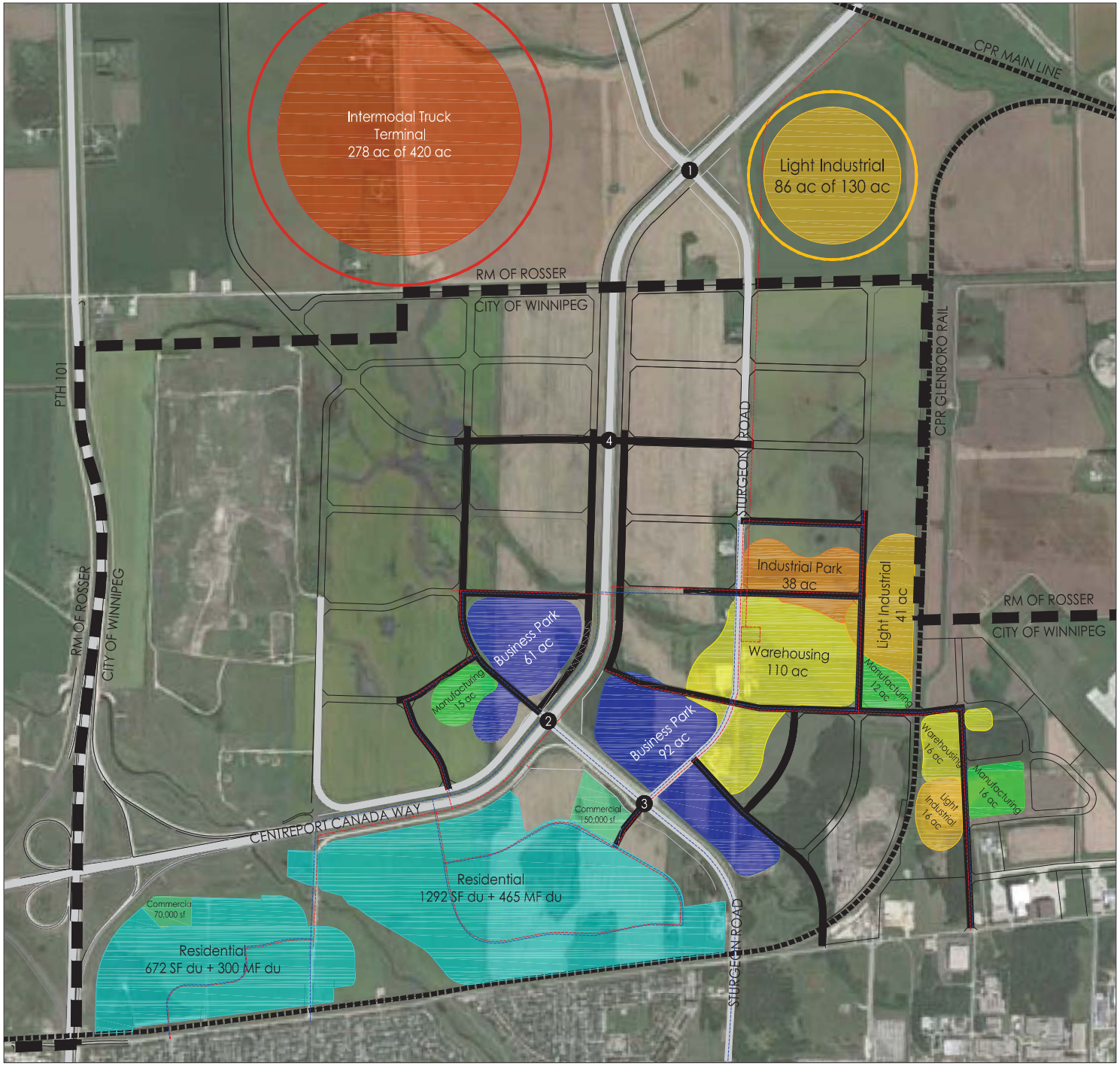
LAND USES

	City of Winnipeg	RM of Rosser
Business Park	76 ac of 153 ac	None
Warehousing	63 ac of 467 ac	0 ac of 102 ac
Manufacturing	21 ac of 501 ac	0 ac of 102 ac
Light Industrial	8 ac of 281 ac	43 ac of 130 ac
Industrial Park	0 ac of 98 ac	None
Intermodal Truck Terminal	None	139 ac of 420 ac
R & D Centre	None	0 ac of 102 ac
Residential	1,747 du of 2,729 du	None
Commercial	170,000 sf of 220,000 sf	None

DRAFT

FOR DISCUSSION ONLY

SCENARIO 2 - IMPROVED AND ADDITIONAL INTERSECTIONS



LEGEND

City of Winnipeg Boundary

New Road

Existing Rail

New WM

Existing Road

New Pump Station

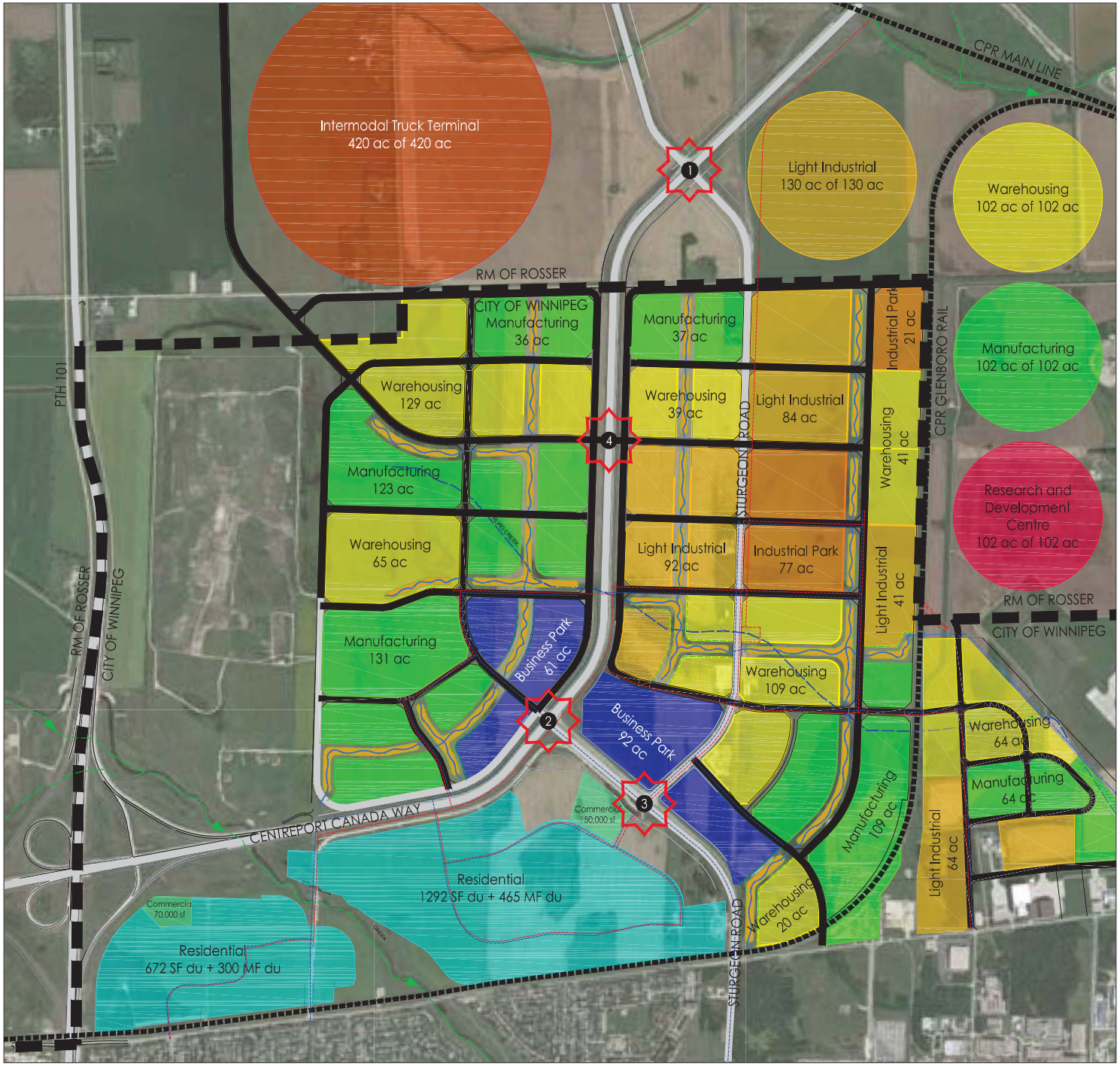
New WWS

LAND USES

	City of Winnipeg	RM of Rosser
Business Park	153 ac of 153 ac	None
Warehousing	126 ac of 467 ac	0 ac of 102 ac
Manufacturing	43 ac of 501 ac	0 ac of 102 ac
Light Industrial	57 ac of 281 ac	86 ac of 130 ac
Industrial Park	38 ac of 98 ac	None
Intermodal Truck Terminal	None	278 ac of 420 ac
R & D Centre	None	0 ac of 102 ac
Residential	2,729 du of 2,729 du	None
Commercial	220,000 sf of 220,000 sf	None

FOR DISCUSSION ONLY

SCENARIO 3 - FULL BUILD OUT



LEGEND

City of Winnipeg Boundary

New Road

Existing Rail

New WM

Existing Road

New Pump Station

New WWS

LAND USES

	City of Winnipeg	RM of Rosser
Business Park	153 ac of 153 ac	None
Warehousing	467 ac of 467 ac	102 ac of 102 ac
Manufacturing	501 ac of 501 ac	102 ac of 102 ac
Light Industrial	281 ac of 281 ac	130 ac of 130 ac
Industrial Park	98 ac of 98 ac	None
Intermodal Truck Terminal	None	420 ac of 420 ac
R & D Centre	None	102 ac of 102 ac
Residential	2,729 du of 2,729 du	None
Commercial	220,000 sf of 220,000 sf	None

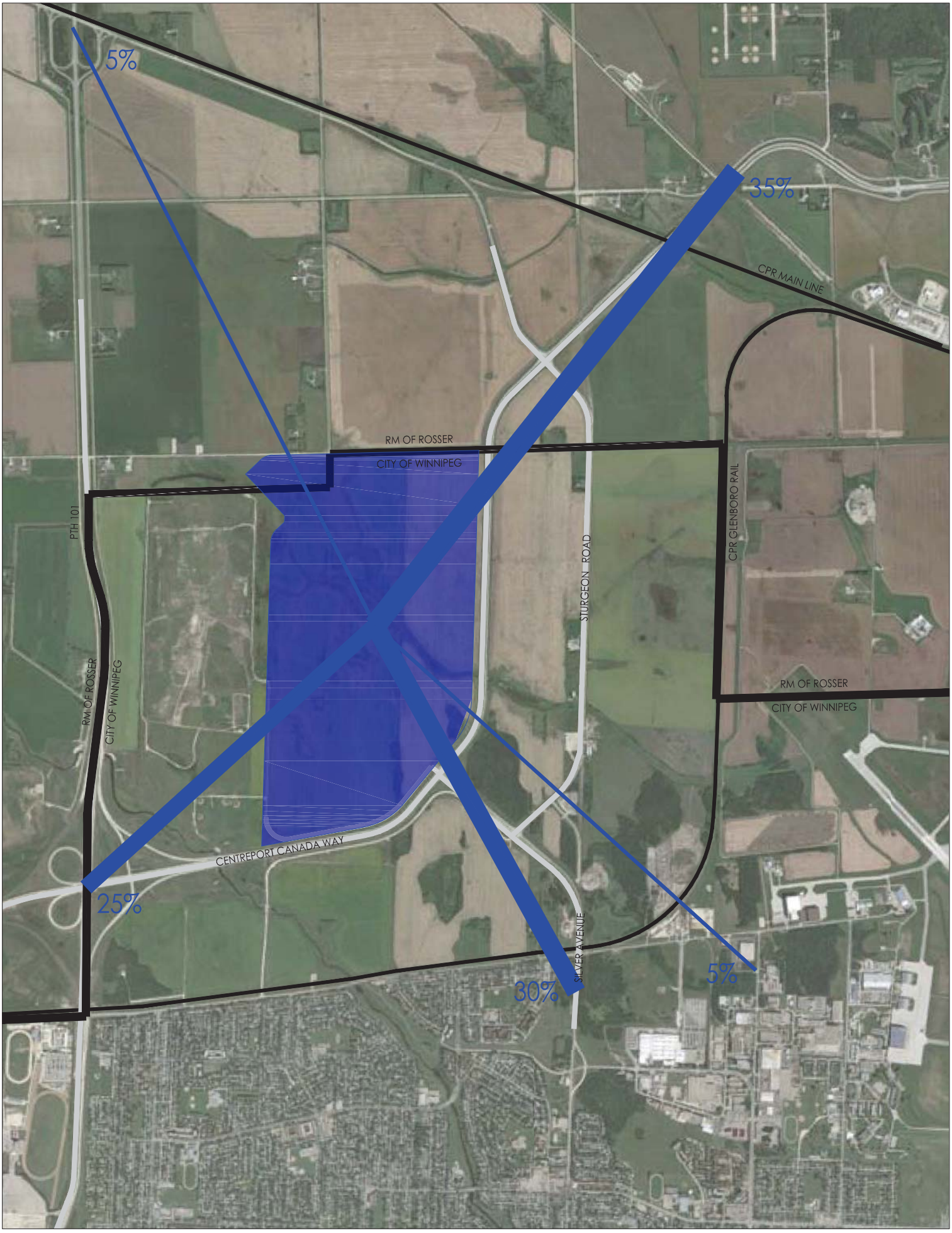


Figure 16 - Directional Distribution (Centreport West)

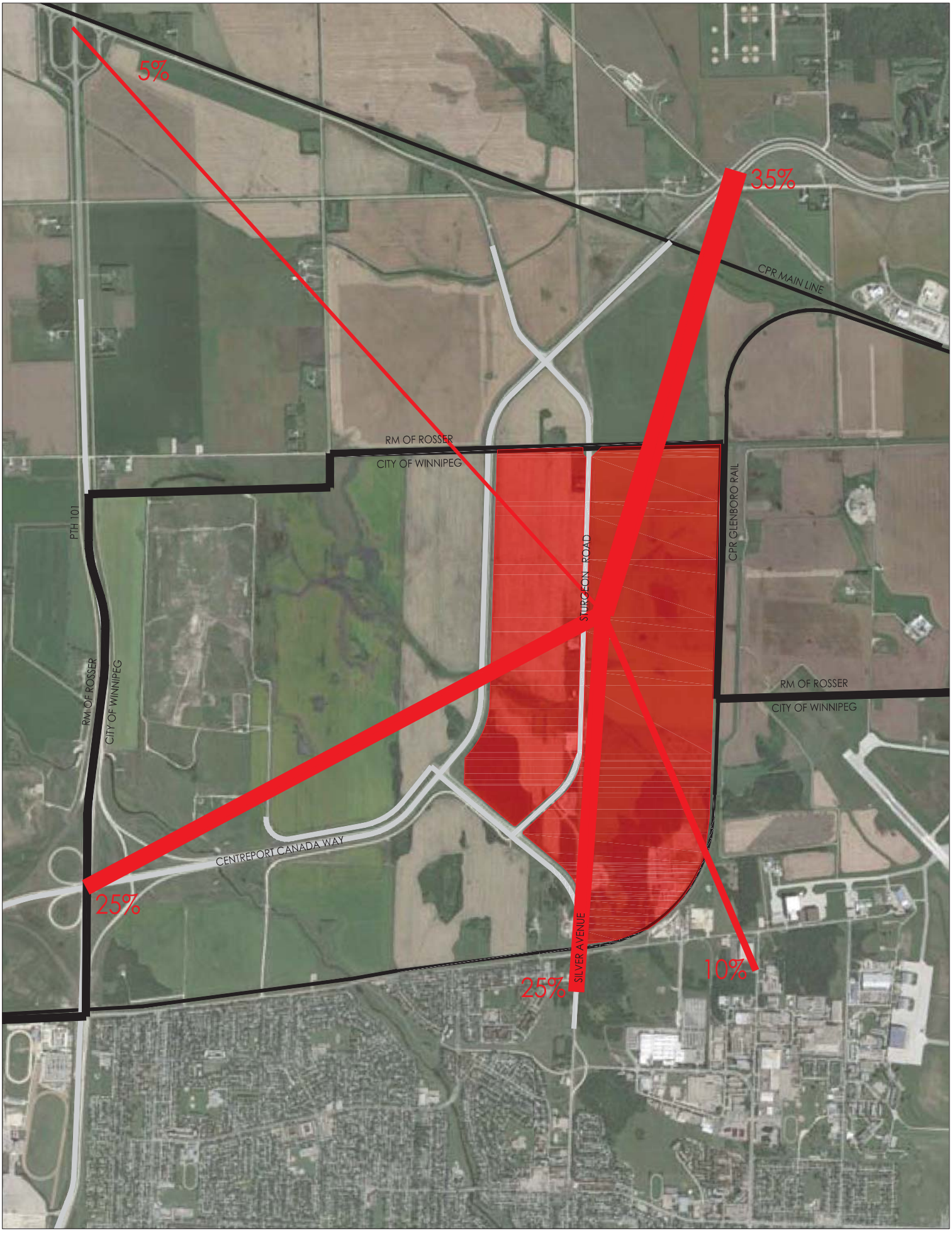


Figure 17 - Directional Distribution (Centreport East)

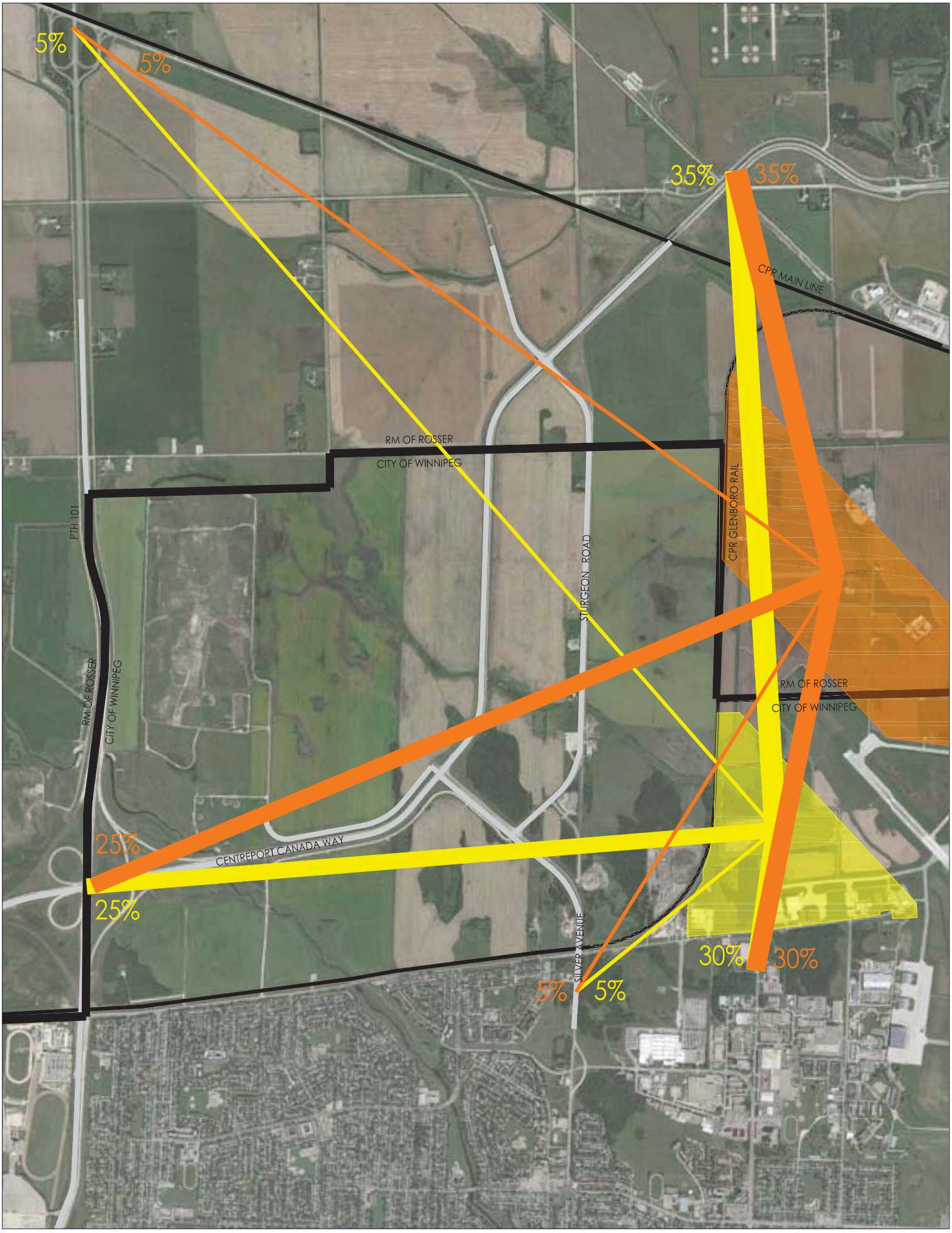


Figure 18 - Directional Distribution (Winnipeg Airports Authority Lands)

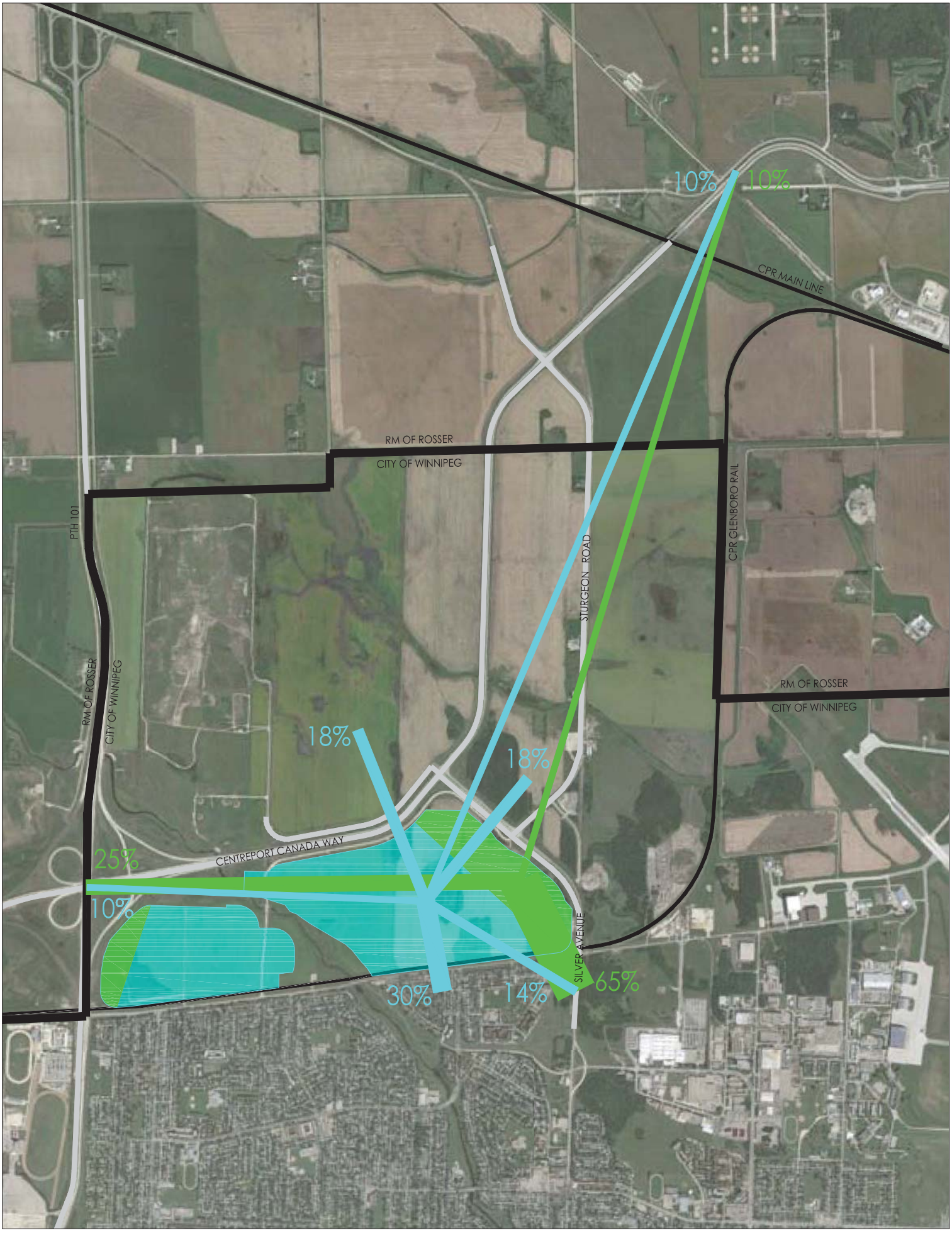


Figure 19 - Directional Distribution (Residential and Commercial)

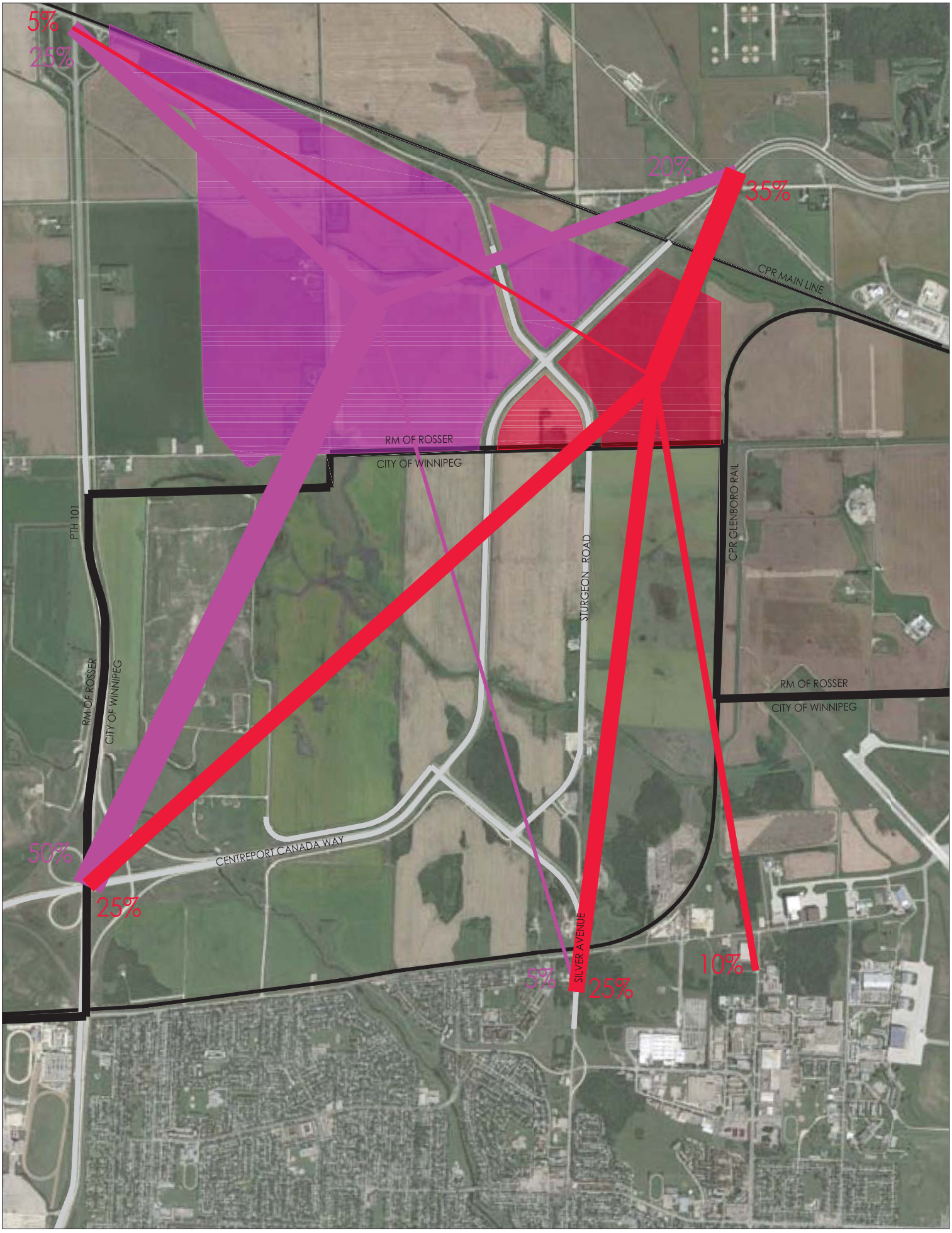
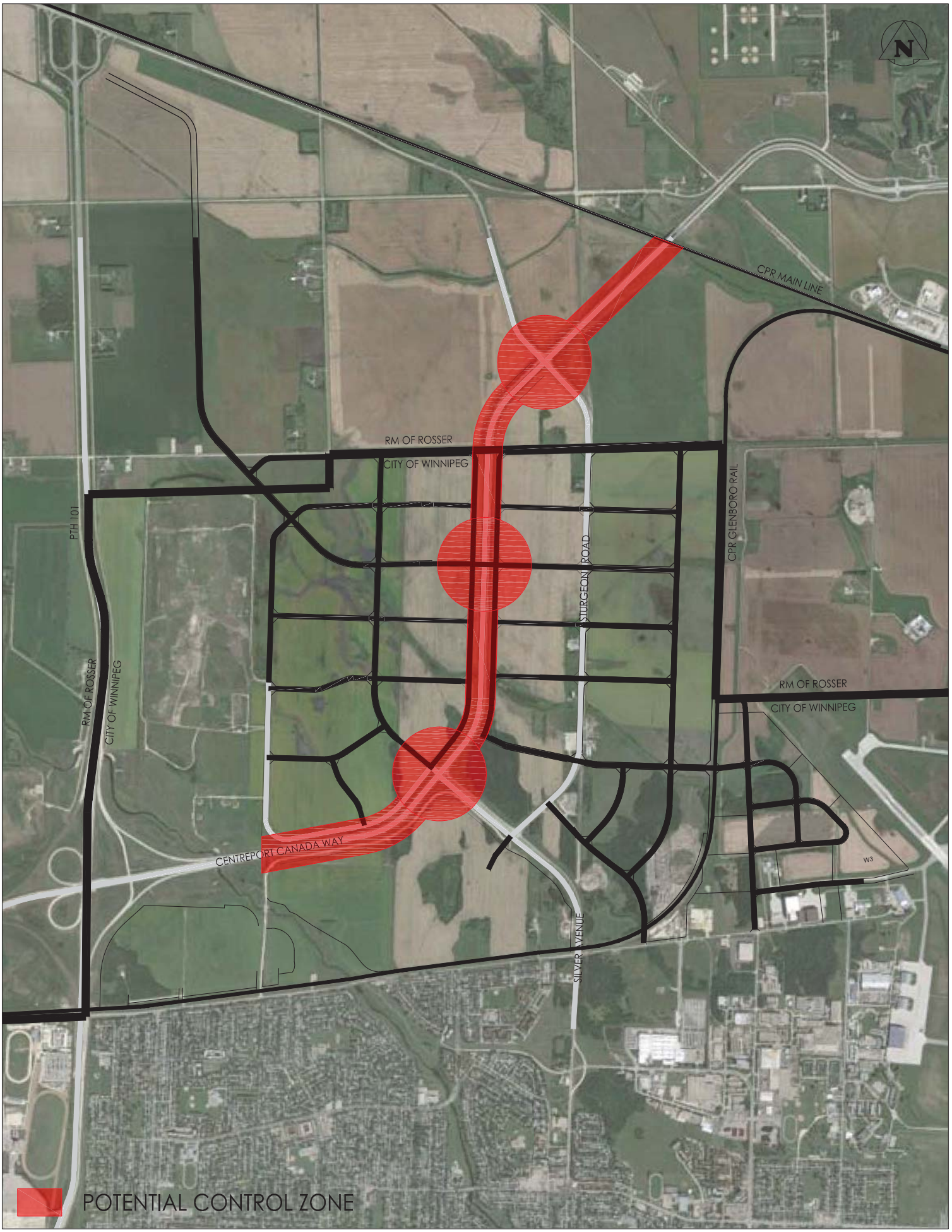


Figure 20 - Directional Distribution (RM of Rosser)


N
CPR MAIN LINE
RM OF ROSSER
CITY OF WINNIPEG
PTH 101
RM OF ROSSER
CITY OF WINNIPEG
STURGEON ROAD
CPR GLENBORO RAIL
RM OF ROSSER
CITY OF WINNIPEG
CENTREPORT CANADA WAY
W3
SILVER AVENUE
POTENTIAL CONTROL ZONE

APPENDIX B
TRANSPORTATION ENGINEERING BACKGROUND INFORMATION

Appendix B TRANSPORTATION ENGINEERING BACKGROUND INFORMATION

This appendix contains background information on transportation engineering concepts and performance measures

A.1 PERFORMANCE MEASURES

A.1.1 Highway Capacity Manual

The intersection capacity and level of service analysis was based in part on methodology from the *Highway Capacity Manual* (HCM). Several performance measures from the HCM methodology are detailed below:

- **Level of Service (LOS)** – Based on the average vehicle delay during a 15-minute analysis period. Levels of Service range from A (minimal delay) to F (unacceptable delay) and may be measured on an intersection, approach, or movement basis.

- **Degree of Saturation** – The ratio of demand flow rate (v) to maximum capacity (c). Where the v/c ratio is 1.0 or greater, the intersection is operating at full capacity and experiencing major congestion.

- **Vehicle Delay** – The average time that vehicles are delayed on an intersection, approach, or movement basis. Measured in seconds of delay per vehicle or total hours of delay during the peak hour being analyzed.

For design and planning purposes, LOS D or better under peak hour conditions is considered acceptable. Table A.1 and Table A.2 describe the characteristics of each LOS for signalized and unsignalized stop-controlled intersections, respectively, as listed in the HCM.

Table B.1: Signalized Intersections - HCM Level of Service Characteristics

HCM Level of Service	Average Signal Delay per Vehicle (sec/veh)	Characteristics
A	≤ 10	Free flow, low volumes and high speeds, most drivers can select own speed
B	> 10 and ≤ 20	Stable flow, speed restricted slightly by traffic
C	> 20 and ≤ 35	Stable flow, speed controlled by traffic
D	> 35 and ≤ 55	Approaching unstable flow, low speed
E	> 55 and ≤ 80	Unstable flow and speeds, volumes at/near capacity
F	> 80	Forced flow, low speed, volume above capacity

Table B.2: Stop Controlled Intersections - HCM Level of Service Characteristics

HCM Level of Service	Total Delay (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

APPENDIX C
TRAFFIC VOLUME CALCULATIONS

AM PEAK HOUR

2015 Background Volumes (AM)

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	5	30	200	40	25	5	25	1010	5	165	805	30
12	5	620	190	490	320	5	5	5	5	50	5	415
13	5	425	225	5	675	5	5	5	5	150	5	40
14		1040			815							

Generated

Scenario 1 (2030) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	26	24	126	119	98	110	58	143	125	536	235	83
12	138	86	356	114	49	208	31	71	23	96	261	209
13	103	295	294	355	104	82	159	73	209	73	38	112
14	0	326	0	0	371	0	0	0	0	0	0	0

Scenario 2 (2040) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	51	16	82	238	76	359	153	436	251	409	1247	166
12	259	315	675	194	138	134	14	109	36	157	474	376
13	157	562	693	674	186	118	262	121	349	165	54	183
14	0	564	141	968	424	265	42	0	0	42	0	234

Scenario 3 (2066) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	78	27	526	418	107	234	164	700	380	2455	2590	465
12	630	1980	1175	381	538	613	70	278	97	263	976	1014
13	157	1725	1641	1258	458	118	262	121	349	364	54	266
14	957	804	1303	1255	1010	637	158	496	229	293	213	282

Post-Development

Scenario 1 (2030) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	31	54	326	159	123	115	83	1153	130	701	1040	113
12	143	706	546	604	369	213	36	76	28	146	266	624
13	108	720	519	360	779	87	164	78	214	223	43	152
14	0	1366	0	0	1186	0	0	0	0	0	0	0

Scenario 2 (2040) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	56	46	282	278	101	364	178	1446	256	574	2052	196
12	264	935	865	684	458	139	19	114	41	207	479	791
13	162	987	918	679	861	123	267	126	354	315	59	223
14	0	1604	141	968	1239	265	42	0	0	42	0	234

Scenario 3 (2066) AM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	83	57	726	458	132	239	189	1710	385	2620	3395	495
12	635	2600	1365	871	858	618	75	283	102	313	981	1429
13	162	2150	1866	1263	1133	123	267	126	354	514	59	306
14	957	1844	1303	1255	1825	637	158	496	229	293	213	282

PM PEAK HOUR

2015 Background Volumes (PM)

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	5	25	260	55	20	10	20	620	5	175	1235	40
12	5	340	65	585	660	5	5	5	5	180	5	300
13	5	465	270	15	635	5	5	5	5	175	10	15
14		645			1250							

Generated

Scenario 1 (2030) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	114	80	436	104	29	74	75	256	33	159	189	78
12	32	39	118	244	87	46	165	249	108	279	123	160
13	263	125	93	125	279	207	159	73	199	241	95	278
14	0	364	0	0	377	0	0	0	0	0	0	0

Scenario 2 (2040) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	229	66	344	207	25	186	269	1107	65	138	507	156
12	53	126	202	415	297	34	96	429	206	546	185	251
13	407	213	201	219	517	310	224	104	295	578	143	545
14	0	426	47	253	623	46	216	0	0	123	0	799

Scenario 3 (2066) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	346	89	1968	463	40	204	154	2060	98	912	1169	346
12	266	767	458	880	1644	241	420	754	439	886	537	581
13	407	832	579	463	1319	310	224	104	295	1332	143	948
14	504	835	429	371	1016	332	438	240	652	1097	444	1039

Post-Development

Scenario 1 (2030) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	119	105	696	159	49	84	95	876	38	334	1424	118
12	37	379	183	829	747	51	170	254	113	459	128	460
13	268	590	363	140	914	212	164	78	204	416	105	293
14	0	1009	0	0	1627	0	0	0	0	0	0	0

Scenario 2 (2040) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	234	91	604	262	45	196	289	1727	70	313	1742	196
12	58	466	267	1000	957	39	101	434	211	726	190	551
13	412	678	471	234	1152	315	229	109	300	753	153	560
14	0	1071	47	253	1873	46	216	0	0	123	0	799

Scenario 3 (2066) PM

Node	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
11	351	114	2228	518	60	214	174	2680	103	1087	2404	386
12	271	1107	523	1465	2304	246	425	759	444	1066	542	881
13	412	1297	849	478	1954	315	229	109	300	1507	153	963
14	504	1480	429	371	2266	332	438	240	652	1097	444	1039

Sturgeon Access Road/Sturgeon Road & Summit Road

2015 BG	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
AM	5	425	225	5	675	5	150	5	40	5	5	5
PM	5	465	270	15	635	5	175	10	15	5	5	5

AM2/AM	1.95
Mid2/AM	1.80
PM2/PM	1.95

2015 BG	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
AM2	10	829	439	10	1316	10	293		78			
Mid2	9	765	405	9	1215	9	270		72			
PM2	10	907	527	29	1238	10	341		29			

2030 Sc1	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
AM	108	720	519	360	779	87	164	78	214	223	43	152
PM	268	590	363	140	914	212	164	78	204	416	105	293

AM2/AM	1.95
Mid2/AM	1.80
PM2/PM	1.95

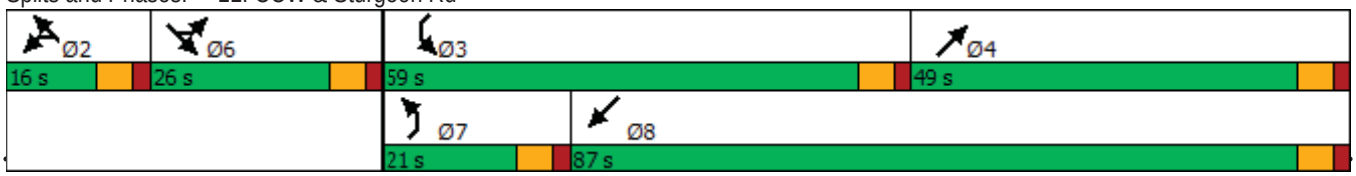
	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
AM2	211	1404	1012	702	1519	170	320	152	417	435	84	296
Mid2	194	1296	934	648	1402	157	295	140	385	401	77	274
PM2	523	1151	708	273	1782	413	320	152	398	811	205	571

APPENDIX D
SYNCHRO REPORTS

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	159	123	115	31	54	326	83	1153	130	701	1040	113
Future Volume (vph)	159	123	115	31	54	326	83	1153	130	701	1040	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	0		1	0		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	0	1699	1484	0	1715	1484	1659	3318	1484	1659	3318	1484
Flt Permitted		0.973			0.982		0.950			0.950		
Satd. Flow (perm)	0	1699	1484	0	1715	1484	1659	3318	1484	1659	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			343			196			196
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			7.8			7.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	129	121	33	57	343	87	1214	137	738	1095	119
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	296	121	0	90	343	87	1214	137	738	1095	119
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	26.0	26.0		16.0	16.0		21.0	49.0		59.0	87.0	
Total Lost Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)		20.0	149.8		9.8	149.8	12.4	43.0	149.8	53.0	83.6	149.8
Actuated g/C Ratio		0.13	1.00		0.07	1.00	0.08	0.29	1.00	0.35	0.56	1.00
v/c Ratio		1.31	0.08		0.80	0.23	0.64	1.28	0.09	1.26	0.59	0.08
Control Delay		215.4	0.1		112.4	0.4	86.7	175.0	0.1	169.8	23.9	0.1
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		215.4	0.1		112.4	0.4	86.7	175.0	0.1	169.8	23.9	0.1
LOS		F	A		F	A	F	F	A	F	C	A
Approach Delay		152.9			23.6			153.0			77.6	
Approach LOS		F			C			F			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 149.8			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.31			
Intersection Signal Delay: 105.1		Intersection LOS: F	
Intersection Capacity Utilization 110.5%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 11: CCW & Sturgeon Rd

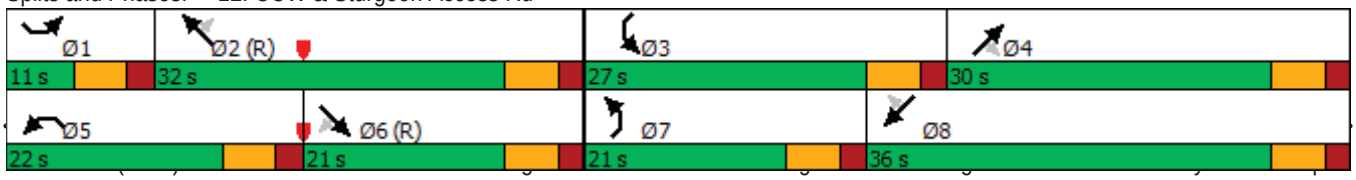


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	36	76	28	146	266	624	143	706	546	604	369	213
Future Volume (vph)	36	76	28	146	266	624	143	706	546	604	369	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	0.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	1746	1484	1659	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	1746	1484	1659	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229			427			486			229
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		317.8			399.7			212.7			251.5	
Travel Time (s)		14.3			18.0			9.6			11.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	38	80	29	154	280	657	151	743	575	636	388	224
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	80	29	154	280	657	151	743	575	636	388	224
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	11.0	21.0	21.0	22.0	32.0	32.0	21.0	30.0	30.0	27.0	36.0	36.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	5.1	17.3	17.3	13.5	30.2	30.2	13.0	24.2	24.2	21.0	32.2	32.2
Actuated g/C Ratio	0.05	0.17	0.17	0.14	0.30	0.30	0.13	0.24	0.24	0.21	0.32	0.32
v/c Ratio	0.45	0.14	0.07	0.69	0.53	0.88	0.70	0.93	0.79	0.94	0.36	0.35
Control Delay	63.7	37.0	0.3	37.9	17.7	28.2	58.9	56.3	15.6	62.5	27.9	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.7	37.0	0.3	37.9	17.7	28.2	58.9	56.3	15.6	62.5	27.9	5.1
LOS	E	D	A	D	B	C	E	E	B	E	C	A
Approach Delay		36.7			26.9			40.6			41.4	
Approach LOS		D			C			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 36.9 Intersection LOS: D
Intersection Capacity Utilization 77.3% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 12: CCW & Sturgeon Access Rd



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	360	779	87	108	720	519	164	78	214	223	43	152
Future Volume (vph)	360	779	87	108	720	519	164	78	214	223	43	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	1		1	1		1	0		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	3318	1484	1659	1746	1484	1659	1746	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	3318	1484	1659	1746	1484	1659	1746	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			164			511			229			295
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		223.1			357.6			188.1			377.8	
Travel Time (s)		10.0			16.1			8.5			17.0	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	379	820	92	114	758	546	173	82	225	235	45	160
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	820	92	114	758	546	173	82	225	235	45	160
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			Free
Total Split (s)	31.0	46.0	46.0	18.0	33.0	33.0	23.0	14.0	14.0	22.0	13.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Act Effct Green (s)	24.4	41.9	41.9	10.7	28.2	28.2	21.3	7.7	7.7	15.7	6.9	100.0
Actuated g/C Ratio	0.24	0.42	0.42	0.11	0.28	0.28	0.21	0.08	0.08	0.16	0.07	1.00
v/c Ratio	0.94	0.59	0.13	0.64	0.81	0.70	0.49	0.62	0.69	0.90	0.37	0.11
Control Delay	70.1	12.6	0.2	59.5	42.0	9.3	42.0	65.1	17.9	78.2	53.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.1	12.6	0.2	59.5	42.0	9.3	42.0	65.1	17.9	78.2	53.4	0.1
LOS	E	B	A	E	D	A	D	E	B	E	D	A
Approach Delay		28.6			30.8			34.6			47.3	
Approach LOS		C			C			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 32.5 Intersection LOS: C
Intersection Capacity Utilization 73.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd

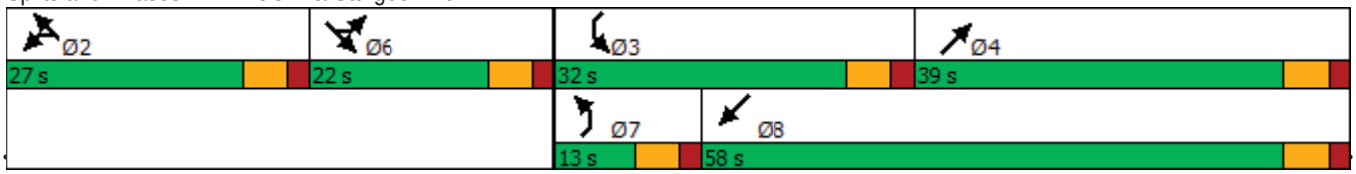


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	159	49	84	119	105	696	95	876	38	334	1424	118
Future Volume (vph)	159	49	84	119	105	696	95	876	38	334	1424	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	0		1	0		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	0	1682	1484	0	1701	1484	1659	3318	1484	1659	3318	1484
Flt Permitted		0.963			0.974		0.950			0.950		
Satd. Flow (perm)	0	1682	1484	0	1701	1484	1659	3318	1484	1659	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			245			539			245			245
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			8.9			8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	52	88	125	111	733	100	922	40	352	1499	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	219	88	0	236	733	100	922	40	352	1499	124
Turn Type	Split	NA	Free	Split	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	22.0	22.0		27.0	27.0		13.0	39.0		32.0	58.0	
Total Lost Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)		16.0	118.4		19.3	118.4	7.0	33.0	118.4	26.0	52.0	118.4
Actuated g/C Ratio		0.14	1.00		0.16	1.00	0.06	0.28	1.00	0.22	0.44	1.00
v/c Ratio		0.96	0.06		0.85	0.49	1.02	1.00	0.03	0.97	1.03	0.08
Control Delay		103.1	0.1		75.2	1.2	153.2	72.0	0.0	86.2	64.6	0.1
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		103.1	0.1		75.2	1.2	153.2	72.0	0.0	86.2	64.6	0.1
LOS		F	A		E	A	F	E	A	F	E	A
Approach Delay		73.5			19.2			76.9			64.4	
Approach LOS		E			B			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 118.4
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 58.0 Intersection LOS: E
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15

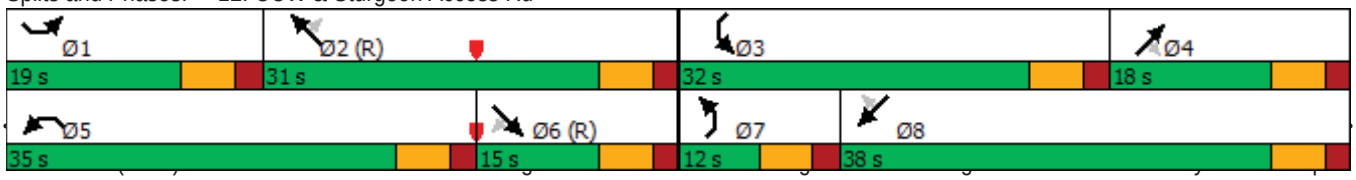
Splits and Phases: 11: CCW & Sturgeon Rd



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	254	113	459	128	460	37	379	183	829	747	51
Future Volume (vph)	170	254	113	459	128	460	37	379	183	829	747	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	0.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	1746	1484	1659	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	1746	1484	1659	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			295			484			295			229
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		317.8			399.7			212.7			251.5	
Travel Time (s)		14.3			18.0			10.9			12.9	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	267	119	483	135	484	39	399	193	873	786	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	267	119	483	135	484	39	399	193	873	786	54
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	19.0	15.0	15.0	35.0	31.0	31.0	12.0	18.0	18.0	32.0	38.0	38.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	12.7	9.0	9.0	29.0	25.3	25.3	5.9	12.0	12.0	26.0	36.8	36.8
Actuated g/C Ratio	0.13	0.09	0.09	0.29	0.25	0.25	0.06	0.12	0.12	0.26	0.37	0.37
v/c Ratio	0.85	0.90	0.30	1.00	0.31	0.66	0.40	1.00	0.44	1.04	0.64	0.08
Control Delay	77.2	77.4	1.9	67.7	22.9	11.7	57.8	90.9	3.4	80.3	30.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.2	77.4	1.9	67.7	22.9	11.7	57.8	90.9	3.4	80.3	30.4	0.2
LOS	E	E	A	E	C	B	E	F	A	F	C	A
Approach Delay		61.4			37.6			62.1			54.9	
Approach LOS		E			D			E			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 61 (61%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 52.2		Intersection LOS: D	
Intersection Capacity Utilization 86.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 12: CCW & Sturgeon Access Rd

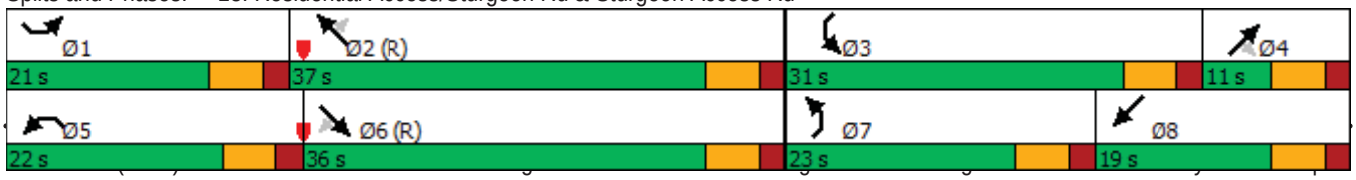


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	140	914	212	268	590	363	164	78	204	416	105	293
Future Volume (vph)	140	914	212	268	590	363	164	78	204	416	105	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	1		1	1		1	0		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	3318	1484	1659	1746	1484	1659	1746	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	3318	1484	1659	1746	1484	1659	1746	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229			382			229			308
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		223.1			357.6			188.1			377.8	
Travel Time (s)		10.0			16.1			13.5			27.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	962	223	282	621	382	173	82	215	438	111	308
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	962	223	282	621	382	173	82	215	438	111	308
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			Free
Total Split (s)	21.0	36.0	36.0	22.0	37.0	37.0	23.0	11.0	11.0	31.0	19.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Act Effct Green (s)	12.9	30.0	30.0	16.0	33.1	33.1	19.8	5.0	5.0	25.0	12.8	100.0
Actuated g/C Ratio	0.13	0.30	0.30	0.16	0.33	0.33	0.20	0.05	0.05	0.25	0.13	1.00
v/c Ratio	0.69	0.97	0.37	1.06	0.57	0.51	0.53	0.94	0.74	1.06	0.50	0.21
Control Delay	67.6	21.7	1.6	115.0	30.5	5.5	44.8	131.6	21.6	98.0	48.4	0.3
Queue Delay	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 Delay	67.6	21.7	1.6	115.0	30.5	5.5	44.8	131.6	21.6	98.0	48.4	0.3
LOS	E	C	A	F	C	A	D	F	C	F	D	A
Approach Delay		23.4			41.6			49.4			56.5	
Approach LOS		C			D			D			E	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 39.6 Intersection LOS: D
Intersection Capacity Utilization 84.8% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd

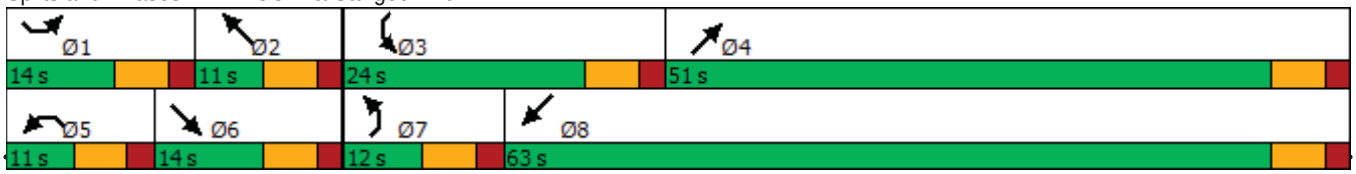


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	278	101	364	56	46	282	178	1446	256	574	2052	196
Future Volume (vph)	278	101	364	56	46	282	178	1446	256	574	2052	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	1746	1484	3219	1746	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	1746	1484	3219	1746	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			295			295			295			295
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			8.9			8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	106	383	59	48	297	187	1522	269	604	2160	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	293	106	383	59	48	297	187	1522	269	604	2160	206
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	14.0	14.0		11.0	11.0		12.0	51.0		24.0	63.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	8.0	8.0	97.8	5.0	5.0	97.8	6.0	45.1	97.8	18.0	57.1	97.8
Actuated g/C Ratio	0.08	0.08	1.00	0.05	0.05	1.00	0.06	0.46	1.00	0.18	0.58	1.00
v/c Ratio	1.11	0.75	0.26	0.36	0.54	0.20	0.94	0.99	0.18	1.02	1.11	0.14
Control Delay	132.1	75.7	0.4	52.4	69.0	0.3	99.3	49.6	0.3	82.6	82.0	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	132.1	75.7	0.4	52.4	69.0	0.3	99.3	49.6	0.3	82.6	82.0	0.2
LOS	F	E	A	D	E	A	F	D	A	F	F	A
Approach Delay		60.0			16.1			47.6			76.4	
Approach LOS		E			B			D			E	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 97.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 61.0 Intersection LOS: E
Intersection Capacity Utilization 91.4% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 11: CCW & Sturgeon Rd



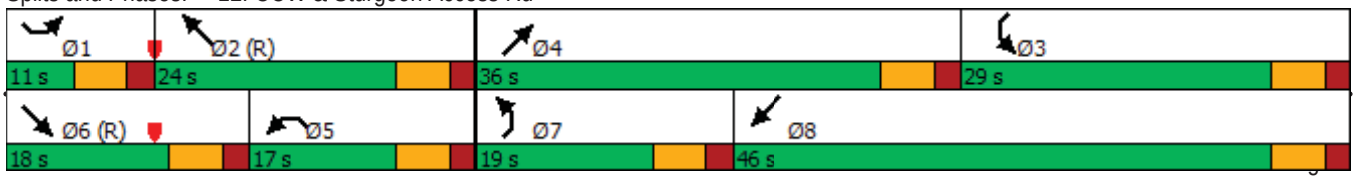
Lanes, Volumes, Timings
12: CCW & Sturgeon Access Rd

05/12/2020

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	114	41	207	479	791	264	935	865	684	458	139
Future Volume (vph)	19	114	41	207	479	791	264	935	865	684	458	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	150.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3216	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			360			652			480			360
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			207.8			212.7			251.5	
Travel Time (s)		7.1			9.4			10.9			12.9	
Confl. Peds. (#/hr)										3		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	20	120	43	218	504	833	278	984	911	720	482	146
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	120	43	218	504	833	278	984	911	720	482	146
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	11.0	18.0		17.0	24.0		19.0	36.0		29.0	46.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	5.0	9.0	100.0	13.2	23.7	100.0	12.2	30.9	100.0	23.0	41.6	100.0
Actuated g/C Ratio	0.05	0.09	1.00	0.13	0.24	1.00	0.12	0.31	1.00	0.23	0.42	1.00
v/c Ratio	0.12	0.40	0.03	0.51	0.64	0.56	0.71	0.96	0.61	0.97	0.35	0.10
Control Delay	47.3	46.6	0.0	24.5	20.2	4.6	52.5	55.4	1.9	66.3	21.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.3	46.6	0.0	24.5	20.2	4.6	52.5	55.4	1.9	66.3	21.3	0.1
LOS	D	D	A	C	C	A	D	E	A	E	C	A
Approach Delay		35.8			12.5			32.6			43.0	
Approach LOS		D			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 72 (72%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 29.4		Intersection LOS: C	
Intersection Capacity Utilization 73.6%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 12: CCW & Sturgeon Access Rd

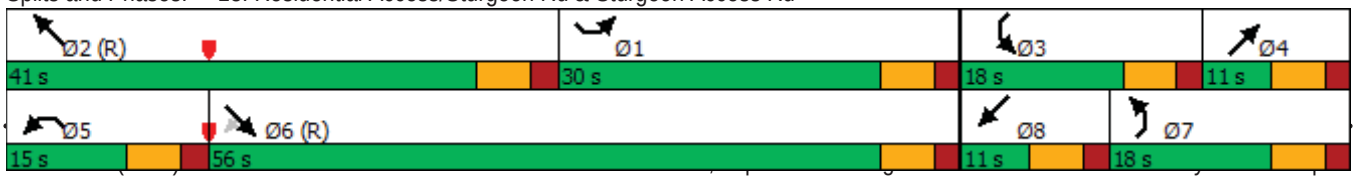


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	679	841	143	162	943	918	311	126	354	315	59	223
Future Volume (vph)	679	841	143	162	943	918	311	126	354	315	59	223
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229			504			360			360
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		223.1			150.1			188.1			231.4	
Travel Time (s)		10.0			6.8			13.5			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	715	885	151	171	993	966	327	133	373	332	62	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	715	885	151	171	993	966	327	133	373	332	62	235
Turn Type	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			Free			Free			Free
Total Split (s)	30.0	56.0	56.0	15.0	41.0		18.0	11.0		18.0	11.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	24.0	49.8	49.8	8.7	34.5	100.0	14.7	5.5	100.0	12.0	5.1	100.0
Actuated g/C Ratio	0.24	0.50	0.50	0.09	0.34	1.00	0.15	0.06	1.00	0.12	0.05	1.00
v/c Ratio	0.93	0.54	0.18	0.61	0.87	0.65	0.69	0.74	0.25	0.86	0.37	0.16
Control Delay	39.0	9.3	0.3	53.8	40.0	2.2	50.7	71.5	0.4	65.1	52.5	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	9.3	0.3	53.8	40.0	2.2	50.7	71.5	0.4	65.1	52.5	0.2
LOS	D	A	A	D	D	A	D	E	A	E	D	A
Approach Delay		20.6			24.0			31.5			39.6	
Approach LOS		C			C			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 25.9 Intersection LOS: C
Intersection Capacity Utilization 78.6% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	5	5	42	5	234	5	1604	141	968	1239	265
Future Volume (vph)	42	5	5	42	5	234	5	1604	141	968	1239	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		50.0	50.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			227			246			176			279
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		225.8			271.2			169.3			238.4	
Travel Time (s)		16.3			19.5			8.7			12.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	5	5	44	5	246	5	1688	148	1019	1304	279
Shared Lane Traffic (%)												
Lane Group Flow (vph)	44	5	5	44	5	246	5	1688	148	1019	1304	279
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			2			6
Total Split (s)	11.0	11.0		11.0	11.0		11.0	66.0	66.0	42.0	97.0	97.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	5.0	5.0	119.0	5.0	5.0	119.0	5.0	60.2	60.2	36.1	101.7	101.7
Actuated g/C Ratio	0.04	0.04	1.00	0.04	0.04	1.00	0.04	0.51	0.51	0.30	0.85	0.85
v/c Ratio	0.64	0.04	0.00	0.64	0.04	0.17	0.04	1.01	0.18	1.04	0.46	0.21
Control Delay	95.5	58.4	0.0	95.5	58.4	0.2	58.4	53.7	2.0	81.7	4.4	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	95.5	58.4	0.0	95.5	58.4	0.2	58.4	53.7	2.0	81.7	4.4	0.9
LOS	F	E	A	F	E	A	E	D	A	F	A	A
Approach Delay		83.2			15.4			49.5			34.3	
Approach LOS		F			B			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 119			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 39.5		Intersection LOS: D	
Intersection Capacity Utilization 95.9%		ICU Level of Service F	
Analysis Period (min) 15			

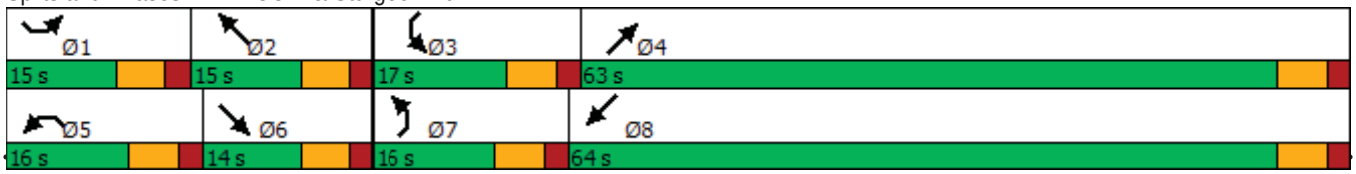
Splits and Phases: 26: CCW & New Access



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	262	45	196	234	91	604	289	1727	70	313	1742	196
Future Volume (vph)	262	45	196	234	91	604	289	1727	70	313	1742	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	1746	1484	3219	1746	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	1746	1484	3219	1746	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			208			241			208			208
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			8.9			8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	276	47	206	246	96	636	304	1818	74	329	1834	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	276	47	206	246	96	636	304	1818	74	329	1834	206
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	15.0	14.0		16.0	15.0		16.0	63.0		17.0	64.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	9.0	7.5	109.7	12.5	8.7	109.7	10.0	57.0	109.7	11.0	58.0	109.7
Actuated g/C Ratio	0.08	0.07	1.00	0.11	0.08	1.00	0.09	0.52	1.00	0.10	0.53	1.00
v/c Ratio	1.05	0.40	0.14	0.67	0.70	0.43	1.04	1.05	0.05	1.02	1.05	0.14
Control Delay	117.3	59.0	0.2	58.1	75.9	0.9	111.8	64.5	0.1	105.1	60.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	117.3	59.0	0.2	58.1	75.9	0.9	111.8	64.5	0.1	105.1	60.9	0.2
LOS	F	E	A	E	E	A	F	E	A	F	E	A
Approach Delay		66.5			22.6			68.9			61.8	
Approach LOS		E			C			E			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 109.7			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.05			
Intersection Signal Delay: 58.5		Intersection LOS: E	
Intersection Capacity Utilization 85.8%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 11: CCW & Sturgeon Rd



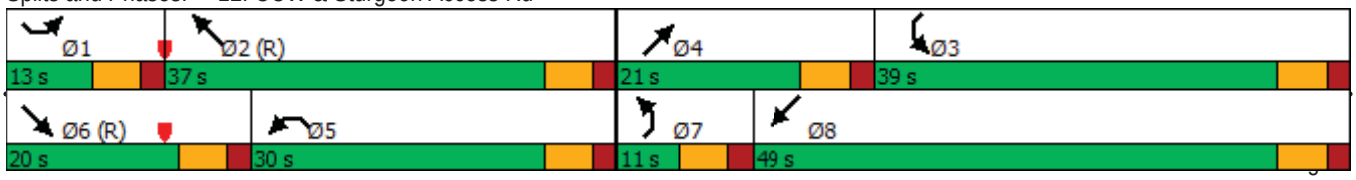
Lanes, Volumes, Timings
12: CCW & Sturgeon Access Rd

05/12/2020

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	101	434	211	726	190	551	58	466	267	1000	957	39
Future Volume (vph)	101	434	211	726	190	551	58	466	267	1000	957	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	150.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3214	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			327			580			327			327
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			207.8			212.7			251.5	
Travel Time (s)		7.1			9.4			10.9			12.9	
Confl. Peds. (#/hr)										3		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	106	457	222	764	200	580	61	491	281	1053	1007	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	106	457	222	764	200	580	61	491	281	1053	1007	41
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	13.0	20.0		30.0	37.0		11.0	21.0		39.0	49.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	6.9	14.0	110.0	24.0	31.1	110.0	5.0	15.0	110.0	33.0	45.2	110.0
Actuated g/C Ratio	0.06	0.13	1.00	0.22	0.28	1.00	0.05	0.14	1.00	0.30	0.41	1.00
v/c Ratio	0.53	1.08	0.15	1.09	0.21	0.39	0.42	1.09	0.19	1.09	0.74	0.03
Control Delay	59.9	113.5	0.2	88.7	17.0	0.8	60.0	112.6	0.3	94.2	32.1	0.0
Queue Delay	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 Delay	59.9	113.5	0.2	88.7	17.0	0.8	60.0	112.6	0.3	94.2	32.1	0.0
LOS	E	F	A	F	B	A	E	F	A	F	C	A
Approach Delay		74.2			46.4			70.9			62.6	
Approach LOS		E			D			E			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 8 (7%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.09			
Intersection Signal Delay: 60.9		Intersection LOS: E	
Intersection Capacity Utilization 94.1%		ICU Level of Service F	
Analysis Period (min) 15			

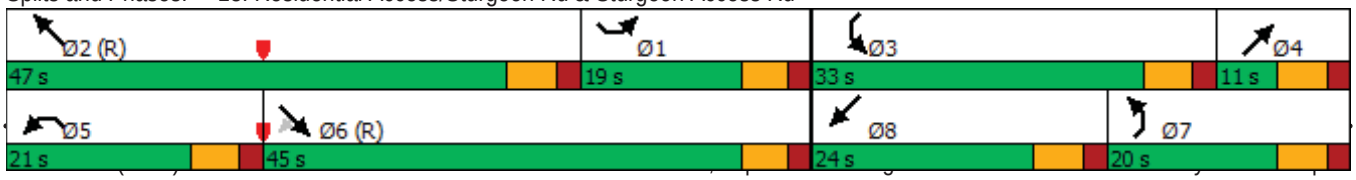
Splits and Phases: 12: CCW & Sturgeon Access Rd



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	234	1101	366	412	641	471	266	109	300	753	153	560
Future Volume (vph)	234	1101	366	412	641	471	266	109	300	753	153	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			243			347			327			510
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		223.1			150.1			188.1			231.4	
Travel Time (s)		10.0			6.8			13.5			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	246	1159	385	434	675	496	280	115	316	793	161	589
Shared Lane Traffic (%)												
Lane Group Flow (vph)	246	1159	385	434	675	496	280	115	316	793	161	589
Turn Type	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			Free			Free			Free
Total Split (s)	19.0	45.0	45.0	21.0	47.0		20.0	11.0		33.0	24.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	25.2	39.0	39.0	15.0	28.8	110.0	21.3	5.0	110.0	27.0	10.7	110.0
Actuated g/C Ratio	0.23	0.35	0.35	0.14	0.26	1.00	0.19	0.05	1.00	0.25	0.10	1.00
v/c Ratio	0.33	0.99	0.56	0.99	0.78	0.33	0.45	0.77	0.21	1.00	0.50	0.40
Control Delay	15.9	26.5	4.2	88.9	44.0	0.6	42.4	83.2	0.3	74.9	52.2	0.8
Queue Delay	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 Delay	15.9	26.5	4.2	88.9	44.0	0.6	42.4	83.2	0.3	74.9	52.2	0.8
LOS	B	C	A	F	D	A	D	F	A	E	D	A
Approach Delay		20.3			42.7			30.3			44.3	
Approach LOS		C			D			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 108 (98%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 34.5		Intersection LOS: C	
Intersection Capacity Utilization 87.8%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	216	5	5	123	0	799	5	1071	47	253	1873	46
Future Volume (vph)	216	5	5	123	0	799	5	1071	47	253	1873	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		50.0	50.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	1659	3318	1484	1659	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1659	3318	1484	1659	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			295			295			229			164
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		225.8			271.2			169.3			238.4	
Travel Time (s)		16.3			19.5			8.7			12.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	5	5	129	0	841	5	1127	49	266	1972	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	5	5	129	0	841	5	1127	49	266	1972	48
Turn Type	Prot	NA	Free	Prot		Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			2			6
Total Split (s)	18.0	11.0		18.0	11.0		11.0	52.0	52.0	19.0	60.0	60.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	13.9	5.0	83.1	12.1		83.1	5.0	39.6	39.6	11.4	55.2	55.2
Actuated g/C Ratio	0.17	0.06	1.00	0.15		1.00	0.06	0.48	0.48	0.14	0.66	0.66
v/c Ratio	0.82	0.02	0.00	0.53		0.57	0.03	0.71	0.06	0.60	0.89	0.05
Control Delay	57.5	41.2	0.0	44.1		1.6	41.2	21.0	0.1	40.8	20.1	0.1
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	57.5	41.2	0.0	44.1		1.6	41.2	21.0	0.1	40.8	20.1	0.1
LOS	E	D	A	D		A	D	C	A	D	C	A
Approach Delay		55.9			7.2			20.3			22.1	
Approach LOS		E			A			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 83.1			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 20.3		Intersection LOS: C	
Intersection Capacity Utilization 89.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 26: CCW & New Access



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	458	132	239	83	57	726	189	1710	385	2620	3395	495
Future Volume (vph)	458	132	239	83	57	726	189	1710	385	2620	3395	495
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			622			196			196
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			8.9			8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	482	139	252	87	60	764	199	1800	405	2758	3574	521
Shared Lane Traffic (%)												
Lane Group Flow (vph)	482	139	252	87	60	764	199	1800	405	2758	3574	521
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	19.0	18.0		13.0	12.0		12.0	48.0		71.0	107.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	14.6	11.2	149.2	6.9	6.0	149.2	6.0	42.0	149.2	65.0	101.0	149.2
Actuated g/C Ratio	0.10	0.08	1.00	0.05	0.04	1.00	0.04	0.28	1.00	0.44	0.68	1.00
v/c Ratio	1.53	0.56	0.17	0.58	0.45	0.51	1.54	1.93	0.27	1.97	1.59	0.35
Control Delay	295.8	75.5	0.2	85.9	81.5	1.3	323.5	450.6	0.5	463.8	291.7	0.7
Queue Delay	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 Delay	295.8	75.5	0.2	85.9	81.5	1.3	323.5	450.6	0.5	463.8	291.7	0.7
LOS	F	E	A	F	F	A	F	F	A	F	F	A
Approach Delay		175.4			14.6			364.2			338.8	
Approach LOS		F			B			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 149.2			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.97			
Intersection Signal Delay: 304.7		Intersection LOS: F	
Intersection Capacity Utilization 159.2%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 11: CCW & Sturgeon Rd



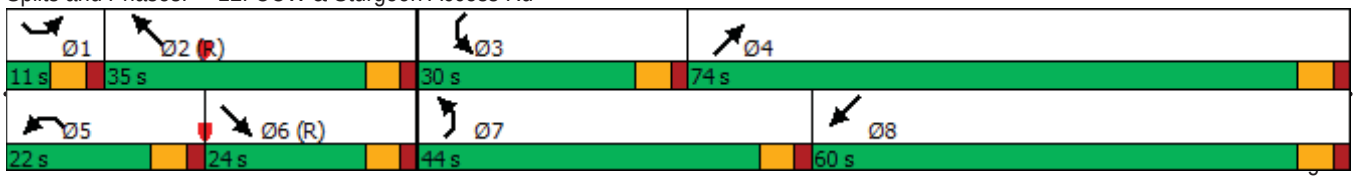
Lanes, Volumes, Timings
12: CCW & Sturgeon Access Rd

05/12/2020

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	75	283	102	313	981	1429	635	2600	1365	871	858	618
Future Volume (vph)	75	283	102	313	981	1429	635	2600	1365	871	858	618
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	150.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3218	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			240			452			240			249
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		317.8			399.7			212.7			251.5	
Travel Time (s)		14.3			18.0			10.9			12.9	
Confl. Peds. (#/hr)										3		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	298	107	329	1033	1504	668	2737	1437	917	903	651
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	298	107	329	1033	1504	668	2737	1437	917	903	651
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	11.0	24.0		22.0	35.0		44.0	74.0		30.0	60.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	5.0	18.0	150.0	16.0	29.0	150.0	35.0	68.0	150.0	24.0	57.0	150.0
Actuated g/C Ratio	0.03	0.12	1.00	0.11	0.19	1.00	0.23	0.45	1.00	0.16	0.38	1.00
v/c Ratio	0.74	0.75	0.07	0.96	1.61	1.01	0.89	1.82	0.97	1.78	0.72	0.44
Control Delay	107.4	76.3	0.1	75.4	305.8	41.7	70.5	398.8	19.0	393.7	44.0	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.4	76.3	0.1	75.4	305.8	41.7	70.5	398.8	19.0	393.7	44.0	0.9
LOS	F	E	A	E	F	D	E	F	B	F	D	A
Approach Delay		64.5			140.7			240.8			162.4	
Approach LOS		E			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 68 (45%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.82			
Intersection Signal Delay: 187.7		Intersection LOS: F	
Intersection Capacity Utilization 148.0%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 12: CCW & Sturgeon Access Rd



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1263	1113	143	162	2106	1866	311	126	354	514	59	306
Future Volume (vph)	1263	1113	143	162	2106	1866	311	126	354	514	59	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			306			216			322
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		223.1			357.6			188.1			231.4	
Travel Time (s)		10.0			16.1			13.5			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1329	1172	151	171	2217	1964	327	133	373	541	62	322
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1329	1172	151	171	2217	1964	327	133	373	541	62	322
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	45.0	98.0		18.0	71.0		23.0	11.0		23.0	11.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	39.0	92.6	150.0	11.4	65.0	150.0	19.2	5.0	150.0	17.0	5.2	150.0
Actuated g/C Ratio	0.26	0.62	1.00	0.08	0.43	1.00	0.13	0.03	1.00	0.11	0.03	1.00
v/c Ratio	1.59	0.57	0.10	0.70	1.54	1.32	0.80	1.21	0.25	1.49	0.54	0.22
Control Delay	291.7	19.9	0.0	83.0	279.3	161.4	78.5	209.7	0.4	276.3	88.9	0.3
Queue Delay	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 Delay	291.7	19.9	0.0	83.0	279.3	161.4	78.5	209.7	0.4	276.3	88.9	0.3
LOS	F	B	A	F	F	F	E	F	A	F	F	A
Approach Delay		155.0			218.4			64.5			167.7	
Approach LOS		F			F			E			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.59			
Intersection Signal Delay: 179.2		Intersection LOS: F	
Intersection Capacity Utilization 133.1%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	496	229	293	213	282	957	1844	1303	1255	1825	637
Future Volume (vph)	158	496	229	293	213	282	957	1844	1303	1255	1825	637
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			297			244			196
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		225.8			271.2			206.1			238.4	
Travel Time (s)		16.3			19.5			10.6			12.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	522	241	308	224	297	1007	1941	1372	1321	1921	671
Shared Lane Traffic (%)												
Lane Group Flow (vph)	166	522	241	308	224	297	1007	1941	1372	1321	1921	671
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	17.0	22.0		16.0	21.0		37.0	65.0		47.0	75.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	10.7	16.0	150.0	10.0	15.3	150.0	31.0	59.0	150.0	41.0	69.0	150.0
Actuated g/C Ratio	0.07	0.11	1.00	0.07	0.10	1.00	0.21	0.39	1.00	0.27	0.46	1.00
v/c Ratio	0.72	1.48	0.16	1.44	0.66	0.20	1.51	1.49	0.92	1.50	1.26	0.45
Control Delay	86.2	273.9	0.2	268.6	75.3	0.3	278.5	257.2	12.2	269.7	157.3	1.0
Queue Delay	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 Delay	86.2	273.9	0.2	268.6	75.3	0.3	278.5	257.2	12.2	269.7	157.3	1.0
LOS	F	F	A	F	E	A	F	F	B	F	F	A
Approach Delay		169.4			120.2			184.4			168.4	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.51			
Intersection Signal Delay: 171.4		Intersection LOS: F	
Intersection Capacity Utilization 128.8%		ICU Level of Service H	
Analysis Period (min) 15			

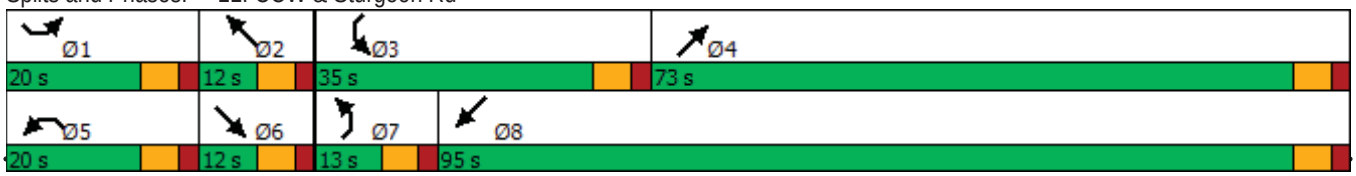
Splits and Phases: 26: CCW & New Access



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	518	60	214	351	114	2228	174	2680	103	1087	2404	386
Future Volume (vph)	518	60	214	351	114	2228	174	2680	103	1087	2404	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			210			288			210			210
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		157.9			164.0			172.6			165.4	
Travel Time (s)		7.1			7.4			8.9			8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	545	63	225	369	120	2345	183	2821	108	1144	2531	406
Shared Lane Traffic (%)												
Lane Group Flow (vph)	545	63	225	369	120	2345	183	2821	108	1144	2531	406
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	20.0	12.0		20.0	12.0		13.0	73.0		35.0	95.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	14.0	6.0	140.0	16.4	6.0	140.0	7.0	67.0	140.0	29.0	89.0	140.0
Actuated g/C Ratio	0.10	0.04	1.00	0.12	0.04	1.00	0.05	0.48	1.00	0.21	0.64	1.00
v/c Ratio	1.70	0.45	0.15	0.98	0.85	1.58	1.14	1.78	0.07	1.72	1.20	0.27
Control Delay	363.5	75.6	0.2	102.6	108.7	278.3	171.8	378.8	0.1	362.7	120.9	0.5
Queue Delay	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 Delay	363.5	75.6	0.2	102.6	108.7	278.3	171.8	378.8	0.1	362.7	120.9	0.5
LOS	F	E	A	F	F	F	F	F	A	F	F	A
Approach Delay		243.6			248.2			353.5			176.7	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.78			
Intersection Signal Delay: 251.2		Intersection LOS: F	
Intersection Capacity Utilization 141.5%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 11: CCW & Sturgeon Rd



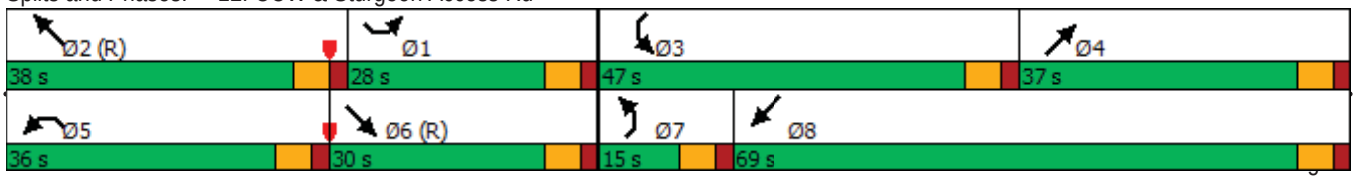
Lanes, Volumes, Timings
12: CCW & Sturgeon Access Rd

05/12/2020

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	425	759	444	1066	542	881	271	1107	523	1465	2304	246
Future Volume (vph)	425	759	444	1066	542	881	271	1107	523	1465	2304	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	150.0		50.0	120.0		50.0	120.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3217	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			202			560			196			196
Link Speed (k/h)		80			80			70			70	
Link Distance (m)		317.8			399.7			212.7			251.5	
Travel Time (s)		14.3			18.0			10.9			12.9	
Confl. Peds. (#/hr)										3		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	447	799	467	1122	571	927	285	1165	551	1542	2425	259
Shared Lane Traffic (%)												
Lane Group Flow (vph)	447	799	467	1122	571	927	285	1165	551	1542	2425	259
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	28.0	30.0		36.0	38.0		15.0	37.0		47.0	69.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	24.3	24.0	150.0	30.0	29.7	150.0	9.0	31.0	150.0	41.0	63.0	150.0
Actuated g/C Ratio	0.16	0.16	1.00	0.20	0.20	1.00	0.06	0.21	1.00	0.27	0.42	1.00
v/c Ratio	0.86	1.51	0.31	1.74	0.87	0.62	1.48	1.70	0.37	1.75	1.74	0.17
Control Delay	77.7	279.2	0.6	369.9	58.1	3.9	285.6	356.7	0.7	376.5	365.4	0.3
Queue Delay	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 Delay	77.7	279.2	0.6	369.9	58.1	3.9	285.6	356.7	0.7	376.5	365.4	0.3
LOS	E	F	A	F	E	A	F	F	A	F	F	A
Approach Delay		150.6			172.5			248.5			347.1	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 102 (68%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.75			
Intersection Signal Delay: 253.2		Intersection LOS: F	
Intersection Capacity Utilization 143.8%		ICU Level of Service H	
Analysis Period (min) 15			

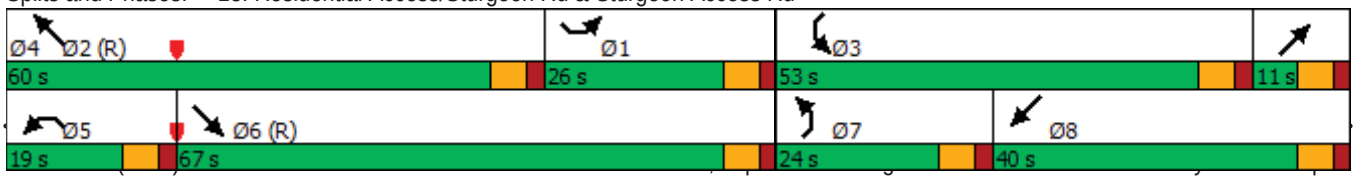
Splits and Phases: 12: CCW & Sturgeon Access Rd



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	478	1903	366	412	1260	849	266	109	300	1507	153	963
Future Volume (vph)	478	1903	366	412	1260	849	266	109	300	1507	153	963
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		50.0	50.0		50.0	50.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			240			240			240			470
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		223.1			357.6			188.1			231.4	
Travel Time (s)		10.0			16.1			13.5			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	503	2003	385	434	1326	894	280	115	316	1586	161	1014
Shared Lane Traffic (%)												
Lane Group Flow (vph)	503	2003	385	434	1326	894	280	115	316	1586	161	1014
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	26.0	67.0		19.0	60.0		24.0	11.0		53.0	40.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	20.0	61.0	150.0	13.0	54.0	150.0	16.8	5.0	150.0	47.0	35.2	150.0
Actuated g/C Ratio	0.13	0.41	1.00	0.09	0.36	1.00	0.11	0.03	1.00	0.31	0.23	1.00
v/c Ratio	1.17	1.48	0.26	1.56	1.11	0.60	0.78	1.05	0.21	1.57	0.21	0.68
Control Delay	111.1	236.7	0.0	311.3	106.0	1.8	80.2	165.4	0.3	297.5	47.4	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	111.1	236.7	0.0	311.3	106.0	1.8	80.2	165.4	0.3	297.5	47.4	2.6
LOS	F	F	A	F	F	A	F	F	A	F	D	A
Approach Delay		183.4			104.5			58.5			174.6	
Approach LOS		F			F			E			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 140 (93%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.57			
Intersection Signal Delay: 147.6		Intersection LOS: F	
Intersection Capacity Utilization 131.5%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 13: Residential Access/Sturgeon Rd & Sturgeon Access Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	438	240	652	1097	444	1039	504	1480	429	371	2266	332
Future Volume (vph)	438	240	652	1097	444	1039	504	1480	429	371	2266	332
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Satd. Flow (prot)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3219	3318	1484	3219	3318	1484	3219	3318	1484	3219	3318	1484
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			221			291			196			196
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		225.8			271.2			206.1			238.4	
Travel Time (s)		16.3			19.5			10.6			12.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	461	253	686	1155	467	1094	531	1558	452	391	2385	349
Shared Lane Traffic (%)												
Lane Group Flow (vph)	461	253	686	1155	467	1094	531	1558	452	391	2385	349
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Total Split (s)	26.0	14.0		39.0	27.0		22.0	74.0		23.0	75.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effct Green (s)	20.0	8.0	150.0	33.0	21.0	150.0	16.0	68.0	150.0	17.0	69.0	150.0
Actuated g/C Ratio	0.13	0.05	1.00	0.22	0.14	1.00	0.11	0.45	1.00	0.11	0.46	1.00
v/c Ratio	1.07	1.44	0.46	1.63	1.01	0.74	1.55	1.04	0.30	1.07	1.56	0.24
Control Delay	124.3	273.0	1.0	326.7	106.5	3.3	302.3	73.0	0.5	129.1	286.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	124.3	273.0	1.0	326.7	106.5	3.3	302.3	73.0	0.5	129.1	286.9	0.4
LOS	F	F	A	F	F	A	F	E	A	F	F	A
Approach Delay		90.8			158.6			108.0			235.2	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.63			
Intersection Signal Delay: 160.2		Intersection LOS: F	
Intersection Capacity Utilization 134.9%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 26: CCW & New Access



APPENDIX E
TRAFFIC SIGNAL WARRANT ANALYSES

City of Winnipeg Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Sturgeon Rd	Direction (EW or NS)	NS
Side Street (name)	Summit Rd	Direction (EW or NS)	EW
Quadrant / Int #	1	Comments	2015 Background
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	City of Winnipeg
City:	Winnipeg, Manitoba
Analysis Date:	2018 Mar 02, Fri
Count Date:	-
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Sturgeon Rd	NB			2			1	925	2
Sturgeon Rd	SB	1		2				600	2
Summit Rd	WB		1				1		
Summit Rd	EB								

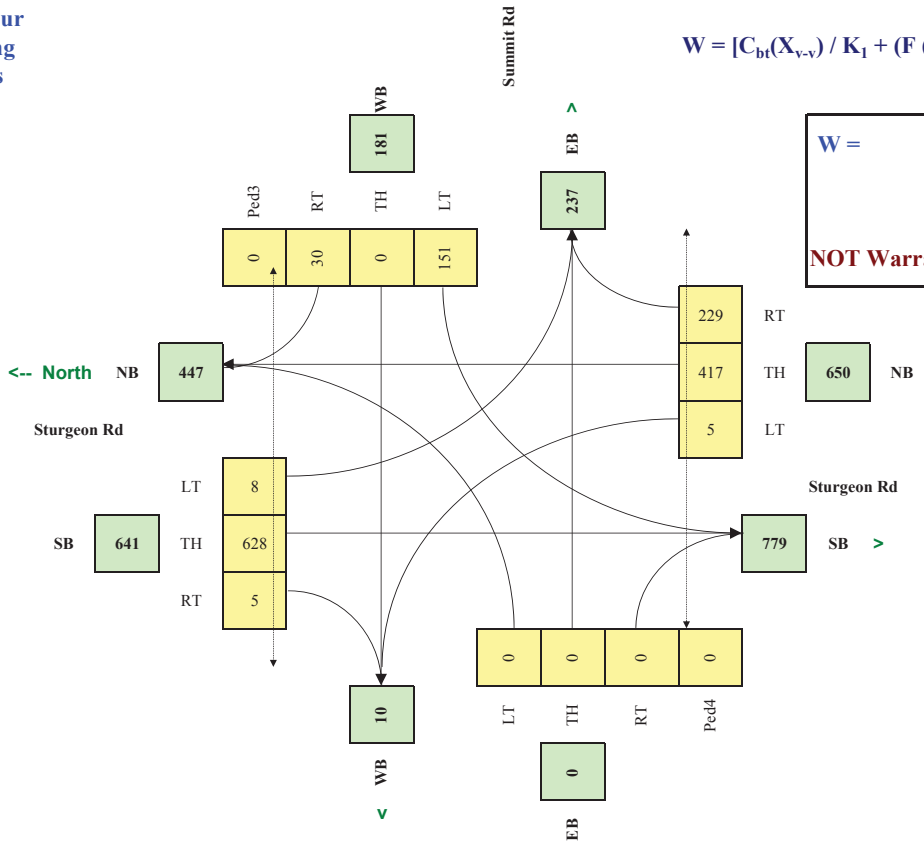
Demographics		
Elem. School/Mobility Impaired	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	700,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Sturgeon Rd	NS	80	10.0%	n	10.0
Summit Rd	EW		10.0%	n	

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	10	829	439	10	1316	10	293		78							
8:00 - 9:00																
12:00 - 13:00	9	765	405	9	1215	9	270		72							
13:00 - 14:00																
15:30 - 16:30	10	907	527	29	1238	10	341		29							
16:30 - 17:30																
Total (6-hour peak)	**29**	**2,501**	**1,371**	**48**	**3,769**	**29**	**904**	**0**	**179**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**5**	**417**	**229**	**8**	**628**	**5**	**151**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	62	62	0
		Veh	*Ped*

NOT Warranted

RESET SHEET

City of Winnipeg Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Sturgeon Rd	Direction (EW or NS)	NS	Road Authority:	City of Winnipeg
Side Street (name)	Summit Rd	Direction (EW or NS)	EW	City:	Winnipeg, Manitoba
Quadrant / Int #	1	Comments	2030 Scenario 1	Analysis Date:	2018 Mar 02, Fri
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	-
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Sturgeon Rd	NB			2			1	925	2
Sturgeon Rd	SB	1		2				600	2
Summit Rd	WB		1				1		
Summit Rd	EB								

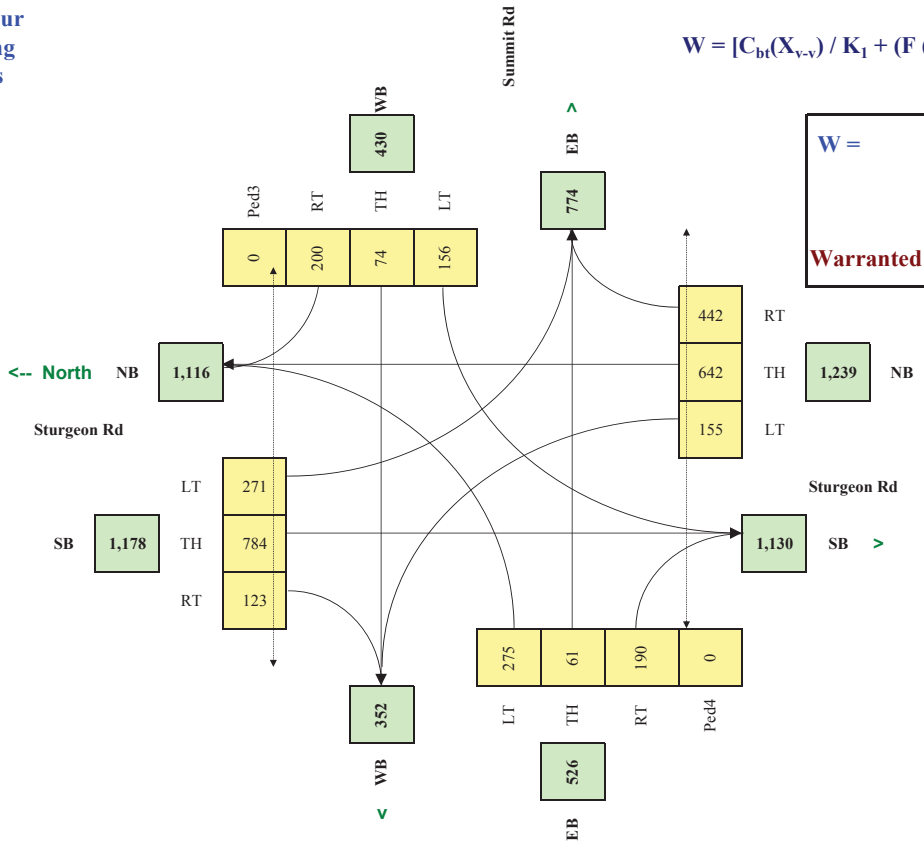
Demographics		
Elem. School/Mobility Impaired	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	700,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Sturgeon Rd	NS	80	10.0%	n	10.0
Summit Rd	EW		10.0%	n	

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	211	1404	1012	702	1519	170	320	152	417	435	84	296				
8:00 - 9:00																
12:00 - 13:00	194	1296	934	648	1402	157	295	140	385	401	77	274				
13:00 - 14:00																
15:30 - 16:30	523	1151	708	273	1782	413	320	152	398	811	205	571				
16:30 - 17:30																
Total (6-hour peak)	**928**	**3,851**	**2,654**	**1,623**	**4,703**	**740**	**935**	**444**	**1,200**	**1,647**	**366**	**1,141**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**155**	**642**	**442**	**271**	**784**	**123**	**156**	**74**	**200**	**275**	**61**	**190**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	693	693	0
		Veh	*Ped*

Warranted

RESET SHEET

CentrePort Winnipeg
AAWSP Industrial Amendment
Servicing Infrastructure

DRAFT

Prepared for:
Winnipeg Airport Land Corporation

Prepared by:
Stantec Consulting Ltd.
500-311 Portage Avenue
Winnipeg, MB R3B 2B9

Project No. 116809380

March 4, 2016

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1.0 INTRODUCTION

The servicing of the CentrePort area of Winnipeg west of the airport has always been a challenge because shallow depths of cover to till and bedrock are constraints to gravity sewer trenching. Precise mapping of till and bedrock elevations should be used to refine road and servicing alignments to achieve the most cost effective gravity sewer systems. To overcome trenching depth constraints, a pump station and forcemain can be a solution, as well as the possibility of low pressure wastewater collection systems.

The servicing of the area has been studied over many years and the servicing concept remains generally unchanged from the 1995 City of Winnipeg Servicing Memorandum for Development West of the Airport and North of Saskatchewan Avenue to the latest 2012 wastewater and land drainage studies prepared by AECOM for MIT.

This servicing assessment has been based on a layout concept prepared for the industrial land which considered transportation issues servicing feasibility and probable market lot size input. The assessment included a review of previous available servicing and drainage studies, geological studies, discussions with the City of Winnipeg Water and Wastewater Department and Manitoba Conservation and preparation of a new preliminary water distribution analysis.

It is anticipated that shallow utilities including electrical services, natural gas and telecommunication services will be provided by Manitoba Hydro and MTS, coordinated with final subdivision layout and service demands.

2.0 EXISTING INFRASTRUCTURE

2.1 EXISTING WATERMAIN SYSTEM

The existing Winnipeg water distribution system in St. James consists of a feedermain system that extends west in Silver Avenue, south Moray Street, west in Ness Avenue, Sturgeon Road, west Courage Road, and Hamilton Avenue and south in Cavalier.

A local watermain distribution consists of watermains leading north to Saskatchewan Avenue in Buchanan Blvd (150 m), Cavalier Drive (300 m), Sturgeon Road (300 mm) and Moray Avenue (300 mm), plus a 300 mm watermain in Saskatchewan Avenue from west of Saskatchewan Avenue from west of Sturgeon Road west to the WAA Combined Services Building (Figure 1).

The City proposes to install a watermain in Saskatchewan Avenue west from Cavalier Drive in the near future.

At the time of the preparation of the 2012 CentrePort Regional Water and Wastewater review study, it was assumed that the City of Winnipeg would supply water to both the Winnipeg and Rosser areas of CentrePort.

For the southern sector of CentrePort the primary water delivery concept was a 750 mm extension of the Silver Avenue feedermain, from Moray Street, with supporting St. James feedermain connections, through the CentrePort Winnipeg and Rosser Lands in the Sturgeon Road alignment to Inkster Boulevard (PR 221) and east in Inkster Boulevard to connect to the existing feedermain at Brookside Boulevard. It was envisioned that this new feedermain loop would be constructed in stages, with the first stage in Winnipeg extending north in Sturgeon Road to approximately the Truro Creek crossing.

A subsequent ruling that Winnipeg was ineligible to provide water to Rosser led to the development of a new water supply source in Headingley for the Rosser lands in CentrePort.

2.2 EXISTING WASTEWATER SEWER SYSTEM

The existing Winnipeg wastewater sewer system in St. James south and west of CentrePort generally consists of a series of 250 to 300 mm wastewater sewers draining south from Saskatchewan Avenue in existing streets toward the Charleswood Interceptor system and eventually the West End Wastewater Treatment Facility. There are only a few premises serviced by the system north of Saskatchewan Avenue, including the Air Canada hangar, the RCMP hangar, the Stars base, Red River College Training Centre and the WAA Combined Services Building. There is very limited remaining capacity in the St. James System (Figure 2).

2.3 EXISTING LAND DRAINAGE SYSTEMS

The CentrePort Industrial lands in Winnipeg are located within the catchment areas of 2 creek systems. The larger northeast sector drains to the relatively small Truro Creek System, across the airport and a St. James residential area to the Assiniboine River. The remainder of the CentrePort Winnipeg Industrial area and the proposed CentrePort Residential area drain to the much larger Sturgeon Creek System. (Figure 3).

3.0 PROPOSED INFRASTRUCTURE CONCEPT

3.1 PROPOSED WATERMAIN SYSTEM

In discussion with the City's Water and Wastewater Department, Stantec has prepared a water distribution model based on the assumed land use and general street layout for the CentrePort Winnipeg lands (Figure 4). The model was then tested to determine the extent to which development meeting the design domestic and fire flows can be achieved with supply from the existing watermain system at Saskatchewan Avenue and with no existing system upgrades such as feedermain extension. The resulting output showed that it appears there is adequate supply to meet design criteria for the proposed residential area immediately north of Saskatchewan Avenue, but for very little of the proposed industrial area. The model of the proposed distribution system and the test results where then submitted to the City to be assessed in the overall City water distribution model, to identify the feedermain extension needs for the Winnipeg lands of CentrePort.

On January 4, 2016 the City provided results of the overall CentrePort distribution model assessment, which indicates that a 750 mm feedermain interconnection between the existing 900 mm Silver Avenue Feedermain at Moray Street and the 600 mm Carriage Road Feedermain at Sturgeon Road is required, plus the extension of a 750 mm feedermain north into CentrePort approximately 2850 mm on the Sturgeon Road general alignment, with a feederpoint at the Silver Avenue Extension and Sturgeon Road roughly 1400 mm south of Selkirk Avenue (City boundary).

The City also advised that a 300 mm watermain connection from the northeast corner of the CentrePort Winnipeg servicing area to Omand's Creek industrial park will be required to meet design requirements.

It is expected that watermains servicing to the industrial area will be a minimum 300 mm size.

3.2 PROPOSED WASTEWATER SEWER SYSTEM

The wastewater system concept to service CentrePort City of Winnipeg lands has been developed in the comprehensive 2012 CenterPort Regional Water and Wastewater Review study prepared by AECOM for Manitoba Infrastructure and Transportation (MIT) (Figure 5).

The study proposes that all of the City lands be serviced by a gravity sewer system draining to a regional pump station optimally located on the east side of Sturgeon Road and the north side of Truro Creek. The pump station would transfer sewage by forcemain to the new 1350 mm gravity interceptor sewer in Inkster Boulevard. The pump station and forcemain system concept would be developed to full capacity to service the CentrePort Winnipeg lands in 2 stages. To provide

for ultimate development, a capacity improvement on a section of the existing Northwest Interceptor in Adsum Drive may be required.

A system of contributing wastewater subtrunk sewers (of interceptor size) would be routed to this pump station on alignments that minimize the impacts of shallow depths to till and bedrock. The progressive extension of the subtrunk sewers would be a factor determining the sequential servicing of development phases.

3.3 PROPOSED LAND DRAINAGE SYSTEMS

To minimize waterfowl activity near the airport the CentrePort Winnipeg land drainage systems would incorporate dry bottom linear stormwater retention basins (SRB's). To minimize construction costs, the alignment of the dry bottom SRB systems must consider varying relatively shallow depths to till and bedrock in the CentrePort area.

The proposed general concept will be to direct the industrial area drainage from east of CCW to the Truro Creek System and from west of CCW to the Sturgeon Creek system (Figure 6).

The proposed SRB layout shown is compatible with interconnection of the Sturgeon Creek and Truro Creek systems to optimize outflow management.

The existing Truro Creek system at the west boundary of the airport is of insufficient depth to serve as a gravity outfall for a cost effective SBR system. Unless it is practical to regrade a portion of the creek system within the airport, a pump station will be required for SBR discharge. Existing information indicates that the Truro Creek channel south of the airport has adequate capacity for existing flow rates.

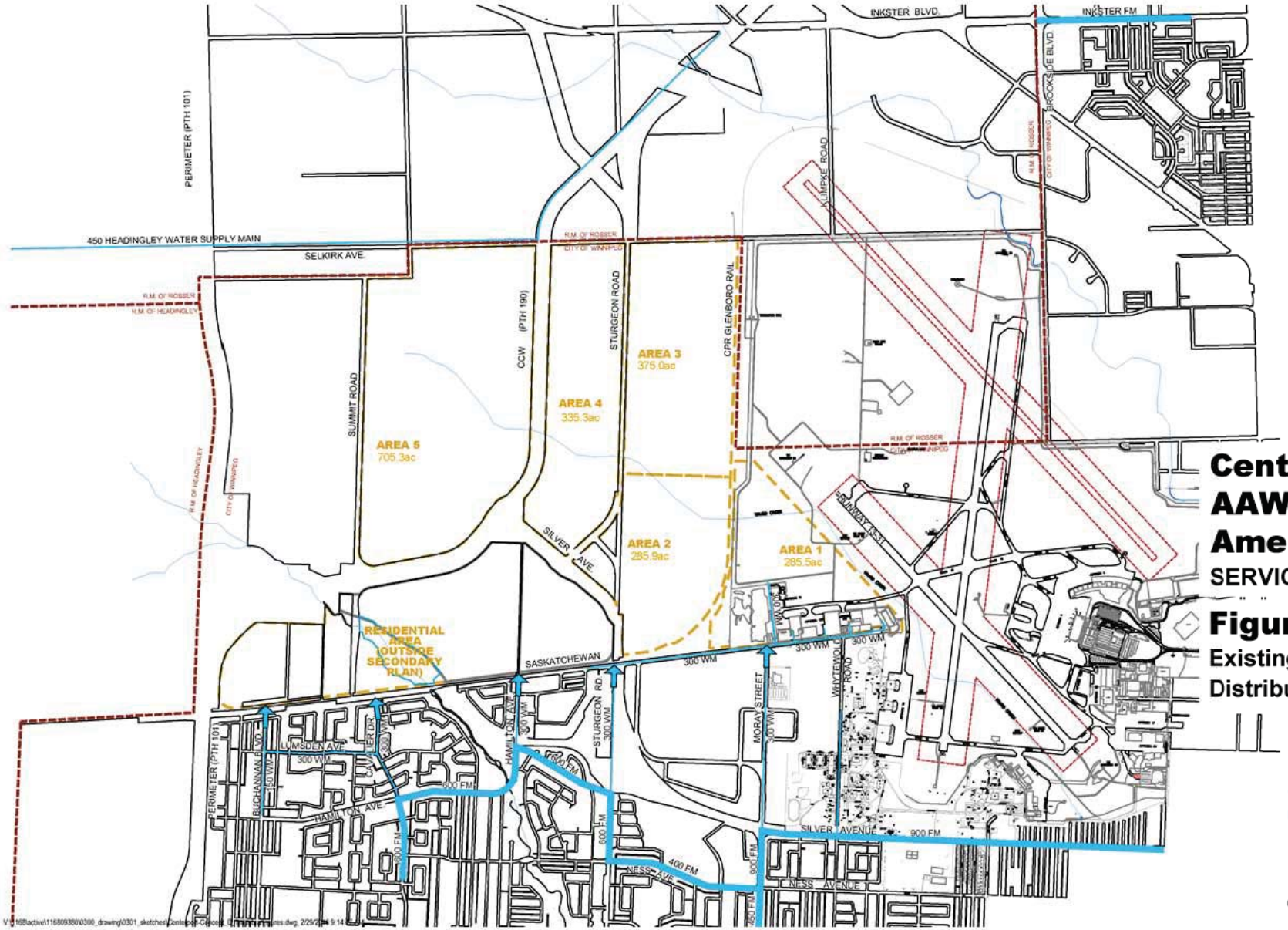
Sturgeon Creek provides a deep channel which is beneficial to land drainage system hydraulics during normal flow levels. However, under high flow conditions there is a capacity deficiency at downstream road and rail crossings, which results in high water levels in the CentrePort drainage area. The primary crossing constraint is the Saskatchewan Avenue road crossing, planned for replacement in the next few years, and the adjacent CPR rail crossing. These two constraints should be improved before significant development occurs. Even so, high creek water levels would require flood protection measures including outfall gates and pumping facilities to isolate and discharge the SRB system. The feasibility of a single outfall serving both the Sturgeon Creek industrial catchment and the east side residential area should be evaluated.

A detailed land drainage study should be undertaken, based on updated flow forecasts and topographic mapping to further refine the CentrePort Winnipeg primary land drainage system concept.

The land drainage component of the AAWSP industrial area amendment servicing evaluation is based on a review of the following available background data:

- Winnipeg Area Airports System Study 1976 Storm Drainage Study for Transport Canada (Dillon) – provided by WAA
- University of Manitoba Geological Engineering 1983 mapping for "Geological Report for Urban Development Winnipeg"
- Existing 1985 design drawings of Truro Creek drainage system within the WIA boundaries provided by WAA
- Geological investigation data from 1988 report on "Sewer Alignment Investigation and Property Investigation Lands North of Saskatchewan Avenue" and 1989 report "Municipal Servicing Lands North of Saskatchewan Avenue District 2" prepared for Genstar and Qualico by UMA
- 1995 City of Winnipeg memorandum on Land Drainage Servicing Requirements for Industrial Development west of the airport and north of Saskatchewan Avenue
- 1996 Airport Area Plan study
- 2003 Winnipeg Flood activity/Emergency Manual – Natural Channels (UMA – KGS)
- 2004 Environmental Impact Assessment – Airport Site Redevelopment Project / Winnipeg International Airport – provided by WAA
- 2009 LiDar survey of CentrePort area related to CCW design (Manitoba Conservation & Water Stewardship)
- 2009 Water Stewardship report on Sturgeon Creek & Hydrodynamic Model and Economic study (AECOM)
- 2014 LiDar top survey of Winnipeg International Airport and adjacent lands (WAA)
- 2015 Topographic survey of Logan Farms land (Barnes & Duncan/Sturgeon Business Park)
- Sturgeon Creek flood levels and profile mapping from west of PTH 101 to Sturgeon Road bridge from prior to CCW development – provided by City of Winnipeg (2015)
- Meeting and discussion with Geoff Reimer, P.Eng. of Manitoba Conservation and Water Stewardship (2015)
- 2015 City of Winnipeg email on recommended references re: Truro Creek and CentrePort Drainage

FIGURES



CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 1

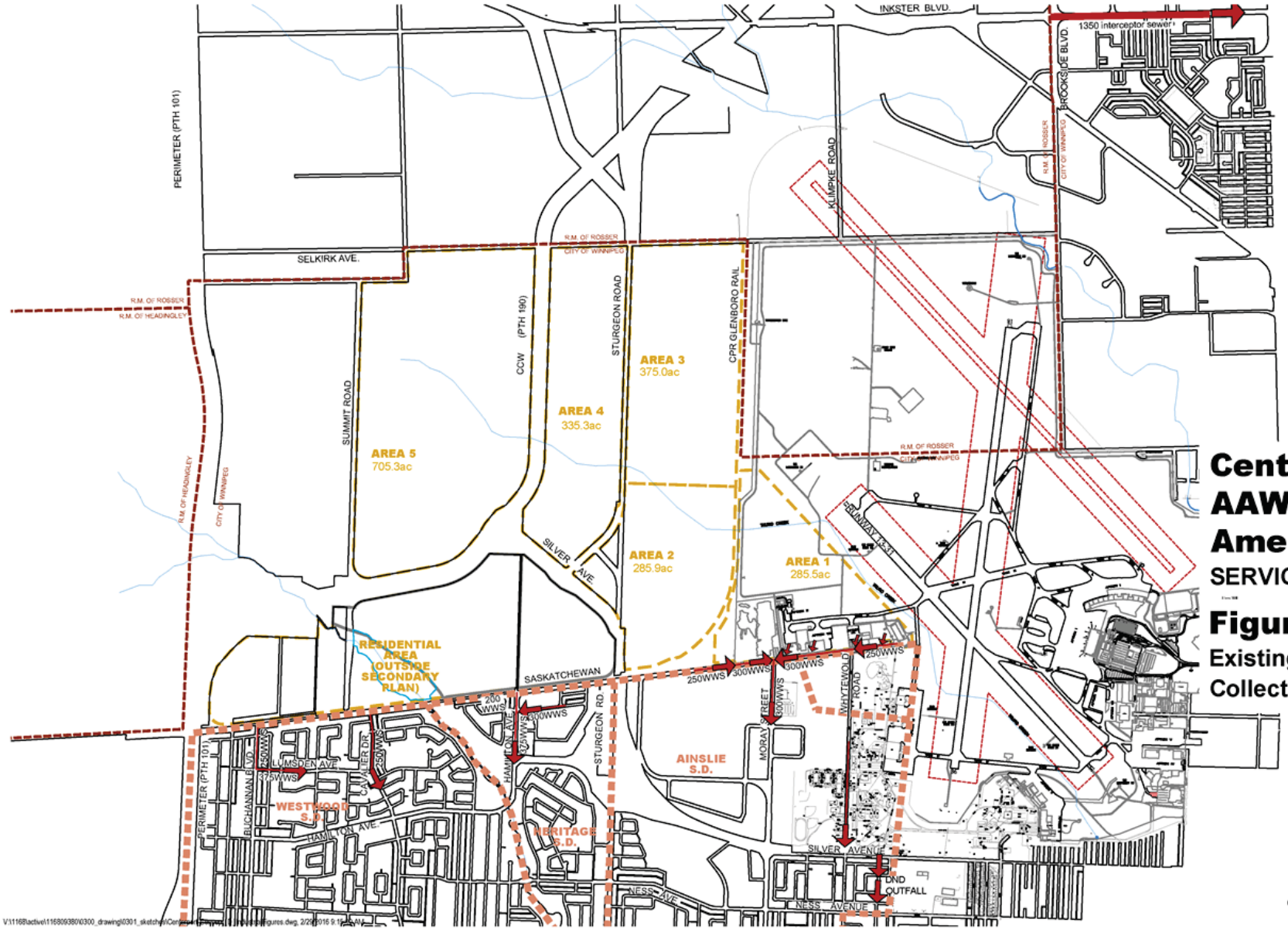
Existing Water Distribution System

SERVICING LEGEND:

- SERVICING AREA BOUNDARY
- EXISTING WM
- EXISTING FM

Scale : 35,000
February 29, 2016
Meters

0 500



CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 2

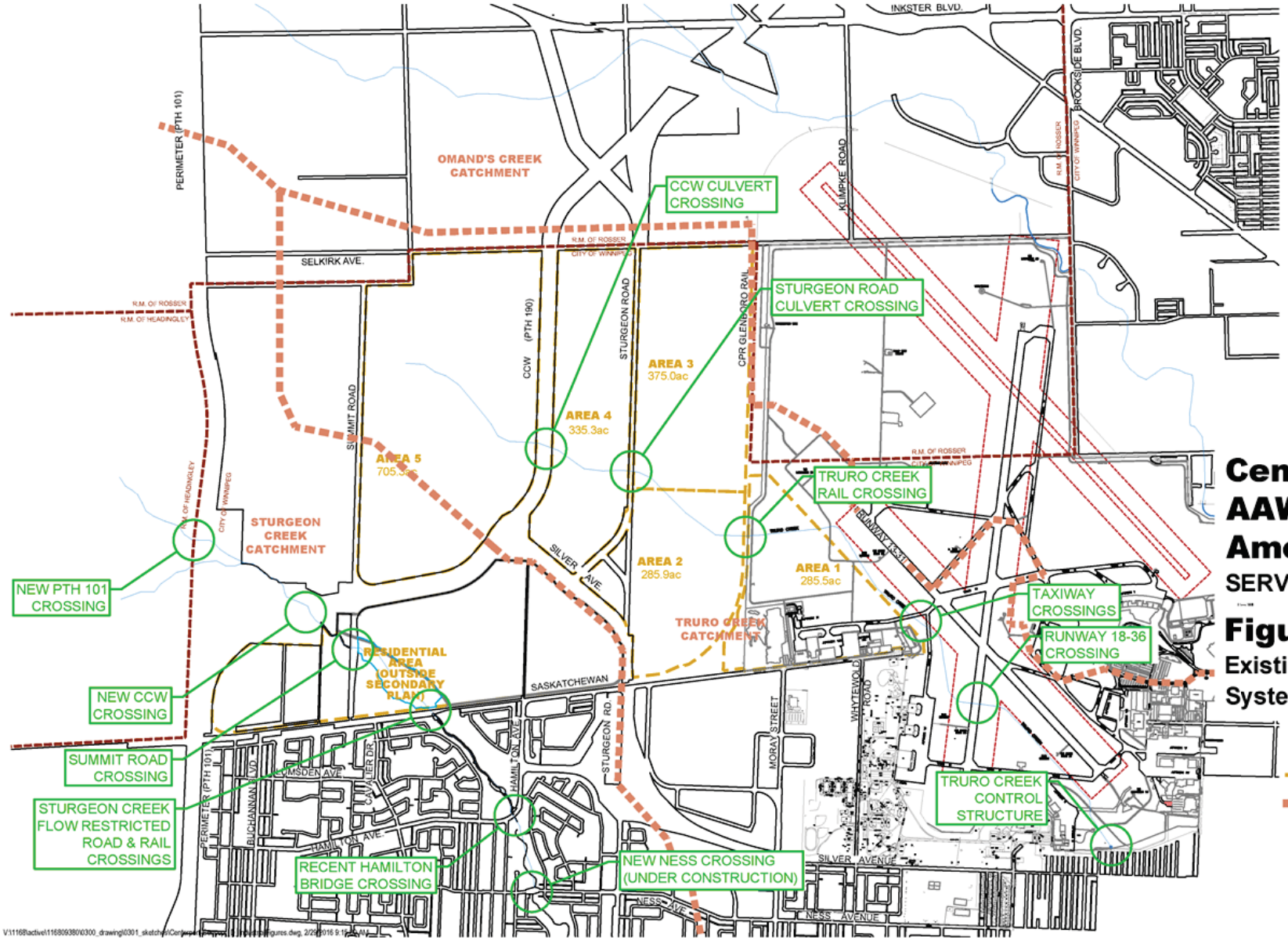
Existing Wastewater Sewer Collection System

SERVICING LEGEND:

- SERVICING AREA BOUNDARY
- EXISTING WWS
- EXISTING INTERCEPTER SEWER
- SEWER DISTRICT BOUNDARY

Scale : 35,000
February 29, 2016
Meters

0 500



CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 3

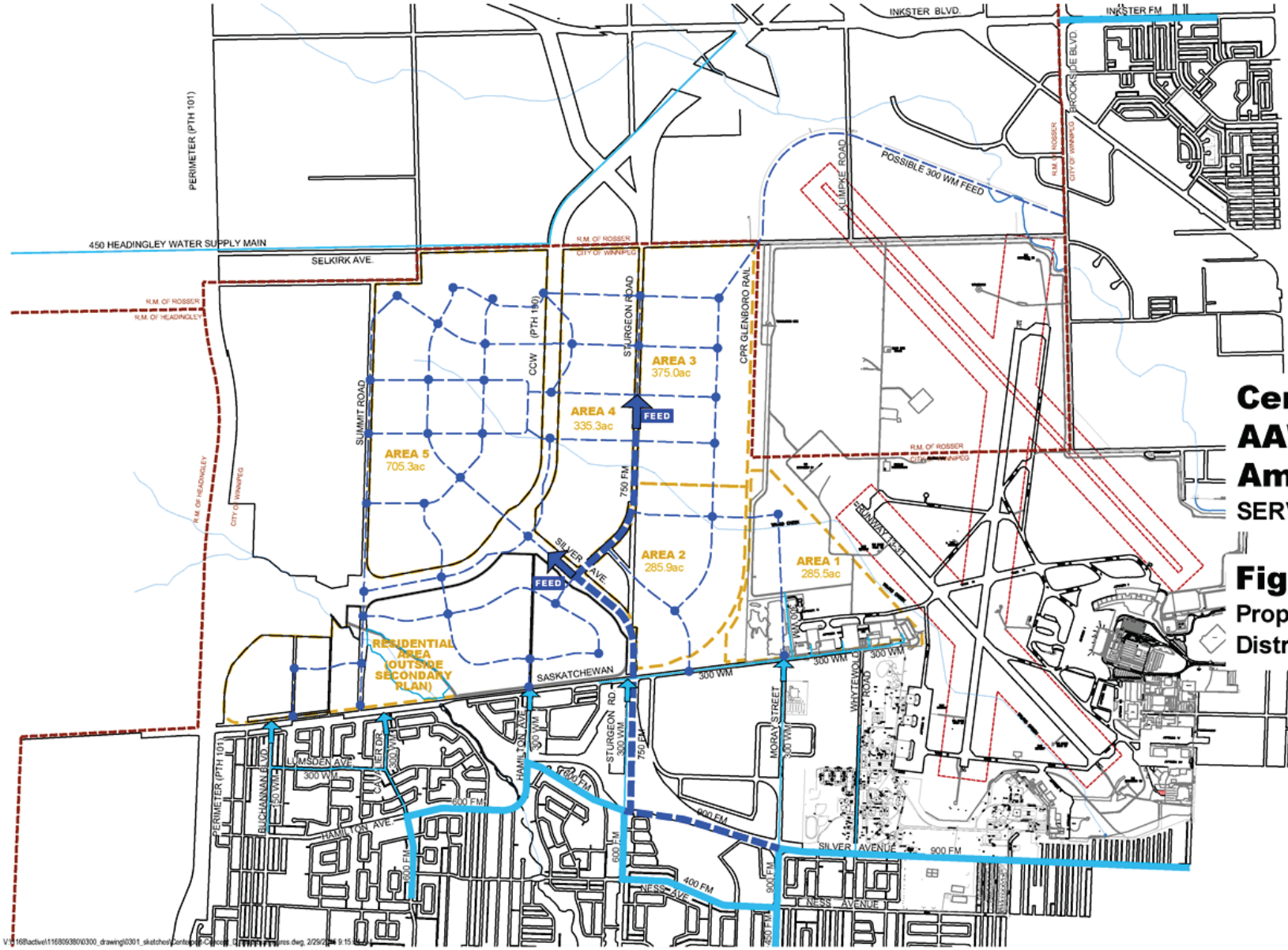
Existing Land Drainage Systems

SERVICING LEGEND:

- SERVICING AREA BOUNDARY
- APPROXIMATE EXISTING CATCHMENT BOUNDARIES

Scale : 35,000
February 29, 2016
Meters

0 500



CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 4

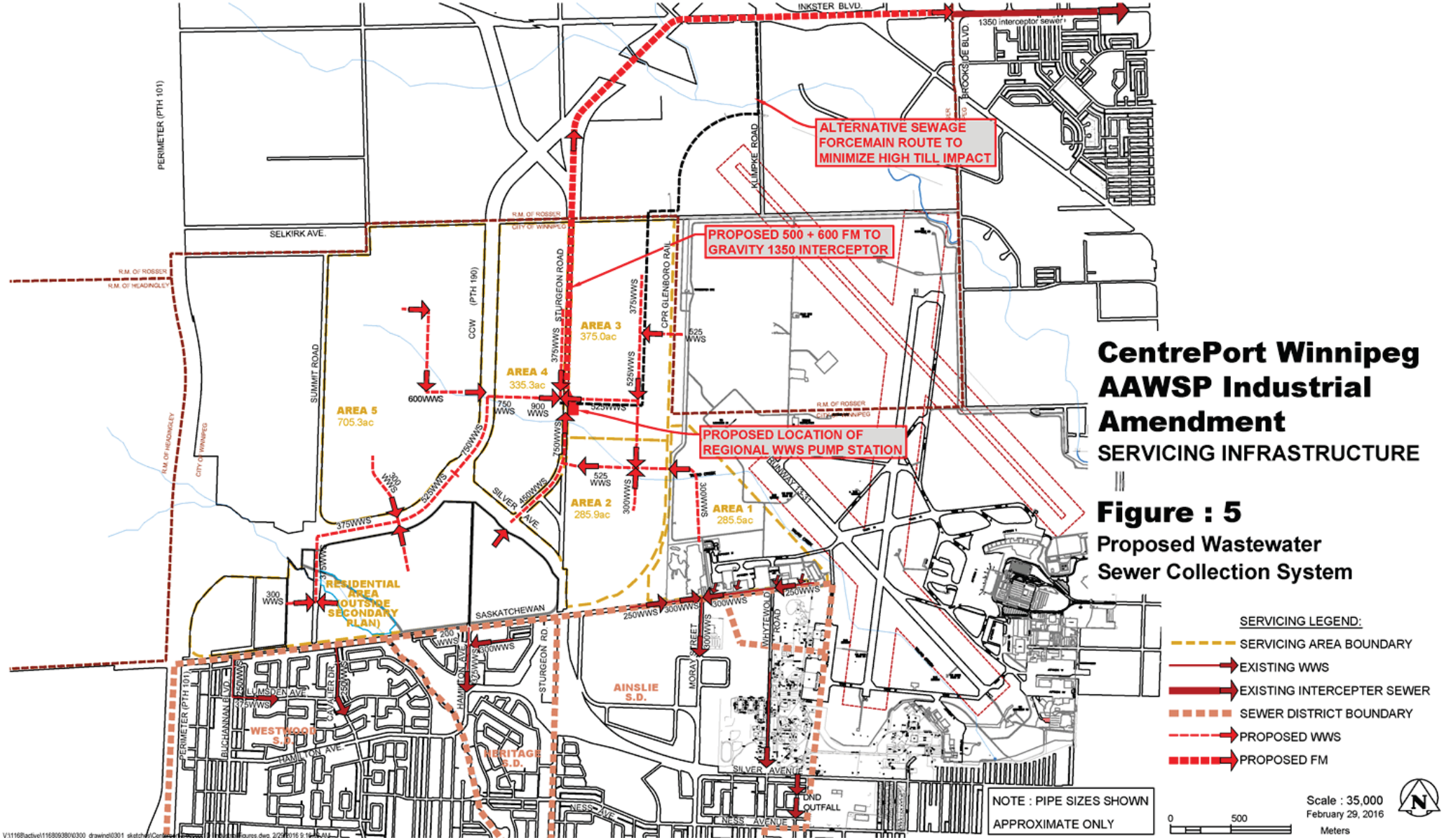
Proposed Water Distribution System

SERVICING LEGEND:

- SERVICING AREA BOUNDARY
- EXISTING WM
- EXISTING FM
- PROPOSED WM
- PROPOSED FM

Scale : 35,000
February 29, 2016
Meters

0 500

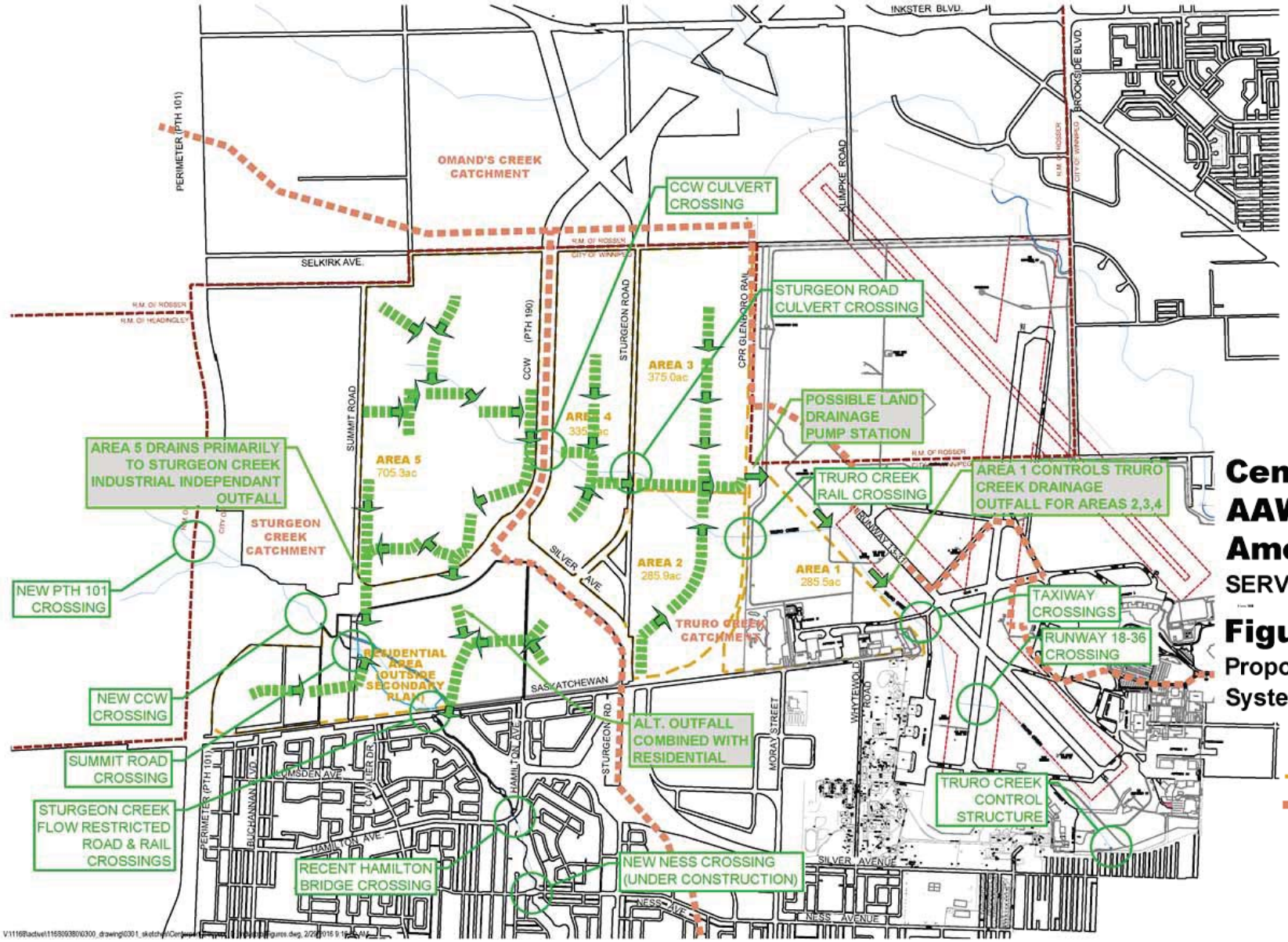


CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 5

Proposed Wastewater Sewer Collection System



CentrePort Winnipeg AAWSP Industrial Amendment

SERVICING INFRASTRUCTURE

Figure : 6

Proposed Land Drainage Systems

SERVICING LEGEND:

- SERVICING AREA BOUNDARY
- APPROXIMATE PROPOSED CATCHMENT BOUNDARIES

Scale : 35,000
February 29, 2016
Meters

0 500

CENTREPORT SOUTH INDUSTRIAL DEVELOPMENT MANITOBA ECONOMIC IMPACT ESTIMATES

MANITOBA
BUREAU OF STATISTICS

RIGHT ANSWERS
RIGHT NOW

February, 2016

CENTREPORT SOUTH INDUSTRIAL DEVELOPMENT
MANITOBA ECONOMIC IMPACT ESTIMATES

The Manitoba Bureau of Statistics (MBS) has been requested to estimate the total Manitoba economic and tax revenue impacts of an industrial development plan for CentrePort South.

This is a high level analysis which uses expenditure estimates provided by the Winnipeg Airport Lands Corporation, to model the total impacts to Manitoba Gross Domestic Product (GDP), Labour Income, Employment and Taxes expected to occur as a result of site development and building construction.

Manitoba economic and tax revenue impact estimates have been produced for four parcels of land (Sturgeon South, Sturgeon West, Sturgeon East, and CCW West) which are identified in a map in the Winnipeg Airport Lands Corporation document provided to MBS, and included in this report.

Manitoba impact estimates have been produced using the MBS Economic Impact Assessment Model and MBS Tax Revenue Impact Assessment Model.

The MBS Economic Impact Assessment Model is an input-output model of the Manitoba economy which uses the flow of expenditures between Manitoba industries to estimate the total impacts to the economy in terms of GDP, Labour Income and Employment. Total impacts are the sum of direct expenditure impacts, impacts derived from direct and secondary suppliers to the project (i.e., direct and indirect industry impacts), plus the induced impacts derived from the re-spending of labour income paid out by industry.

The MBS Tax Revenue Impact Assessment Model estimates total taxes collected in Manitoba by the three levels of government. Tax estimates are based on GDP, labour income, and employment impacts produced by the MBS Economic Impact Assessment Model, and historical relationships between various taxes.

Additional explanation of the MBS models and a glossary of terms are presented at the end of this report.

As with any modeling exercise, please note that all impacts presented are to be used as general estimates only, not taken as fact.

ECONOMIC IMPACT ASSESSMENT DATA & ASSUMPTIONS:

Data used for the economic impact assessment of CentrePort South Industrial Development was provided by the Winnipeg Airport Lands Corporation (Concept A).

Analyses have been produced for four parcels of land (Sturgeon South, Sturgeon West, Sturgeon East, and CCW West) which are identified in a map in the Winnipeg Airport Lands Corporation document, and for convenience, also included in this report.

Total Construction Costs for each area are the sum of Site Infrastructure Costs and Building Shell Costs, plus a 20% markup for Soft Costs and Contingencies.

For modeling the impacts of these expenditures, Building Shell Costs (plus 20% contingency) were run through the MBS Economic Impact Assessment Model as Non-Residential Building Construction Projects, and Infrastructure Costs (plus 20% contingency) were treated as 50% Transportation Engineering Construction and 50% Other Engineering Construction.

The expenditures as provided to MBS, and MBS's treatment for modeling of these expenditures, are summarized in the following tables.

CentrePort South Industrial Development (Concept A)

($000's)	Infrastructure	Building Shell	Soft Costs & Contingency	TOTAL
STURGEON SOUTH	16,239.6	206,327.7	44,513.5	267,080.7
STURGEON WEST	19,620.9	205,041.5	44,932.5	269,594.9
STURGEON EAST	21,925.8	265,503.2	57,485.8	344,914.8
CCW WEST	41,242.5	269,565.1	62,161.5	372,969.2
TOTALS	**99,028.8**	**946,437.5**	**209,093.3**	**1,254,559.6**

($000's)	Non-Residential Building Constuction	Transportation Engineering Construction	Other Engineering Construction	TOTAL
STURGEON SOUTH	247,593.2	9,743.8	9,743.8	267,080.7
STURGEON WEST	246,049.8	11,772.5	11,772.5	269,594.9
STURGEON EAST	318,603.9	13,155.5	13,155.5	344,914.8
CCW WEST	323,478.2	24,745.5	24,745.5	372,969.2
TOTALS	**1,135,725.0**	**59,417.3**	**59,417.3**	**1,254,559.6**

“Non-residential Building Construction” consists of building construction for all purposes other than residential. Therefore it includes industrial buildings, office buildings, retail developments, other commercial buildings, education facility construction, health facility construction, and other institutional buildings.

“Transportation Engineering Construction” includes all costs for transportation infrastructure (other than pipeline transportation) such as road, highway and runway construction, also traffic structures and controls, and parking facilities.

Construction projects will often have a significant portion of their costs that should be modeled as “Other Engineering Construction”. This category includes earthworks such as site preparation for drainage and underground services, also construction of water supply and waste systems.

Local, Provincial and Federal Tax estimates have been produced using the MBS Tax Revenue Impact Assessment Model. Tax model results have been tailored to take into account the types of projects being assessed.

ECONOMIC IMPACT ASSESSMENT RESULTS:

The $1,255 million total cost for development of the four parcels of land is expected to require $99 million in site infrastructure, $946 million for building construction, and $209 million for soft costs and contingency. Reallocating soft costs and contingency, these expenditures are modeled as $1,135.7 million for non-residential building construction, and $59.4 million for each of transportation engineering construction and other engineering construction.

Manitoba economic and tax revenue impact estimates for industrial development of the four areas in the CentrePort South plan are presented on the following page.

Total impacts for complete development are estimated as follows:

Through economic multiplying, the MBS model estimates the $1,255 million total cost would produce Gross Manitoba Expenditures of $2,115 million; that is the $1,255 million direct expenditure plus $860 million additional spending in the province.

This figure represents the gross monetary impact to the provincial economy. However, the gross expenditures statistic contains significant double-counting as the same dollars are spent and re-spent in the economy. Measurements of Gross Domestic Product (GDP) remove this double-counting, to present the unduplicated value-added, or net monetary impact to the economy.

Total GDP at market prices attributable to full development of the area is estimated at $954 million. Therefore, for each $1.00 of direct project expenditures, the impact to Manitoba GDP is estimated at $0.76.

Labour income is typically the largest component of GDP. The total impact to Manitoba labour income resulting from complete development is estimated at $662 million in today's dollars. For each $1.00 of direct project expenditures, the total Manitoba labour income impact is estimated at $0.53.

Total Manitoba employment associated with this level of labour income is estimated at 11,700 person-years, consisting of 6,400 person-years in the construction industry and 5,300 person-years of spin-off employment within Manitoba. This equates to about 9.3 person-years for each $1.0 million of direct project expenditure. (A person-year is the equivalent of one person working full-time for one year.)

Total taxes collected in Manitoba resulting from the CentrePort South industrial development, and associated spin-off activities, are estimated at $322 million. This includes $140 million in Manitoba provincial taxes, $27 million in local Manitoba taxes and $155 million in federal taxes collected in Manitoba. For each $1.00 of direct project expenditures, total Manitoba tax collection is estimated at $0.26.

While the above are the impacts of construction of the plan, additional on-going impacts would be generated by the businesses that will eventually populate the proposed development. Such operations impacts have not been explored in this analysis.

Total Manitoba Economic Impacts of CentrePort South Industrial Development

TOTAL MANITOBA ECONOMIC IMPACT ESTIMATES ($Millions)

	Total Estimated Land Development Impacts by Defined Region				Total Devel.
	Sturgeon South	Sturgeon West	Sturgeon East	CCW West	Impacts
Development Expenditure	267	270	345	373	1,255
Gross Expenditure	450	455	582	629	2,115
GDP at Market Price	203	205	262	284	954
GDP at Basic Prices	185	187	239	260	871
Labour Income	141	142	182	197	662
Employment (Person-Years)					
Direct Employment	1,375	1,375	1,750	1,900	6,400
Indirect & Induced	1,125	1,150	1,450	1,575	5,300
Total Employment	2,500	2,525	3,200	3,475	11,700

Notes: (1) GDP at Market Prices is the total value of goods and services produced in the Manitoba economy.
(2) GDP at Basic Prices is the total value of goods and services produced by Manitoba industries (i.e., GDP at Market Prices excluding taxes and subsidies).
(3) All Economic impact estimates presented are in current dollars.
(4) Employment impacts are presented in terms of "Person-Years". A Person-Year is defined as one person being fully employed for a period of one year.
(5) Figures may not add to total, due to rounding.

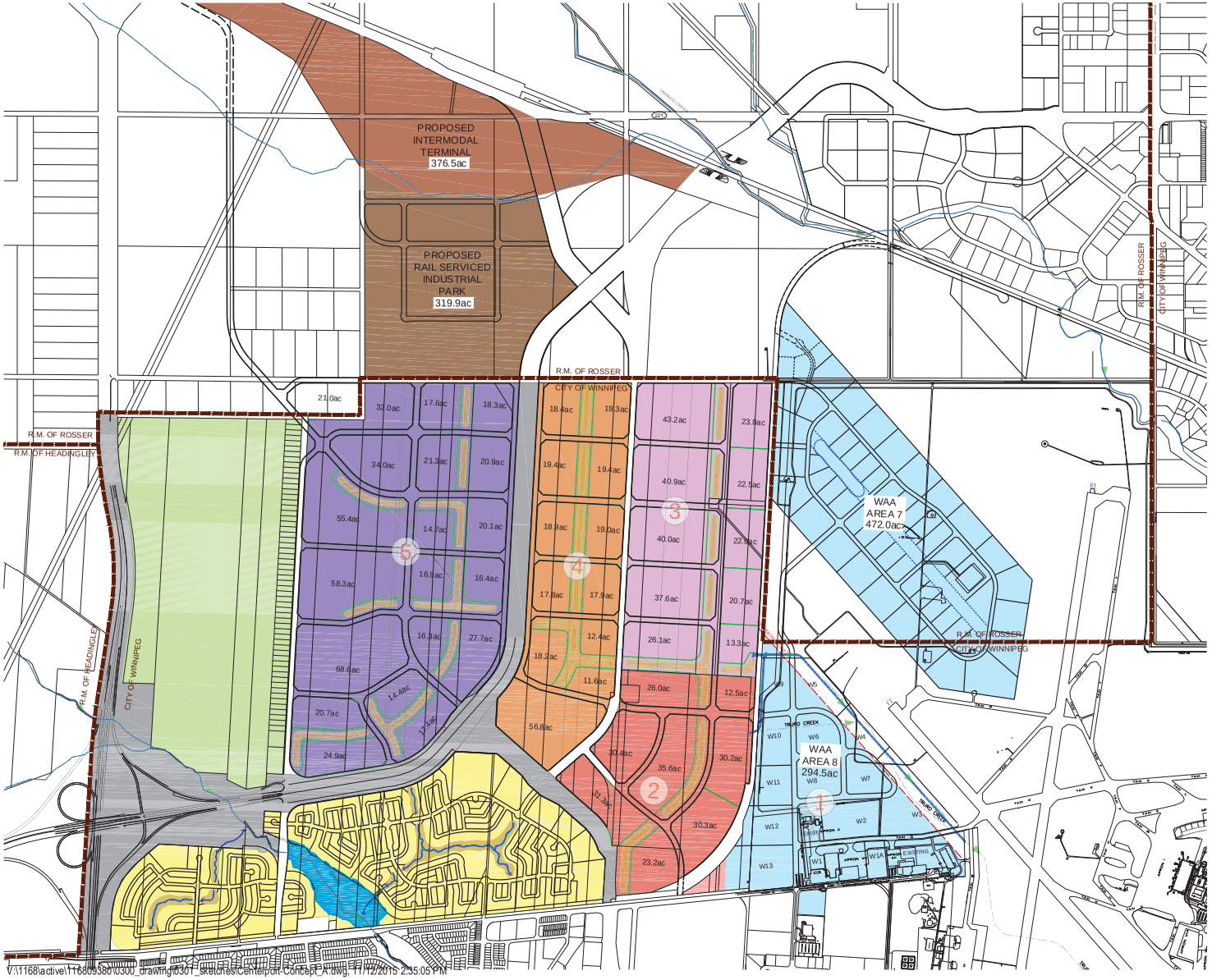
TOTAL MANITOBA TAX REVENUE IMPACT ESTIMATES ($Millions)

	Total Estimated Land Development Impacts by Defined Region				Total Devel.
	Sturgeon South	Sturgeon West	Sturgeon East	CCW West	Impacts
Income Taxes					
Individuals	9	9	12	13	43
Corporations	2	2	2	2	8
Other Direct Taxes	15	16	20	21	72
Indirect Taxes	3	4	4	5	16
Total Provincial Taxes	30	30	39	42	140
Local Taxes	6	6	7	8	27
Federal Taxes	33	33	43	46	155
Total Collected in Manitoba	69	69	89	96	322

Notes: (1) Other Direct Taxes includes Retail Sales Tax, Fuel Tax, Tobacco Tax, Liquor and Lotteries Corporation Revenues, and Other Taxes.
(2) Indirect Taxes includes Corporations Taxes, Land Transfer Tax, and the Health and Education Levy.
(3) Tax revenue impact estimates are based on 2015-16 Manitoba Budget and 2010 income tax data.
(4) Figures may not add to total, due to rounding.

Data Source: Manitoba Bureau of Statistics
Economic Impact Assessment Model
Tax Revenue Impact Assessment Model

February, 2016



INDUSTRIAL GROSS AREA		*NET INDUSTRIAL LOT AREA
STURGEON EAST (3)	374.7ac	290.1ac
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2.*NET LOT AREAS FOR AREA 1 NOT SHOW

CentrePort

PRELIMINARY INDUSTRIAL CONCEPT - A

Scale 25,000
November 12, 2015

0 500 1000 Meters

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MBS ECONOMIC & TAX REVENUE IMPACT ASSESSMENT MODELS:

Economic impact estimates have been derived from the MBS Economic Impact Assessment Model. The current MBS model is based on Statistics Canada's Input-Output Tables for 2012. These tables contain detailed information on the inter-industry flow of goods and services within the economy of Manitoba. The 2011 Input-Output Tables track the production and use of 481 specific commodities by 235 industries and 280 final demand categories (e.g., personal consumption, capital investment, inter-provincial or international trade, etc).

Within the model, any direct change in demand, such as increased production of buses, or reduced demand for potatoes, has three levels of impact; Direct Industry effects, Indirect Industry effects and Induced effects.

1) **Direct effects** refers to the impact on firms assumed to expand/reduce production in response to a direct change in demand. Positive or negative changes in production outputs are assumed to require corresponding changes to production inputs from suppliers – the indirectly effected industries.
2) **Indirect effects** are therefore the ripple effect assumed to occur from directly impacted firms placing increased/decreased demands on their suppliers.
3) **Induced effects** are the result of consumer spending in the economy, which is a function of available labour income. Available labour income is scaled up or down with the level of direct and indirect production. The induced effect is also referred to as the "household" or "consumer" effect.

Total Manitoba economic impacts are the sum of the above impacts estimated by the model, plus Direct Project Impacts, such as direct contributions to Gross Domestic Product (GDP), Labour Income and Employment associated with Direct Project Expenditures.

It should be noted that the level of direct expenditures in Manitoba limits the magnitude of Manitoba economic impacts. Expenditures made directly to suppliers outside Manitoba are generally excluded from the analysis - production of goods and services sourced directly outside Manitoba have no multiplying effect on the Manitoba economy.

Input-Output models, such as the MBS Economic Impact Assessment Model can be a useful component in the decision making process. However they do have certain limitations:

1) The model is Static: It is based on technologies and business practices at a fixed point in time, including where increased commodity demand will be procured (Manitoba/Non-Manitoba) and with no provision for the effects of supply and demand on commodity prices.
2) The Model is Linear: It assumes a 10% increase in output from some industry, would require 10% greater expenditure on all inputs, and result in a 10% increase to direct labour costs, employment and profits. Therefore, it assumes production capacity is always at 100%, and changes in demand fuel immediate response. Moreover, the model assumes infinite production capacity – that industries are able to respond to increased demand without need to add infrastructure.
3) The Model is based on Averages: Construction of a particular non-residential building, such as a strip-mall, or large office tower, are both treated the same; as average non-residential building projects. If all that is known about each of these projects is the construction cost, they will be treated as scalable projects based on the input requirements of the average non-residential building project. In reality, few projects are average. The analysis can be refined by specifying the value of specific commodities used in the construction of each of these projects. However, the model still must revert to using averages in terms of the average source of each commodity used

(Manitoba/non-Manitoba), the average transportation cost, wholesale and retail mark-ups, the average market share different industries may have for production of commodities, average wage rates for different industries etc.

Understanding these limitations, and given sufficient information about a project, MBS is able to compensate for model effects. However, while data inputs, commodity supply ratios, wage rates and various special treatments can all be applied to a particular project, there is never perfect knowledge. As a result, the model cannot provide a complete or absolute measure of the impact of economic change. **The resultant impacts should be treated as general estimates only and never as absolutes**.

Provincial, Local and Federal taxation estimates have been prepared using the MBS Tax Revenue Impact Assessment Model. The MBS tax model's structure is based on 2015-16 Manitoba Budget data, 2010 Income Tax data, and MBS Manitoba Provincial Economic Accounts 2012 data.

The MBS Tax Revenue Impact Assessment Model utilizes output from the MBS Economic Impact Assessment Model, such as the estimated impacts on GDP at Market Prices, Labour Income and Employment, as well as information on average wage rates for direct and spin-off jobs.

Federal and local taxes accruing in Manitoba are estimated, in part, by utilizing their average relationships to Manitoba provincial taxes. **As with the economic impacts, tax revenue impacts should also be treated as general estimates only.**

It is noted that the local tax revenue is the "softest" of the three tax estimates.

GLOSSARY OF TERMS:

DIRECT EXPENDITURE IMPACTS
Direct Expenditure Impacts are economic impacts that are inherent in the direct expenditures associated with the project or activity being assessed, such as the identified labour content of the project, which contributes to Employment, Labour Income and GDP impacts. Direct Expenditure Impacts Are not estimated by the MBS model; they exist external to the model.

DIRECT INDUSTRY IMPACTS
Direct Industry Impacts are derived from the Direct Suppliers to the Project. In working to supply the various goods and services required for the project, directly impacted firms generate revenue, pay out wages and place additional demands on their own suppliers.

INDIRECT INDUSTRY IMPACTS
Indirect Impacts are the second level of economic impacts resulting from Project Expenditures. Indirect Impacts result when Directly Impacted firms require additional inputs from other firms in order to meet the demands of the Project, or to "restock shelves" in preparation for future demands.

INDUCED IMPACTS
Induced Impacts are the "Consumer" or "Household" effect, which occurs as a result of wage re-spending. It is assumed that most of the Labour Income in the Direct Expenditures and resulting Industry Impacts is spent on consumable or household items. This is the third level of economic activity resulting from Direct Project Expenditures.

TOTAL DIRECT IMPACTS
Total Direct Impacts are the sum of Direct Expenditure Impacts and Direct Industry Impacts.

TOTAL IMPACTS
Total Impacts are the sum of Total Direct Impacts, Indirect Industry Impacts and Induced Impacts.

TOTAL EXPENDITURES
Refers to the Total Expenditures specified for the project or activity being assessed (such as Operations or Construction). Total Expenditures are the initial expenditures from which all other economic impacts ultimately result (be they in Manitoba, the Rest-of-Canada or the Rest-of-the-World).

DIRECT MANITOBA EXPENDITURES
Direct Manitoba Expenditures identifies the volume of Total Expenditures estimated to be spent directly in Manitoba. Only Expenditures in Manitoba can impact Manitoba GDP, Labour Income and Employment etc. Direct Expenditures outside of Manitoba are a direct leakage from the economy, and do not impact Manitoba GDP, Labour Income and Employment levels.

DIRECT MANITOBA SUPPLY
The value of Direct Manitoba Expenditures estimated to be produced by Manitoba industry. To yield high impacts relative to direct expenditures, the direct supply should approach the value of direct expenditures. A relatively small direct supply value results in lesser impacts to the economy. The MBS model has estimates of the Manitoba Supply Ratio for each commodity contained in the Model. These can be adjusted if necessary.

GROSS EXPENDITURES
Additional expenditures by businesses and persons are levered by the Direct Expenditures. The Gross Expenditures statistic provides a measure of these expenditures, which includes re-spending of the initial direct expenditures by suppliers and wage earners. It represents the gross monetary benefit to the economy.

GDP AT MARKET PRICES
A measure of the total value of goods and services produced in the economy, GDP at Market Prices is the net monetary benefit to the economy. This statistic removes the double counting of expenditures and expenditure leakages from the economy, which are included in the Gross Expenditures statistic.

GDP AT BASIC PRICES
A measure of the total value of goods and services produced by industry. GDP at Basic Prices is equal to GDP at Market Prices excluding the effects of Taxes and Subsidies.

LABOUR INCOME
The sum of all Wages, Salaries, Supplementary Labour Income and Net Income of Unincorporated Businesses. Any or all of these may be present in the Direct Expenditures and resultant Direct, Indirect and Induced Impacts.

EMPLOYMENT
The Employment estimated to result from the above Labour Income. Jobs are presented as "full-time equivalent person-years" (i.e. one job represents the equivalent of one person being employed on a full-time basis for a period of one-year).

FEDERAL TAXES
The sum of Federal Income Taxes (Corporate and Personal), Other Direct Federal Taxes and Indirect Federal Taxes, estimated to be collected in Manitoba.

PROVINCIAL TAXES
The sum of Provincial Income Taxes (Corporate and Personal), Other Direct Provincial Taxes and Indirect Provincial Taxes, estimated to be collected in Manitoba.

LOCAL TAXES
An estimate of the total taxes, of any description, accruing to all Local Municipalities in Manitoba as a result of the project or activity being assessed and its spin-off activities.

CentrePort South Industrial Development
Economic Overview

Prepared by the

Winnipeg Airport Lands Corporation

February 23, 2016

CentrePort South Industrial Development - Economic Overview

Purpose of Report

The purpose of this report is to examine the economic growth opportunities associated with the development of lands identified as CentrePort South. Located on the west side of the James A. Richardson International Airport, bordered to the south by Saskatchewan Avenue and within the City of Winnipeg's north and west limits, CentrePort South consists of approximately 1,700 acres of land for industrial use. The development of these lands is contingent on the installation of sewer and water infrastructure.

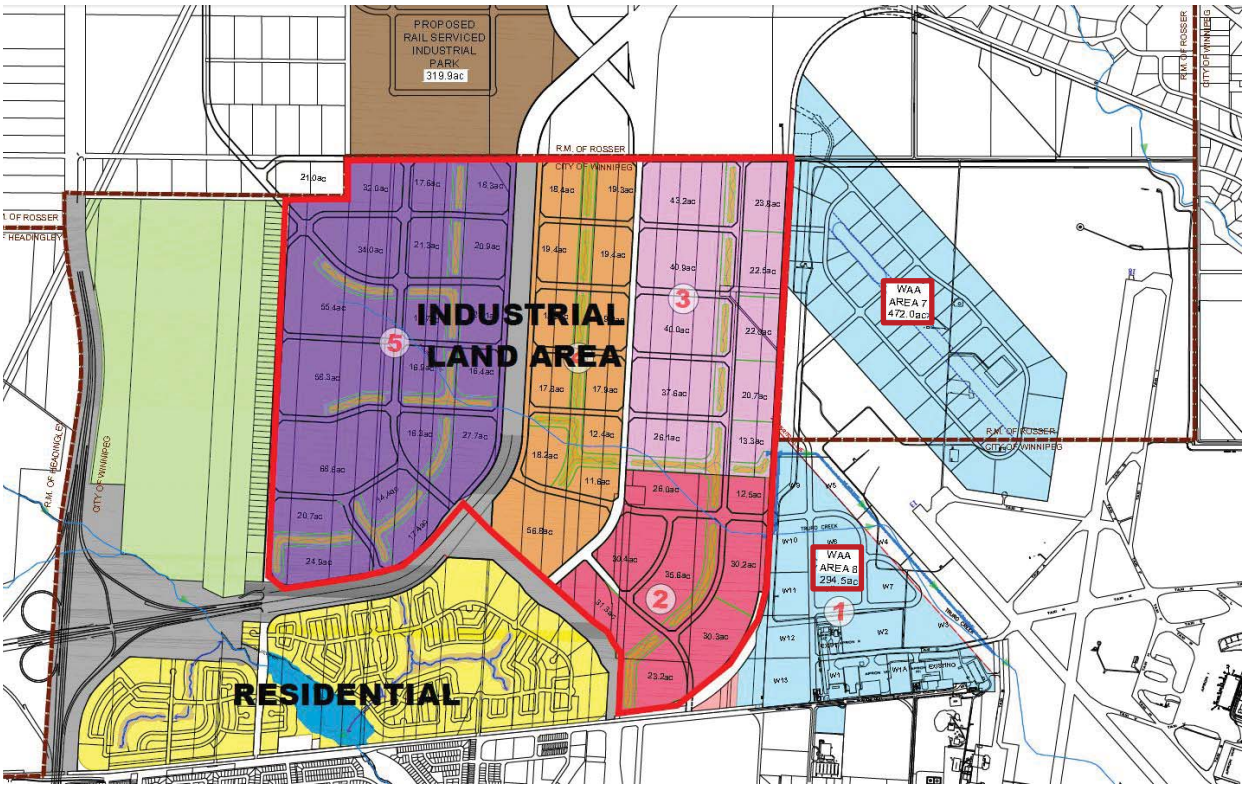

Figure 1 – CentrePort South Preliminary Industrial Concept

Development Facts and Assumptions

The industrial lands within CentrePort South are comprised of 1,692.56[i] gross acres. Estimates of land required for roads, utility servicing, land drainage and public reserve reduce the available acreage by 35% to roughly 1,100 net acres of land for industrial development. This is equal to 47.9 million ft of new land development area within the City of Winnipeg.

A list of industry sectors likely to develop within CentrePort South is included later in the report. Assuming the land coverage for industrial buildings in these sectors is consistent with industry averages; new buildings will warrant a footprint of 10.6 million ft [ii] of industrial space.

Since 1999, the Winnipeg region has seen an average absorption of almost 500,000 ft [iii] of new industrial construction per year, built over approximately 57 acres.

Considering the proximity to existing infrastructure and development of CentrePort North, in the RM of Rosser, it is believed CentrePort South will absorb a large percentage of Winnipeg's industrial land development once the required infrastructure has been laid. An estimate of 325,000 ft per year or 65% of all industrial development in the capital region, on 37 acres of land, results in a build out over 33 years.

A conservative build out model of 50 years was also calculated. This timeframe assumes a building footprint of 213,639 ft per year or 42.6% of the average capital region demand, occupying 25 acres of land. The following economic benefit estimates were calculated based on this 50 year build out model.

Economic Benefit Estimates

Current rental rates for similar buildings and capitalization rates associated to the specific asset class generate assessment values of $1.733 billion in CentrePort South, at full build out, for the City of Winnipeg to collect taxes against.

A calculation of construction cost was completed with the assumptions that infrastructure costs are approximately $90,000[iv] per gross acre, average building shell costs are $88.99 per ft , and a 20% contingency would be required to offset costs associated to design and project management throughout the life of the development. Based on this information, this industrial zone will generate $1.25 billion in construction associated spending at today's dollars[v] and would spur an additional $860 million in additional spending within Manitoba[vi].

The impact to the Manitoba GDP on construction related activities alone is estimated at $954 million at full build out, which is equal to $0.76 on every dollar of direct project expenditures, $0.53 of which is from labour income in today's dollars. Total employment from construction activity of the development is estimated at 11,700 person-years (a person-year is the equivalent of one person working full-time for one year) with 6,400 person-years related to construction and 5,300 person-years from spin-off employment in Manitoba. Total taxes collected at all three levels of government from construction and associated spin-off activities total $322 million, or $0.26 on every dollar of direct expenditure.[vii]

These estimates do not factor in the ongoing economic benefits associated with the businesses that will operate on the lands within the development.

Industrial Overview of the Winnipeg Market

The four largest industrial zones in the City of Winnipeg make up nearly 47.7 million ft of land development and are comprised of the following areas: St. James (18.2 million ft or 38.1%), St. Boniface (10.2 million ft or 21.4%), Fort Garry (10.0 million ft or 21%) and Inkster Park (9.3 million ft or 19.5%).[viii] The average age of Winnipeg's industrial building inventory is 60 years old with only 5.8% built after 2000.[ix]

Over the past decade, new industrial building construction has been driven by a demand for newer and more modern buildings. The need for higher ceiling clearances and more flexible

building configurations make Winnipeg's aging inventory obsolete and insufficient for many end users across several industries.[x]

The average industrial lease rate for the City of Winnipeg, at 2014's year-end, was $6.44 per square foot.[xi] The highest rental rates in the Winnipeg industrial market are realized in transactions involving new flex-space industrial buildings. The asking rate for similar new construction units has been $8.00 to $12.00 per square foot net.[xii] Rates on comparable properties in south-west Winnipeg suggest this is a conservative range as rates are currently between $10.00 and $13.95 per square foot net in that region.

Regional Trends

CentrePort South's strategic advantages within the CentrePort Canada development and directly adjacent to the Winnipeg Airport Authority land is expected to create a shift of industrial development from other quadrants to the CentrePort region.

Among Winnipeg's industrial areas, the City's north-west quadrant has historically been the dominant location for industrial development. But with the continued build out of Inkster and St. James industrial areas, development has pushed towards the north-west edge of the City. The St. Boniface Industrial Park has been extremely slow to build out as of late and is near full build-out. Within the north-east quadrant, limited lands remain for industrial development within the City limits. The south-west quadrant is moving away from potential industrial development towards a more commercial environment, extending into the RM of MacDonald's Fort Whyte/McGillivray Boulevard region.

Within the 11 rural municipalities in the Winnipeg CMA, 522 acres of land were sold between 2011 and 2015(Q1), producing an average land absorption rate of 35 lots and 122 acres per year. Rosser has been the dominant market with 140 acres sold (28.9%), primarily due to the development of Brookside Industrial Park in CentrePort North. Most of the remaining acres sold were in Richot (20.8%), Springfield (18.5%), St. Clements (11.3% - now at full build out), and Headingley (9.8%). The majority of sales in Rosser and Springfield were in very close proximity to the City of Winnipeg border.[xiii]

Winnipeg Airport Authority Lands

The Winnipeg Airport Authority (WAA) lands on the east side of the airport are reaching capacity and demand exists for expansion of more modern facilities, in particular for cargo and heavy freight operators. The available lands on the west side of the airport (Areas 7 and 8 – see Figure 1), adjacent to CentrePort South, present an opportunity for operations that require airside access for testing and/or transfers between road and air on multi-modal transportation routes.

The WAA Areas 7 and 8 consist of 482 acres of gross developable area, or almost 3.75 million ft of gross leasable area.[xiv] Area 8, or West Campus, is earmarked for near-term development of an Advanced Manufacturing and Intermodal Campus. This area is expected to attract catalyst projects and lead to direct employment of 4,329 jobs and 3,247 of indirect employment. Area 7 is designated as a Research, Development and Testing Campus with additional economic benefit potential. It is already home to the very successful GE Aviation Engine Testing, Research and Development Centre.

Development of WAA lands requires service infrastructure and an extension of Moray Street further north. This will set up a future connection between CentrePort South and WAA, efficiently linking air transport within CentrePort Canada and creating land absorption opportunities for supporting businesses and suppliers of airport-reliant industries within the clusters outlined below.

Industry Clusters within CentrePort South

Adapted from Stevenson Advisors Ltd. Concept Overview

Fast Cycle Logistics and Information, Communications and Technology Manufacturing

The Fast Cycle Logistics sector relies heavily on proximity to tri-modal transportation networks for time-sensitive manufacturing and distribution. It attracts supporting industries and businesses to co-locate in close proximity and generates efficiencies for logistics firms. The sector accounted for 4.4% of the Canadian GDP in 2014.

The Information, Communications and Technology (ICT) sector is the largest private sector industry of research and development, accounting for approximately 32% of all Canadian expenditures. This sector employs a highly educated workforce with above-average wages of around $76,000 annually. Manitoba's ICT sector is highly export-focused, and companies earn revenues in excess of $1.1 billion per year.[xv]

E-Commerce and Retail Fulfillment

The impact of internet-related commerce on the wholesale and retail business process is significant. Companies are adopting new warehousing and stocking strategies and agile distribution networks. Distribution relies on multi-modal transportation between ground and air for "just in time" delivery, and air to ground for regional truck distribution. Winnipeg's cargo capacity, reliable airport capabilities, and central location within the Mid-Continent Trade Corridor are very well suited for these distribution networks.

North American e-commerce revenues were $462.5 billion in 2014 and are projected to reach $660.5 billion by 2018.

Cold Chain Logistics and Perishables

Temperature controlled facilities house various product types such as chemicals, bio-pharmaceuticals and food products (including temporary holding of livestock) between shipments via air, road, and rail. The industry is experiencing significant growth globally and revenues are expected to reach $157 billion by 2018. North America represents 40% of the global revenues from Cold Chain Logistics and is expected to see annual growth of 12% until at least 2017.

Agribusiness – Livestock Genetic Testing

Livestock genetic testing is a growing management tool within the agricultural industry. The sector consists of multi-disciplinary and multi-agency research partnerships between the private sector, government and universities.

Advanced Manufacturing

Advanced manufacturing is focused on improving the performance of industry through the application of technologies, processes and methods to design and production. Operations are becoming more mixed use, integrating institutional uses, office space and manufacturing space.

Aerospace – Testing and Advanced Manufacturing

The aerospace sector contributes $29 billion of GDP to the Canadian economy annually and reached $27.7 billion in direct revenues in 2014. Manufacturing makes up 73% of industry activities and nearly 20% of aerospace manufacturing activity is dedicated to R&D.[xvi]

Winnipeg's aerospace industry is the largest in Western Canada and third largest in Canada with product and service values exceeding $1.6 billion annually.[xvii] The WAA lands and supporting aerospace campus are home to manufacturing facilities of three major aerospace companies (Boeing, Magellan Aerospace, and StandardAero) and several R&D and testing facilities, including the GE Aviation Engine Testing, Research and Development Centre; the Centre for Aerospace Training and Technology; and the Centre for Non-Destructive Inspection Technologies.

Flex Tech and Industrial Assembly Parks

Technology parks coordinate entrepreneurial efforts and increase technology transfer and commercialization of research while establishing a network of entrepreneurs, academia and business professionals, fostering innovation and economic growth.

Light Industry

Light industrial activities take place within enclosed buildings. Light industrial activities are generally seen as having little environmental impact and compatible with adjacent or nearby residential neighbourhoods.

Overall Analysis of Industrial Growth Trends in Winnipeg and CentrePort South

Industry experts Stevenson Advisors Ltd. believe CentrePort South will capture the majority of new industrial development activity within the City of Winnipeg due to the strategic advantages offered by the inland port and the ongoing momentum it has within the industrial marketplace as the location of choice for most industrial users.

This report has demonstrated the expectation that CentrePort South would capture between 43% and 65% of the industrial development in Winnipeg.

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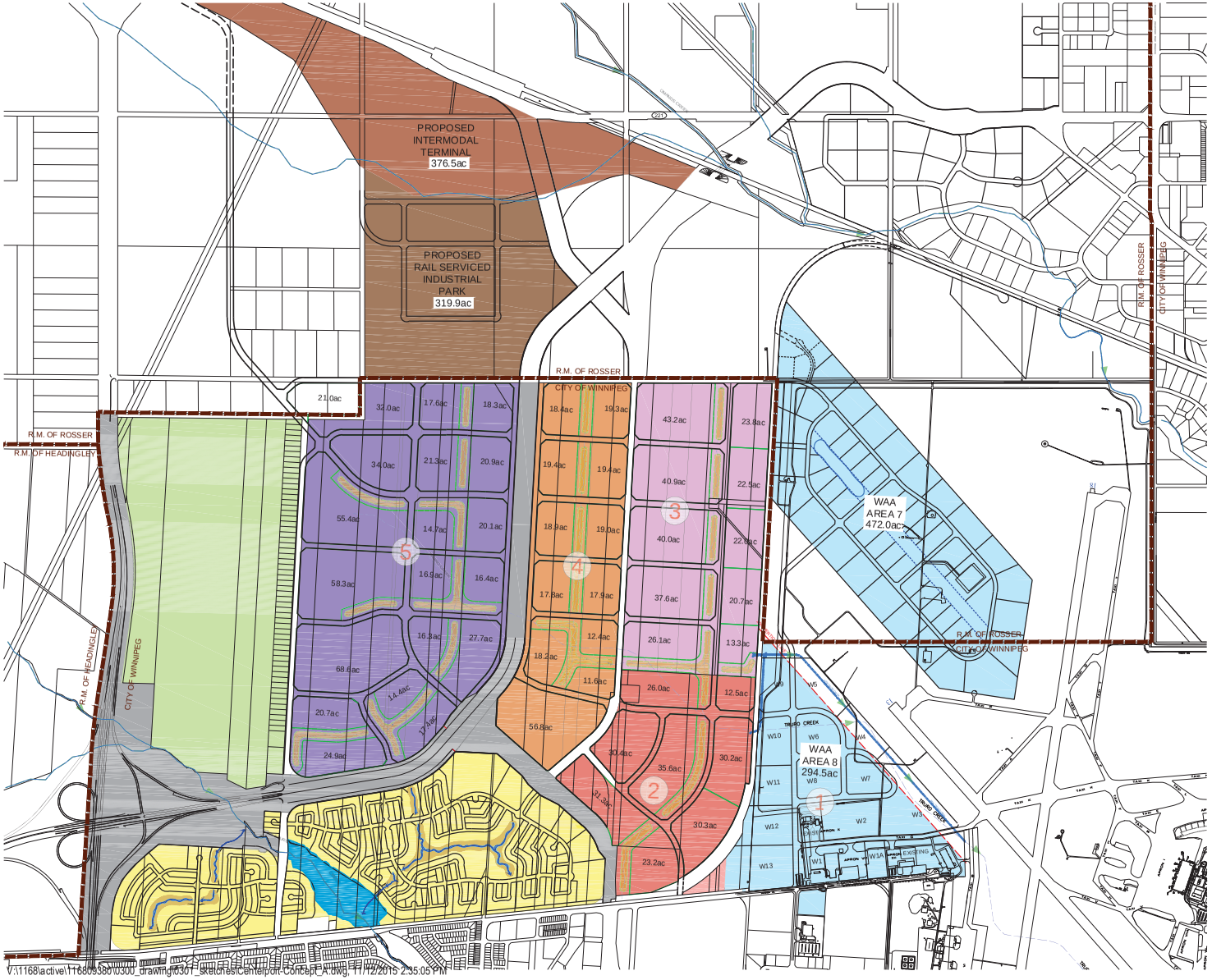
[i] Stantec, CentrePort Preliminary Industrial Concept – A, November 12, 2015 – APPENDIX A
[ii] 10,631,967 ft² - Robert Bachart, Land Estimates Spreadsheet – APPENDIX B
[iii] Stevenson Advisors Ltd., CentrePort Industrial Development Concept Overview and Employment Lands Analysis
[iv] Bachart
[v] Bachart

[vi] Manitoba Bureau of Statistics, CentrePort South Industrial Development – Manitoba Economic Impact Estimates, February 2016
[vii] Manitoba Bureau of Statistics
[viii] Wayne K. Johnson, The Johnson Report, June 2015
[ix] Stevenson Advisors Ltd.
[x] Stevenson Advisors Ltd.
[xi] Stevenson Advisors Ltd.
[xii] Stevenson Advisors Ltd.
[xiii] Stevenson Advisors Ltd.
[xiv] Winnipeg Airport Authority, YWG West Campus Opportunity – Economic Impacts
[xv] Economic Development Winnipeg, ICT Sector Brief
[xvi] Aerospace Industries Association of Canada, 2015 Industry Statistics Report
[xvii] Economic Development Winnipeg, Aerospace Sector Profile

APPENDIX

1. **CentrePort Preliminary Industrial Concept**
2. **Land Estimates Spreadsheet**



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CentrePort

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WALC Lands - CentrePort Preliminary Industrial Concept A - 25 Year Horizon

Land Estimates

Red Shaded Area

Primary Economic Cluster Development	Areas	Gross Acres	Est. Net Acres	Gross Square Feet	Net Square Feet (Post Servicing 35%)	Floor Area Ratio F.A.R.	Preliminary Revenue Estimates: NNN Rent	NNN Rent Revenue/Yr.	CAP Rate	Project Value	Estimated Cost of Construction: Site Infrastructure Per Acre	Ttl Site Infrastructure Costs	Est. Building Costs (Shell Only)	Ttl Building Costs	Ttl Hard Costs	Soft Costs, Financing & Contingency (20%)	Ttl Construction Costs	Residual Land Value: $ Available Land & Developer Profit	Residual Land Value /Acre
Cold Chain & Perishables	1	29.3	19.05	1,276,308	829,600	248,880	$11.95	$ 2,974,117	7.00%	$ 42,487,382	$ 90,000	$ 1,714,050	100	$ 24,888,006	$ 26,602,056	$ 5,320,411	$ 31,922,467	$ 10,564,914	$ 554,734
Cold Chain & Perishables	2	39.6	25.74	1,724,976	1,121,234	336,370	$11.95	$ 4,019,625	7.00%	$ 57,423,219	$ 90,000	$ 2,316,600	100	$ 33,637,032	$ 35,953,632	$ 7,190,726	$ 43,144,358	$ 14,278,861	$ 554,734
Advanced Manufacturing	3	38.5	25.03	1,677,060	1,090,089	272,522	$11.95	$ 3,256,641	7.00%	$ 46,523,441	$ 90,000	$ 2,252,250	100	$ 27,252,225	$ 29,504,475	$ 5,900,895	$ 35,405,370	$ 11,118,071	$ 444,279
Fast Cycle Logistics & ICT Manufacturing	4	45.0	29.25	1,960,200	1,274,130	318,533	$11.95	$ 3,806,463	7.00%	$ 54,378,048	$ 90,000	$ 2,632,500	95	$ 30,260,588	$ 32,893,088	$ 6,578,618	$ 39,471,705	$ 14,906,343	$ 509,619
Fast Cycle Logistics & ICT Manufacturing	5	38.3	24.90	1,668,348	1,084,426	271,107	$11.95	$ 3,239,723	7.00%	$ 46,281,761	$ 90,000	$ 2,240,550	95	$ 25,755,122	$ 27,995,672	$ 5,599,134	$ 33,594,807	$ 12,686,954	$ 509,619
Cold Chain & Perishables	6	38.2	24.83	1,663,992	1,081,595	324,478	$11.95	$ 3,877,517	7.00%	$ 55,393,105	$ 90,000	$ 2,234,700	95	$ 30,825,452	$ 33,060,152	$ 6,612,030	$ 39,672,182	$ 15,720,923	$ 633,142
Cold Chain & Perishables	7	15.8	10.27	688,248	447,361	134,208	$11.95	$ 1,603,790	7.00%	$ 22,911,284	$ 90,000	$ 924,300	95	$ 12,749,794	$ 13,674,094	$ 2,734,819	$ 16,408,913	$ 6,502,371	$ 633,142
Advanced Manufacturing	8	32.9	21.39	1,433,124	931,531	232,883	$11.95	$ 2,782,948	7.00%	$ 39,756,395	$ 90,000	$ 1,924,650	90	$ 20,959,439	$ 22,884,089	$ 4,576,818	$ 27,460,906	$ 12,295,489	$ 574,959
Totals		**277.60**	**180.44**	**12,092,256**	**7,859,966**	**2,138,981**	**$11.95**	**$ 25,560,825**	**7.00%**	**$ 365,154,636**	**$ 90,000**	**$ 16,239,600**	**96.25**	**$ 206,327,657**	**$ 222,567,257**	**$ 44,513,451**	**$ 267,080,709**	**$ 98,073,927**	**$ 551,778**
			65.0%			27.2%						6.3%		77.3%		16.7%	100.0%	36.7%	

Orange Shaded Area

Primary Economic Cluster Development	Areas	Gross Acres	Est. Net Acres	Gross Square Feet	Net Square Feet (Post Servicing 35%)	Floor Area Ratio F.A.R.	NNN Rent	NNN Rent Revenue/Yr.	CAP Rate	Project Value	Site Infrastructure Per Acre	Ttl Site Infrastructure Costs	Est. Building Costs (Shell Only)	Ttl Building Costs	Ttl Hard Costs	Soft Costs, Financing & Contingency (20%)	Ttl Construction Costs	$ Available Land & Developer Profit	Residual Land Value /Acre
Light Industry	1	76.4	49.66	3,327,984	2,163,190	648,957	$ 10.95	$ 7,106,078	6.75%	$ 105,275,227	$ 90,000	$ 4,469,400	95	$ 61,650,904	$ 66,120,304	$ 13,224,061	$ 79,344,364	$ 25,930,863	$ 522,168
Flex Tech & Industrial Assembly Parks	2	15.7	10.21	683,892	444,530	133,359	$ 11.95	$ 1,593,639	7.00%	$ 22,766,276	$ 90,000	$ 918,450	100	$ 13,335,894	$ 14,254,344	$ 2,850,869	$ 17,105,213	$ 5,661,063	$ 554,734
Flex Tech & Industrial Assembly Parks	3	16.6	10.79	723,096	470,012	141,004	$ 11.95	$ 1,684,994	7.00%	$ 24,071,349	$ 90,000	$ 971,100	100	$ 14,100,372	$ 15,071,472	$ 3,014,294	$ 18,085,766	$ 5,985,583	$ 554,734
Fast Cycle Logistics & ICT Manufacturing	4	24.6	15.99	1,071,576	696,524	174,131	$ 10.95	$ 1,906,736	6.75%	$ 28,247,934	$ 90,000	$ 1,439,100	95	$ 16,542,455	$ 17,981,555	$ 3,596,311	$ 21,577,865	$ 6,670,069	$ 417,140
E-Commerce and Retail Fulfillment	5	23.9	15.54	1,041,084	676,705	169,176	$ 9.95	$ 1,683,303	6.50%	$ 25,896,965	$ 90,000	$ 1,398,150	85	$ 14,379,973	$ 15,778,123	$ 3,155,625	$ 18,933,747	$ 6,963,217	$ 448,228
E-Commerce and Retail Fulfillment	6	24.2	15.73	1,054,152	685,199	171,300	$ 9.95	$ 1,704,432	6.50%	$ 26,222,031	$ 90,000	$ 1,415,700	85	$ 14,560,475	$ 15,976,175	$ 3,195,235	$ 19,171,409	$ 7,050,622	$ 448,228
E-Commerce and Retail Fulfillment	7	25.3	16.45	1,102,068	716,344	179,086	$ 9.95	$ 1,781,906	6.50%	$ 27,413,942	$ 90,000	$ 1,480,050	85	$ 15,222,314	$ 16,702,364	$ 3,340,473	$ 20,042,837	$ 7,371,104	$ 448,228
E-Commerce and Retail Fulfillment	8	25.5	16.58	1,110,780	722,007	180,502	$ 9.95	$ 1,795,992	6.50%	$ 27,630,653	$ 90,000	$ 1,491,750	85	$ 15,342,649	$ 16,834,399	$ 3,366,880	$ 20,201,279	$ 7,429,374	$ 448,228
AgriBusiness (Livestock & Generic Testing)	9	26.1	16.97	1,136,916	738,995	147,799	$ 9.50	$ 1,404,091	6.00%	$ 23,401,521	$ 90,000	$ 1,526,850	80	$ 11,823,926	$ 13,350,776	$ 2,670,155	$ 16,020,932	$ 7,380,589	$ 435,048
AgriBusiness (Livestock & Generic Testing)	10	26.2	17.03	1,141,272	741,827	148,365	$ 9.50	$ 1,409,471	6.00%	$ 23,491,182	$ 90,000	$ 1,532,700	80	$ 11,869,229	$ 13,401,929	$ 2,680,386	$ 16,082,315	$ 7,408,867	$ 435,048
AgriBusiness	11	24.8	16.12	1,080,288	702,187	105,328	$ 9.50	$ 1,000,617	5.75%	$ 17,402,031	$ 90,000	$ 1,450,800	75	$ 7,899,606	$ 9,350,406	$ 1,870,081	$ 11,220,487	$ 6,181,543	$ 383,470
AgriBusiness	12	26.1	16.97	1,136,916	738,995	110,849	$ 9.50	$ 1,053,068	5.75%	$ 18,314,234	$ 90,000	$ 1,526,850	75	$ 8,313,698	$ 9,840,548	$ 1,968,110	$ 11,808,658	$ 6,505,576	$ 383,470
Totals		**335.40**	**218.01**	**14,610,024**	**9,496,516**	**2,309,856**	**$ 10.30**	**$ 24,124,328**	**6.42%**	**$ 370,133,344**	**$ 90,000**	**$ 19,620,900**	**86.67**	**$ 205,041,494**	**$ 224,662,394**	**$ 44,932,479**	**$ 269,594,873**	**$ 100,538,471**	**$ 456,560**
			65.0%			24.3%						7.3%		76.1%		16.7%	100.0%	37.3%	

Light Purple Shaded Area

Primary Economic Cluster Development	Areas	Gross Acres	Est. Net Acres	Gross Square Feet	Net Square Feet (Post Servicing 35%)	Floor Area Ratio F.A.R.	NNN Rent	NNN Rent Rev/Yr.	CAP Rate	Project Value	Site Infrastructure Per Acre	Ttl Site Infrastructure Costs	Est. Building Costs (Shell Only)	Ttl Building Costs	Ttl Hard Costs	Soft Costs, Financing & Contingency (20%)	Ttl Construction Costs	$ Available Land & Developer Profit	Residual Land Value /Acre
Flex Tech & Industrial Assembly Parks	1	33.7	21.91	1,467,972	954,182	286,255	$ 11.95	$ 3,420,742	7.00%	$ 48,867,739	$ 90,000	$ 1,971,450	100	$ 28,625,454	$ 30,596,904	$ 6,119,381	$ 36,716,285	$ 12,151,455	$ 554,734
Flex Tech & Industrial Assembly Parks	2	17.2	11.18	749,232	487,001	146,100	$ 11.95	$ 1,745,898	7.00%	$ 24,941,398	$ 90,000	$ 1,006,200	100	$ 14,610,024	$ 15,616,224	$ 3,123,245	$ 18,739,469	$ 6,201,929	$ 554,734
Flex Tech & Industrial Assembly Parks	3	48.5	31.53	2,112,660	1,373,229	411,969	$ 11.95	$ 4,923,026	7.00%	$ 70,328,942	$ 90,000	$ 2,837,250	100	$ 41,196,870	$ 44,034,120	$ 8,806,824	$ 52,840,944	$ 17,487,998	$ 554,734
Flex Tech & Industrial Assembly Parks	4	26.7	17.36	1,163,052	755,984	226,795	$ 11.95	$ 2,710,202	7.00%	$ 38,717,170	$ 90,000	$ 1,561,950	100	$ 22,679,514	$ 24,241,464	$ 4,848,293	$ 29,089,757	$ 9,627,414	$ 554,734
Light Industry	5	51.6	33.54	2,247,696	1,461,002	438,301	$ 10.95	$ 4,799,393	6.75%	$ 71,102,117	$ 90,000	$ 3,018,600	95	$ 41,638,568	$ 44,657,168	$ 8,931,434	$ 53,588,602	$ 17,513,515	$ 522,168
Light Industry	6	28.4	18.46	1,237,104	804,118	241,235	$ 10.95	$ 2,641,526	6.75%	$ 39,133,723	$ 90,000	$ 1,661,400	95	$ 22,917,352	$ 24,578,752	$ 4,915,750	$ 29,494,502	$ 9,639,221	$ 522,168
Light Industry	7	52.8	34.32	2,299,968	1,494,979	448,494	$ 10.95	$ 4,911,007	6.75%	$ 72,755,654	$ 90,000	$ 3,088,800	95	$ 42,606,907	$ 45,695,707	$ 9,139,141	$ 54,834,849	$ 17,920,806	$ 522,168
Light Industry	8	29.3	19.05	1,276,308	829,600	248,880	$ 10.95	$ 2,725,237	6.75%	$ 40,373,876	$ 90,000	$ 1,714,050	95	$ 23,643,606	$ 25,357,656	$ 5,071,531	$ 30,429,187	$ 9,944,690	$ 522,168
Logistics	9	55.7	36.21	2,426,292	1,577,090	236,563	$ 9.50	$ 2,247,353	5.75%	$ 39,084,399	$ 90,000	$ 3,258,450	75	$ 17,742,260	$ 21,000,710	$ 4,200,142	$ 25,200,852	$ 13,883,547	$ 383,470
Logistics	10	30.9	20.09	1,346,004	874,903	131,235	$ 9.50	$ 1,246,736	5.75%	$ 21,682,369	$ 90,000	$ 1,807,650	75	$ 9,842,654	$ 11,650,304	$ 2,330,061	$ 13,980,365	$ 7,702,004	$ 383,470
Totals		**374.80**	**243.62**	**16,326,288**	**10,612,087**	**2,815,827**	**$ 11.06**	**$ 31,371,119**	**6.65%**	**$ 466,987,389**	**$ 90,000**	**$ 21,925,800**	**93**	**$ 265,503,209**	**$ 287,429,009**	**$ 57,485,802**	**$ 344,914,811**	**$ 122,072,578**	**$ 507,455**
			65.0%			26.5%						6.4%		77.0%		16.7%	100.0%	35.4%	

Dark Purple Shaded Areas

Primary Economic Cluster Development	Areas	Gross Acres	Est. Net Acres	Gross Square Feet	Net Square Feet (Post Servicing 35%)	Floor Area Ratio F.A.R.	NNN Rent	NNN Rent Revenue/Yr.	CAP Rate	Project Value	Site Infrastructure Per Acre	Ttl Site Infrastructure Costs	Est. Building Costs (Shell Only)	Ttl Building Costs	Ttl Hard Costs	Soft Costs, Financing & Contingency (20%)	Ttl Construction Costs	$ Available Land & Developer Profit	Residual Land Value /Acre
Logistics	1	28.4	18.46	1,237,104	804,118	120,618	$ 8.95	$ 1,079,528	5.50%	$ 19,627,780	$ 90,000	$ 1,661,400	80	$ 9,649,411	$ 11,310,811	$ 2,262,162	$ 13,572,973	$ 6,054,806	$ 327,996
Logistics	2	34.1	22.17	1,485,396	965,507	144,826	$ 8.95	$ 1,296,194	5.50%	$ 23,567,158	$ 90,000	$ 1,994,850	80	$ 11,586,089	$ 13,580,939	$ 2,716,188	$ 16,297,127	$ 7,270,031	$ 327,996
Logistics	3	19.7	12.81	858,132	557,786	83,668	$ 8.95	$ 748,827	5.50%	$ 13,615,044	$ 90,000	$ 1,152,450	80	$ 6,693,430	$ 7,845,880	$ 1,569,176	$ 9,415,056	$ 4,199,989	$ 327,996
Logistics	4	23.8	15.47	1,036,728	673,873	101,081	$ 8.95	$ 904,675	5.50%	$ 16,448,632	$ 90,000	$ 1,392,300	80	$ 8,086,478	$ 9,478,778	$ 1,895,756	$ 11,374,534	$ 5,074,098	$ 327,996
Logistics	5	94.0	61.10	4,094,640	2,661,516	399,227	$ 8.95	$ 3,573,085	5.50%	$ 64,965,186	$ 90,000	$ 5,499,000	80	$ 31,938,192	$ 37,437,192	$ 7,487,438	$ 44,924,630	$ 20,040,556	$ 327,996
Logistics	6	22.3	14.50	971,388	631,402	94,710	$ 8.95	$ 847,657	5.50%	$ 15,411,954	$ 90,000	$ 1,304,550	80	$ 7,576,826	$ 8,881,376	$ 1,776,275	$ 10,657,652	$ 4,754,302	$ 327,996
Logistics	7	37.8	24.57	1,646,568	1,070,269	160,540	$ 8.95	$ 1,436,836	5.50%	$ 26,124,298	$ 90,000	$ 2,211,300	80	$ 12,843,230	$ 15,054,530	$ 3,010,906	$ 18,065,436	$ 8,058,862	$ 327,996
Multimodel Logistics Hub	8	79.6	51.74	3,467,376	2,253,794	338,069	$ 8.95	$ 3,025,719	6.00%	$ 50,428,650	$ 90,000	$ 4,656,600	80	$ 27,045,533	$ 31,702,133	$ 6,340,427	$ 38,042,559	$ 12,386,090	$ 239,391
Multimodel Logistics Hub	9	23.1	15.02	1,006,236	654,053	143,892	$ 8.95	$ 1,287,831	6.00%	$ 21,463,852	$ 90,000	$ 1,351,350	80	$ 11,511,340	$ 12,862,690	$ 2,572,538	$ 15,435,228	$ 6,028,625	$ 401,507
Multimodel Logistics Hub	10	22.4	14.56	975,744	634,234	139,531	$ 8.95	$ 1,248,806	6.00%	$ 20,813,433	$ 90,000	$ 1,310,400	80	$ 11,162,511	$ 12,472,911	$ 2,494,582	$ 14,967,494	$ 5,845,939	$ 401,507
Multimodel Logistics Hub	11	75.6	49.14	3,293,136	2,140,538	470,918	$ 8.95	$ 4,214,720	6.00%	$ 70,245,335	$ 90,000	$ 4,422,600	80	$ 37,673,476	$ 42,096,076	$ 8,419,215	$ 50,515,291	$ 19,730,044	$ 401,507
Multimodel Logistics Hub	12	20.1	13.07	875,556	569,111	125,205	$ 8.95	$ 1,120,580	6.00%	$ 18,676,339	$ 90,000	$ 1,175,850	80	$ 10,016,361	$ 11,192,211	$ 2,238,442	$ 13,430,653	$ 5,245,686	$ 401,507
Multimodel Logistics Hub	13	27.4	17.81	1,193,544	775,804	170,677	$ 8.95	$ 1,527,557	6.00%	$ 25,459,288	$ 90,000	$ 1,602,900	80	$ 13,654,143	$ 15,257,043	$ 3,051,409	$ 18,308,452	$ 7,150,836	$ 401,507
AgriBusiness	14	46.4	30.16	2,021,184	1,313,770	197,065	$ 8.95	$ 1,763,736	5.50%	$ 32,067,922	$ 90,000	$ 2,714,400	80	$ 15,765,235	$ 18,479,635	$ 3,695,927	$ 22,175,562	$ 9,892,359	$ 327,996
AgriBusiness (Livestock & Generic Testing)	15	29.1	18.92	1,267,596	823,937	164,787	$ 9.50	$ 1,565,481	5.50%	$ 28,463,292	$ 90,000	$ 1,702,350	80	$ 13,182,998	$ 14,885,348	$ 2,977,070	$ 17,862,418	$ 10,600,874	$ 560,448
AgriBusiness	16	28.5	18.53	1,241,460	806,949	121,042	$ 8.95	$ 1,083,329	5.50%	$ 19,696,892	$ 90,000	$ 1,667,250	80	$ 9,683,388	$ 11,350,638	$ 2,270,128	$ 13,620,766	$ 6,076,126	$ 327,996
AgriBusiness	17	43.7	28.41	1,903,572	1,237,322	185,598	$ 8.95	$ 1,661,105	5.50%	$ 30,201,900	$ 90,000	$ 2,556,450	80	$ 14,847,862	$ 17,404,312	$ 3,480,862	$ 20,885,174	$ 9,316,726	$ 327,996
AgriBusiness	18	24.0	15.60	1,045,440	679,536	101,930	$ 8.95	$ 912,277	5.50%	$ 16,586,856	$ 90,000	$ 1,404,000	80	$ 8,154,432	$ 9,558,432	$ 1,911,686	$ 11,470,118	$ 5,116,738	$ 327,996
AgriBusiness	19	25.0	16.25	1,089,000	707,850	106,178	$ 8.95	$ 950,289	5.50%	$ 17,277,975	$ 90,000	$ 1,462,500	80	$ 8,494,200	$ 9,956,700	$ 1,991,340	$ 11,948,040	$ 5,329,935	$ 327,996
Totals		**705.00**	**458.25**	**30,709,800**	**19,961,370**	**3,369,564**	**$ 8.98**	**$ 30,248,233**	**5.66%**	**$ 531,141,785**	**$ 90,000**	**$ 41,242,500**	**80.00**	**$ 269,565,136**	**$ 310,807,636**	**$ 62,161,527**	**$ 372,969,163**	**$ 158,172,622**	**$ 354,912**
			65.0%			16.9%						11.1%		72.3%		16.7%	100.0%	42.4%	
Area Totals		**1692.80**	**1100.32**	**73,738,368**	**47,929,939**	**10,634,229**	**$ 10.57**	**$ 111,304,504**	**6.43%**	**$ 1,733,417,154**	**$ 90,000**	**$ 99,028,800**	**88.98**	**$ 946,437,496**	**$ 1,045,466,296**	**$ 209,093,259**	**$ 1,254,559,556**	**$ 478,857,598**	**$ 435,198**
			65.0%			22.2%						7.9%					$ 117.97		

Residual Land Value

Construction Est. (Shell Only)

	Calgary (2nd Highest in Country)		Winnipeg	
Office Buildings	$185	$215	$194	$226
Industrial				
Light Eng Factories & Warehouses (Light Ind) - (20 - 50K SF)	$85	$105	$89	$110
Light Eng Factories & Warehouses (Light Ind) - (50 - 100K SF)	$80	$100	$84	$105
Light Eng Factories & Warehouses (Light Ind) - (100 - 200K SF)	$75	$90	$79	$95
Altus Cost Guide 2014				
	LOW	**HIGH**	**LOW**	**HIGH**
	Total Cost		**Cost/SF**	
Factory 1 Story - 50K - Concrete Block / Steel Frame	$3,875,550	$5,255,600	$77.51	$105.11
Factory 1 Story - 100K - Concrete Block / Steel Frame	$7,335,950	$10,165,950	$73.36	$101.66
Factory 1 Story - 200K - Concrete Block / Steel Frame	$14,265,360	$19,775,650	$71.33	$98.88
	Total Cost		**Cost/SF**	
Warehouse - 50K - Tiltup Concrete Panels / Steel Frame	$3,094,200	$4,297,500	$61.88	$85.95
Warehouse - 100K - Tiltup Concrete Panels / Steel Frame	$5,754,150	$7,991,875	$57.54	$79.92
Warehouse - 200K - Tiltup Concrete Panels / Steel Frame	$11,074,500	$15,381,250	$55.37	$76.91
			Blended Cost	
Factories & Warehouses - 50K SF			$69.70	$95.53
Factories & Warehouses - 100K SF			$65.45	$90.79
Factories & Warehouses - 200K SF			$63.35	$87.89
RS Means 2014 Estimate			**$66.17**	**$91.40**
			$65/ft. md down	*$90/ft. md down*