REPORT

Quance Park Developments Ltd.

Willow Creek Concept Plan

January 2014

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1 Introduction and Background

This report has been prepared by Associated Engineering (AE) to describe a new proposed residential, commercial, and industrial development in the City of Yorkton (the City), known as the Willow Creek Subdivision (the development site). The development site, owned by Quance Park Developers Ltd (the Developer) encompasses 107.8 hectares (267 acres) and is located immediately east of Husky Road and north of Highway No. 10.

The Developer has commissioned AE to prepare a concept plan and an accompanying report to support the rezoning of the development site for low and medium density residential, mixed use commercial-industrial, arterial and highway commercial development.

This report is intended to supplement the proposed concept plan which has been prepared to a block level of detail to respect the need for approval of future subdivision plans as the principle means of its implementation. The concept plan illustrates the distribution of land uses within the development site, identifies public open space and the locations and conceptual standards for internal roadways, storm water, sanitary sewer and potable water facilities.

1.1 SITE DESCRIPTION OF THE LAND

The development site is located in the S ½ 6-26-3-W2 within the City's existing corporate limits. It is bound on the west by Husky Road, in the north by undeveloped agriculture land, on the east by an existing rural road allowance labelled as Willow Creek Road, and in the south by Highway No. 10; as illustrated in Figure 1-1.

The development site comprises undeveloped farmland but lies adjacent and directly north of five existing light industrial/commercial lots along the north side of Highway No. 10. Two existing watercourses including Yorkton Creek and a manmade drainage channel commonly known as Willow Creek physically divide the development site into three distinct and separate development areas. The development site also contains a drainage easement located west of Yorkton Creek, extending north of Highway No. 10 and terminating near the midpoint of Yorkton Creek within the site. The landscape is relatively flat and treeless with the exception of a few isolated tree bluffs located along the northern boundary of the development site. All development has been located outside of the 1:500 design flood elevation of 500.78 metres as prescribed by the Water Security Agency. The contours and property boundaries of the site are shown in Figures 1-2 and 1-3.

1.2 EXISTING CONDITIONS

1.2.1 Surface Topography

The topography of the development site is relatively flat with the highest elevations recorded at 507 metres in the site's north east corner to a low point of 497 metres located along the western boundary of Yorkton Creek. The development site generally slopes in a northerly direction and towards the two existing

watercourses. The floodplain associated with these watercourses, defined by a 1:500 design flood elevation, established through consultations with the Water Security Agency includes all of the shaded areas illustrated on attached Figure 1-3. Along Yorkton Creek, the 1:500 design flood elevation ranges from 498.11 m at the north side of Highway No. 10 to 497.54 m near the north side of the development site. Similarly, the 1:500 design flood elevation for Willow Creek is estimated to be 500.78 m. Consideration of the potential for flooding within these areas has been acknowledged within the conceptual design through the location of development and the dedication of undeveloped public open space within the development site.

1.3 CITY SANITARY SEWER AND POTABLE WATER SYSTEMS

The development site does not currently have access to a major sanitary trunk sewer. Existing commercial and industrial properties located along Highway No. 10 rely exclusively on private onsite disposal systems. Plans are in place for the City to construct a new sanitary service line along Husky Road extending north from Caldwell Drive to the Yorkton Creek crossing where a proposed temporary lift station is planned which would provide some interim capacity for servicing a portion of the development site.

Two water mains are located within the immediate area of the proposed development. A 400 mm water main extends north along the west side of Husky Road and a 450 mm line extends east along the south side of Highway No. 10. It is expected that the 400 mm mainline along Husky Road will be used to supply internal waterlines within the residential component of the development. The proposed mixed use commercial-industrial development will access potable water provided by the 450 mm mainline along Highway No. 10.

YORK Rd.E

YORK Rd.E

Grouse

N

HIGHWAY #9

HIGHWAY #10

HUSKY ROAD

Weinmaster Street

Weinmaster Street

Service Street

Service Street

HIGHWAY #10

ROAD ALLOWANCE

WILLOW CREEK

YORKTON CREEK

YORKTON CREEK

WILLOW CREEK

WILLOW CREEK ROAD

LEGEND

- CONCEPT PLAN AREA
- SITE BOUNDARY

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SCALE:	n.t.s.
DWG. No.	4259-000-FG107

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WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 1-1 KEY PLAN

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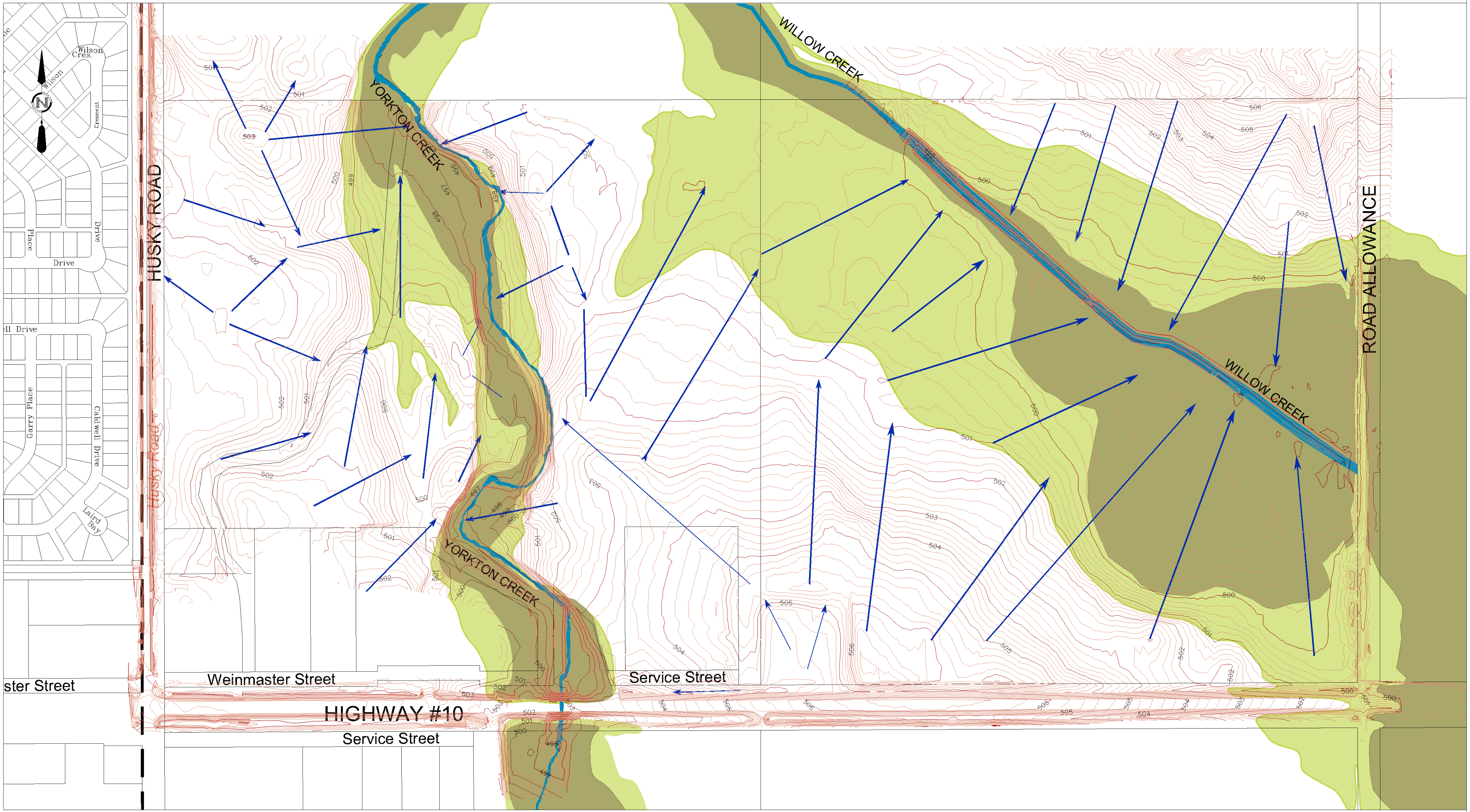
DATE: 2014-01-27 , Mike Pawluski



LEGEND

MAJOR CONTOUR LINES

MINOR CONTOUR LINES

NATURAL DRAINAGE DIRECTION

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DWG. No. 4259–00–FG108

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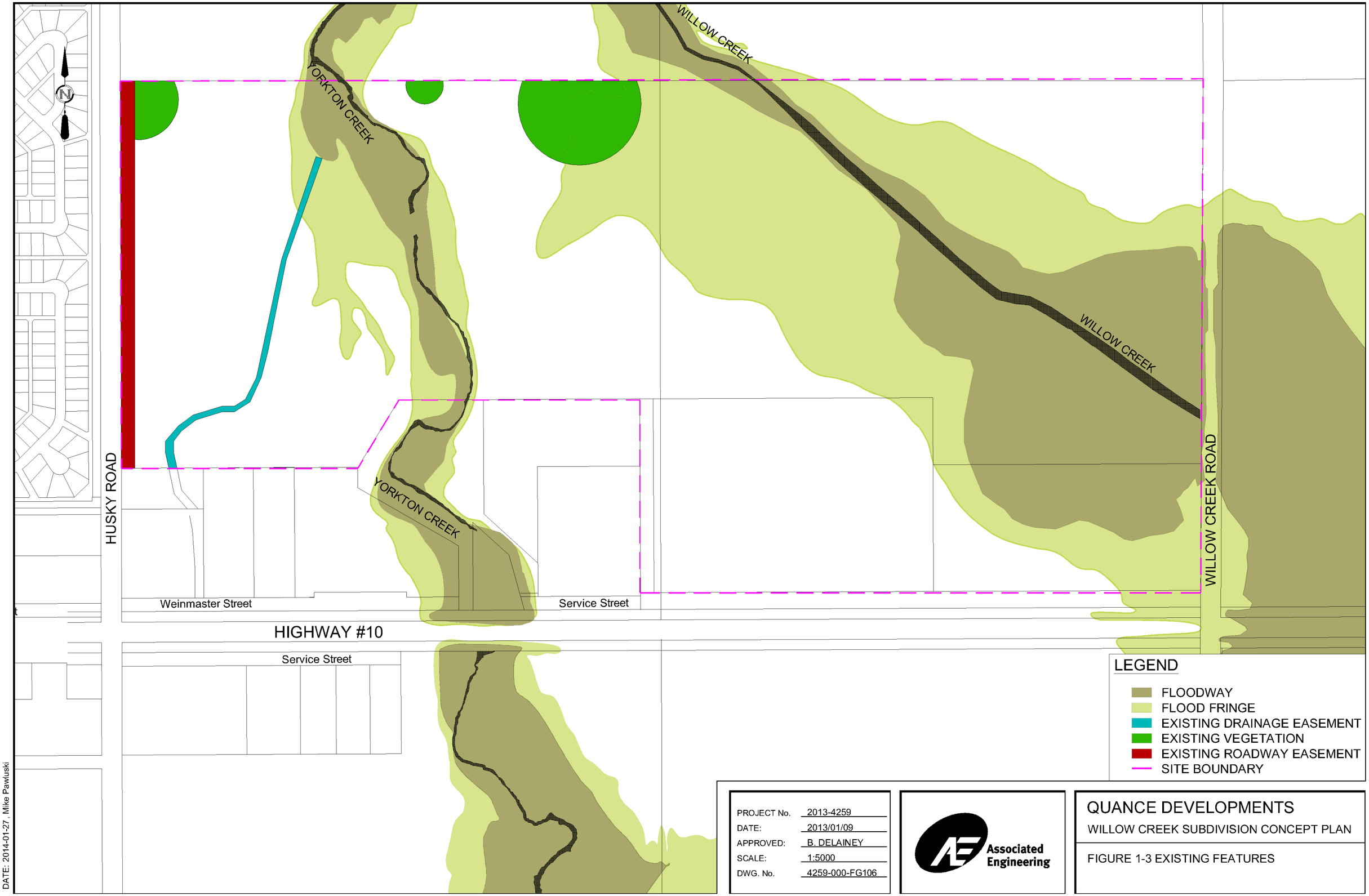
WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 1-2 PREDEVELOPMENT DRAINAGE



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SCALE:	1:5000
DWG. No.	4259-000-FG106

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WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 1-3 EXISTING FEATURES

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2 Concept Plan

2.1 PLANNING OBJECTIVES

The main planning objectives of the concept plan are as follows:

- To provide services in a cost effective and economically sustainable manner. This includes maximizing the efficiency of existing and new infrastructure and wherever possible taking advantage of existing physical conditions and natural assets on the site.
- To enhance the quality of life for residents, business owners, and visitors by creating a development that provides features which promote identity of place and supports social interaction within a high quality urban landscape.
- To provide local residents with a walkable “live-work-play” option by providing employment opportunities and open space recreational amenities within walking distance of planned residential development.
- To facilitate and provide for sustainable forms of transportation modes such as public transit, walking and cycling.
- To promote the use of linear park systems and natural areas to provide for a distance buffer and transition between residential and more intensive commercial and industrial uses within the development site.
- To provide for a wide range of housing choices spanning a variety of densities and housing forms.
- To promote the health, safety and well-being of residents by providing open space recreational opportunities along the Yorkton and Willow Creeks through the provision of a trail system linking the development areas through a system of pedestrian bridges.
- To strategically design storm management facilities within public open space areas providing for a dual purpose of managing the quality and quantity of storm water while also creating an aesthetic site amenity, wildlife habitat and a focal recreational area for local residents.

2.2 CONCEPT PLAN OVERVIEW

The Yorkton and Willow Creeks physically divide the development site into three distinct and physically separated development areas as illustrated on Figure 2-1. The existence of these two watercourses within the development site provides both challenges and opportunities for the development of the land. The creeks provide obvious challenges to internal connectivity within the development site but by the same token, this physical separation provides an opportunity to successfully integrate more intensive land uses within a relatively small area of land.

The overall development site will provide for a diverse range of land uses consisting of single family residential, multi-family residential, arterial commercial, mixed commercial-industrial, highway commercial, and a swing site located in the northeast corner of the development site. The inclusion of a swing site on the plan provides the developer and the City with flexibility to adapt the development concept in the future to respond to changes in the market.

2.2.1 Area 1

Area 1 will include a variety of land uses consisting of arterial commercial, single family housing, multi-family housing, and municipal and environmental reserves. This area will serve as a focal point for residential development and has the potential to be connected to all areas of the development site through a neighbourhood-wide trail and park system. The concept plan design encourages a pedestrian scale by ensuring a reasonable walking distance is provided to neighbourhood parks, employment areas, and commercial uses.

Large portions of open space surrounding Yorkton Creek have been dedicated as either municipal or environmental reserve based upon the risk of flooding. Development within these public areas is limited to parks and recreation except where regulations can be developed to allow for necessary infrastructure determined by the City.

Public areas are designed and located to allow for non-vehicular access to Yorkton Creek and its surrounding fringe areas. There is an opportunity for playground infrastructure, pedestrian/cycling trails, and/or potential sports fields to be developed in these areas which would provide residents with a variety of recreational opportunities. This relatively undeveloped area also provides for the opportunity to assist with the conveyance of runoff from the southern areas of the development site to proposed Storm Pond A.

Recognizing the value of Yorkton Creek as a focal point and a significant amenity in the area, an opportunity exists for the development of several low maintenance pedestrian bridges in the north and the south ends of the creek which would provide the opportunity to create a pedestrian/cycling loop connecting residents to the mixed use commercial-industrial area to the east.

Storm Pond A provides not only for the management of the quality and quantity of water flowing into Yorkton Creek, but may be designed to encourage the creation of wildlife habitat and support multi-seasonal recreational opportunities including canoeing in the summer months and skating during the winter months.

Area 1 utilizes a greenway or linear park along its southern boundary to insulate proposed residential development from the existing highway commercial development located directly south along Highway No. 10. This vegetated

corridor will allow for some overland storm water management in addition to acting as a pedestrian corridor to the creek side park spaces. It is expected that this corridor will include a pedestrian pathway and will be vegetated with drought resistant, low maintenance vegetation and a constructed berm that will assist in mitigating negative views from the existing and future commercial development to the south.

Area 1 provides for a wide range of housing options, including single family dwellings, and sites for multi-unit dwellings, such as townhouses, condos, and senior housing. A range of lot sizes for single family dwellings can be provided to promote affordable home ownership. The area has been designed using a modified grid layout, which is intended to protect the community from the effects of traffic shortcutting and at the same time, providing meaningful destinations for people to walk to. The modified grid, adapted from CMHC's fused grid design, "combines the connectivity and ease of orientation of the common street grid with the efficiency, safety and tranquility of recent suburban cul-de-sac and loop street patterns."

Single family dwellings will be located adjacent to the west side of Yorkton Creek to take advantage of the scenic views of the creek and provide consistency with the proposed Boardwalk development located directly north of the development site.

Multi-family dwellings have been located along the minor collector streets which will maximize accessibility to public transit routes, provide consistency with the proposed Boardwalk development to the north and allow for a land use transition separating the proposed arterial commercial developments proposed along Husky Road to less intensive single family homes within internal areas of the development site.

The Arterial Commercial District enables a diversity of uses that will provide residents with opportunities to access goods and services, and local employment and/or business opportunities. The future arterial commercial area will be easily accessed by vehicles or pedestrians/cyclists through the planned right-of-ways and/or through dedicated public lands.

Overall this location provides the opportunity to access recreation, a diversity of housing options, employment and/or business opportunities, and enables pedestrian access to goods and services.

2.2.2 Area 2

Area 2 will feature mixed use commercial-industrial and highway commercial uses with some lands dedicated as municipal and environmental reserves. This area will function as an important commercial-industrial and employment node for the City. The street and block layout permits the future subdivision of lots based upon market demand. The City of Yorkton Zoning Bylaw provides for a variety of principal and discretionary uses within the mixed use commercial-industrial and highway commercial zones. Some of the

uses which the City's Zoning Bylaw allows for includes but is not limited to agriculture sales and service establishments, animal hospitals, business support services, convenience stores with or without associated gas bars, strip malls, office and office buildings, warehouses, and restaurants. The variety of principal and discretionary uses will assist in marketing the location for future businesses development.

Vehicle access to the area is intended to be provided along Lily Avenue via a proposed new approach from Highway No. 10. The location of this approach will enable the closure of the existing property approach located just west of the new intersection location. It is expected that a service road will be extended to the east and west from this location to satisfy the access needs of the existing and future highway commercial uses while minimizing the number of permanent highway access points. The internal road system follows a curvilinear road pattern that responds to the topography of the site and accommodates the two existing watercourses.

A significant portion of Area 2 is located within the flood fringe of Willow Creek. The flood fringe is characterized as areas inundated by flood waters but where the dynamic forces of water flows are minimal. Generally these areas are capable of being safely developed by raising the grade of the site above the design flood elevation. Development of the site will require areas to be cut and filled as part of the property grading and it is estimated that some areas within the mixed use commercial-industrial area will require up to 2 metres of fill in order to meet the required minimum elevation of 500.78 metres. The precise amount of fill required will be confirmed during detailed design.

2.2.3 Area 3

Area 3 has been designated as a "swing site" as described previously. The concept plan illustrates a potential location of a minor collector street which may also serve as a utility corridor for future property servicing. Although the area is included within the concept plan, the nature of future development and the provision of sanitary sewer service to this area is difficult to predict at this time. By identifying this area as a swing site, it provides flexibility to the Developer and the City to respond to changes in market demands and decisions made for the future development of adjacent lands to the north. The location and orientation of the minor street would facilitate low density, country residential development on larger sites however; this would entail a much lower level of servicing to this area which in turn would significantly hinder the future extension of urban residential development within the City to adjacent lands to the east in the future.

2.3 PHASING

Development phasing is influenced by a combination of factors including the relative marketability of a given land use versus another within the development site or the dependency on staged servicing between various areas within the larger development site. The provision of water, sanitary sewer and storm water management services to Areas 1 and 2 are physically separate and completely independent of one another. In the absence of this dependency, cost and timing become important determinants for phasing development. Area 1 can be accommodated in the short term by connecting a new trunk sewer main to the Darlington system whereas Area 2 will require the construction of a much longer section of trunk sewer to

the City's waste water treatment facility. For this reason alone, it is expected that development of Area 1 will precede development of Area 2.

2.4 LAND USE SUMMARY

Table 2-1 provides a statistical summary of the land use distribution and population estimates for the development site. Table 2-2 provides a summary of the municipal reserve calculations for the development site. Figure 2-2 shows how the proposed development's land use will be distributed.

Table 2-1
Land Use Summary

Land Use	Area (ha)	% Total Development Site	Units/Net ha	Total Units	Pop/Unit	Projected Population
Single Family Residential	7.4	6.9	13.4	100	3.3	340
Multi-Family Residential	4.4	4.1	24.8	109	3.3	360
Swing Site	11.2	10.6	18	201	3.3	665
Residential Density Total			**17.11**[1]	**410**		**1365**
Arterial Commercial	3.2	3.0				
Highway Commercial	19.1	18.0				
Mixed Use Commercial-Industrial	22.1	20.8				
Right-of-Ways	13.3	12.6				
Municipal Reserve	7.9	7.5				
Environmental Reserve	17.6	16.5				
Gross Concept Plan Area	**105.8**	**100.0**				

[1] This value excludes the potential medium density residential development within the "swing site"

Table 2-2
Municipal Reserve Summary

Land Use	Net Developable Area (ha)	% Dedication Required	Total MR Required (ha)
Residential	11.8	10%	1.18
Arterial Commercial	3.2	5%	0.16
Highway Commercial	19.1	5%	0.95
Mixed Use Commercial-Industrial	22.1	5%	1.1
Total MR Required		**3.39**	
Total MR Shown		**7.9**	

2.5 CITY OF YORKTON POLICY AND BYLAW CONSIDERATIONS

2.5.1 City of Yorkton Municipal Development Plan Bylaw 15-03 (Plan Yorkton):

Plan Yorkton…"is a statement of the City of Yorkton's goals, aims and policies, which will guide Yorkton's growth into the 21st Century..." It is intended to "… guide decisions regarding future development and re-development of the community towards a population of 25,000." Plan Yorkton articulates the City's land use and development policy and thus has been an important consideration in the design process for Willow Creek Subdivision. It is believed that the Willow Creek Subdivision Concept Plan is in compliance with Plan Yorkton, except as noted below.

Schedule C to Plan Yorkton is a map that outlines Future Residential, Commercial, Industrial and Parks and Recreation Development. This map designates the majority of the concept plan area for residential, parks and recreation, and a small portion for commercial. The residential blocks in the conceptual layout of Area 1 appear to comply with this map, but amendments to the map are required to accommodate the arterial commercial blocks on the west boundary of Area 1 adjacent to Husky Road. Area 2 contains the mixed use commercial-industrial blocks which require an amendment to the map because the area which these lands lay is designated future residential. A small portion of the highway commercial block in Area 2 also requires an amendment to the map because its location lies within the future residential area. It is anticipated that these amendments would be considered upon formal submission of the concept plan to the City.

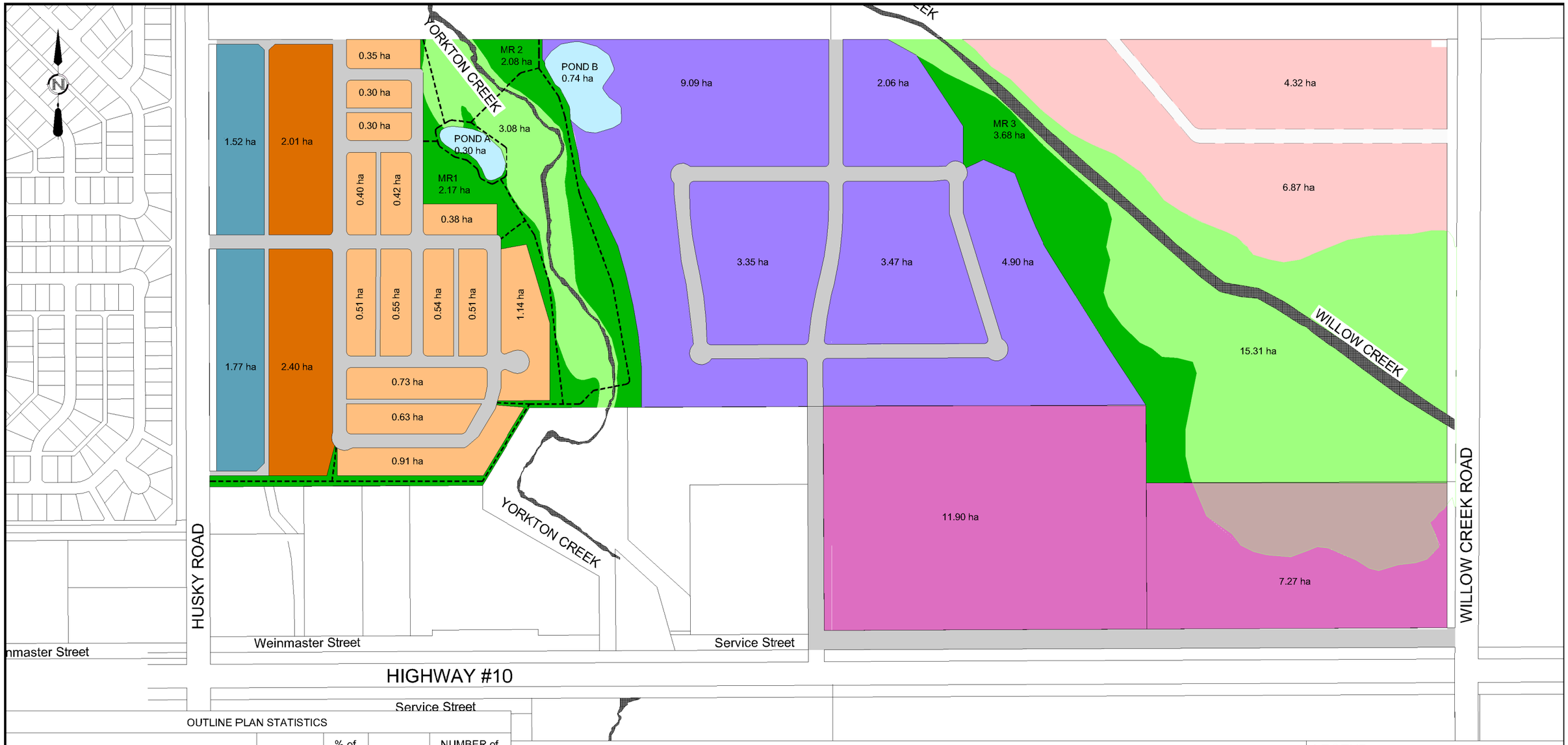
2.6 CITY OF YORKTON ZONING BYLAW 14/2003:

The City's Zoning Bylaw's purpose is as follows:

"*1.2.1*
The purpose of the Zoning Bylaw is to regulate the use of land and the locations and use of buildings and other structures in the City of Yorkton so as to provide for the amenity of the City and the health, safety and general welfare of the inhabitants.

1.2.2
In all cases, this Zoning Bylaw is subject to the policies contained in the Development Plan and to the staging schedule of the Plan. No new zoning amendment will be permitted in any district except in accordance with those policies and the development staging schedule."

Yorkton's Zoning Bylaw contains development standards and regulations that are intended to implement the policies contained within Plan Yorkton.



OUTLINE PLAN STATISTICS

	HECTARE	% of GDA	DENSITY	NUMBER of UNITS
GROSS CONCEPT PLAN AREA	105.8			
MUNICIPAL RESERVE	7.9	7.5		
RIGHT-OF-WAY	13.3	12.6		
ENVIRONMENTAL RESERVE	16.6	15.6		
RETENTION PONDS	1.0	0.9		
ARTERIAL COMMERCIAL	3.2	3.0		
HIGHWAY COMMERCIAL	19.1	18.0		
MIXED USE COMMERCIAL-INDUSTRIAL	22.1	20.8		
SINGLE FAMILY RESIDENTIAL	7.4	6.9	13.4 uph	100
MULTI-FAMILY RESIDENTIAL	4.4	4.1	24.8 uph	109
SWING SITE	11.2	10.6	18 uph	201
RESIDENTIAL DENSITY TOTAL			17.11 uph	410

LEGEND

- SINGLE FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- ARTERIAL COMMERCIAL
- HIGHWAY COMMERCIAL
- MIXED USE COMMERCIAL-INDUSTRIAL
- SWING SITE
- MUNICIPAL RESERVE
- ENVIRONMENTAL RESERVE
- RETENTION POND
- TRAIL SYSTEM

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WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 2-1 CONCEPT PLAN

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N.W. 1/4 Section 6 - Twp. 26 - Rge. 3 - W2Mer.

Future Development

RV

ER1

MR

CLUB

DARLINGTON STREET

WILLOW CREEK

YORKTON CREEK

ROAD ALLOWA

ROAD

WILLOW CREEK

HUSKY ROAD

YORKTON CREEK

Weinmaster Street

Weinmaster Street

Service Street

HIGHWAY #10

Service Street

W2

W1

LEGEND

- SINGLE FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- ARTERIAL COMMERCIAL
- HIGHWAY COMMERCIAL
- MIXED USE COMMERCIAL-INDUSTRIAL
- SWING SITE
- MUNICIPAL RESERVE
- FLOODWAY
- RETENTION POND
- TRAIL SYSTEM

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WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 2-2 BOARDWALK CONNECTION

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3 Transportation

A Traffic Impact Study (TIS) has been prepared for the development site to determine how it would impact the safety and capacity of the existing and future road network. This section serves as the TIS and identifies how the concept plan may affect pedestrian movements and traffic flows.

3.1 ROAD NETWORK

3.1.1 Existing Conditions

The proposed development is bounded on the south by Broadway Street East, the urban highway connector for Provincial Highway No. 10. To the west is Husky Road and to the east is an undeveloped north-south road allowance labelled herein as Willow Creek Road. Broadway Street is an undivided paved roadway with a rural cross section. The posted speed limit is 70 km/h to the west of Husky Road where the roadway becomes divided with two lanes of traffic in each direction and 100 km//h through the study area. Traffic on Broadway St at Husky Road was estimated at 4240 vehicles per day (vpd) by the Ministry of Highways and Infrastructure (MHI) in 2012.

Husky Road is a narrow, two-lane road with a rural cross section running in the north-south direction. West of Husky Road is existing development, which is accessed via Darlington Street. Darlington Street intersects Husky Road north of the proposed development. Husky Road also provides access to two rural residences to the east and terminates further north. Traffic volumes on Husky Road are not known but are assumed to be small.

3.1.2 Street Layout

The proposed street layout for the subdivision, illustrated in Figure 3-2, features the following key roadways:

- Husky Road, proposed Willow Creek Road, and Highway No. 10 act as arterial roadways to access the concept plan area. They will be the main access roads on traffic flows to and from the concept plan area.

- Kenneth Street, Chestnut Drive, and Aster Avenue provide for the minor collector streets for Area 1. The right-of-way width for the minor collector streets is 18 m which is consistent with other residential minor collectors within the City. These right-of-ways provide a loop through the community and connectivity with Husky Road and the Boardwalk development to the north of Area 1.

- Lily Avenue runs south to north connecting Highway No. 10 with the mixed use commercial-industrial area. It also provides connection for the future growth north of the concept plan area. The proposed intersection location on Highway No. 10 and Lily Avenue is approximately 800 m east of Husky Road and 840 m west of Willow Creek Road. Lily

Avenue is considered a minor collector and the right-of-way is approximately 20 m wide which is consistent with other commercial-industrial minor collector streets within the City.

- A north-south roadway within the existing road allowance (labelled as Willow Creek Road) is the proposed access point to the most eastern development area identified as the swing site. This proposed access point will also provide for future development to the north east of the City.

- Sawchuk Street provides access to the south side of the highway commercial blocks along Highway No. 10 via Lily Avenue to the west and proposed Willow Creek Road to the east.

- Silver Willow Street is designated as a minor collector within an 18 m wide right-of-way and will provide access to the proposed swing site via the proposed Willow Creek Road.

- The local streets sizes consist of 15 m right-of-ways for the residential areas and 18 m for the business areas. These local streets provide access to and from the minor collector streets.

Figure 3-3 provides roadway classifications for the concept plan and assists in the verification of the proposed street layout determination above.

3.1.3 Street Network Features

The street network for the development site meets the objectives for neighbourhood concepts as follows:

- Kenneth Street, Chestnut Drive, Aster Avenue, Lily Avenue, and Silver Willow Street are designed to serve as minor collector streets within the development site and provide access for the local street networks. The minor collector streets provide access to major green spaces and parks in the neighbourhood.

- Networks of on and off street pathways serve to facilitate a variety of travel modes including pedestrian and bicycle.

- All three areas within the development site have an opportunity to be connected via the dedicated public open space corridors. This connection would be facilitated by the construction of a number of pedestrian crossings which would also reduce the reliance on vehicular travel.

- Lily Avenue extends north from the existing highway commercial development located along Highway No. 10 into the proposed mixed use commercial-industrial development and provides a future connection point with future development lands lying north of the development site.

- On and off street pathways provide an opportunity to create “walkable” neighbourhoods, which are reinforced with standards for sidewalks, pedestrian crossings and pedestrian access to and from commercial areas and parks.

- The neighbourhood is designed with seven entrance points, one from Kenneth Street (west side of Area 1), one from Aster Avenue (north of Area 1), two from Lily Avenue (north and south ends of Area 2), one from Sawchuk Street (east of Area 2), and two from Silver Willow Street (north and east area of Area 3).

- The concept plan provides the for vehicle, pedestrian, transit and bicycle links to the planned Boardwalk neighbourhood to the north of the development site.

- Minor collector streets within the development site are designed to facilitate efficient transit routing, including acceptable walking distances to transit stops.

3.2 FORECAST TRAFFIC

3.2.1 Trip Generation and Distribution

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition was used to calculate the AM and PM peak hour volumes along with the daily traffic volumes generated by this proposed development. The trip generation analysis is used to determine the impacts the proposed development will have on the existing roadways.

The following assumptions were made to determine the traffic volumes for the roads surrounding the proposed development:

- The development year is 2021.
- The analysis year is 2026, five years after development completion.
- Existing traffic was unknown at the Husky Road and Broadway Street intersection and Willow Creek Road and Highway 10 intersection therefore; Ministry of Highways and Infrastructure (MHI) corridor volumes were used along Highway 10.
- A minimum of 2 vehicles per movement were used at existing intersections of Husky Road and Broadway Street, and at Willow Creek Road and Highway 10 for background traffic.
- Driveway access will be provided off of Husky Road into each Arterial Commercial development area.
- Along Highway 10 an overall directional split was estimated that 60% of traffic will travel west in the AM peak hour and 40% will travel east. In the PM peak hour 60% of traffic will travel east and 40% will travel west.
- 10% of the total traffic entering and exiting the Arterial Commercial area will be diverted from existing traffic on Highway 10.
- 20% of the total traffic entering the Highway Commercial area will be diverted from existing traffic on Highway 10.

- No existing Highway 10 traffic will travel to the Residential development area.
- 2% of the total traffic entering the Mixed Use Industrial/Commercial area will be diverted from existing traffic on Highway 10.

A number of assumptions were made to relate each development land use to an ITE Land Use category. The Highway Commercial development is the highest traffic generator in the proposed development, with an estimated 4,690 vehicles per day. The land uses assumed to be located in the Highway Commercial area are; general light industrial (ITE Land Use 110), tractor supply store (810), recreational vehicle sales (842), motel (320), building materials and lumber store (812), automobile sales (841), auto parts sales (843), restaurant (932), and a gasoline/service station with a convenience market (945).

The Arterial Commercial area located along Husky Road is the second largest trip generator and is assumed to be comprised of a shopping centre (820), restaurant (932), and a medical-dental office building (720). New trips generated are 2766 per day. During the p.m. peak hour, 238 new trips are anticipated with 113 entering and 125 trips leaving the Arterial Commercial area.

The Residential area is comprised of single family housing and multi-family housing. This area will add 2236 new trips per day. New trips during the PM peak hour will include 215 vehicles with 140 vehicles entering and 75 exiting.

The Mixed-Use Commercial/Industrial development area has been assumed to be general light industrial (110) development adding 1,672 vehicles daily to the existing traffic. In the PM peak hour 168 vehicles will be leaving the proposed development area and 19 vehicles will be entering.

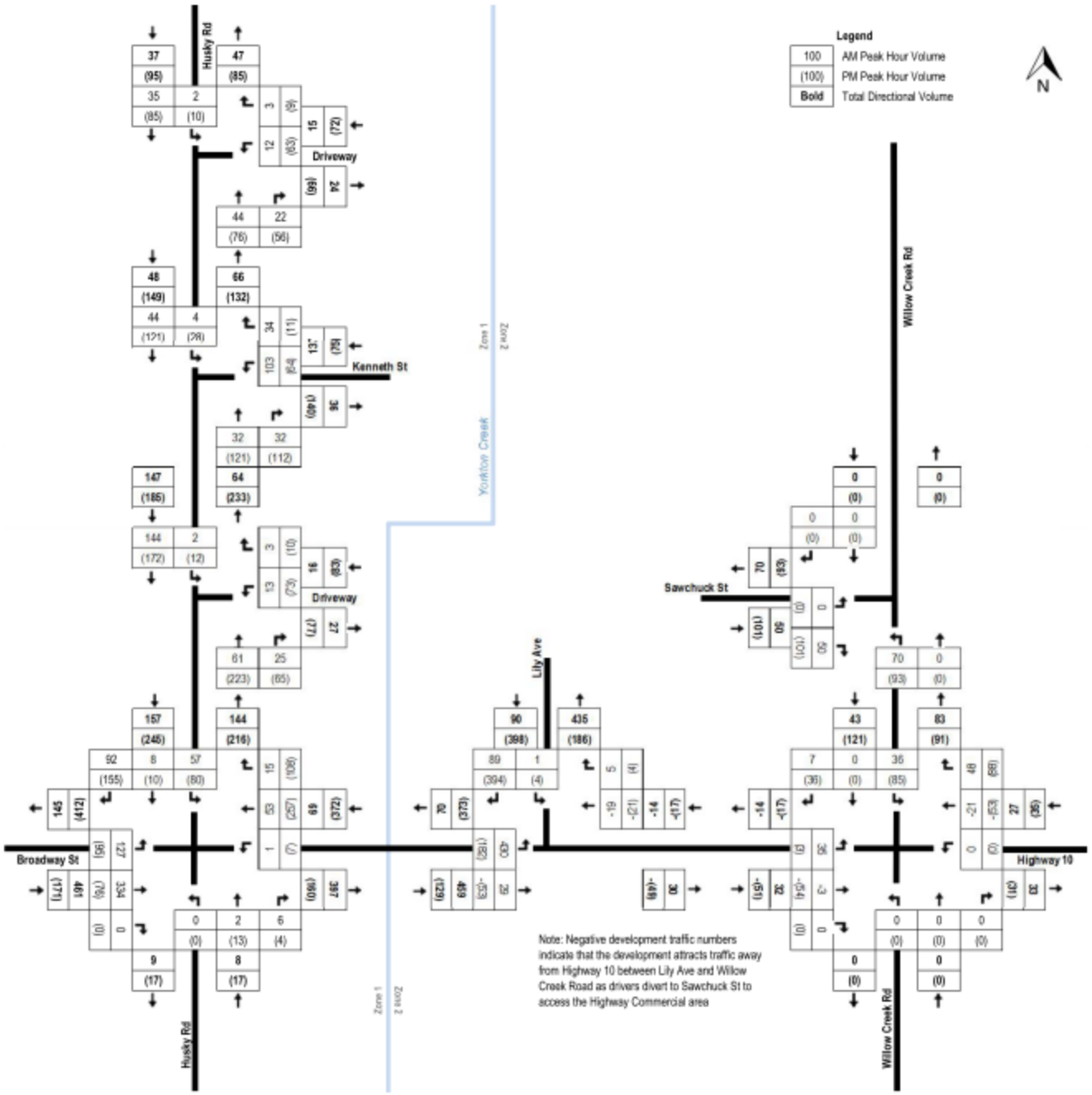
The trip generation analysis was conducted by dividing the development area into two zones with Yorkton Creek providing the dividing line. The land uses are substantially different and are not connected to each other, providing independent access to each development area. Table 3-1 shows the total expected trip generation for the proposed development.

Table 3-1
Trip Generation for Proposed Development

Subdivision Total							
Trips			**Diverted**		**New**		
In	**Out**	**Total**	**%**	**Number**	**In**	**Out**	**Total New**
432	300	732	9%	67	365	233	598
645	738	138	12%	169	476	56	1,045

Subdivision Total							
		3				9	
7568	7684	15252	13%	1944	5624	5740	11,364

Figure 3-1
Forecast Traffic Volumes



3.2.2 Forecast Traffic

Forecast traffic volumes are the total of existing traffic with appropriate growth plus the new trips generated from the proposed development. Figure 3-1 shows total forecast full build-out traffic volumes at each intersection

MHI supplied traffic count data for Highway 10. The most recent data from 2012 shows an Average Annual Daily Traffic (AADT) of 4240 vehicles per day. Trucks comprised 8% of the total traffic. Based on trends from the past 15 years, we assumed linear growth equivalent to 2.9% of the 2012 highway traffic volume.

3.2.3 Traffic Analysis

Intersection capacity analysis was completed using Synchro 7. MHI warrants were also used at the intersection of Highway 10 and Willow Creek Road to determine the lane configurations. The total forecast AM and PM peak hour traffic for the horizon year, 2026, was used for the analysis.

All roads were assumed to have one lane in each direction, with the exception of Broadway St, which currently has two lanes at the intersection with Husky Road. The left lane is designated for through or left turning traffic, and the right lane is designated for through or right turning traffic.

Level of Service (LOS) is a measure of the intersection delay converting it to a level between A to F where LOS A has the least average delay per vehicle (less than 10 seconds) and LOS F has the most average delay, 50 second delay for an un-signalized intersection and an 80 second delay for a signalized intersection. Another critical measure to assess the operational congestion for an intersection is the volume-to-capacity (v/c) ratio. The v/c ratio gives the amount of congestion for a movement where any value greater than or equal to 1 indicates that the approach will operate above capacity. A traffic signal analysis was also completed at the intersection of Husky Road and Highway 10. Details of the analyses are included in Appendix A.

As an initial analysis, baseline conditions were used, which assumed Highway 10 / Broadway St would remain free-flowing with stop control from the minor roads. In this scenario, the intersections at Lily Avenue and at Willow Creek Road performed with a minimum level of service of B, so no additional improvements are deemed required based on level of service. However, the north and southbound approaches at Husky Road were found to operate with poor levels of service, including LOS F with 140 seconds of average delay for the southbound approach in the PM peak.

To alleviate these delays, two additional scenarios were considered for the intersection of Broadway St and Husky Rd:

- Four way stop
- Traffic signals

With a four-way stop, the worst-leg LOS improves from LOS F to LOS C; however, the LOS decreases on Broadway St from LOS A to LOS C while introducing an average delay of 20 seconds. Traffic signals would

improve the LOS on Broadway St from LOS C to LOS B, with an average control delay of 12 seconds. Full results of each scenario are included in Appendix A.

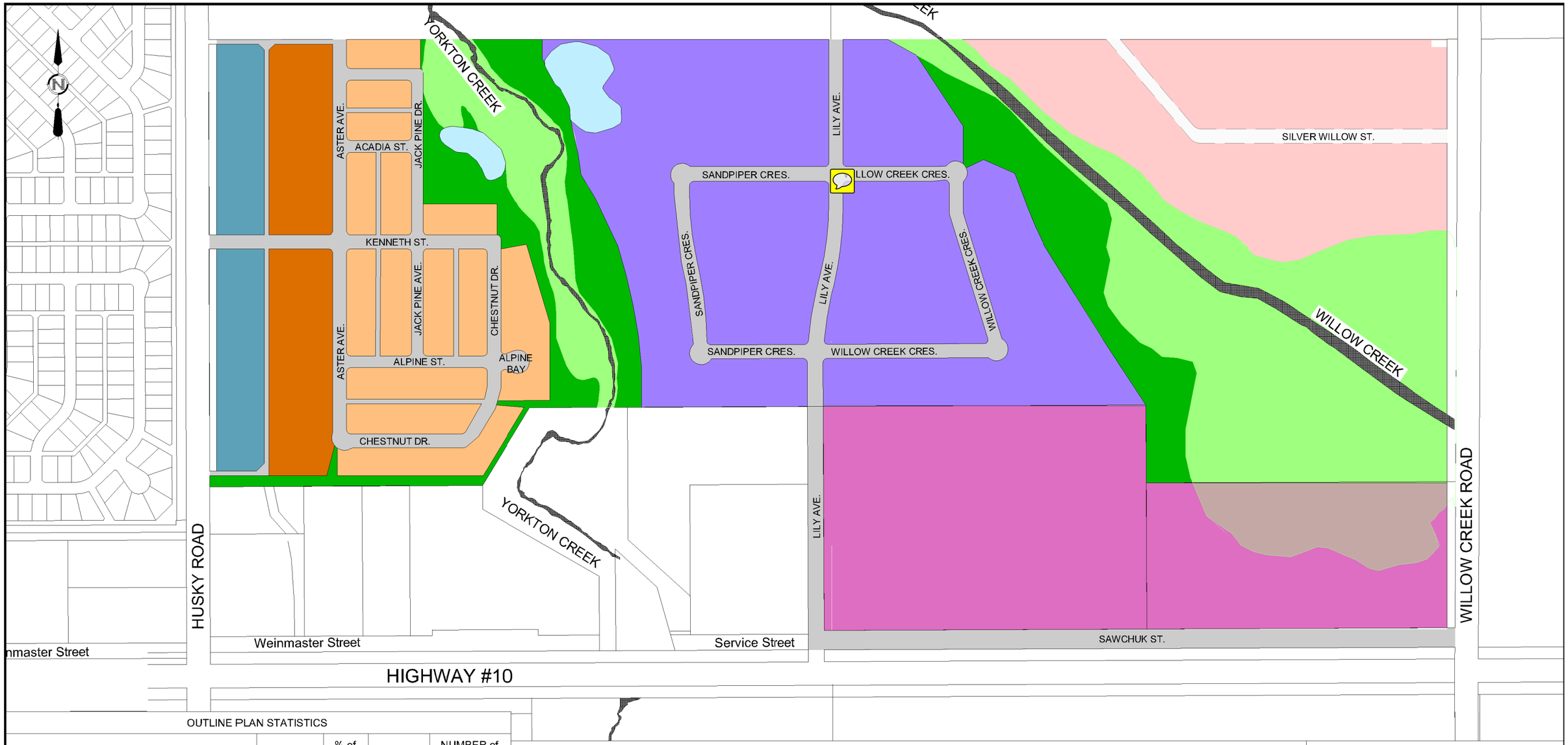
3.2.4 MHI Warrants

For rural highways, MHI has a warrant procedure based on minimizing the probability that a through driver will need to slow or stop to wait for a left turning driver in the same lane. While this warrant procedure does not apply within cities, the procedure was used at the intersections of Highway 10 and Willow Creek Road and Lily Ave. This analysis determined that a bypass lane is warranted for eastbound traffic and that a right turn lane is warranted for westbound traffic at both intersections.

MHI warrant procedures recognizes that not all drivers will slow down immediately upon entering the reduced speed zone, with the perceived function remaining as a rural highway until denser development begins further to the west. MHI warrants are based on the probability of a through driver being required to slow or stop for a turning driver. As it is equally desirable to avoid this situation at the urban fringe as on rural highways, MHI warrant methods were deemed appropriate for this urban fringe location.

3.2.5 Speed Limit

The existing speed limit on Highway 10 is 100 km/hr. The TAC Speed Limit Guidelines were used to analyze the current speed limit and if it should be adjusted. The guidelines resulted in the speed limit being reduced to 80 km/hr along Highway 10 from Willow Creek Road to Husky Road. The guidelines are attached in Appendix A. Since the speed limit immediately to the west is 70 km/h, it is recommended to match this speed limit rather than introducing an 80 km/h zone between the rural 100 km/h zone and the existing 70 km/h zone.



OUTLINE PLAN STATISTICS

	HECTARE	% of GDA	DENSITY	NUMBER of UNITS
GROSS CONCEPT PLAN AREA	105.8			
MUNICIPAL RESERVE	7.9	7.5		
ROADWAYS	13.3	12.6		
ENVIRONMENTAL RESERVE	16.6	15.6		
RETENTION PONDS	1.0	0.9		
ARTERIAL COMMERCIAL	3.2	3.0		
HIGHWAY COMMERCIAL	19.1	18.0		
MIXED USE COMMERCIAL - INDUSTRIAL	22.1	20.8		
SINGLE FAMILY RESIDENTIAL	7.4	6.9	13.4 uph	100
MULTI-FAMILY RESIDENTIAL	4.4	4.1	24.8 uph	109
SWING SITE	11.1	10.6	18 uph	201
RESIDENTIAL DENSITY TOTAL			17.11 uph	410

LEGEND

- SINGLE FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- ARTERIAL COMMERCIAL
- HIGHWAY COMMERCIAL
- MIXED USE COMMERCIAL-INDUSTRIAL
- SWING SITE
- MUNICIPAL RESERVE
- ENVIRONMENTAL RESERVE
- RETENTION POND

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QUANCE DEVELOPMENTS

WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 3-2 PROPOSED STREET LAYOUT

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N

YORKTON CREEK

YORKTON CREEK

WILLOW CREEK

HUSKY ROAD

WILLOW CREEK ROAD

einmaster Street

Weinmaster Street

Service Street

HIGHWAY #10

Service Street

LEGEND

- ARTERIAL STREET
- MINOR COLLECTOR STREET
- LOCAL STREET
- TRAIL SYSTEM

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QUANCE DEVELOPMENTS

WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 3-3 PROPOSED CIRCULATION PLAN

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4 Servicing

4.1 CONSTRAINTS

There are two creeks running through the development site serving as important considerations in developing site servicing. Yorkton Creek runs through the west side of the subdivision and provides a natural outlet for the drainage of the storm water. Willow Creek runs parallel to Yorkton Creek and provides an additional storm water discharge point for development located along the east side of the development site.

4.2 STORM WATER SYSTEM

Willow Creek is a manmade channel, and will be dredged to promote positive flows as it drains directly into Yorkton Creek. The design flood elevation for Willow Creek is 500.78 m which is a direct product of flow restrictions at its point of convergence with Yorkton Creek.

Wet retention ponds are being proposed to help alleviate the pressure of the additional run-off from the proposed site development along Yorkton Creek. The construction of the storm ponds will enable the temporary storage of post-development flows allowing the controlled discharge of storm run-off into Yorkton Creek at a pre-development rate of flow. By retaining the additional this water, the additional storm run-off generated as a result of development of the site should not have any significant impact on the quantity and quality of water entering the two creeks.

The storm water management will be designed to the following criteria:

- Minor (piped) system will accommodate 1:5 storm events and convey storm water to one of the two wet retention ponds which will discharge to Yorkton Creek.
- Major system consisting of pipe drainage, overland flow, and surface drainage to a wet retention pond and drainage channels will accommodate a 1:100 storm event.
- The wet retention ponds will be designed to accommodate the minor system and major system during storm events. By accepting both minor and major systems into the wet retention ponds, the water will become less stagnant and have the opportunity to be regenerated during all storm events and snow melts. Outlets from the wet retention ponds will drain to a certain volume which will be contained in the retention pond. This retained volume may fluctuate through ground seepage or evaporation during dryer months or years.
- Pond A is located adjacent to Yorkton Creek on the west bank. It requires a retention volume of 6,000 m^2 to achieve the pre-development release rate of 0.06 m^3/s and is approximately 0.30 hectares in size. Pond B is located adjacent to Yorkton Creek on the east bank. It requires a retention volume of 14,750 m^2 to achieve the pre-development

release rate of 0.06 m³/s and is approximately 0.74 hectares in size. These two ponds will assist to reduce frequent peak storm water discharge into Yorkton Creek which, in turn, controls downstream flooding and reduces scouring and erosion of stream banks. Both ponds provide service for the 1:5 and 1:100 storm event. This assists the retained water within the ponds from becoming stagnant as the majority of storm water will convey to the wet retention ponds providing continual regeneration of water.

- In extreme storm events greater than 1:100, drainage from the wet retention pond will directly flow towards Yorkton Creek without flooding private property.

- By utilizing wet retention ponds a certain volume of water will always be contained within the ponding areas and provide the opportunity for some storm water to infiltrate the underlying soils and some to evaporate.

- A range of on-street greenways and neighbourhood parks provides the opportunity for overland drainage and storm water retention throughout the area, as well as a high level of pedestrian and cyclist accessibility.

- Larger lot commercial and industrial developments provides an opportunity for some localized storm water storage which would allow for greater infiltration into underlying soils, evaporation or reuse as part of a yard maintenance program.

- The assumptions made for this area are based on the modified rational method and are thus conservative by nature, resulting in pipe sizes and retention pond storage volumes that are larger than necessary. This information is subject to revision as a result of the detail design process associated with a formal subdivision application in the future.

4.3 SANITARY SEWER SYSTEM

The proposed sanitary sewer system for the development as illustrated in Figure 4-2 is anticipated to consist of a gravity collection system that is drained to either a planned temporary lift station located north of Yorkton Creek and Darlington Street or to a planned main sewer trunk extending north along Huskie Road to the City's wastewater treatment facility.

A preliminary servicing assessment confirmed that sewage generated from the development of Area 1 can be accommodated by constructing a 250 mm trunk sewer line along Kenneth Avenue which would connect to a planned 900 mm sewer trunk to be constructed along Huskie Road. The sewage would be transported via gravity to a planned temporary lift station located north of Yorkton Creek. The sewage would then be pumped under Yorkton Creek through an existing line servicing the Riverside Subdivision and into the Darlington sewer system. The 250 mm sewer trunk on Kenneth Street will provide primary collection within the residential development area with all local streets employing a 200 mm sewer line along the frontage of the residential properties.

Area 2 will utilize Willow Creek as a guide to locate a proposed 450 mm gravity sewer trunk to dispose of wastewater. This 450 mm sewer trunk will follow the natural grade of Willow Creek ultimately connecting to the planned 900 mm sewer trunk located along Husky Road, north of the Yorkton Creek crossing and terminating at the City's waste water treatment facility. The 450 mm sewer trunk will service the mixed use commercial-industrial area with Sandpiper Crescent and Willow Creek Crescent containing a 300 mm sewer trunk and all local streets providing a 200 mm sewer line along the frontage of the properties. The placement of the 450 mm sewage trunk along Willow Creek may require additional engineered fill and construction of the proposed 450 mm extension from the northern property boundary to its connection point along Husky Road will require permission from adjacent landowners for access to construct and future repair or replacement of the system.

4.4 WATER DISTRIBUTION SYSTEM

Two water mains are located within the immediate area of the proposed development. A 400 mm water main extends north along the west side of Husky Road and a 450 mm line extends east along the south side of Highway No. 10. To supply water to the development site, a new 250 mm main waterline connection through Area 1, Area 2, and Area 3 will be required and a new 450 mm main waterline extension along Highway No. 10 will be required.

The new 250 mm main waterline would be constructed along Kenneth Street, Sandpiper Crescent, Willow Creek Crescent, and Silver Willow Street. Two other 250 mm main waterlines would be located along Lily Avenue and Willow Creek Road to provide additional water flow and provide a loop to the entire system. Sawchuk Street will provide the extension of the 450 mm waterline along Highway No. 10 providing additional downstream capacity to support future expansion of the City to the east. Minor distribution lines (150 mm) will be located along the local streets.

Looped lines are generally preferred to provide for redundancy in the event of a water main break as well as to maintain water quality. The existing (including future planned infrastructure) and proposed water distribution system is shown in Figure 4-3 and will extend through Husky Road south to north.

The proposed water distribution system was reviewed running a steady state simulation utilizing Water CAD. Preliminary results verify that the system is capable to provide constant pressure in the range from 448 to 517 kilopascals (65 to75 psi) during peak day flow demand. A minimum fire flow of 80 L/s can also be provided with a change in the local pressure system of approximately 15 psi. This proposed water system is subject to change when the detailed design is completed for the subdivision application.

4.5 ROADWAY CROSS-SECTION

Two options for the roadway cross-section were considered:

- Internal Streets will be urban, cross section with the following features:
    - 11.9 Traffic width

- Asphalt concrete driving surface
- Concrete curbs for surface drainage and 1.5 m sidewalk each side of collectors and 1.2 m in one side of the streets
- Storm sewer system

- Husky Road will have a rural cross sections with the following futures:

  - 11.0 m Traffic width (two 3.5 m driving lanes plus 2.0 wide shoulders)
  - Asphalt concrete driving surface
  - 4:1 side slopes
  - 3.0 m wide ditch bottom
  - 3:1 back slopes

4.6 LOT GRADING AND DEVELOPMENT

A detailed site grading plan has not been developed as part of this concept plan. However, the following is recommended for consideration during the detailed design of the concept plan:

- Consider the Ministry of Environment's Storm Water Guidelines (April 2006).
- Maintain building elevations at a minimum of 0.6 m above the roadway elevation.
- Maintain an overland flow path around both creeks and do not permit maximum ponding depths to exceed 0.45 m.
- Grade lots at a minimum of 2% away from the building elevation.
- Implement erosion and sediment control during construction.

4.7 REGULATORY APPROVALS

Detailed design drawings must be submitted to the appropriate regulatory agencies for approval prior to construction. This process now includes a Heritage Resource Impact Review which must be submitted to the Ministry of Tourism, Parks Culture and Sport separately from the permit to construct. Design criteria used in the development of this conceptual study are appended. All designs should follow Ministry of Environment guidelines for water distribution and for sanitary sewage and storm water collection. Guidelines may be obtained from the website: http://www.saskh20.ca/foroperators.asp.

POND A
RETENTION VOLUME = 6000 m³
FSL AREA = 0.30 ha
PRE-DEVELOPMENT RELEASE
RATE = 0.06 m³/s

POND B
RETENTION VOLUME = 14,750 m³
FSL AREA = 0.74 ha
PRE-DEVELOPMENT RELEASE
RATE = 0.06 m³/s

MAJOR SYSTEM
INLET CULVERT

MAJOR SYSTEM
INLET CULVERT

375 mm STORM SEWER
450 mm STORM SEWER
900 mm STORM SEWER
600 mm STORM SEWER
450 mm STORM SEWER
450 mm STORM SEWER
1050 mm STORM SEWER
750 mm STORM SEWER
600 mm STORM SEWER
900 mm STORM SEWER
750 mm STORM SEWER

YORKTON CREEK
YORKTON CREEK
WILLOW CREEK
WILLOW CREEK ROAD
HUSKY ROAD
Weinmaster Street
Weinmaster Street
Service Street
Service Street
HIGHWAY #10

PRE-DEVELOPMENT
CATCHMENT BOUNDARY

LEGEND

- PROPOSED UNDERGROUND STORM SEWER
- OVERLAND DRAINAGE FLOW
- CATCHEMENT AREA A
- CATCHMENT AREA B
- CATCHMENT AREA C

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QUANCE DEVELOPMENTS

WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 4-1 DRAINAGE CONCEPT

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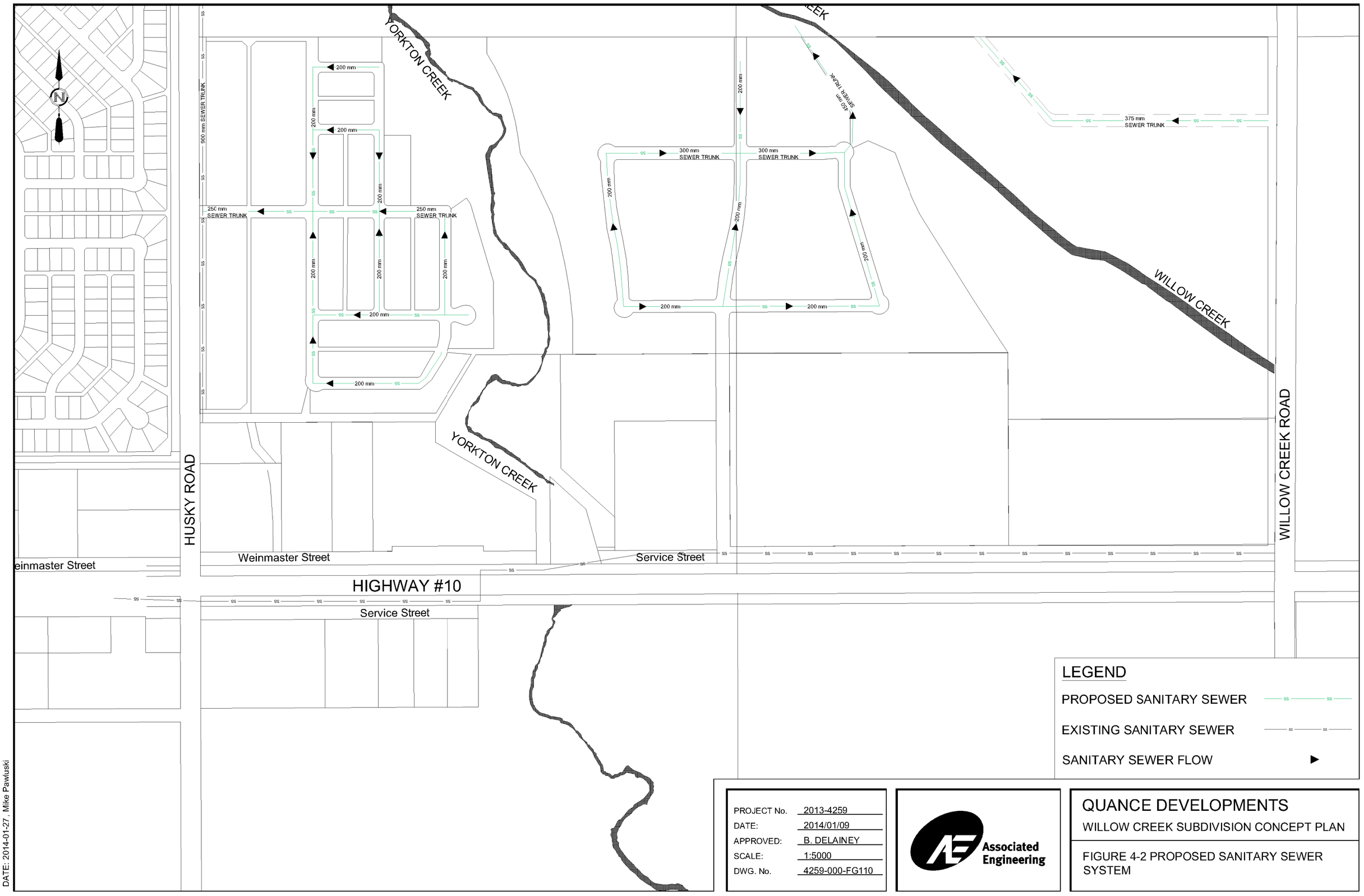

LEGEND

PROPOSED SANITARY SEWER

EXISTING SANITARY SEWER

SANITARY SEWER FLOW ▶

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QUANCE DEVELOPMENTS

WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 4-2 PROPOSED SANITARY SEWER SYSTEM

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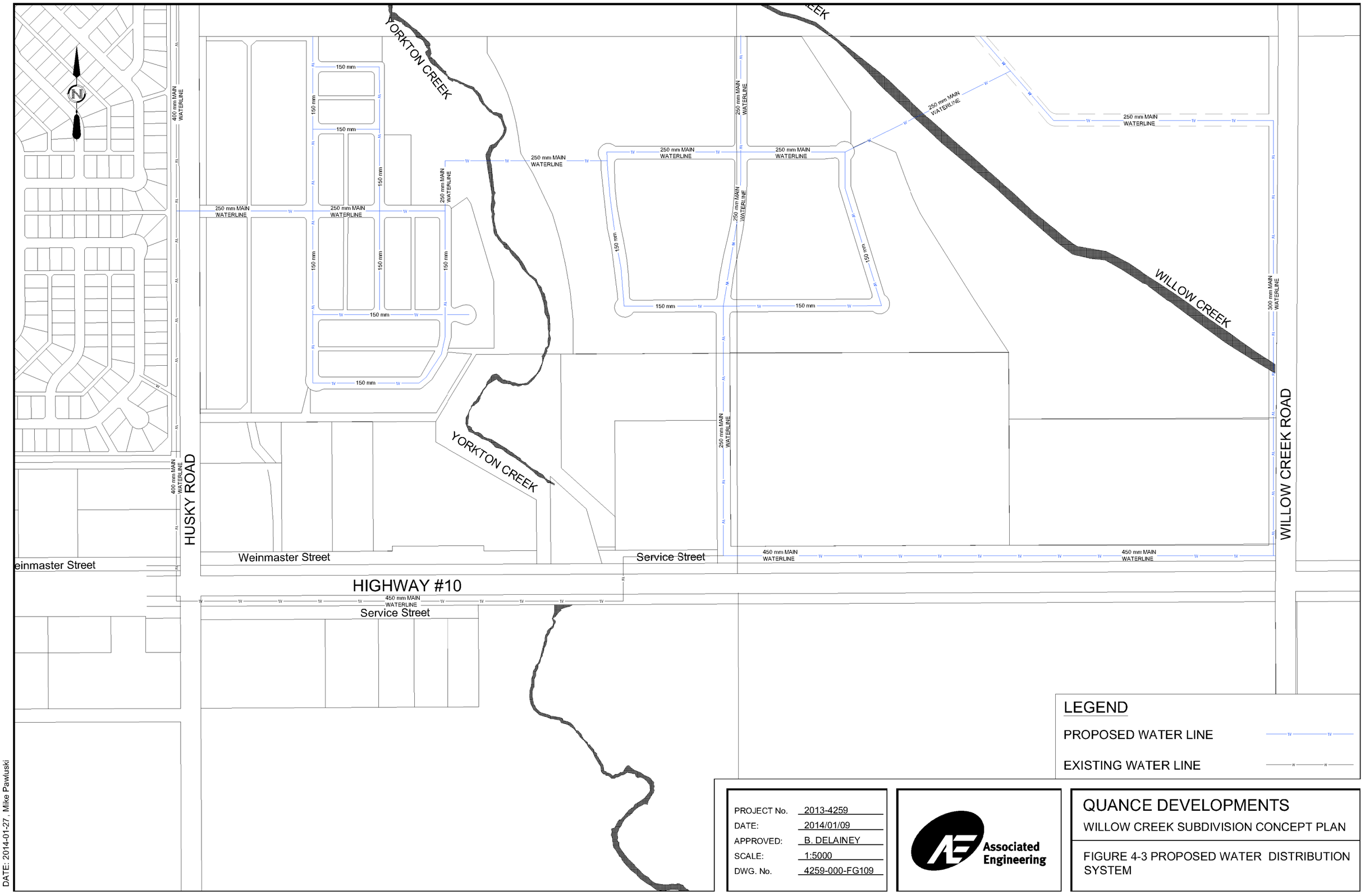

LEGEND

PROPOSED WATER LINE

EXISTING WATER LINE

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QUANCE DEVELOPMENTS

WILLOW CREEK SUBDIVISION CONCEPT PLAN

FIGURE 4-3 PROPOSED WATER DISTRIBUTION SYSTEM

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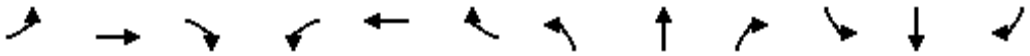
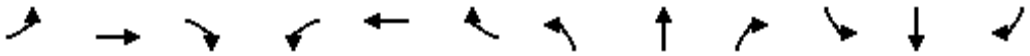
Appendix A – Traffic Analysis



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	129	546	2	3	372	17	2	4	8	59	10	106
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	140	593	2	3	404	18	2	4	9	64	11	115

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	437	299	205	221	15	190
Volume Left (vph)	140	0	3	0	2	64
Volume Right (vph)	0	2	0	18	9	115
Hadj (s)	0.19	0.03	0.14	0.08	-0.28	-0.26
Departure Headway (s)	5.9	5.8	6.3	6.2	6.6	6.0
Degree Utilization, x	0.72	0.48	0.36	0.38	0.03	0.32
Capacity (veh/h)	593	611	554	561	485	555
Control Delay (s)	21.6	12.8	11.5	11.7	9.8	11.8
Approach Delay (s)	18.0		11.6		9.8	11.8
Approach LOS	C		B		A	B

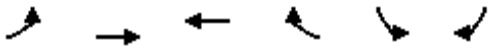
Intersection Summary				
Delay	15.1			
HCM Level of Service	C			
Intersection Capacity Utilization	56.8%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	129	546	2	3	372	17	2	4	8	59	10	106
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	140	593	2	3	404	18	2	4	9	64	11	115
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	423			596			1204	1304	298	1008	1296	211
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	423			596			1204	1304	298	1008	1296	211
tC, single (s)	4.1			4.3			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			100			98	97	99	62	92	85
cM capacity (veh/h)	1133			937			102	139	698	170	140	794

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	437	299	205	221	15	190
Volume Left	140	0	3	0	2	64
Volume Right	0	2	0	18	9	115
cSH	1133	1700	937	1700	234	317
Volume to Capacity	0.12	0.18	0.00	0.13	0.07	0.60
Queue Length 95th (m)	3.2	0.0	0.1	0.0	1.6	27.9
Control Delay (s)	3.6	0.0	0.2	0.0	21.5	32.1
Lane LOS	A		A		C	D
Approach Delay (s)	2.2		0.1		21.5	32.1
Approach LOS					C	D

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	430	245	304	5	1	89
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	467	266	330	5	1	97
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	336				1534	333
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	336				1534	333
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	62				99	86
cM capacity (veh/h)	1223				76	691

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	734	336	98
Volume Left	467	0	1
Volume Right	0	5	97
cSH	1223	1700	634
Volume to Capacity	0.38	0.20	0.15
Queue Length 95th (m)	13.8	0.0	4.1
Control Delay (s)	7.8	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	7.8	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	37	209	2	2	298	50	2	2	2	38	2	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	227	2	2	324	54	2	2	2	41	2	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	378			229			675	691	228	667	665	351
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	378			229			675	691	228	667	665	351
tC, single (s)	4.2			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			99	99	100	88	99	99
cM capacity (veh/h)	1148			1304			351	354	811	359	367	692

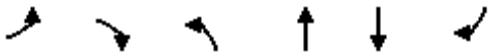
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	270	380	7	53
Volume Left	40	2	2	41
Volume Right	2	54	2	10
cSH	1148	1304	434	394
Volume to Capacity	0.04	0.00	0.02	0.14
Queue Length 95th (m)	0.8	0.0	0.3	3.5
Control Delay (s)	1.5	0.1	13.4	15.6
Lane LOS	A	A	B	C
Approach Delay (s)	1.5	0.1	13.4	15.6
Approach LOS			B	C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	103	34	38	32	4	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	37	41	35	4	54
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	122	59			76	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	122	59			76	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	87	96			100	
cM capacity (veh/h)	876	1013			1523	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	149	76	59
Volume Left	112	0	4
Volume Right	37	35	0
cSH	906	1700	1523
Volume to Capacity	0.16	0.04	0.00
Queue Length 95th (m)	4.5	0.0	0.1
Control Delay (s)	9.8	0.0	0.6
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	0.6
Approach LOS	A		

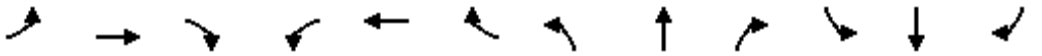
Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	50	70	6	6	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	54	76	7	7	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	165	7	7			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	165	7	7			
tC, single (s)	6.5	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	95	95			
cM capacity (veh/h)	769	1053	1614			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	54	83	7
Volume Left	0	76	0
Volume Right	54	0	0
cSH	1053	1614	1700
Volume to Capacity	0.05	0.05	0.00
Queue Length 95th (m)	1.2	1.1	0.0
Control Delay (s)	8.6	6.8	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	6.8	0.0
Approach LOS	A		

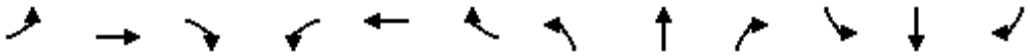
Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	20.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	129	546	2	3	372	17	2	4	8	59	10	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.92			0.92	
Flt Protected		0.99			1.00			0.99			0.98	
Satd. Flow (prot)		3543			3357			1719			1701	
Flt Permitted		0.79			0.95			0.97			0.91	
Satd. Flow (perm)		2823			3191			1685			1579	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	140	593	2	3	404	18	2	4	9	64	11	115
RTOR Reduction (vph)	0	1	0	0	8	0	0	5	0	0	67	0
Lane Group Flow (vph)	0	734	0	0	417	0	0	10	0	0	123	0
Heavy Vehicles (%)	2%	2%	2%	8%	8%	8%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.2			14.2			16.1			16.1	
Effective Green, g (s)		14.2			14.2			16.1			16.1	
Actuated g/C Ratio		0.37			0.37			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1047			1183			708			664	
v/s Ratio Prot												
v/s Ratio Perm		c0.26			0.13			0.01			c0.08	
v/c Ratio		0.70			0.35			0.01			0.19	
Uniform Delay, d1		10.2			8.7			6.5			7.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.1			0.2			0.0			0.6	
Delay (s)		12.4			8.9			6.5			7.6	
Level of Service		B			A			A			A	
Approach Delay (s)		12.4			8.9			6.5			7.6	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	38.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

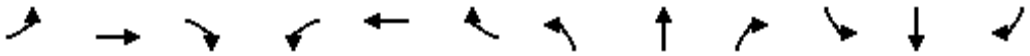
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	97	503	2	9	541	110	2	15	6	82	12	157
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	547	2	10	588	120	2	16	7	89	13	171

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	379	276	304	414	25	273
Volume Left (vph)	105	0	10	0	2	89
Volume Right (vph)	0	2	0	120	7	171
Hadj (s)	0.17	0.03	0.15	-0.07	-0.11	-0.28
Departure Headway (s)	6.8	6.7	6.8	6.5	7.7	6.5
Degree Utilization, x	0.72	0.51	0.57	0.75	0.05	0.49
Capacity (veh/h)	516	526	523	538	409	527
Control Delay (s)	24.3	15.3	17.1	25.4	11.1	15.6
Approach Delay (s)	20.5		21.9		11.1	15.6
Approach LOS	C		C		B	C

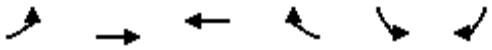
Intersection Summary				
Delay	20.2			
HCM Level of Service	C			
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	503	2	9	541	110	2	15	6	82	12	157
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	547	2	10	588	120	2	16	7	89	13	171
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	708			549			1249	1486	274	1166	1427	354
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	708			549			1249	1486	274	1166	1427	354
tC, single (s)	4.1			4.3			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			99			97	85	99	24	89	73
cM capacity (veh/h)	887			976			79	108	723	118	117	643

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	379	276	304	414	25	273
Volume Left	105	0	10	0	2	89
Volume Right	0	2	0	120	7	171
cSH	887	1700	976	1700	133	241
Volume to Capacity	0.12	0.16	0.01	0.24	0.19	1.13
Queue Length 95th (m)	3.1	0.0	0.2	0.0	5.0	93.5
Control Delay (s)	3.7	0.0	0.4	0.0	38.3	141.9
Lane LOS	A		A		E	F
Approach Delay (s)	2.1		0.2		38.3	141.9
Approach LOS					E	F

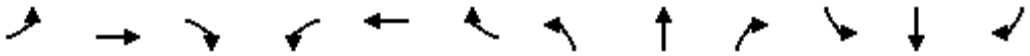
Intersection Summary			
Average Delay	24.7		
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	182	378	267	4	4	394
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	198	411	290	4	4	428
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	295				1099	292
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	295				1099	292
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	84				98	41
cM capacity (veh/h)	1267				192	728

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	609	295	433
Volume Left	198	0	4
Volume Right	0	4	428
cSH	1267	1700	708
Volume to Capacity	0.16	0.17	0.61
Queue Length 95th (m)	4.2	0.0	31.9
Control Delay (s)	3.9	0.0	17.7
Lane LOS	A		C
Approach Delay (s)	3.9	0.0	17.7
Approach LOS			C

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	375	2	2	231	90	2	2	2	87	2	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	408	2	2	251	98	2	2	2	95	2	41
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	349			410			766	773	409	727	725	300
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	349			410			766	773	409	727	725	300
tC, single (s)	4.2			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	99	100	72	99	94
cM capacity (veh/h)	1177			1117			299	328	643	335	349	740

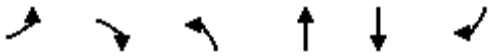
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	415	351	7	138
Volume Left	5	2	2	95
Volume Right	2	98	2	41
cSH	1177	1117	377	401
Volume to Capacity	0.00	0.00	0.02	0.34
Queue Length 95th (m)	0.1	0.0	0.4	11.5
Control Delay (s)	0.2	0.1	14.7	18.6
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	0.1	14.7	18.6
Approach LOS			B	C

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	103	11	127	112	28	127
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	12	138	122	30	138
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	398	199			260	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	398	199			260	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	99			98	
cM capacity (veh/h)	597	847			1305	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	124	260	168
Volume Left	112	0	30
Volume Right	12	122	0
cSH	615	1700	1305
Volume to Capacity	0.20	0.15	0.02
Queue Length 95th (m)	5.7	0.0	0.5
Control Delay (s)	12.3	0.0	1.6
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	1.6
Approach LOS	B		

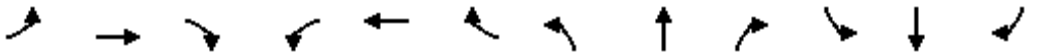
Intersection Summary			
Average Delay		3.2	
Intersection Capacity Utilization		38.1%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	101	93	6	6	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	110	101	7	7	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	215	7	7			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	215	7	7			
tC, single (s)	6.5	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	90	94			
cM capacity (veh/h)	708	1053	1614			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	110	108	7
Volume Left	0	101	0
Volume Right	110	0	0
cSH	1053	1614	1700
Volume to Capacity	0.10	0.06	0.00
Queue Length 95th (m)	2.6	1.5	0.0
Control Delay (s)	8.8	7.0	0.0
Lane LOS	A	A	
Approach Delay (s)	8.8	7.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	503	2	9	541	110	2	15	6	82	12	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.97			0.96			0.92	
Flt Protected		0.99			1.00			1.00			0.98	
Satd. Flow (prot)		3548			3293			1805			1697	
Flt Permitted		0.74			0.94			0.98			0.90	
Satd. Flow (perm)		2640			3112			1776			1558	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	105	547	2	10	588	120	2	16	7	89	13	171
RTOR Reduction (vph)	0	1	0	0	44	0	0	4	0	0	91	0
Lane Group Flow (vph)	0	653	0	0	674	0	0	21	0	0	182	0
Heavy Vehicles (%)	2%	2%	2%	8%	8%	8%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.9			13.9			16.1			16.1	
Effective Green, g (s)		13.9			13.9			16.1			16.1	
Actuated g/C Ratio		0.37			0.37			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		966			1138			752			660	
v/s Ratio Prot												
v/s Ratio Perm		c0.25			0.22			0.01			c0.12	
v/c Ratio		0.68			0.59			0.03			0.28	
Uniform Delay, d1		10.2			9.8			6.4			7.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.9			0.8			0.1			1.0	
Delay (s)		12.0			10.6			6.5			8.2	
Level of Service		B			B			A			A	
Approach Delay (s)		12.0			10.6			6.5			8.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Right Turn Lanes - Rural Highways
Standard Plan 20614

Associated Engineering

Highway:	Highway 10
Crossroad:	Willow Creek Rd
Scenario:	2026 Combined Traffic PM

Four Lane Highway?		0	Yes: 1 No: 0
Highway Direction 1:		WB	
		PHV (vph)	Advancing Conflict?
	WB Left	2	*1* Yes: 1 No: 0
	WB Through	298	*1* Yes: 1 No: 0
	WB Right	50	*1* Yes: 1 No: 0
	WB Total	350	
Highway Direction 2:		EB	
		PHV (vph)	Advancing Conflict?
	EB Left	37	*1* Yes: 1 No: 0
	EB Through	209	*1* Yes: 1 No: 0
	EB Right	2	*1* Yes: 1 No: 0
	EB Total	248	

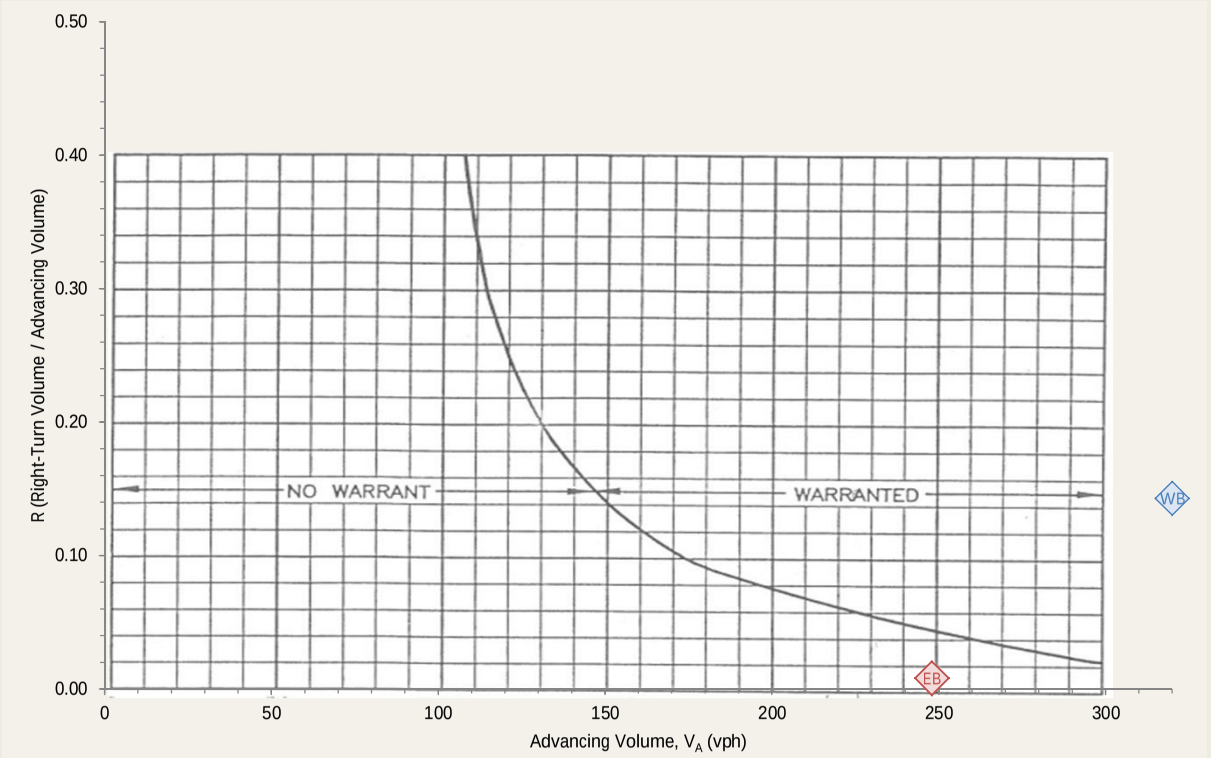
Notes:
Right turn lanes are warranted if the plotted point falls to the right of the curve

Right turn lanes are warranted at:
- -Intersections with other Provincial Highways
- -Industrial Access Roads
- -Provincial Campgrounds and Picnic Sites

Use the corrected peak hour volumes (vph) projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.

Length of turning lane is related to highway design speed and turning speed. See STP 20618

For four-lane highways, advancing volume should be half of the directional volume with no further reducetion for left turning vehicles



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	350	248	320	248
R (V_R / V_A)	0.14	0.01	0.14	0.01

If Four Lane	V_A	175	124
If Two Lane	V_A	350	248

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Right Turn Lanes - Rural Highways
Standard Plan 20614

Associated Engineering

Highway:	Highway 10
Crossroad:	Willow Creek Rd
Scenario:	2026 Combined Traffic PM

Four Lane Highway?	0	Yes: 1 No: 0	
Highway Direction 1:	WB		
	PHV (vph)	Advancing Conflict?	
WB Left	2	*1*	Yes: 1 No: 0
WB Through	231	*1*	Yes: 1 No: 0
WB Right	90	*1*	Yes: 1 No: 0
WB Total	323		
Highway Direction 2:	EB		
	PHV (vph)	Advancing Conflict?	
EB Left	5	*1*	Yes: 1 No: 0
EB Through	373	*1*	Yes: 1 No: 0
EB Right	2	*1*	Yes: 1 No: 0
EB Total	380		

Notes:
Right turn lanes are warranted if the plotted point falls to the right of the curve

Right turn lanes are warranted at:
- -Intersections with other Provincial Highways
- -Industrial Access Roads
- -Provincial Campgrounds and Picnic Sites

Use the corrected peak hour volumes (vph) projected to the 10th year after construction.
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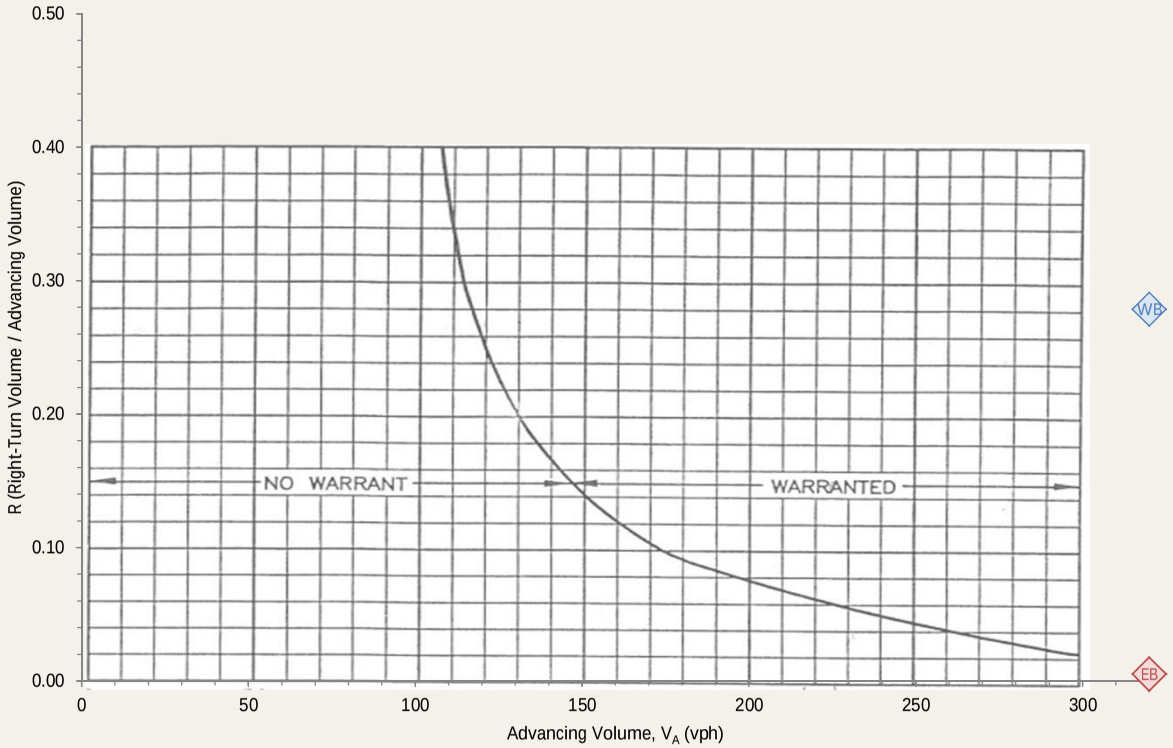


	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	323	380	320	320
R (V_R / V_A)	0.28	0.01	0.28	0.01

If Four Lane	V_A	161.5	190
If Two Lane	V_A	323	380

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Right Turn Lanes - Rural Highways
Standard Plan 20614

Associated Engineering

Highway:	Highway 10
Crossroad:	Lily Ave
Scenario:	2026 Combined Traffic AM

Four Lane Highway?	0	Yes: 1 No: 0
Highway Direction 1:	WB	

	PHV (vph)	Advancing Conflict?	
WB Left	0	*0*	Yes: 1 No: 0
WB Through	304	*1*	Yes: 1 No: 0
WB Right	5	*1*	Yes: 1 No: 0
WB Total	309		

Highway Direction 2:	EB

	PHV (vph)	Advancing Conflict?	
EB Left	430	*1*	Yes: 1 No: 0
EB Through	245	*1*	Yes: 1 No: 0
EB Right	0	*0*	Yes: 1 No: 0
EB Total	675		

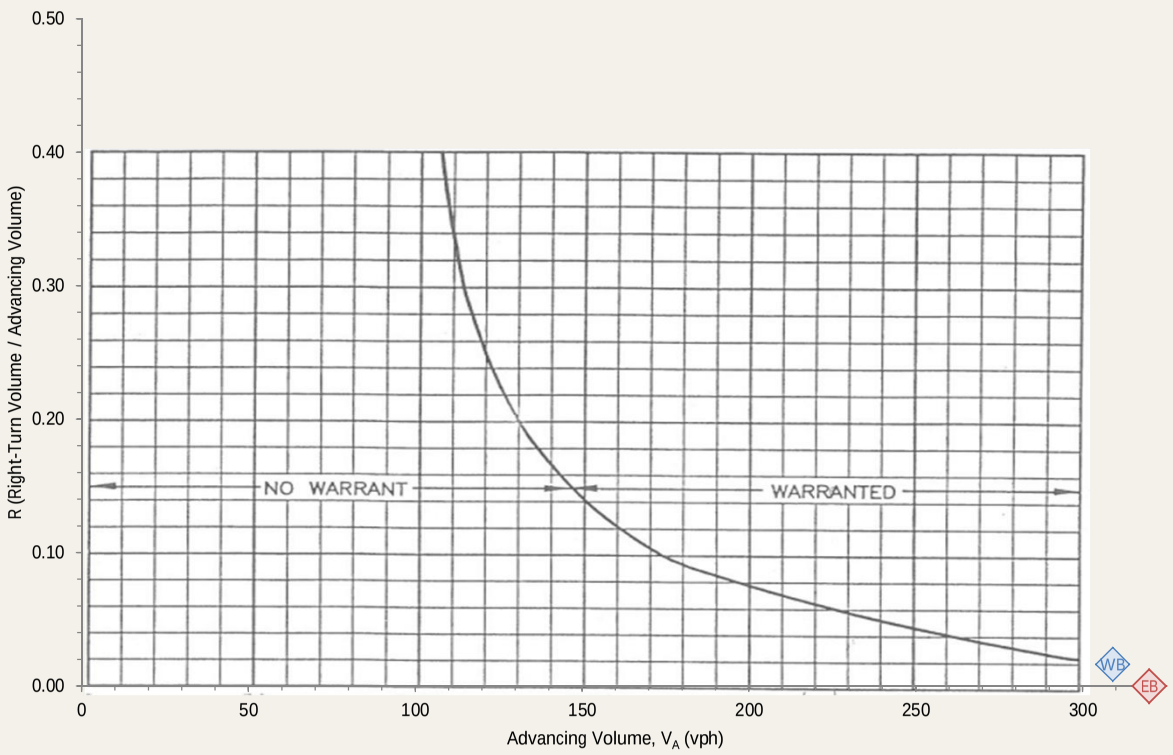
Notes:
Right turn lanes are warranted if the plotted point falls to the right of the curve

Right turn lanes are warranted at:
- -Intersections with other Provincial Highways
- -Industrial Access Roads
- -Provincial Campgrounds and Picnic Sites

Use the corrected peak hour volumes (vph) projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.

Length of turning lane is related to highway design speed and turning speed. See STP 20618

For four-lane highways, advancing volume should be half of the directional volume with no further reducetion for left turning vehicles



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	309	675	309	320
R (V_R / V_A)	0.02	0.00	0.02	0.00

If Four Lane	V_A	154.5	337.5
If Two Lane	V_A	309	675

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Right Turn Lanes - Rural Highways
Standard Plan 20614

Associated Engineering

Highway:	Highway 10
Crossroad:	Lily Ave
Scenario:	2026 Combined Traffic PM

Four Lane Highway?	0	Yes: 1 No: 0
Highway Direction 1:	WB	

	PHV (vph)	Advancing Conflict?	
WB Left	0	*0*	Yes: 1 No: 0
WB Through	267	*1*	Yes: 1 No: 0
WB Right	4	*1*	Yes: 1 No: 0
WB Total	271		

Highway Direction 2:	EB

	PHV (vph)	Advancing Conflict?	
EB Left	182	*1*	Yes: 1 No: 0
EB Through	378	*1*	Yes: 1 No: 0
EB Right	0	*0*	Yes: 1 No: 0
EB Total	560		

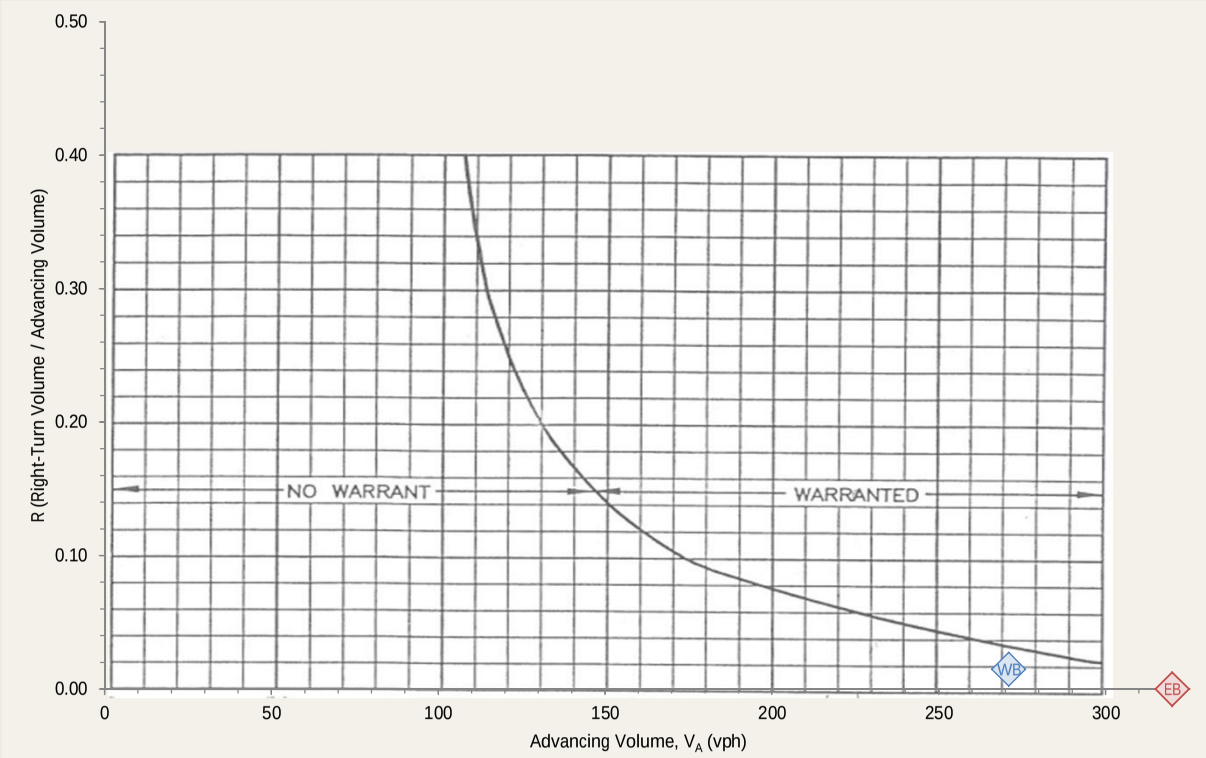
Notes:
Right turn lanes are warranted if the plotted point falls to the right of the curve

Right turn lanes are warranted at:
- -Intersections with other Provincial Highways
- -Industrial Access Roads
- -Provincial Campgrounds and Picnic Sites

Use the corrected peak hour volumes (vph) projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.

Length of turning lane is related to highway design speed and turning speed. See STP 20618

For four-lane highways, advancing volume should be half of the directional volume with no further reducetion for left turning vehicles



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	271	560	271	320
R (V_R / V_A)	0.01	0.00	0.01	0.00

If Four Lane	V_A	135.5	280
If Two Lane	V_A	271	560

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Bypass Lane
Standard Plan 20612

Associated Engineering

Highway: Highway 10
Crossroad: Willow Creek Rd
Scenario: 2026 Combined Traffic PM

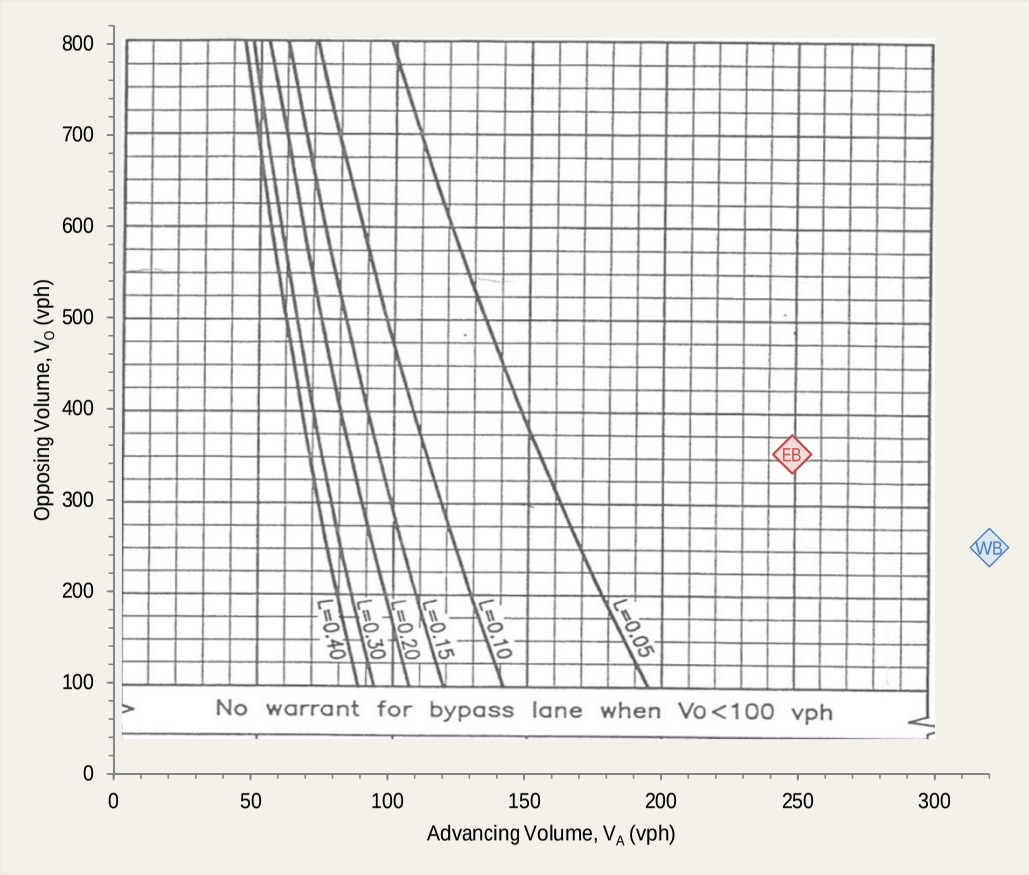
Highway Direction 1:	WB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
WB Left	2	*1*	*1*	Yes: 1 No: 0
WB Through	298	*1*	*1*	Yes: 1 No: 0
WB Right	50	*1*	*1*	Yes: 1 No: 0
WB Total	350			

Highway Direction 2:	EB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
EB Left	37	*1*	*1*	Yes: 1 No: 0
EB Through	209	*1*	*1*	Yes: 1 No: 0
EB Right	2	*1*	*1*	Yes: 1 No: 0
EB Total	248			

Notes:
No warrant for a bypass lane if the plotted point
falls to the left of the applicable "L" line

No warrant if L <0.05

Use the corrected peak hour volumes (vph)
projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	350	248	320	248
Opposing Volume, V_O	248	350	248	350
L (V_L / V_A)	0.01	0.15		

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Channelized Intersection
Standard Plan 20611

Associated Engineering

Highway:	Highway 10
Crossroad:	Willow Creek Rd
Scenario:	2026 Combined Traffic PM

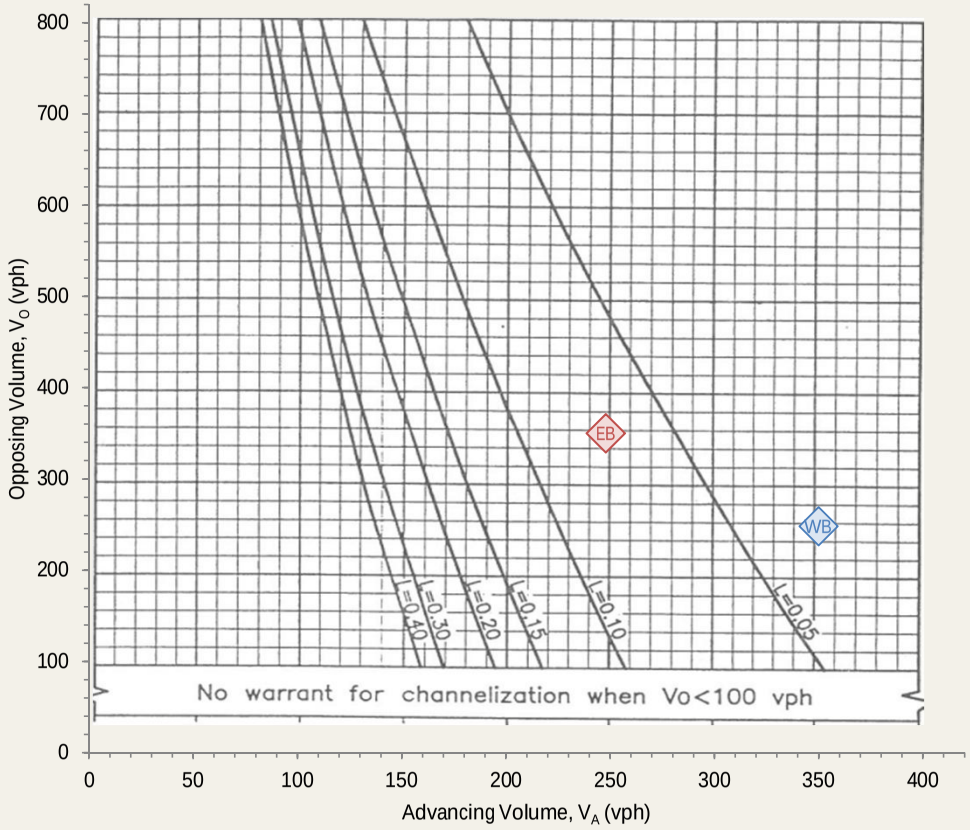
Highway Direction 1:	WB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
WB Left	2	*1*	*1*	Yes: 1 No: 0
WB Through	298	*1*	*1*	Yes: 1 No: 0
WB Right	50	*1*	*1*	Yes: 1 No: 0
WB Total	350			

Highway Direction 2:	EB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
EB Left	37	*1*	*1*	Yes: 1 No: 0
EB Through	209	*1*	*1*	Yes: 1 No: 0
EB Right	2	*1*	*1*	Yes: 1 No: 0
EB Total	248			

Notes:
No warrant for a bypass lane if the plotted point
falls to the left of the applicable "L" line

No warrant if L <0.05

Use the corrected peak hour volumes (vph)
projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	350	248	350	248
Opposing Volume, V_O	248	350	248	350
L (V_L / V_A)	0.01	0.15		

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Bypass Lane
Standard Plan 20612

Associated Engineering

Highway:	Highway 10
Crossroad:	Willow Creek Rd
Scenario:	2026 Combined Traffic PM

Highway Direction 1: WB

	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
WB Left	2	*1*	*1*	Yes: 1 No: 0
WB Through	231	*1*	*1*	Yes: 1 No: 0
WB Right	90	*1*	*1*	Yes: 1 No: 0
WB Total	323			

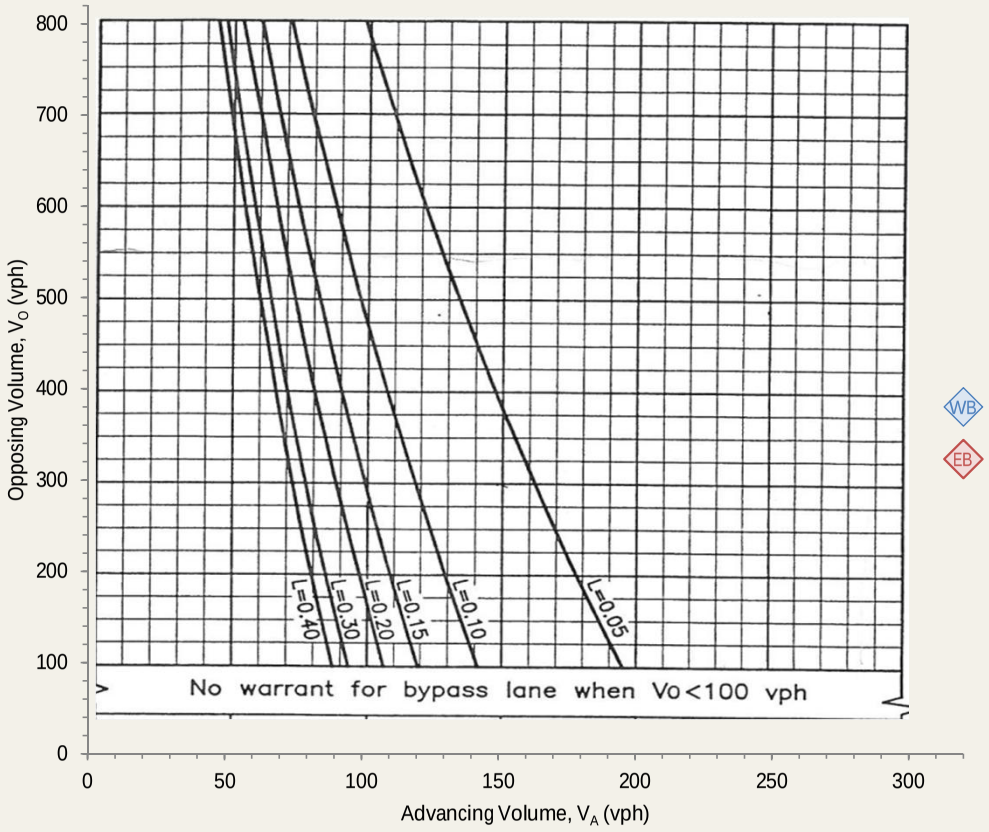
Highway Direction 2: EB

	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
EB Left	5	*1*	*1*	Yes: 1 No: 0
EB Through	373	*1*	*1*	Yes: 1 No: 0
EB Right	2	*1*	*1*	Yes: 1 No: 0
EB Total	380			

Notes:
No warrant for a bypass lane if the plotted point
falls to the left of the applicable "L" line

No warrant if L <0.05

Use the corrected peak hour volumes (vph)
projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	323	380	320	320
Opposing Volume, V_O	380	323	380	323
L (V_L / V_A)	0.01	0.01		

Inputs

Saskatchewan Ministry of Highways and Infrastructure
Warrants for Channelized Intersection
Standard Plan 20611

Associated Engineering

Highway:	Highway 10
Crossroad:	Willow Creek Rd
Scenario:	2026 Combined Traffic PM

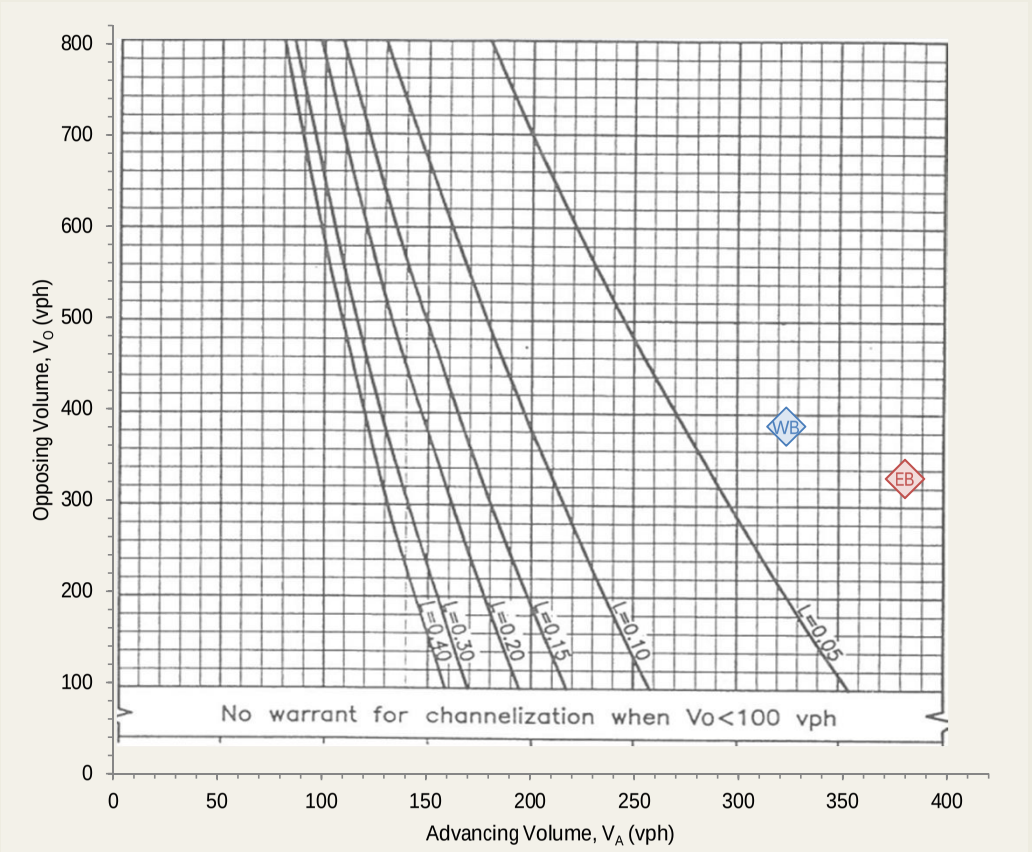
Highway Direction 1:	WB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
WB Left	2	*1*	*1*	Yes: 1 No: 0
WB Through	231	*1*	*1*	Yes: 1 No: 0
WB Right	90	*1*	*1*	Yes: 1 No: 0
WB Total	323			

Highway Direction 2:	EB			
	PHV (vph)	Opposing Conflict?	Advancing Conflict?	
EB Left	5	*1*	*1*	Yes: 1 No: 0
EB Through	373	*1*	*1*	Yes: 1 No: 0
EB Right	2	*1*	*1*	Yes: 1 No: 0
EB Total	380			

Notes:
No warrant for a bypass lane if the plotted point
falls to the left of the applicable "L" line

No warrant if L <0.05

Use the corrected peak hour volumes (vph)
projected to the 10th year after construction.
See SKS 2.3.1-C (formerly DM 502-3) for correction factors.



	Actual		Plotted	
	WB	EB	WB	EB
Advancing Volume, V_A	323	380	323	380
Opposing Volume, V_O	380	323	380	323
L (V_L / V_A)	0.01	0.01		

A flared intersection treatment is warranted at the following locations:

1. At all intersections with Provincial Highways.

2. At all accesses to towns and villages where:

   - highway classification is a major or minor arterial and the population exceeds 500; or
   - highway classification is a collector or local and the population exceeds 700.

3. At all provincial parks, regional parks, provincial campsites, and provincial picnic sites where:

   - highway classification is a major or minor arterial; or
   - highway classification is a collector or local and the highway AADT exceeds 600 and the left turn AADT exceeds 50.

4. At all industrial access roads where:

   - the highway AADT exceeds 500 and the left turn AADT exceeds 25.

5. At all other intersection roads where:

   - the highway AADT exceeds 600 and the left turn AADT exceeds 50.

NOTE:

1. Use highway AADT projected to the 10th year after the proposed construction date.

2. Check warrants for Channelized or Bypass Lane before considering a flared intersection treatment.

Saskatchewan Highways and Transportation	WARRANTS FOR FLARED INTERSECTIONS 2 LANE RURAL HIGHWAYS					
RECOMMENDED BY:		DIRECTOR TECH. STDS. & POLICIES	DATE	94.08.17	STANDARD PLAN NO	20613
APPROVED BY:		ASSIST. DEPUTY MINISTER OPERATIONS DIVISION	DATE	95-02-28	SHEET	1 of 1

LAST REV DATE: MAY24/94

ACAD DWG: 20613

Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version: 10-Apr-09

Name of Corridor:	Highway 10/Broadway Street				
Segment Evaluated:	Willow Creek Road	to	Husky Road		
Geographic Region:	Yorkton, SK				
Road Agency:	City of Yorkton				
Road Classification:	Arterial	Length of Corridor:	3,200	m	
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	110	km/h	
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	100	km/h	
Major / Minor:	Major	Prevailing Speed: (85th Percentile - for information only)	unknown	km/h	
# Through Lanes Per Direction:	1 lane	Policy: (Maximum Posted Speed)	No policy		

		RISK	Score
A1	GEOMETRY (Horizontal)	Lower	2
A2	GEOMETRY (Vertical)	Lower	2
A3	AVERAGE LANE WIDTH	Lower	2
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Medium	6
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	*Number of Occurrences*	4
	STOP controlled intersection	2	
	Signalized intersection	1	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	0	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	*Number of Occurrences*	0
	Left turn movements permitted	0	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	*Number of Occurrences*	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

24

Recommended Posted Speed Limit (km/h):

As determined by road characteristics

80

As determined by policy

No policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments: