PRECINCT T PLAN
REPORT ON WATER, WASTEWATER, STORMWATER, AND TRANSPORTATION SERVICES

Prepared for:
Terracon Development Ltd.

DRAFT

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Feb. 12, 2013

Project: 116808740

PRECINCT T PLAN
REPORT ON WATER, WASTEWATER, STORMWATER, AND TRANSPORTATION SERVICES

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1.0 Introduction

The purpose of this report is to supplement the Precinct T Plan with considerations on the proposed concepts for water, wastewater, storm water, and transportation servicing.

Precinct T is bounded by King Edward Street, Jefferson Avenue, Commercial Avenue and the Inksbrook Industrial development.

Precinct T is comprised of 48.68 ha. It will be broken up into a combination of Single, two-family and Multi-Family Development.

This report, in conjunction with the Precinct T plan, will help the City of Winnipeg evaluate the impacts of development for this area. This report is based on current City of Winnipeg design standards and guidelines. The information provided is for planning purposes. More detailed design will be required for the detailed servicing report.

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2.0 Watermains

2.1 EXISTING WATERMAIN SERVICE

The primary water supply source for Precinct T is the 600 mm Inkster Boulevard Feedermain from an existing feedpoint at Keewatin Street. There is a 300mm watermain on Commercial Avenue from King Edward Street west to the west limit of Precinct T. There is a 300mm watermain on King Edward Street from Commercial Avenue south to Inkster Garden Drive where it reduces to a 250mm size.

The 300mm main on Commercial Avenue reduces to 250mm in size west of Precinct T within the Inksbrook Park industrial development. This particular portion of the watermain on Commercial Avenue is within an unregistered right of way and thus is currently considered private by the City.

2.2 PROPOSED WATER SYSTEM

Water will be delivered to Precinct T by extending a watermain North on King Edward St. from the 300mm connection point at the intersection of Commercial Ave. and King Edward St. Looping and additional pressure will be provided with a connection to the existing 300 mm watermain on Commercial Ave. In addition the proposed watermain on King Edward Street will be connected to the planned watermain on Old Commonwelath Path in Waterford Green.

The watermain will be designed to provide target fire flow rates based on FUS guidelines during maximum daily demands.

The following design criteria and assumptions will be used in the analysis of the watermains:

- Population based on 3.05 persons per single family dwelling unit and 2.30 persons per multifamily dwelling unit.
- The average daily per capita consumption of 270 L.
- The peak hour multiplier will be 2.5. (PHD = 2.5 x ADD)
- MDD = 1.6 x ADD

Using EPA NET, we developed a simple model to determine if there would be available fire protection within the Precinct. The City provided us with simulated Flow Curves at two Feed Points; 1) on Commercial Ave. roughly 600m west of King Edward and 2) at the intersection of King Edward and Commercial Ave. A 250mm watermain loop through the Precinct, as shown on Figure 1.0, will provide the required fire protection for a Single and Multi-Family Development.

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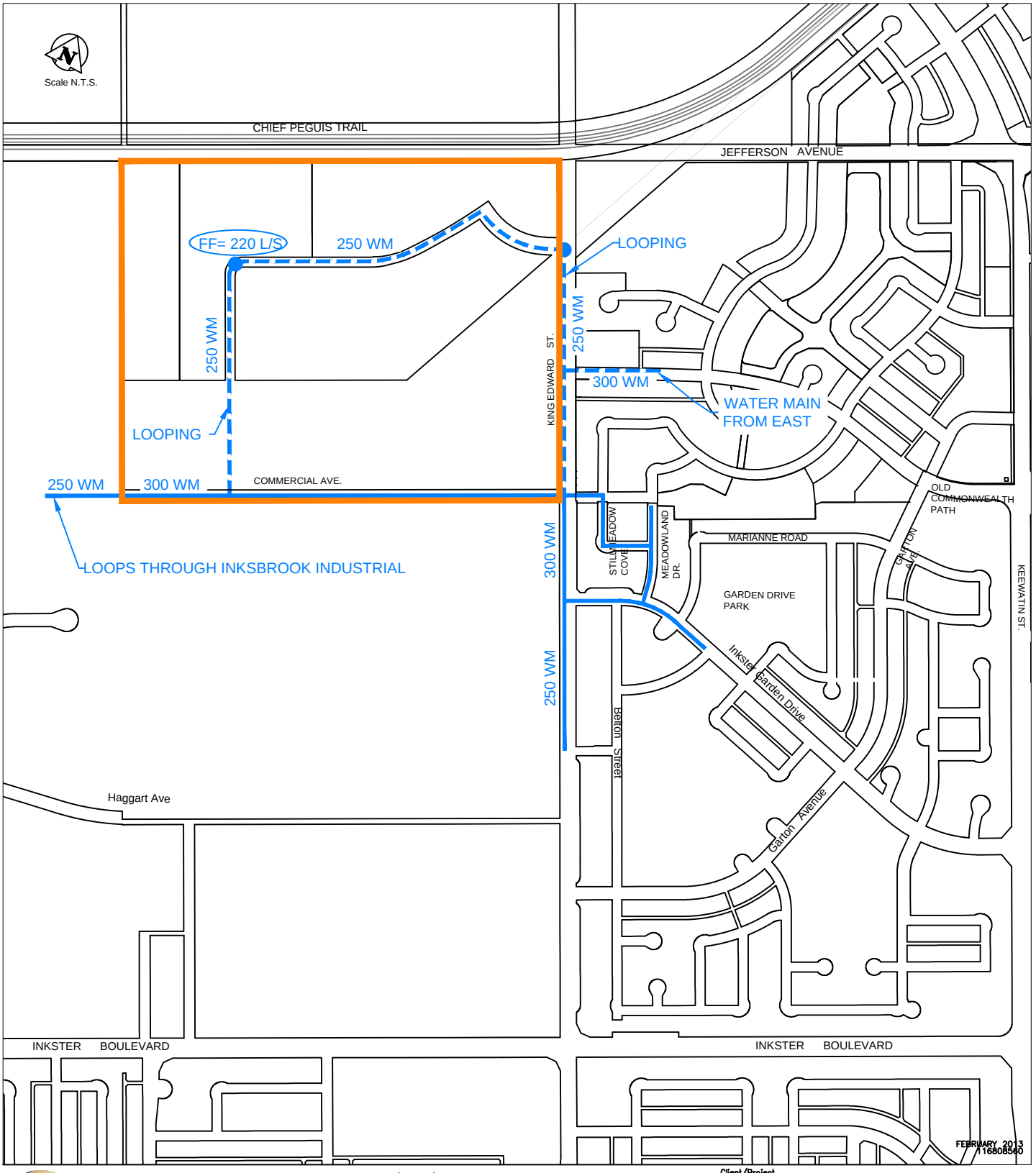

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February 11, 2013

FEBRUARY 2013
116808560

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Legend:

- Precinct Boundary
- Proposed Watermain
- Existing Watermain
- FF=220 L/S — Available Fire Flow

Client/Project

Winnipeg, Manitoba

Figure No.

1

Title

Watermains

3.0 Wastewater Sewer

3.1 EXISTING WASTEWATER SEWER

The 1650 mm Northwest Interceptor Sewer follows an alignment in King Edward Street north from Inkster Boulevard to the north boundary of Inkster Gardens, at Commercial Avenue, then follows this alignment east crossing Keewatin Street just south of Old Commonwealth Path on alignment with Adsum Drive through the Maples subdivision. It is ideally located to provide primary wastewater collection service for Precinct T.

A 375 mm/450 mm wastewater sewer exists on Commercial Ave. west of King Edward St. that is tied into the 1650 mm Interceptor. This sewer was designed to service a portion of the Inksbrook Industrial Park and the area included in Precinct T.

3.2 PROPOSED WASTEWATER SERVICE

Precinct T will have a portion of its area drain to the wastewater sewer on Commercial and a portion is planned to be routed down King Edward St. and connected to the Interceptor. This option is in recognition of the land ownership boundary.

A pipe sizing calculation for the over-sized existing wastewater sewers on Commercial Avenue and Haggart Avenue was completed in 1996 and 2000 by IDG Stanley. The assumption at that time was for the northerly 130 ha. (half section or 320 acres) south of Jefferson, east of Brookside and west of King Edward to drain to the Commercial Avenue sewer. The southerly 130 ha. was planned to drain to the sewer on Haggart Avenue (this includes part of Precinct T and all of the future Precinct S). At that time the planned use of the area within Precinct T was industrial. We have updated the sewer calculations for the quadrant to reflect the current plan for residential development within Precinct T. The sewer flows are calculated in figure 2a.

The design criteria and assumptions for the wastewater sewer system are:

1. Peak Design Flow = domestic sewage x peaking factor plus extraneous flow.
   The extraneous flows include groundwater infiltration and manhole cover inflow.

2. Domestic Sewage (Residential)
   Average Flow: 270 L/capita/day
   Peaking Factor: Harman's = $1 + 14/(4+p^{0.5})$
   Population/dwelling = 3.05 persons (single family)
   = 2.30 persons (multi family)
   Dwelling Density = 12.29 dwellings/ha (single family)
   = 74.13 dwellings/ha (multi family)

3. Peak Commercial Flow: 28,100 L/ha/day
   Peak Light Industrial Flow: 37,600 L/ha/day

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4. Extraneous Flow
   a) Groundwater Infiltration: 2200 L/ha/day
   b) Manhole Infiltration: 12 L/min/manhole
      Manhole Spacing: 1.6 Manholes/ha (Residential)
      0.8 Manholes/ha (Industrial/Commercial)

5. Pipe selection was based on full flow pipe with Manning's N = 0.013 and minimum velocity of 0.6 m/sec (2.0 ft/sec). Adequate pipe cover and slope will be demonstrated on the detailed design drawings.

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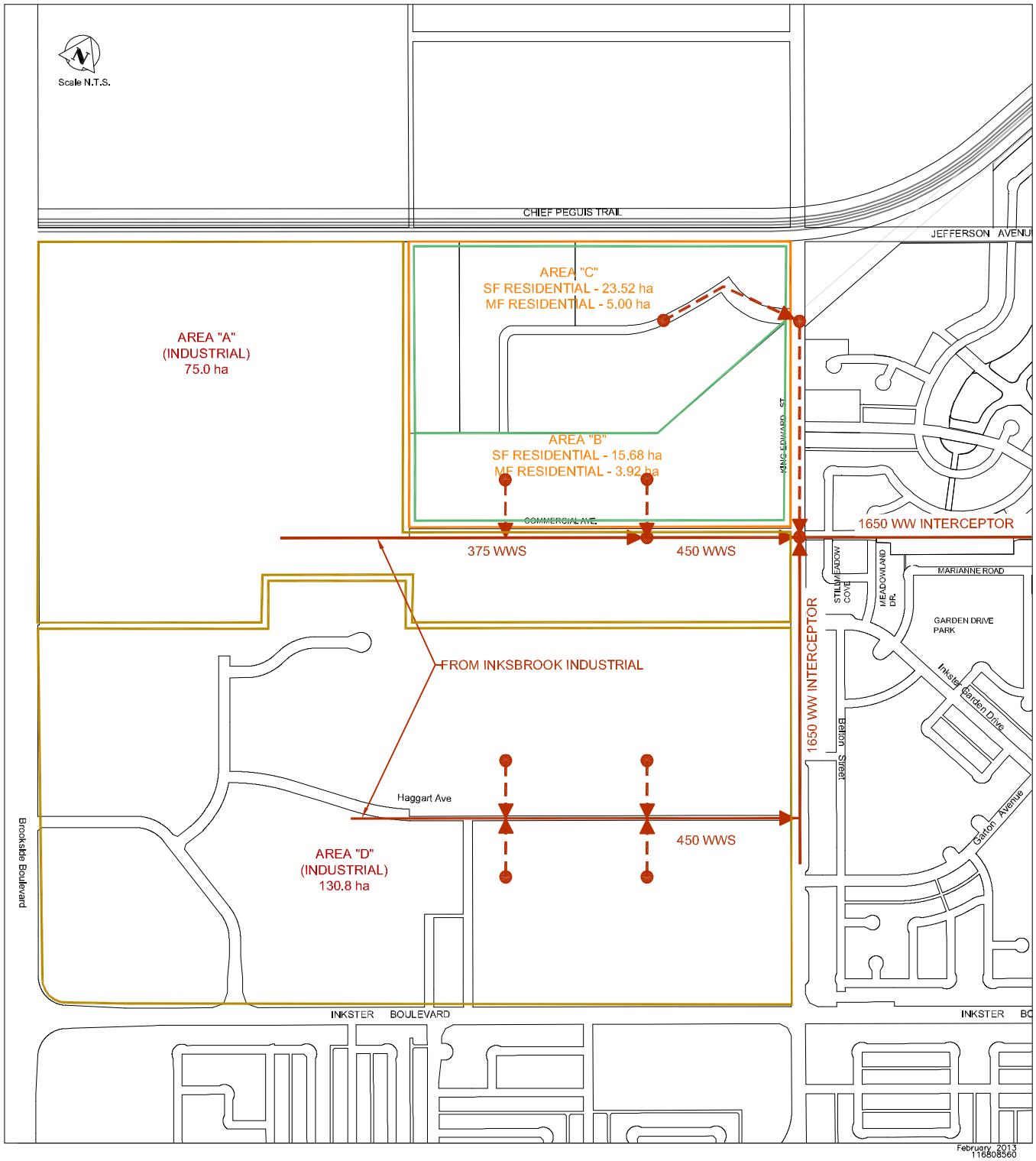

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February 12, 2013

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Legend:

- Precinct Boundary
- Sub Catchement Boundary
- Proposed WWS
- Existing WWS
- Industrial Catchments

Client/Project

Winnipeg, Manitoba

Figure No.

2

Title

Waste Water Sewer

WASTEWATER SEWER DESIGN SHEET **DESCRIPTION:** **WWS Sizing Confirmation**

OWNER Terracon
SUBDIV. NAME Precinct T

Area No.	M.H. From	M.H. To	No. of SF Dwelling Units	No. of MF Dwelling Units	Incremental SF Area (ha)	Incremental MF Area (ha)	Cumulative SF Area (ha)	Cumulative MF Area (ha)	Incremental SF Population (Persons)	Incremental MF Population (Persons)	Incremental Total Population (Persons)	Cumulative Population (Persons)	Peaking Factor M	Peak Res Flow (l/s)	Incremental Com. Area (Ha)	Cumulative Com. Area (Ha)	Incremental Ind. Area (Ha)	Cumulative Ind. Area (Ha)	Cumulative Total Area (Ha)	Ground Water Infiltration (l/s)	Manhole Inflow (l/s)	Peak Com. Flow (l/s)	Cum Com. Flow (l/s)	Peak Ind. Flow (l/s)	Cum Ind. Flow (l/s)	Peak Design Flow (l/s)	Proposed Sewer Dia. (mm)	Slope %	Crit. Slope %	Des.Slope %	Capacity Q. (l/s)	Velocity (m/s)
A			**0**	**0**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0**	**0**	**0**	**0**	**4.500**	**0.00**	**0.0000**	**0.0000**	**75.0000**	**75.0000**	**75.0000**	**1.91**	**12.00**	**0.00**	**0.00**	**32.63**	**32.63**	**46.53**						
B			**193**	**291**	**15.6800**	**3.9200**	**15.6800**	**3.9200**	**588**	**668**	**1256**	**1256**	**3.734**	**14.66**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**19.6000**	**0.50**	**6.27**	**0.00**	**0.00**	**0.00**	**0.00**	**21.43**						
A+B														**14.66**						**2.41**	**18.27**				**32.63**	**67.96**	**375**	**0.15%**	**1.25%**	**0.15%**	**67.91**	**0.61**
C			**289**	**436**	**23.5200**	**5.8800**	**23.5200**	**5.8800**	**882**	**1003**	**1884**	**1884**	**3.606**	**21.23**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**29.4000**	**0.75**	**9.41**	**0.00**	**0.00**	**0.00**	**0.00**	**31.39**	**300**	**0.21%**	**1.34%**	**0.21%**	**44.31**	**0.63**
D			**0**	**0**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0**	**0**	**0**	**0**	**4.500**	**0.00**	**0.0000**	**0.0000**	**130.8000**	**130.8000**	**130.8000**	**3.33**	**20.93**	**0.00**	**0.00**	**56.90**	**56.90**	**81.16**	**450**	**0.12%**	**1.17%**	**0.12%**	**98.76**	**0.62**

Notes:

	Single Family
3.05	Persons per Unit (Single Family)
12.29	Dwellings per Hectare (Single Family)
2.3	Persons per Unit (Multi Family)
74.13	Dwellings per Hectare (Multi Family)

Design Flow Factor, F =	0.003125	l/sec/person	
60 l. Gal/person/day =	270	l/person/day	
Harmon Factor Pf=1+(14/(4+(p)^.5)	P = thousands of persons		
	2<=Pf<=4.5		
Infiltration Factor, Fi =	2200	l/Ha/day	
Manhole Inflow	12	l/MH/min	
Manhole Quantity (Residential)	1.6	MH/Ha	
Manhole Quantity (Industrial/Commercial)	0.8	MH/Ha	

Peak Commerical Flow	28100	L/day/Ha	0.325	L/sec/Ha
Peak Industrial Flow	37600	L/day/Ha	0.435	L/sec/Ha

Calculated By :	D. Mages
Checked By :	D. Mages
Date:	11-Feb-13
File:	116808740

4.0 Stormwater Management

4.1 STORMWATER RETENTION BASINS

Precinct T lies within the Brooklands Rosser Drainage Area, which features a series of retention facilities and interconnecting sewers eventually discharging south to the Assiniboine River.

The catchment area of Precinct T, including rights of way is 48.68 ha, and is bounded King Edward Street, Jefferson Avenue, Commercial Avenue and the Inksbrook Industrial development.

The stormwater will be managed through two centrally located lakes (totaling approximately 5.0 ac). The lakes will be in close proximity to each other to minimize future City operation and maintenance costs. The City has indicated that naturalized ponds will be required to further reduce O and M costs. The lake water levels and discharge rate will be controlled (to the City's satisfaction) by a weir structure that will be located along the interconnecting pipe on Commercial Avenue that will be connected into the existing 750 mm LDS on Chapman Ave.

Since the current plan appears to be for the Terracon north land to precede the south land in Precinct T (owned by others) an easement will be required for the proposed interconnecting pipe to Commercial Avenue. If this easement is not possible to obtain, a second option for an interconnection path is shown on figure 3.0.

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4.2 LAND DRAINAGE SEWERS

The development will be serviced by urban style streets with a piped land drainage system. The land drainage sewers will convey storm water to the centrally located retention ponds. The sewers will be designed in accordance with current city design parameters.

The piped system would be designed using the Rational Design method and based on the following criteria:

5 year storm intensity equation I = 47.2/(t+8)0.828 → (MacLaren 1974).

Pipe friction factor (Manning's n): 0.013 (Concrete and PVC).

Minimum full flow velocity: 3 ft /s.

Maximum full flow velocity: 10 ft /s.

The 1:5 year return frequency for the design of the storm sewer system.

Tailwater Condition at Lakes = 0.45 m above NWL.

Runoff Design Criteria:

The rational design method would be used to estimate rainfall runoff to be handled by the piped system:

Q = CiA

Where:

Q = runoff (CFS)

C = runoff coefficient

i = rainfall intensity (in/hr)

A = area (acres)

The drainage catchments include single family residential and multi-family residential which reflect runoff coefficients (“C” values) of 0.50 and 0.60 respectively.

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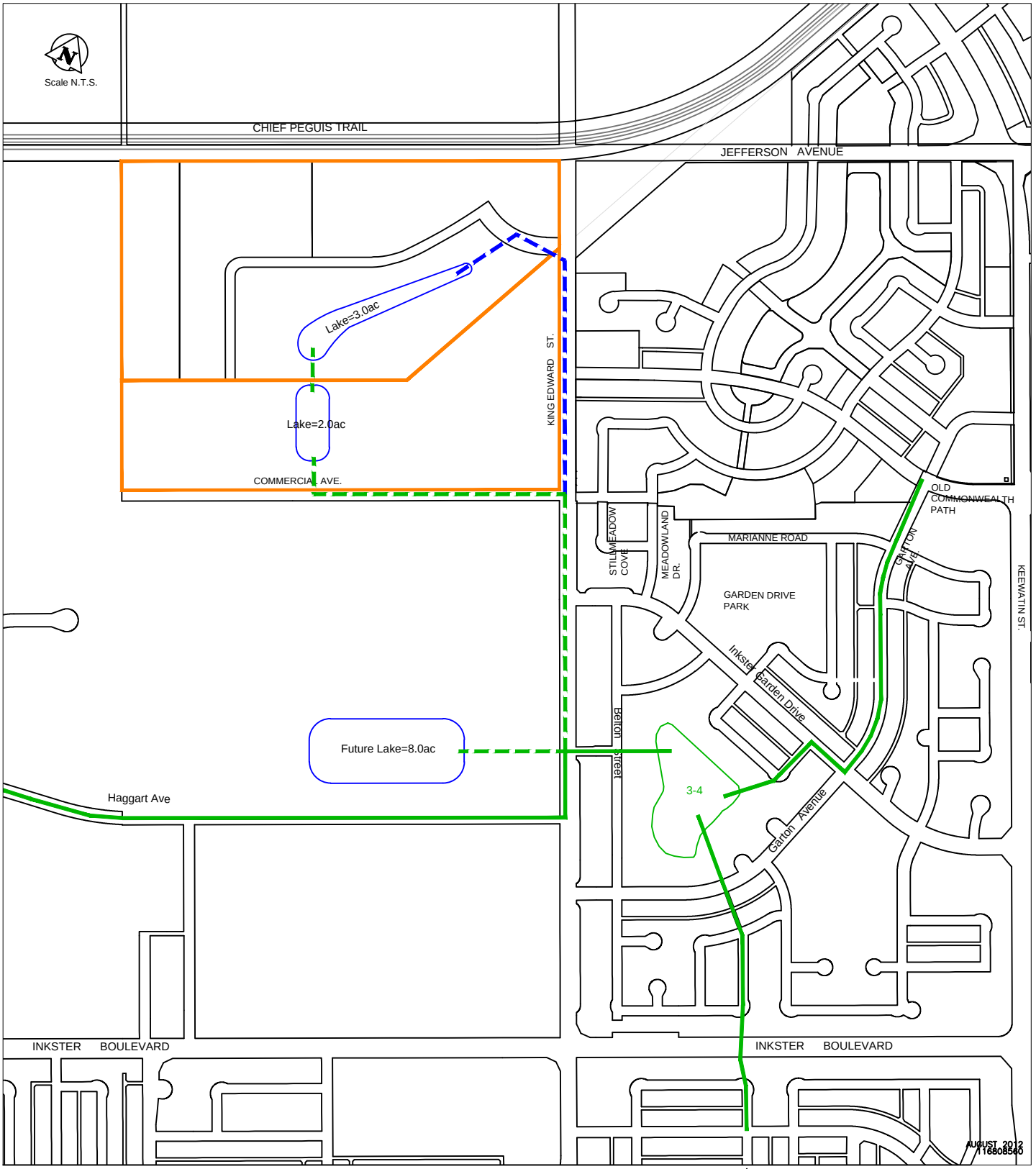

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Legend:

- Precinct / Catchment Boundary
- Future Catchement Boundary
- Proposed LDS Interconnecting Pipe
- Existing LDS
- Option 2 for LDS Interconnecting Pipe

Client/Project

Winnipeg, Manitoba

Figure No.

3

Title

Land Drainage Sewers

5.0 Precinct T Roads

The preliminary road network serving Precinct T includes:

Expressways:

- Chief Peguis Trail (CPT) – a planned expressway serving as an inner ring road for the City. In the vicinity of Precinct T, Chief Peguis Trail is planned to extend from Main Street westerly to Route 90 and beyond. It will form the northern boundary of Precinct T and is expected to be constructed by 2031 according to the latest Transportation Master Plan for the City of Winnipeg.

Arterials:

- Keewatin Street (Dr. Jose Rizal Way) – a north-south arterial that bisects the adjacent Precinct C and intersects Chief Peguis Trail to the north and Inkster Boulevard to the south with a south terminus at Notre Dame Avenue. Currently Keewatin Street in Precinct C is a two-lane undivided roadway; however, it has been designed to allow widening to a four-lane divided arterial cross-section in the future.

Collectors:

- *Jefferson Avenue* – an east-west two-lane undivided urban collector road passing through the Mandalay West area east of Precinct C. Currently Jefferson Avenue becomes a rural two lane undivided gravel roadway after crossing the rail alignment separating Precinct C from Mandalay West and extends westerly to Route 90. The Jefferson Avenue alignment may be terminated at Keewatin Street or become a collector or local street within Precinct C depending on the internal lot layout requirements. West of Precinct C, Jefferson Avenue continues as a rural gravel road connecting to Rte 90 and beyond. The existing Jefferson Avenue alignment will be replaced by the extension of Chief Peguis Trail.

- *Adsum Drive* – an east-west two-lane undivided collector roadway which forms the boundary between the neighborhoods of Mandalay West and The Maples. Adsum Drive links Pipeline Road to Keewatin Street and west of Keewatin Avenue it extends westerly as a collector street (Old Commonwealth Road) within Precinct C, terminating at King Edward Street.

- *King Edward Street* – a north-south undivided collector road passing along the west side of the neighborhoods of Meadows West and Precinct C, forming the east boundary of Precinct T. Currently King Edward Street becomes a rural two lane undivided gravel roadway north of Jefferson Avenue extending to the Perimeter Highway. Future Chief Peguis Trail will cross the King Edward Street alignment with no direct connection anticipated between the two roads. When Chief Peguis Trail is constructed, King Edward Street will terminate south

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of Jefferson Avenue, and there will be no access off King Edward Street onto Chief Peguis Trail.

- *Commercial Avenue* – an existing east-west street that intersects King Edward Street and forms the south limit of Precinct T. It is likely that it will be re-constructed when the area south of the Bergen Cut off R.O.W. is built up.

The proposed street network is shown in Figure 4.

5.1 TRIP GENERATION

Trip generation numbers are based on the proposed development density as discussed in Section 1.0.; Table 1 summarizes the total trips generated by development type within the Precinct.

Table 1 - Precinct T Trip Generation

Land Use		Units	trips	% new	Total Trips
Residential					
Single Family	563	du	5520	100	**5520**
Multi Family	688	du	4540	100	**4540**
Total Generated Trips					***10060***

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5.2 TRIP DISTRIBUTION AND TRAFFIC VOLUMES

Trip distribution was based on the 2007 Winnipeg Area Travel Survey Results – Final Report by the City of Winnipeg. Precinct T is located in District 19 Inkster. Trips were distributed to the primary road network discussed in 5.1.

The distribution of trips from Precinct T was based on the probable routing choice of the future residents and the available street network. Without CPT being in place in the near future and having no direct connection when it does get built, the traffic patterns from the Precinct will get entrenched, making use of existing facilities. Any change in patterns from traffic originating in the Precinct after CPT is operational will be minor when compared to overall system use changes. Table 2 shows the distribution based on this scenario with Figure 5 showing the resultant traffic volumes added to the existing network. Keewatin Street south of Inkster Boulevard will have an increase of 2060 trips, Jefferson Avenue west of King Edward Street will

have an increase of 410 trips, Inkster Boulevard east of Keewatin Street will have an increase of 2480 trips as will Inkster Boulevard west of King Edward Street. Adsum Drive will have an increase of 830 vehicles.

Table 2 - Precinct T Trip Distribution – without Chief Peguis Trail

	Precinct T Trip Distribution [1]	Without Chief Peguis Trail	
From Zone 19	**to**		**trips**
	West via Jefferson	5%	500
	South via King Edward/ Inkster Keewatin	25%	2520
	East via King Edward/Inkster	35%	3520
	West via King Edward/Inkster	30%	3020
	East via Adsum/Commonwealth	5%	500
Total		**100%**	**10060**

[1]-Based on data page 73 - 2007 Winnipeg Area Travel Survey Results - Final Report

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5.3 EXISTING AND FUTURE BACKGROUND TRAFFIC VOLUMES

Existing traffic volumes for AM peak movements in the vicinity of Precinct T were provided by the City of Winnipeg through their Base Model Traffic Assignment map. The AM Peak traffic assignment for 2031 was also provided through the 2031 Model Traffic Assignment map the 2031 map assumed the completion of Chief Peguis Trail (CPT) through the study area. However, with the disconnection of Jefferson Avenue east of King Edward Street, the attraction to Chief Peguis Trail will be limited, as the routes to it are indirect. It was assumed that most traffic from Precinct T would use other roads, such as Inkster Blvd, with more direct access to reach their destinations.

The existing and future traffic volume daily flows (based on a conversion from AM peak to ADT of ADT = AM/0.08) are shown in Figure 6.

There are some discrepancies in the model developed for 2031 when taking Precinct T into consideration. For instance, King Edward Street is shown connecting to CPT when direction has been given that King Edward Street would not extend to CPT; and no connections of Leila Ave or Keewatin Street (Dr. Jose Rizal Way) to CPT are presented. These discrepancies were addressed by assuming that the traffic assigned to King Edward Street in the model would be

assigned to Keewatin Street instead. Leila Avenue does not figure into the area of influence for Precinct T, so was not considered.

5.4 COMBINED TRAFFIC VOLUMES AND IMPACT ASSESSMENT

The traffic volumes generated by Precinct T were added to the background traffic volumes (including development from adjacent precincts that are known to be in the process of being planned) to determine the 5 year projected volumes on adjacent road network. The traffic volumes generated by Precinct T were added to the 2031 Model (with projected additional traffic from adjacent precincts) traffic volumes, to determine the 2031 impact of Precinct T. As noted earlier, the future network in the model does not fully coincide with the network for Precinct T and some volumes were adjusted accordingly. The combined base and development traffic volumes for 2015 and 2031 are shown in Figure 7.

The assessment of the traffic flows for the 5 year period raises an issue in terms of traffic volumes on King Edward Street, where traffic volumes increase from 5000 trips per day to 14160 trips per day. To confirm with City of Winnipeg standards, this would require twinning of King Edward Street south of Commercial Avenue. North of Commercial Avenue a two lane collector cross section would meet current requirements. Adsum Drive east of King Edward will see a slight increase in traffic to 5900 trips per day, slightly over 5000 trips per day, not enough to require any upgrades beyond intersection improvements when necessary.

Volumes on Inkster Boulevard, 24020 vpd east of Keewatin Street and 18740 west of Keewatin Street are well within the capacity of the 4 lane divided cross section that exists on Inkster Boulevard.

The assessment for the 2031 scenario, which includes the completion of CPT indicates that the existing collector system of Adsum Drive and King Edward Street continue to function with traffic volumes within the limits of the collector classification, Adsum Drive to 5800 and King Edward Street staying at about 14060 trips per day

By completing the CPT and providing a connection to Keewatin, traffic volumes on Keewatin Street will increase to 18400 at CPT and 24100 at Inkster Boulevard. These volumes are within the capacity available on a four lane divided road

Traffic volumes on Inkster Boulevard will increase to 28820 east of Keewatin Street and to 221020 west of King Edward Street. These volumes are within the capacity available on a four lane divided road, however the volumes east of Keewatin Street are approaching levels where individual intersection capacity concerns may be noted.

5.5 SUMMARY

Precinct T is served by two arterial streets and one expressway within close proximity to its boundaries. Keewatin Street (Dr. Jose Rizal Way) travels through the adjacent precinct and will be accessed through the collector system or via Inkster Boulevard. Keewatin Street will intersect

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the future Chief Peguis Trail along the northern boundary of the precinct. The primary access for Precinct T will be King Edward Street which will have a four lane cross section up to the precinct boundary, providing access to Inkster Boulevard, which connects to the existing street network east and west of the intersection. Secondary access will be provided into future developments via an allowance for a connection to Commercial Avenue which forms the south boundary to the precinct. A temporary access will be provided, connecting to Jefferson Avenue until such time a s Chief Peguis Trail is built.

The only offsite improvements related to the Terracon development within Precinct T should be restricted to the upgrading of King Edward Street to four lanes, with applicable cost recovery to Terracon as other adjacent developments come on line.

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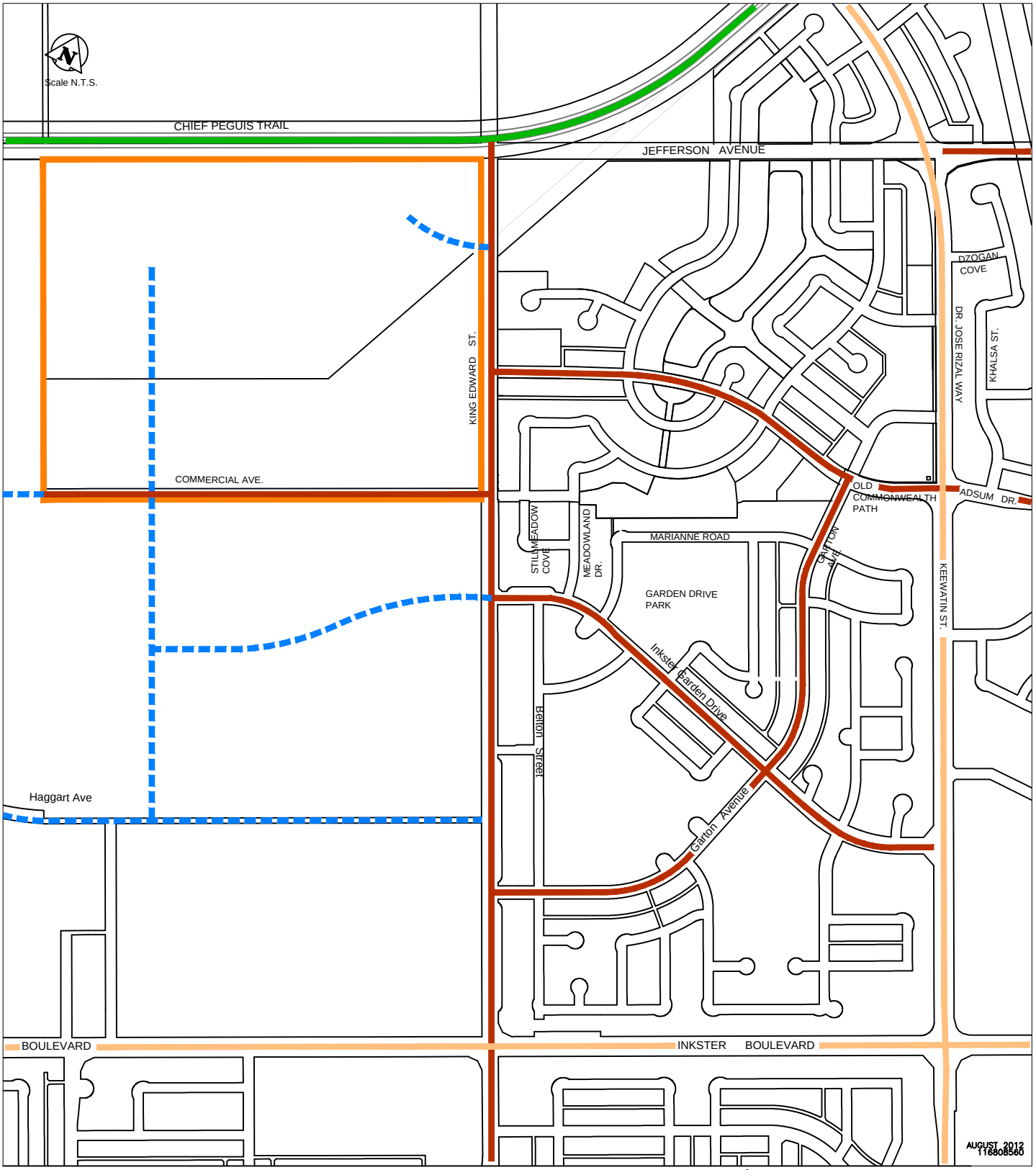

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Legend:

- Precinct Boundary
- Expressway (CPT-2031)
- Arterial
- Collector
- Potential Collector

Client/Project

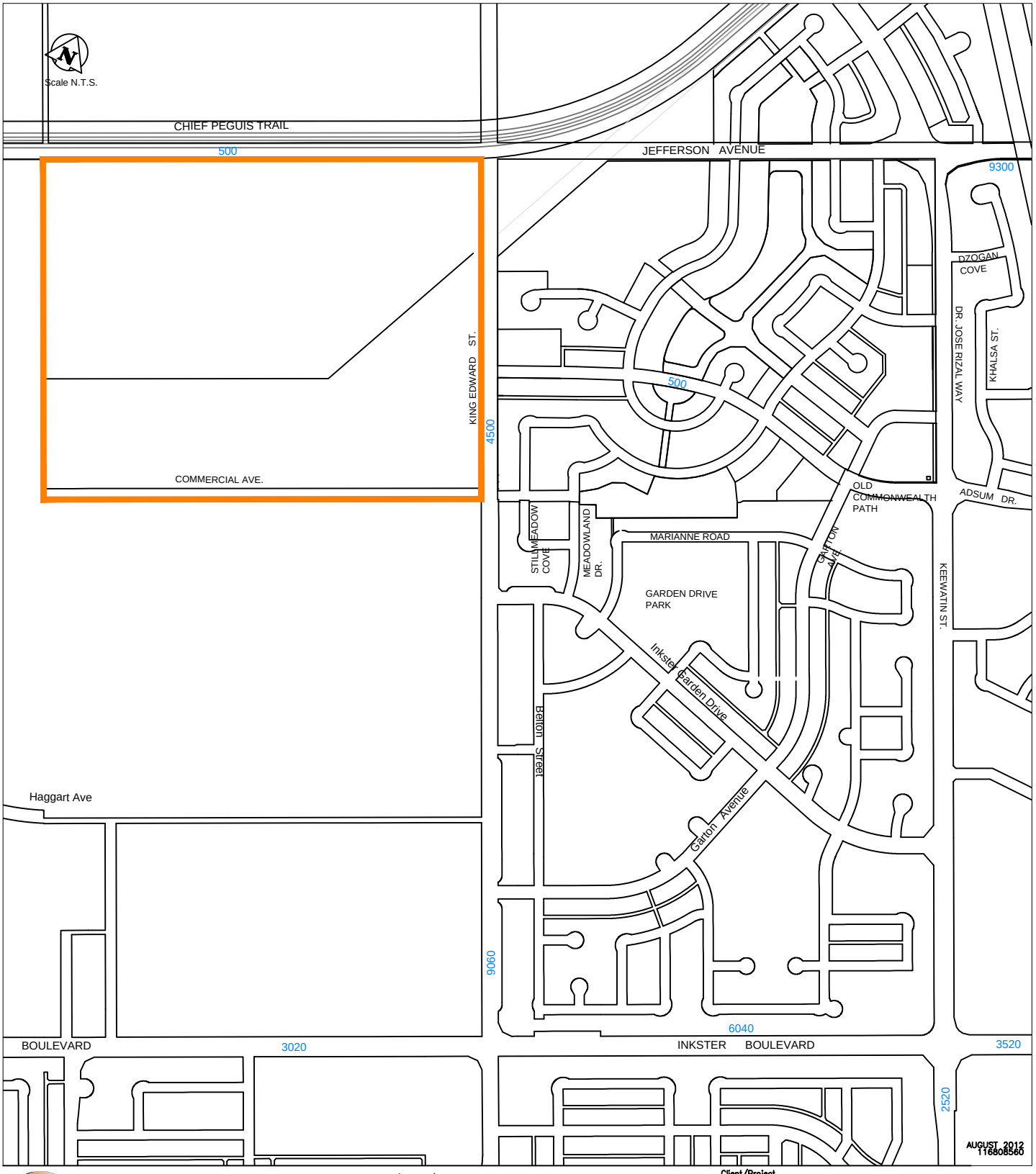
Winnipeg, Manitoba

Figure No.

4

Title

Road Network



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Legend:

Precinct Boundary

5000 2015 Volumes

5000 2031 Volumes (with CPT)

Client/Project

Winnipeg, Manitoba

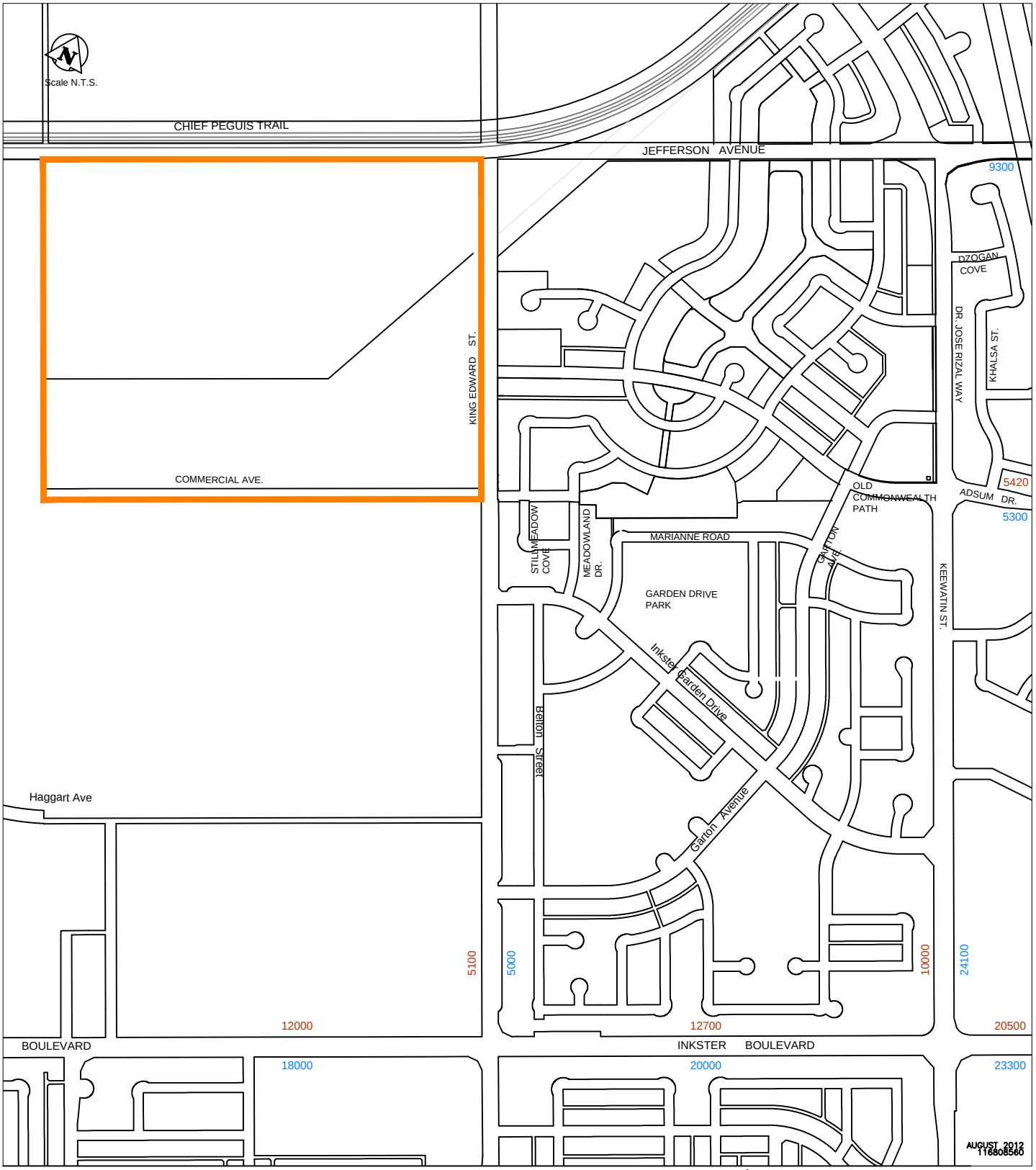
Figure No.

5

Title

Generated Volumes

AUGUST 2012
116808560



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Legend:

Precinct Boundary

5000 2015 Volumes

5000 2031 Volumes (with CPT)

Client/Project

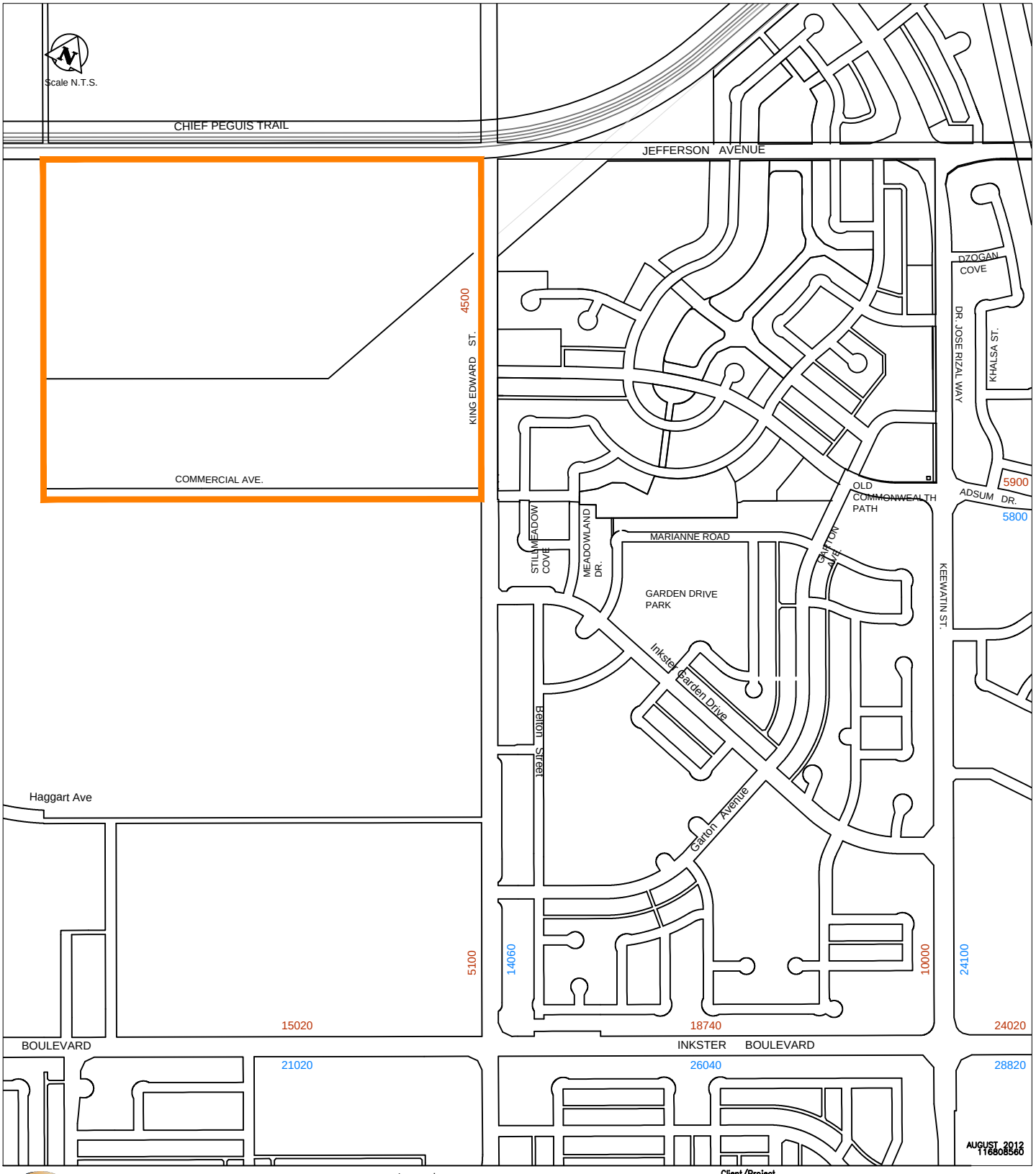
Winnipeg, Manitoba

Figure No.

6

Title

Base Volumes



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Legend:

- Precinct Boundary
- 5000 2015 Volumes
- 5000 2031 Volumes (with CPT)

Client/Project

Winnipeg, Manitoba

Figure No.

7

Title

Combined Volumes

AUGUST 2012
116808560