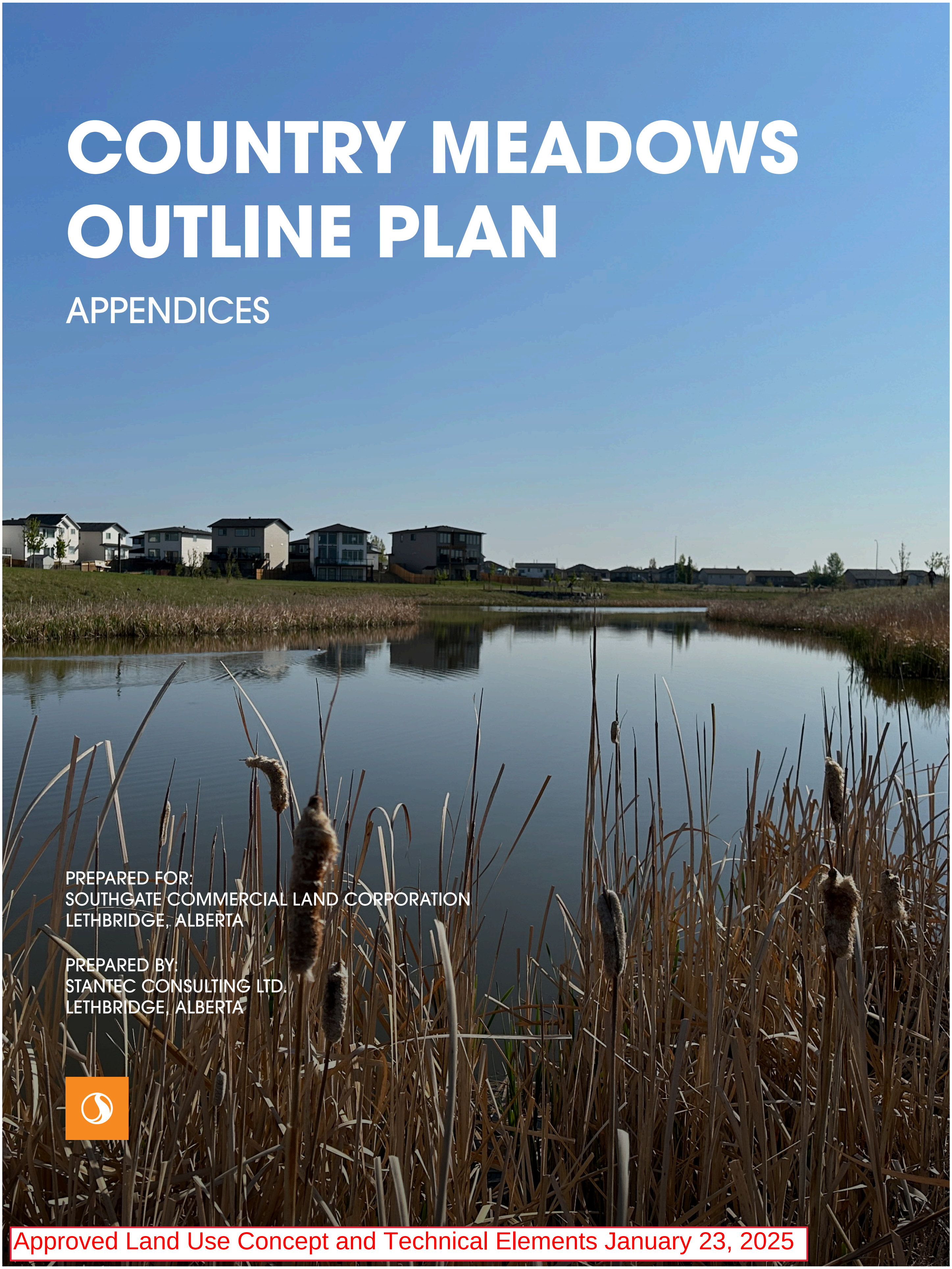
COUNTRY MEADOWS OUTLINE PLAN

APPENDICES



PREPARED FOR:
SOUTHGATE COMMERCIAL LAND CORPORATION
LETHBRIDGE, ALBERTA

PREPARED BY:
STANTEC CONSULTING LTD.
LETHBRIDGE, ALBERTA

Approved Land Use Concept and Technical Elements January 23, 2025

LIST OF APPENDICES

APPENDIX A

CERTIFICATE OF TITLES

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0019 856 798	4;22;8;33;NE	191 194 731

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 33
THE SOUTH HALF OF THE NORTH EAST QUARTER
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 161 073 829

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
191 194 731	24/09/2019	TRANSFER OF LAND	$4,280,301	SEE INSTRUMENT

OWNERS

BW3 DEVELOPMENTS LTD.
OF 1111-3 AVE S
LETHBRIDGE
ALBERTA T1J 0J5

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 319	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT AS TO PORTION DESCRIBED BY 761072087"
131 191 024	07/08/2013	CAVEAT

(CONTINUED)

```
-------------------------------------------------------------------------------
REGISTRATION
  NUMBER    DATE (D/M/Y)      PARTICULARS
-------------------------------------------------------------------------------

                         RE : ACCESS
                         CAVEATOR - SERVUS CREDIT UNION LTD.
                         480 SCENIC DRIVE S.
                         LETHBRIDGE
                         ALBERTA T1J4S3

161 073 830   23/03/2016 MORTGAGE
                         MORTGAGEE - ALBERTA TREASURY BRANCHES.
                         601 MAYOR MAGRATH DRIVE SOUTH
                         LETHBRIDGE
                         ALBERTA T1J4M5
                         ORIGINAL PRINCIPAL AMOUNT: $12,000,000

161 073 831   23/03/2016 CAVEAT
                         RE : ASSIGNMENT OF RENTS AND LEASES
                         CAVEATOR - ALBERTA TREASURY BRANCHES.
                         ATTENTION: DIRECTOR
                         601 MAYOR MAGRATH DRIVE SOUTH
                         LETHBRIDGE
                         ALBERTA T1J4M5
                         AGENT - NOLAN B JOHNSON

161 073 832   23/03/2016 CAVEAT
                         RE : AGREEMENT CHARGING LAND
                         CAVEATOR - ALBERTA TREASURY BRANCHES.
                         ATTENTION: DIRECTOR
                         601 MAYOR MAGRATH DRIVE SOUTH
                         LETHBRIDGE
                         ALBERTA T1J4M5
                         AGENT - NOLAN B JOHNSON

191 194 732   24/09/2019 MORTGAGE
                         MORTGAGEE - ATB FINANCIAL.
                         601 MAYOR MAGRATH DRIVE S
                         LETHBRIDGE
                         ALBERTA T1J4M5
                         ORIGINAL PRINCIPAL AMOUNT: $12,000,000

191 194 733   24/09/2019 CAVEAT
                         RE : ASSIGNMENT OF RENTS AND LEASES
                         CAVEATOR - ATB FINANCIAL.
                         601 MAYOR MAGRATH DRIVE S
                         LETHBRIDGE
                         ALBERTA T1J4M5
                         AGENT - MOHAMMED ALI MEMON.

191 194 734   24/09/2019 CAVEAT
                         RE : ASSIGNMENT OF INTEREST
                         CAVEATOR - ATB FINANCIAL.
```

(CONTINUED)

601 MAYOR MAGRATH DRIVE S
LETHBRIDGE
ALBERTA T1J4M5
AGENT - MOHAMMED ALI MEMON.

211 142 146 24/07/2021 MORTGAGE
MORTGAGEE - 869563 ALBERTA LTD.
1111 - 3 AVE S
LETHBRIDGE
ALBERTA T1J0J5
ORIGINAL PRINCIPAL AMOUNT: $1,816,000

TOTAL INSTRUMENTS: 009

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST, 2024 AT 09:31 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 087 977	4;22;8;33;NE	171 051 016

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 33
THE NORTH HALF OF THE NORTH EAST QUARTER
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING 1.03 ACRES FOR ROADWAY AS SHOWN ON PLAN 1618LK
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 741 052 929

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
171 051 016	02/03/2017	TRANSFER OF LAND	$4,650,000	$4,650,000

OWNERS

2014836 ALBERTA LTD.
OF 11504-170 STREET
EDMONTON
ALBERTA T5S 1J7

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 052 928	03/06/1974	CAVEAT CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
751 003 057	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY

(CONTINUED)

LIMITED.
"DISCHARGED AS TO 20' STRIPS IN NE 1/4 BY INST
761072085"

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST, 2024 AT 09:31 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0035 075 507	4;22;8;33;SE	121 002 636 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
THE NORTH HALF OF THE SOUTH EAST
QUARTER OF SECTION 33
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	1210033	3.01	7.44	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 061 218 951

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
121 002 636	04/01/2012	SUBDIVISION PLAN		

OWNERS

DEBRA L DUDLEY-OLAFSON
OF BOX 511
LETHBRIDGE
ALBERTA T1J 3Z4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 006 966	27/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT AS TO A 20 FOOT STRIP SEE INSTRUMENT 761072088"

(CONTINUED)

```
REGISTRATION
  NUMBER    DATE (D/M/Y)       PARTICULARS

                              (DATA UPDATED BY: 131020588   )

981 066 289   04/03/1998 CAVEAT
                         RE : RIGHT OF WAY AGREEMENT
                         CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY
                         LIMITED.
                         909 - 11 AVENUE,S.W.
                         CALGARY
                         ALBERTA T2R1L8
                              (DATA UPDATED BY: TRANSFER OF CAVEAT
                              981078661)

101 310 658   21/10/2010 MORTGAGE
                         MORTGAGEE - CANADIAN IMPERIAL BANK OF COMMERCE.
                         701 - 4 AVENUE SOUTH, LETHBRIDGE
                         ALBERTA T1J4A5
                         ORIGINAL PRINCIPAL AMOUNT: $500,000

121 002 635   04/01/2012 CAVEAT
                         RE : DEFERRED RESERVE
                         CAVEATOR - THE CITY OF LETHBRIDGE.
                         910 - 4TH AVE. SOUTH, LETHBRIDGE
                         ALBERTA
                         AGENT - MAUREEN GAEHRING.

151 303 969   24/11/2015 DISCHARGE OF CAVEAT 981066289
                         PARTIAL
                         EXCEPT PLAN/PORTION:  9812070

161 168 031   20/07/2016 UTILITY RIGHT OF WAY
                         GRANTEE - THE CITY OF LETHBRIDGE.
                         AS TO PORTION OR PLAN:1611776

TOTAL INSTRUMENTS: 006
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THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN
ACCURATE REPRODUCTION OF THE CERTIFICATE OF
TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST,
2024 AT 09:31 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0039 289 665	4;22;8;34;NW	221 228 526 +29

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 34
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

			HECTARES	(ACRES) MORE OR LESS
A)	PLAN 0211389	SUBDIVISION	2.588	6.39
B)	PLAN 0414578	SUBDIVISION	6.155	15.21
C)	PLAN 0510515	ROAD	8.933	22.07
D)	PLAN 0512653	SUBDIVISION	11.051	27.31
E)	PLAN 1013779	ROAD	1.521	3.76
F)	PLAN 1310667	SUBDIVISION	10.244	25.3
G)	PLAN 1512345	SUBDIVISION	4.981	12.31
H)	PLAN 1711902	SUBDIVISION	2.822	6.97
I)	PLAN 1811628	SUBDIVISION	3.501	8.65
J)	PLAN 2110616	SUBDIVISION	2.324	5.74
K)	PLAN 2210516	SUBDIVISION	1.199	2.96
L)	PLAN 2211638	SUBDIVISION	1.790	4.42

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 221 070 393 +21

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
221 228 526	20/10/2022	SUBDIVISION PLAN		

OWNERS

SOUTHGATE COMMERCIAL LANDS CORP.
OF 238 22 ST NORTH
LETHBRIDGE
ALBERTA T1H 3R7

(CONTINUED)

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--------------------------------------------------------------------------------
                        ENCUMBRANCES, LIENS & INTERESTS
                                                                 PAGE  2
REGISTRATION                                                     # 221 228 526 +29
  NUMBER    DATE (D/M/Y)       PARTICULARS
--------------------------------------------------------------------------------

891 210 688   16/10/1989 UTILITY RIGHT OF WAY
                         GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY
                         LIMITED.
                         "PARTIAL DISCHARGE EXCEPT PTN 8911794 BY 901058685,
                         05 03 1990 (RE-ENTERED 22/12/04 BY 041482893)"

971 107 756   21/04/1997 CAVEAT
                         RE : SURFACE LEASE
                         CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY
                         LIMITED.
                         909-11 AVE SW
                         CALGARY
                         ALBERTA T2R1L7

981 066 287   04/03/1998 CAVEAT
                         RE : RIGHT OF WAY AGREEMENT
                         CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY
                         LIMITED.
                         909 - 11 AVENUE,S.W.
                         CALGARY
                         ALBERTA T2R1L8
                              (DATA UPDATED BY: TRANSFER OF CAVEAT
                              981078399)

021 135 987   23/04/2002 CAVEAT
                         RE : DEFERRED RESERVE
                         CAVEATOR - THE CITY OF LETHBRIDGE.
                         CITY HALL
                         910 4 AVENUE SOUTH
                         LETHBRIDGE
                         ALBERTA
                         AGENT - P GEORGE KUHL

131 056 720   07/03/2013 UTILITY RIGHT OF WAY
                         GRANTEE - THE CITY OF LETHBRIDGE.
                         AS TO PORTION OR PLAN:1310668
                         AREAS 'E', 'F' AND 'G'

131 056 723   07/03/2013 UTILITY RIGHT OF WAY
                         GRANTEE - THE CITY OF LETHBRIDGE.
                         AS TO PORTION OR PLAN:1310668
                         AREAS 'A', 'B' AND 'E'

151 266 460   14/10/2015 UTILITY RIGHT OF WAY
                         GRANTEE - THE CITY OF LETHBRIDGE.
                         AS TO PORTION OR PLAN:1512780

151 303 970   24/11/2015 DISCHARGE OF CAVEAT 981066287
                         PARTIAL
                         EXCEPT PLAN/PORTION:  9812070
                              ( CONTINUED )
```

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
161 133 061	09/06/2016	CAVEAT RE : LEASE INTEREST CAVEATOR - ROGERS COMMUNICATIONS INC. ONE MOUNT PLEASANT RD, 2ND FLR TORONTO ONTARIO M4Y2Y5 AGENT - LANDSOLUTIONS GP INC.
171 212 050	21/09/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1711903
181 181 972	27/08/2018	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1811629 AS TO ACCESS R/W `A'
191 047 708	08/03/2019	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1910472 AREA 'A'
221 228 529	20/10/2022	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:2211638 AS TO AREA 'A'

TOTAL INSTRUMENTS: 013

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST, 2024 AT 09:31 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

THE ABOVE PROVISIONS DO NOT PROHIBIT THE ORIGINAL PURCHASER FROM INCLUDING THIS UNMODIFIED PRODUCT IN ANY REPORT, OPINION, APPRAISAL OR OTHER ADVICE PREPARED BY THE ORIGINAL PURCHASER AS PART OF THE ORIGINAL PURCHASER APPLYING PROFESSIONAL, CONSULTING OR TECHNICAL EXPERTISE FOR THE BENEFIT OF CLIENT(S).

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0036 442 986	1413333;1;2	141 346 867

LEGAL DESCRIPTION

DESCRIPTIVE PLAN 1413333
BLOCK 1
LOT 2
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 3.03 HECTARES (7.49 ACRES) MORE OR LESS

ATS REFERENCE: 4;22;8;34;SW
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 141 332 624

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
141 346 867	19/12/2014	TRANSFER OF LAND	$467,750	SEE INSTRUMENT

OWNERS

SOUTHGATE COMMERCIAL LANDS CORP.
OF 238-22 ST N
LETHBRIDGE
ALBERTA T1H 3R7

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
081 329 013	03/09/2008	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

141 346 867

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		AGENT - GARY WEIKUM.
121 217 480	23/08/2012	CAVEAT RE : RIGHT OF WAY AGREEMENT CAVEATOR - ATCO GAS AND PIPELINES LTD. 909 11 AVE SW CALGARY ALBERTA T2R1L8
151 266 460	14/10/2015	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1512780
161 133 060	09/06/2016	CAVEAT RE : LEASE INTEREST CAVEATOR - ROGERS COMMUNICATIONS INC. ONE MOUNT PLEASANT RD, 2ND FLR TORONTO ONTARIO M4Y2Y5 AGENT - LANDSOLUTIONS GP INC.

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST, 2024 AT 09:31 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 454 852	0814008;1;1	081 329 015

LEGAL DESCRIPTION
PLAN 0814008
BLOCK 1
LOT 1
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 2.06 HECTARES (5.09 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;34;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 329 014

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 329 015	03/09/2008	TRANSFER OF LAND	$167,805	$167,805

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
081 329 013	03/09/2008	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA AGENT - GARY WEIKUM.

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
141 059 478	10/03/2014	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1410742

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF AUGUST, 2024 AT 09:32 A.M.

ORDER NUMBER: 51231859

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

APPENDIX B

TRANSPORTATION IMPACT ASSESSMENT

Stantec

Memo

To:	Adam St. Amant	From:	Angela Forsyth
	City of Lethbridge		Lethbridge Office
File:	112948170 112948065	Date:	January 24, 2019

Reference: Country Meadows Outline Plan Amendment: Transportation Impact Assessment

Background

Stantec was retained by BW2 West & 2014836 Alberta Ltd to prepare a revised transportation impact assessment associated with a land use re-designation and reconfiguration of a portion of internal roadway network within the Country Meadows development. Country Meadows is generally located south of Walsh Drive West, east of the future Chinook Trail, west of Métis Trail, and north of Garry Drive West. The proposed changes include:

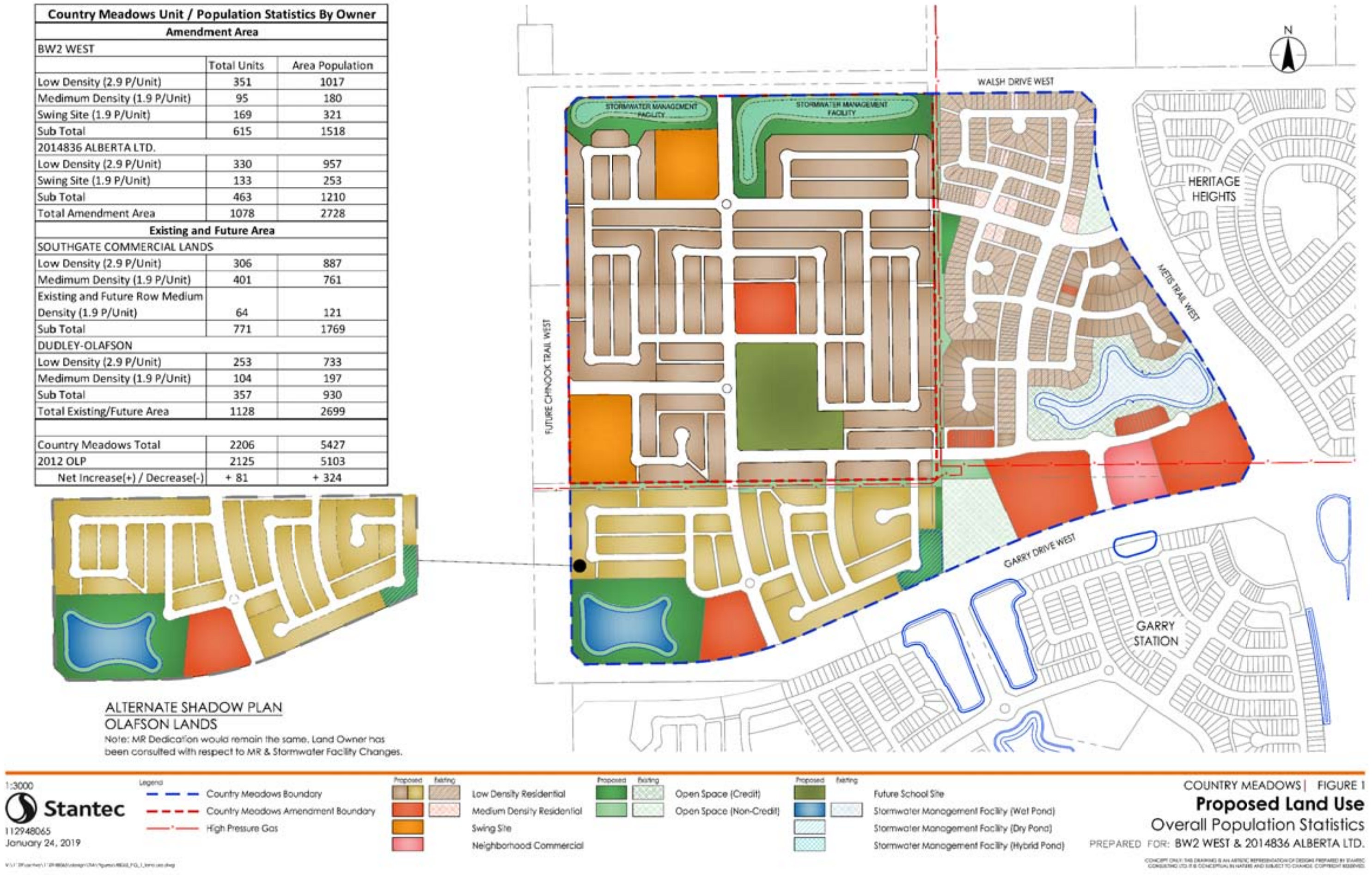
- Reducing the area of the school site.
- Relocation of north Modified Linear Parks.
- Relocation of north community entrance road.
- Addition of 137 low-density single-family dwelling units.
- Removal of 88 medium-density R75 dwelling units.

The cumulative changes result in a net increase of approximately 49 residential dwelling units. To support these density and access changes, the layout of the roadway network area has been revised to accommodate the plan changes. The revised plan is shown in **Figure 1**.

A revised trip generation and intersection analysis was conducted based on the proposed changes and is summarized in this memorandum. Analysis was conducted for both the Weekday AM Peak Hour and Weekday PM Peak Hour using the volumes from the approved TIA and revised site-generated traffic volumes and patterns estimated in this memorandum.

Trip Generation and Trip Distribution

Based on the proposed revisions, a net increase of approximately 137 low-density units and a net decrease of 88 medium-density residential units is anticipated. The associated trip generation for this land use revision is noted below in **Table 1**.



Country Meadows Unit / Population Statistics By Owner		
Amendment Area		
BW2 WEST		
	Total Units	Area Population
Low Density (2.9 P/Unit)	351	1017
Medimum Density (1.9 P/Unit)	95	180
Swing Site (1.9 P/Unit)	169	321
Sub Total	615	1518
2014836 ALBERTA LTD.		
Low Density (2.9 P/Unit)	330	957
Swing Site (1.9 P/Unit)	133	253
Sub Total	463	1210
Total Amendment Area	1078	2728
Existing and Future Area		
SOUTHGATE COMMERCIAL LANDS		
Low Density (2.9 P/Unit)	306	887
Medimum Density (1.9 P/Unit)	401	761
Existing and Future Row Medium Density (1.9 P/Unit)	64	121
Sub Total	771	1769
DUDLEY-OLAFSON		
Low Density (2.9 P/Unit)	253	733
Medimum Density (1.9 P/Unit)	104	197
Sub Total	357	930
Total Existing/Future Area	1128	2699
Country Meadows Total	2206	5427
2012 OLP	2125	5103
Net Increase(+) / Decrease(-)	+ 81	+ 324

ALTERNATE SHADOW PLAN
OLAFSON LANDS
Note: MR Dedication would remain the same. Land Owner has been consulted with respect to MR & Stormwater Facility Changes.

COUNTRY MEADOWS | FIGURE 1
Proposed Land Use
Overall Population Statistics
PREPARED FOR: BW2 WEST & 2014836 ALBERTA LTD.

Table 1: Trip Generation for Land Use Revision

Land Use	Intensity	AM			PM		
		Total Trips (vph)	In	Out	Total Trips (vph)	In	Out
Low Density Residential	Trip Generation Characteristics	0.77 trips/DU	26%	74%	1.02 trips/DU	64%	36%
	137 units	105	27	78	140	90	50
Medium Density Residential	Trip Generation Characteristics	0.75 trips/DU	29%	71%	0.92 trips/DU	61%	39%
	-88 units	-66	-19	-47	-81	-49	-32

Trip Distribution and Site-Generated Traffic Volumes

Figure 1.2 of the Country Meadows TIA illustrates the original study area’s intersection numbers and is included as an attachment. The site-generated traffic volumes from Table 1 were added to the original site-generated and background traffic volumes within the amendment area and re-distributed to the internal and external intersections with consideration for the new internal road network. As the revised internal road network has been altered due to the land use revision, all intersections were analyzed as part of this revised TIA.

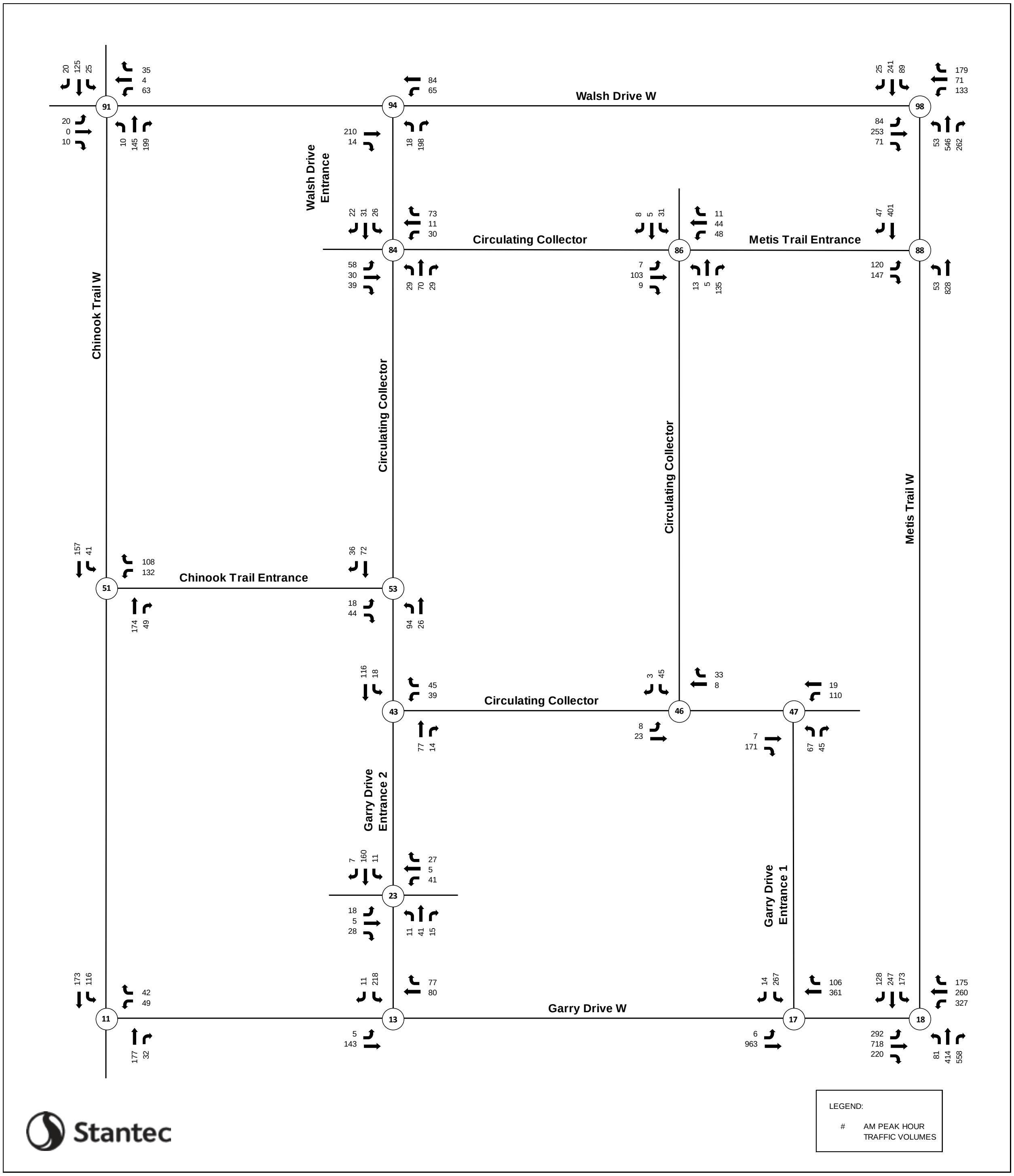
Post-Development Traffic Volumes

The site-generated volumes for the land use revision area were added to the full-build background traffic volumes and full-build site-generated traffic volumes illustrated in Figure 3.7, Figure 3.8, Figure 3.13 and Figure 3.14 of the Country Meadows TIA to develop revised full-build post-development AM Peak Hour and PM Peak Hour traffic volumes. The full-build post-development AM Peak Hour and PM Peak Hour volumes are illustrated in **Figure 3** and **Figure 4**, respectively. Volumes for the revised land use area were re-distributed over the new internal road network, which in effect altered the volumes on the external road network.

Intersection Analysis

Intersection analyses using the revised post-development AM Peak Hour and PM Peak Hour were conducted using Synchro and RODEL software packages. It should be noted that the previous intersection analyses conducted in the Country Meadows TIA used older versions of the Synchro software package and utilized the SIDRA software package for roundabouts. Therefore, analysis results will vary from the Country Meadows TIA due to volume differences as well as software types and versions. For consistency purposes, internal and external intersections analyzed as signalized intersections, stop-controlled intersections and roundabouts in the Country Meadows TIA were analyzed similarly in this analysis.

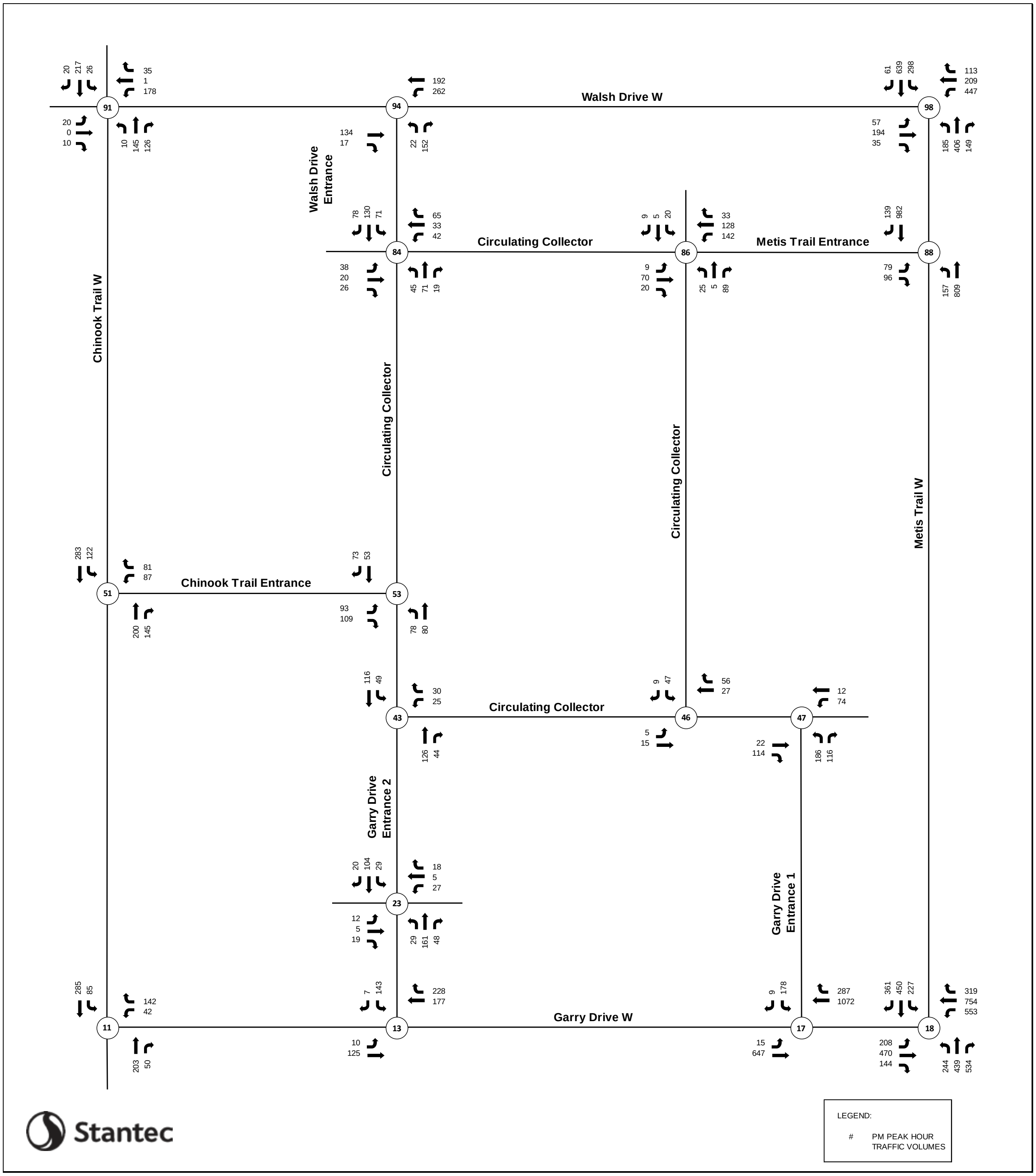
Reference: Country Meadows Outline Plan Amendment: Transportation Impact Assessment



BW2 WEST / 2014836 Alberta Ltd.
COUNTRY MEADOWS
OUTLINE PLAN AMENDMENT

Figure 2
Revised Full-Build Post-Development Traffic Volumes
AM Peak Hour

Reference: Country Meadows Outline Plan Amendment: Transportation Impact Assessment



BW2 WEST / 2014836 Alberta Ltd.
COUNTRY MEADOWS
OUTLINE PLAN AMENDMENT

Figure 3
Revised Full-Build Post-Development Traffic Volumes
PM Peak Hour

The intersection analysis for the internal intersections was undertaken using the Synchro 10 software package, which is based on the Highway Capacity Manual (HCM 2000). For unsignalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit and the type of intersection control. The average delay for each individual movement from the minor street, the major street left-turn movements and the overall intersection are calculated. An operation level of service (LOS) is then assigned based on the calculated average delay. For signalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, the traffic signal phasing/timing plan as well as pedestrian volumes. The average delay for each lane group and the overall intersection are calculated. An operation LOS is then assigned based on the calculated average delay. The level of service criteria for both signalized and unsignalized intersections is described in **Table 2**.

The volume-to-capacity (v/c) ratio was also considered. If the v/c ratio for a movement is greater than 1.00, then that movement has technically exceeded capacity.

Table 2: Level of Service Criteria

Level of Service	Average Control Delay (seconds per vehicle)		Comment
	Signalized Intersection	Unsignalized Intersection	
A	10.0 or less	10.0 or less	Very good operation
B	10.1 to 20.0	10.1 to 15.0	Good operation
C	20.1 to 35.0	15.1 to 25.0	Acceptable operation
D	35.1 to 55.0	25.1 to 35.0	Congestion
E	55.1 to 80.0	35.1 to 50.0	Significant congestion
F	More than 80.0	More than 50.0	Unacceptable operation

Roundabout analysis was conducted using the RODEL software. When conducting the roundabout analysis, the LOS delay and v/c ratio estimates were conducted using HCM 2010.

The results of the post-development intersection analyses are summarized in **Table 3**. It should be noted that Intersection 46 has been altered to operates as a stop-condition in lieu of a roundabout. The results of the analysis indicate all study intersections are expected to operate at an acceptable LOS, v/c ratios and 95th Percentile Queues that are not expected to block adjacent intersections. Two intersections have been altered, as shown in **Figure 4**. The southbound to westbound bypass lane has been eliminated at the intersection of Walsh Drive and Métis Trail, while the right turn storage length on the southbound approach at Garry Drive and Métis Trail has been increased.

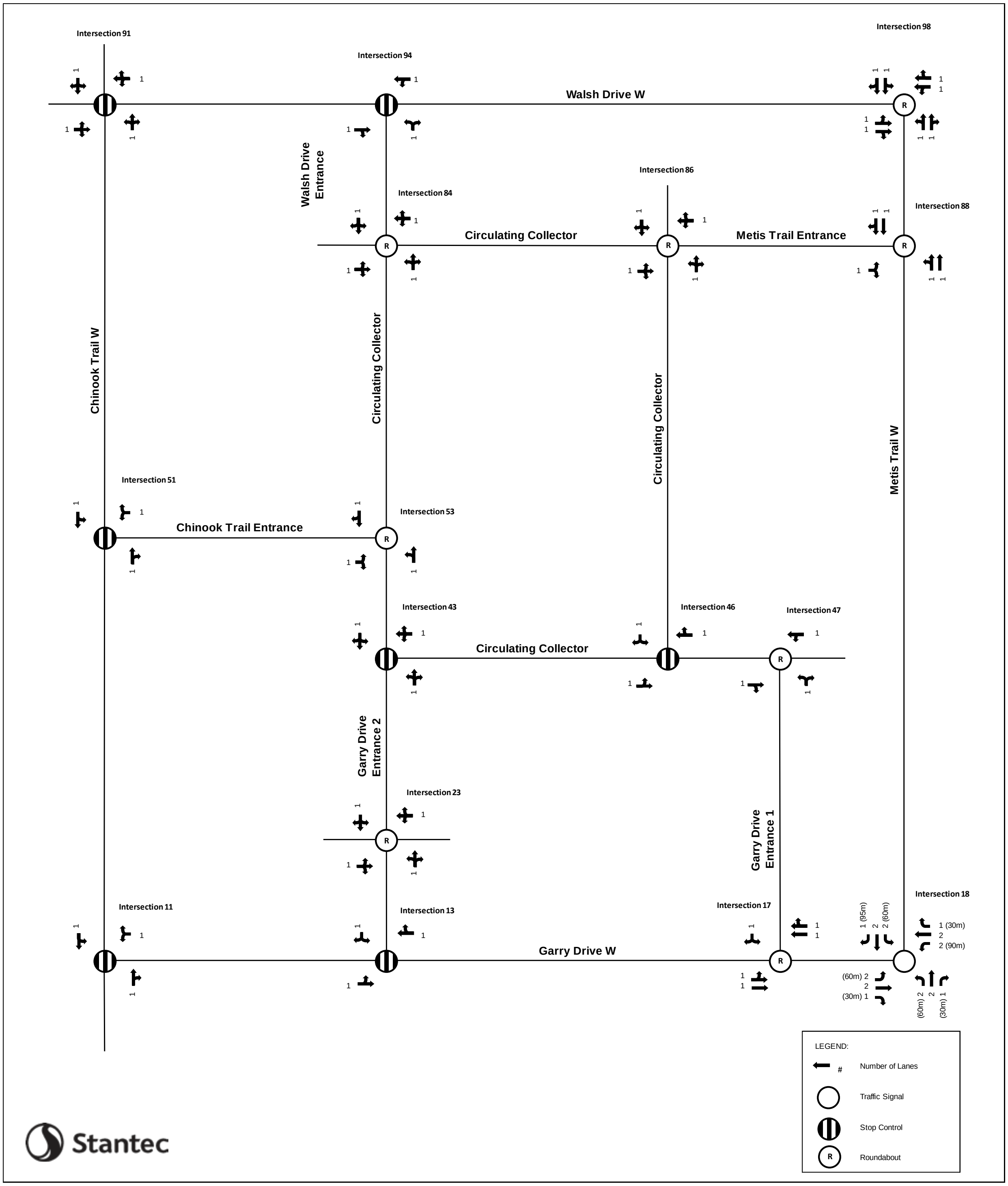
Table 3: Revised Full-Build Horizon (2031) Post-Development Operating Conditions

Intersection	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Garry Drive / Chinook Trail	Stop Control on Garry Drive	AM Peak Hour	Volumes (vph)				49		42		117	32	116	173		A
			Level of Service				B				A		A			
			V/C Ratio by Movement				0.217				-		0.101			
			95th Percentile Queue (veh)				0.8				-					
		PM Peak Hour	Volumes (vph)				42		142		203	50	85	285		B
			Level of Service				B				A		A			
			V/C Ratio by Movement				0.365				-		0.078			
			95th Percentile Queue (veh)				1.7				-		0.3			
Garry Drive / Metis Trail	Signals	AM Peak Hour	Volumes (vph)	292	718	220	327	260	175	81	414	558	173	247	128	C
			Level of Service	E	C	B	E	C	A	E	E	A	D	D	B	
			V/C Ratio by Movement	0.75	0.64	0.39	0.78	0.23	0.29	0.44	0.79	0.45	0.63	0.4	0.34	
			95th Percentile Queue (m)	52	110	42	58	37	15	19	70	0	35	45	23	
		PM Peak Hour	Volumes (vph)	208	470	144	553	754	319	244	439	534	227	450	361	D
			Level of Service	E	D	B	E	C	A	E	D	A	E	C	C	
			V/C Ratio by Movement	0.74	0.6	0.34	0.85	0.65	0.47	0.78	0.75	0.43	0.75	0.78	0.84	
			95th Percentile Queue (veh)	45	81	24	88	107	26	50	72	0	42	68	99	
Walsh Drive / Chinook Trail	Stop Control on Walsh Drive	AM Peak Hour	Volumes (vph)	20	0	10	63	4	35	10	145	199	25	125	20	A
			Level of Service	B			B			A			A			
			V/C Ratio by Movement	0.07			0.23			0.008			0.025			
			95th Percentile Queue (veh)	0.2			0.9			0			0.1			
		PM Peak Hour	Volumes (vph)	20	0	10	178	1	35	10	145	126	26	217	20	A
			Level of Service	B			C			A			A			
			V/C Ratio by Movement	0.077			0.574			0.009			0.024			
			95th Percentile Queue (veh)	0.2			3.5			0			0.1			
Walsh Drive / Metis Trail	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	84	253	71	133	71	179	53	546	262	89	241	25	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.227			0.19			0.411			0.175			
			95th Percentile Queue (veh)	1.1			1.24			2.94			0.82			
		PM Peak Hour	Volumes (vph)	57	190	35	447	209	113	185	406	149	298	639	61	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.179			0.473			0.448			0.499			
			95th Percentile Queue (veh)	0.83			4.87			3.43			4.26			
Garry Drive Entrance Road 1	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	6	963			361	106				267		14	A
			Level of Service	A				A					A			
			V/C Ratio by Movement	0.495				0.228					0.233			
			95th Percentile Queue (veh)	3.03				1.11					0.91			
		PM Peak Hour	Volumes (vph)	1072	287			15	647				178		9	A
			Level of Service	A				A					A			
			V/C Ratio by Movement	0.501				0.637					0.156			
			95th Percentile Queue (veh)	3.89				6.78					0.54			
Garry Drive Entrance Road 2	Stop Control on Entrance Road	AM Peak Hour	Volumes (vph)	5	143			80	77				218		11	A
			Level of Service	A				A					B			
			V/C Ratio by Movement	0.004				-					0.388			
			95th Percentile Queue (veh)	0				-					1.8			
		PM Peak Hour	Volumes (vph)	10	125			177	228				143		7	A
			Level of Service	A				A					C			
			V/C Ratio by Movement	0.011				-					0.327			
			95th Percentile Queue (veh)	0				-					1.4			
Chinook Trail Entrance Road	Stop Control on Entrance Road	AM Peak Hour	Volumes (vph)				132		108		174	49	41	157		A
			Level of Service				C				A		A			
			V/C Ratio by Movement				0.456				-		0.036			
			95th Percentile Queue (veh)				2.4				-		0.1			
		PM Peak Hour	Volumes (vph)				87		81		200	145	122	283		C
			Level of Service				D				A		A			
			V/C Ratio by Movement				0.52				-		0.122			
			95th Percentile Queue (veh)				2.9				-		0.4			
Walsh Drive Entrance Road	Stop Control on Entrance Road	AM Peak Hour	Volumes (vph)		210	14	65	84		18		198				A
			Level of Service		A		A			B						
			V/C Ratio by Movement		-		0.058			0.333						
			95th Percentile Queue (veh)		-		0.2			1.5						
		PM Peak Hour	Volumes (vph)		134	17	262	192		22		152				B
			Level of Service		A		A			B						
			V/C Ratio by Movement		-		0.217			0.323						
			95th Percentile Queue (veh)		-		0.8			1.4						
Metis Trail Entrance Road	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	120		147				53	828			401	47	A
			Level of Service	A						A				A		
			V/C Ratio by Movement	0.225						0.458				0.205		
			95th Percentile Queue (veh)	0.86						2.76				0.83		
		PM Peak Hour	Volumes (vph)	79		96				157	809			982	139	A
			Level of Service	A						B				A		
			V/C Ratio by Movement	0.152						0.698				0.505		
			95th Percentile Queue (veh)	0.53						11.44				3.43		
Intersection 23	Single Lane Roundabout	AM Peak Hour	Volumes (vph)	18	5	28	41	5	27	11	41	15	11	160	7	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.044			0.066			0.057			0.146			
			95th Percentile Queue (veh)	0.14			0.21			0.18			0.51			
		PM Peak Hour	Volumes (vph)	12	5	19	27	5	18	29	161	48	29	104	20	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.033			0.044			0.203			0.129			
			95th Percentile Queue (veh)	0.1			0.14			0.76			0.44			

Intersection 46	Stop Control on Southbound Road	AM Peak Hour	Volumes (vph)	8	23			8	33				45		3	A
			Level of Service	A				A					A			
			V/C Ratio by Movement	0.006				-					0.059			
			95th Percentile Queue (veh)	0				-					0.2			
		PM Peak Hour	Volumes (vph)	5	15			27	56				47		9	A
			Level of Service	A				A					A			
			V/C Ratio by Movement	0.004				-					0.07			
			95th Percentile Queue (veh)	0				-					0.2			
Intersection 47	Single Lane Roundabout	AM Peak Hour	Volumes (vph)		7	171	110	19		67		45				A
			Level of Service		A		A			A						
			V/C Ratio by Movement		0.152		0.107			0.098						
			95th Percentile Queue (veh)		0.53		0.35			0.32						
		PM Peak Hour	Volumes (vph)		74	12	22	114		186		116				A
			Level of Service		A		A			A						
			V/C Ratio by Movement		0.123		0.072			0.259						
			95th Percentile Queue (veh)		0.42		0.23			1.05						
Intersection 53	Single Lane Roundabout	AM Peak Hour	Volumes (vph)	18		44				94	26			72	36	A
			Level of Service	A						A				A		
			V/C Ratio by Movement	0.054						0.103				0.09		
			95th Percentile Queue (veh)	0.17						0.34				0.29		
		PM Peak Hour	Volumes (vph)	93		109				78	80			53	73	A
			Level of Service	A						A				A		
			V/C Ratio by Movement	0.174						0.134				0.109		
			95th Percentile Queue (veh)	0.62						0.46				0.36		
Intersection 84	Single Lane Roundabout	AM Peak Hour	Volumes (vph)	58	30	39	30	11	73	29	70	29	26	31	22	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.112			0.1			0.109			0.07			
			95th Percentile Queue (veh)	0.37			0.33			0.36			0.22			
		PM Peak Hour	Volumes (vph)	38	20	26	42	33	65	45	71	19	71	130	78	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.075			0.13			0.12			0.242			
			95th Percentile Queue (veh)	0.24			0.45			0.4			0.96			
Intersection 86	Single Lane Roundabout	AM Peak Hour	Volumes (vph)	7	103	9	48	44	11	13	5	135	31	5	8	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.102			0.087			0.134			0.039			
			95th Percentile Queue (veh)	0.33			0.28			0.46			0.12			
		PM Peak Hour	Volumes (vph)	9	70	20	142	128	33	25	5	89	20	5	9	A
			Level of Service	A			A			A			A			
			V/C Ratio by Movement	0.089			0.255			0.114			0.03			
			95th Percentile Queue (veh)	0.29			1.02			0.39			0.09			
Intersection 43	Stop Control on East Leg	AM Peak Hour	Volumes (vph)				39		45		77	14	18	116		A
			Level of Service				B				A		A			
			V/C Ratio by Movement				0.119				-		0.014			
			95th Percentile Queue (veh)				0.4				-		0			
		PM Peak Hour	Volumes (vph)				25		30		126	44	49	116		A
			Level of Service				B				A		A			
			V/C Ratio by Movement				0.091				-		0.041			
			95th Percentile Queue (veh)				0.3				-		0.1			

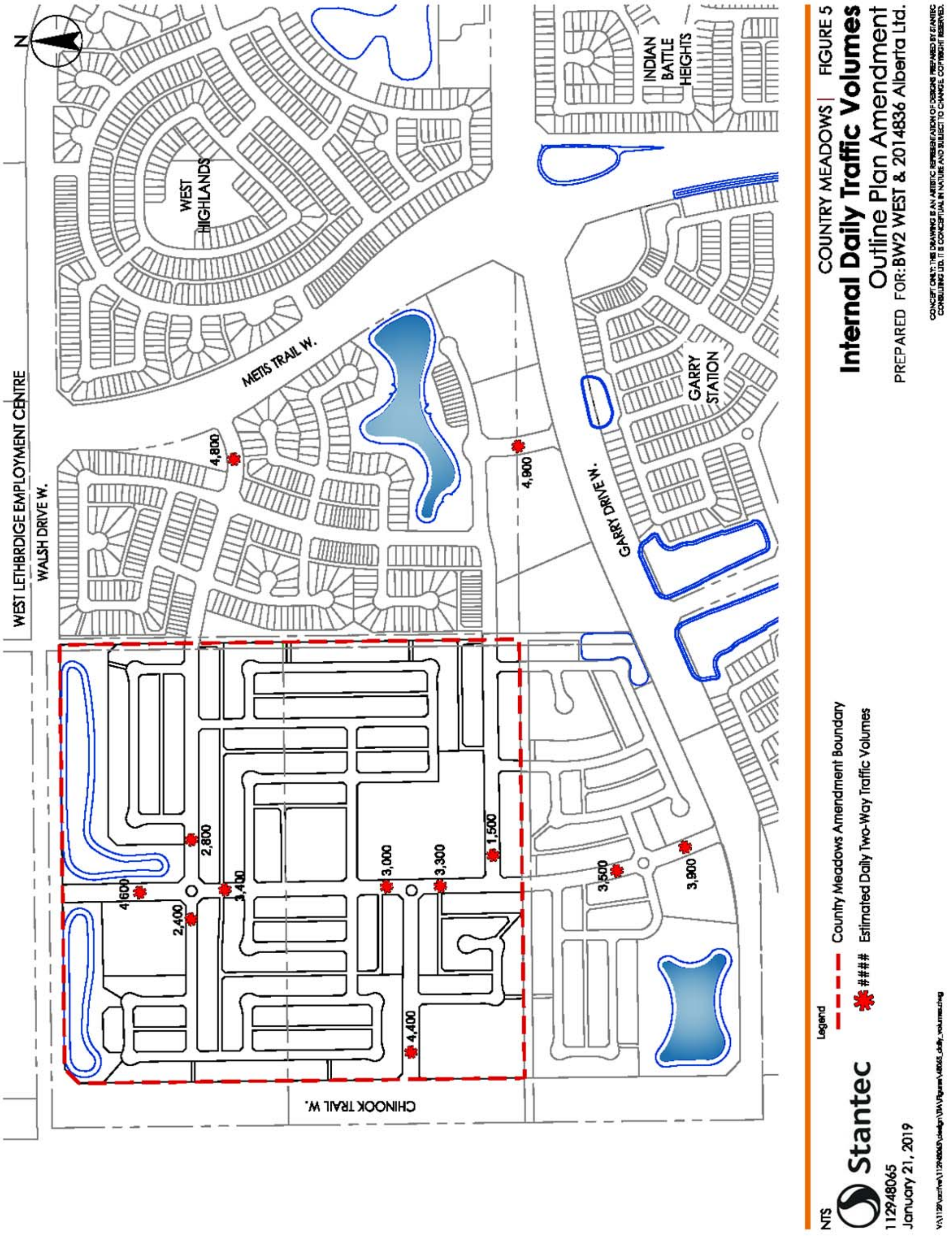
Roadway Classifications

As a result of the changes in roadway layout and traffic volumes, roadway classifications were re-visited to determine suitability for the amended conditions. Updated estimated internal daily traffic volumes are illustrated in **Figure 5**, while internal road network classifications are shown in **Figure 6**.



BW2 WEST / 2014836 Alberta Ltd.
COUNTRY MEADOWS
OUTLINE PLAN AMENDMENT

Figure 4
Revised Full-Build Post-Development Traffic Volumes
Recommended Lane Configurations


N
WEST LETHBRIDGE EMPLOYMENT CENTRE
WALSH DRIVE W.
WEST HIGHLANDS
METIS TRAIL W.
INDIAN BATTLE HEIGHTS
GARRY STATION
GARRY DRIVE W.
CHINOOK TRAIL W.
4,800
4,900
2,800
3,400
3,000
3,300
1,500
3,500
3,900
4600
2,400
4,400
Legend
Country Meadows Amendment Boundary
Estimated Daily Two-Way Traffic Volumes
NTS
Stantec
112948065
January 21, 2019
COUNTRY MEADOWS | FIGURE 5
Internal Daily Traffic Volumes
Outline Plan Amendment
PREPARED FOR: BW2 WEST & 2014836 Alberta Ltd.
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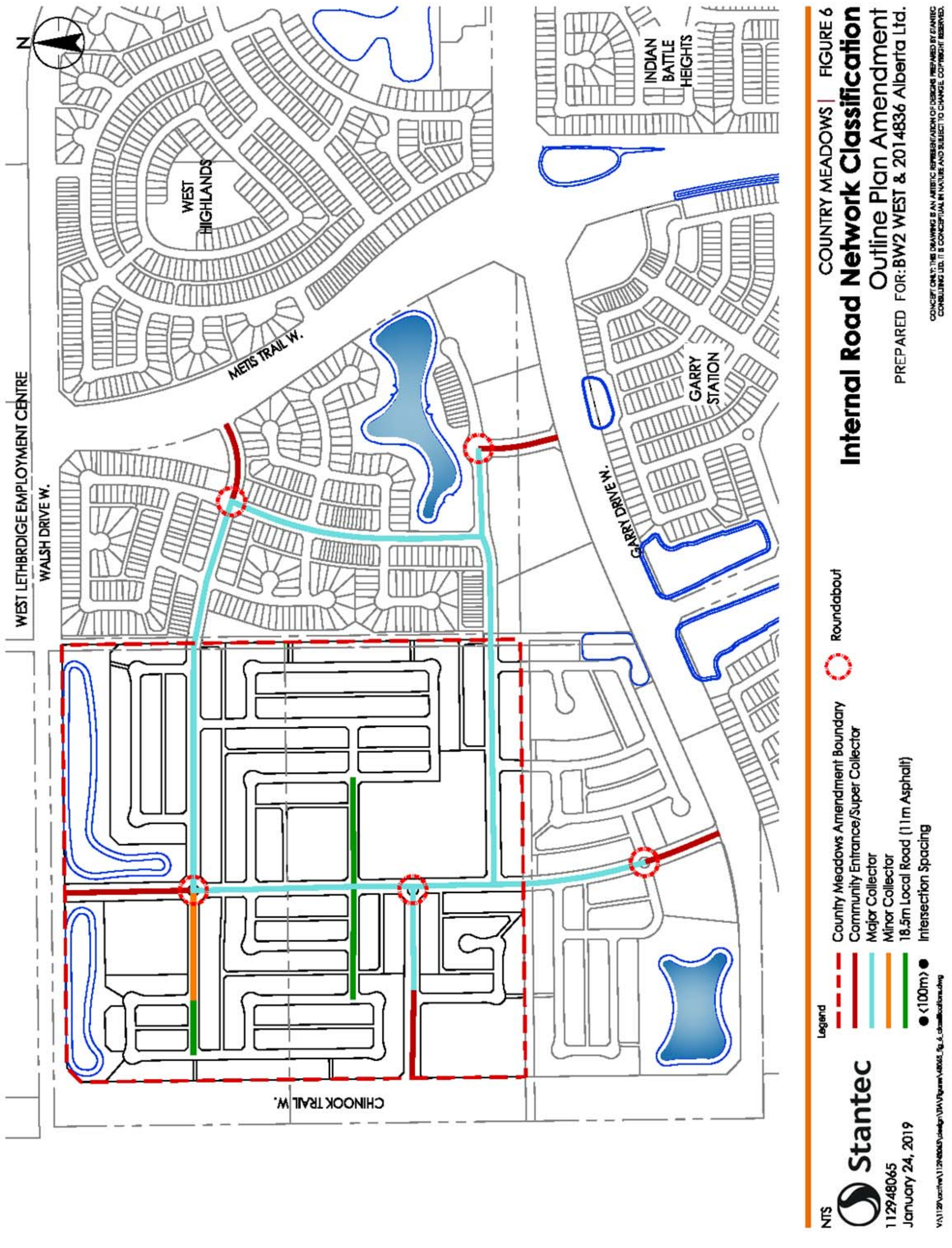
Reference: Country Meadows Outline Plan Amendment: Transportation Impact Assessment

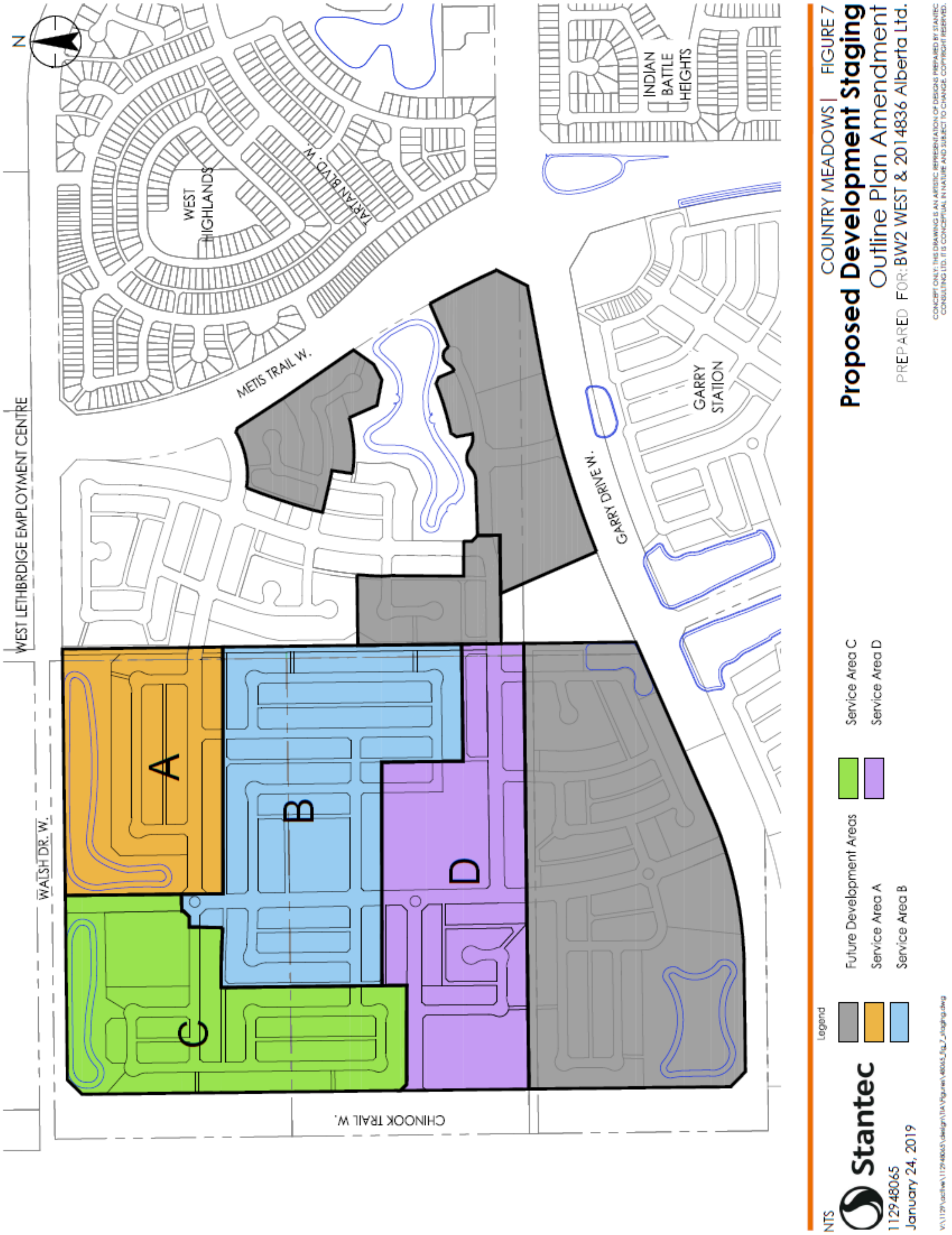


Entrance Road Staging

Estimated daily traffic volumes for each stage of construction were reviewed to assess the timing of construction for each additional access to the development. Currently, the only access road constructed is the Métis Trail access, with a current build-out of 263 single family dwelling units. A second access will need to be constructed upon opening Stages A, B and C, namely the Walsh Drive access point. These two accesses are anticipated to operate acceptably upon the opening of Stage D. **Table 4** outlines the dwelling units and estimated vehicle trips, while **Figure 7** depicts the stages of construction.

Table 4: Anticipated Access Requirements for Staging

Stage	Dwelling Units		Vehicle Trips Per Day	Capacity	Comment
	Single Family	Multi Family			
Existing	263	0	2,860	8,000	
Existing + A	383	0	3,900	8,000	
Existing + A + B	643	95	7,420	8,000	
Existing + A + B + C	816	228	10,400	8,000	Walsh Drive access required
Existing + A + B + C + D	930	397	13,110	16,000	


N
WEST LETHBRIDGE EMPLOYMENT CENTRE
WEST HIGHLANDS
TARTAN BLVD. W.
INDIAN BATTLE HEIGHTS
METIS TRAIL W.
GARRY STATION
GARRY DRIVE W.
WALSH DR. W.
CHINOOK TRAIL W.
A
B
C
D
NTS
Stantec
112948065
January 24, 2019
Legend
Future Development Areas
Service Area A
Service Area B
Service Area C
Service Area D
COUNTRY MEADOWS | FIGURE 7
Proposed Development Staging
Outline Plan Amendment
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Conclusions

The proposed land use revision is expected to result in and additional 137 low-density residential units and a decrease of 88 medium-density residential units within the Country Meadows community. The results of the transportation impact analysis indicate the additional units will have minimal impact to the anticipated operations of surrounding internal intersections and broader external intersections. With minor alterations, the intersection geometries and traffic control measures previously assumed as part of the Country Meadows TIA are expected to be adequate to accommodate the proposed land use revisions.

Stantec Consulting Ltd.

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ANGELA FORSYTH
24 JAN 2019

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Transportation Engineer

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Attachment: Synchro Outputs
Rodel Outputs

c. Brad Schmidtke, Stantec

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	49	42	177	32	116	173
Future Vol, veh/h	49	42	177	32	116	173
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	56	48	201	36	132	197

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	690	229	0	0	242	0
Stage 1	224	-	-	-	-	-
Stage 2	466	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	406	803	-	-	1307	-
Stage 1	806	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	355	794	-	-	1300	-
Mov Cap-2 Maneuver	355	-	-	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	621	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	3.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	477	1300	-
HCM Lane V/C Ratio	-	-	0.217	0.101	-
HCM Control Delay (s)	-	-	14.6	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.3	-

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↲↳	
Traffic Vol, veh/h	5	143	80	77	218	11
Future Vol, veh/h	5	143	80	77	218	11
Conflicting Peds, #/hr	5	0	0	5	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	6	163	91	88	248	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	184	0	-	0	320	145
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	180	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1373	-	-	-	673	902
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	851	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1365	-	-	-	662	892
Mov Cap-2 Maneuver	-	-	-	-	662	-
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	846	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1365	-	-	-	670
HCM Lane V/C Ratio	0.004	-	-	-	0.388
HCM Control Delay (s)	7.6	0	-	-	13.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.8

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Garry Drive Entrance 1	0	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Garry Drive	90	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Garry Drive	270	0	7.00	2	8.50	2	20.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Garry Drive Entrance 1	60.00	10.00	2	5.00	1	4.00	1
2	Garry Drive	60.00	5.00	1	10.00	2	7.00	2
3	Garry Drive	60.00	5.00	1	10.00	2	7.00	2

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Garry Drive Entrance 1	None	281		6		1324	1205		0.2332	
2	Garry Drive	None	467		267		20	2053		0.2275	
3	Garry Drive	None	969		361		373	1959		0.4946	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Garry Drive Entrance 1	None	3.78		3.78	0.91		A		A
2	Garry Drive	None	2.75		2.75	1.11		A		A
3	Garry Drive	None	3.40		3.40	3.03		A		A

Country Meadows TIA - Full Build Post- Development Traffic Volumes
18: Metis Trail & Garry Drive

AM Peak
12/18/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Traffic Volume (vph)	292	718	220	327	260	175	81	414	558	173	247	128
Future Volume (vph)	292	718	220	327	260	175	81	414	558	173	247	128
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3038	3202	1432	3038	3202	1432	3038	3202	1432	3038	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3038	3202	1404	3038	3202	1404	3038	3202	1413	3038	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			132			199			381			145
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	332	816	250	372	295	199	92	470	634	197	281	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	332	816	250	372	295	199	92	470	634	197	281	145
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.0			7.0			7.0			7.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.13	1.10	1.10	1.13	1.10	1.10	1.13	1.10	1.10	1.13	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												

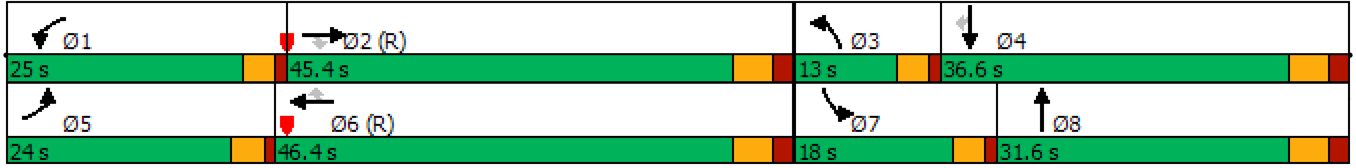
18: Metis Trail & Garry Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	24.0	45.4	45.4	25.0	46.4	46.4	13.0	31.6		18.0	36.6	36.6
Total Split (%)	20.0%	37.8%	37.8%	20.8%	38.7%	38.7%	10.8%	26.3%		15.0%	30.5%	30.5%
Maximum Green (s)	20.0	39.9	39.9	21.0	40.9	40.9	9.0	26.1		14.0	31.1	31.1
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	17.6	47.5	47.5	18.9	48.8	48.8	8.3	22.2	120.0	12.4	26.3	26.3
Actuated g/C Ratio	0.15	0.40	0.40	0.16	0.41	0.41	0.07	0.18	1.00	0.10	0.22	0.22
v/c Ratio	0.75	0.64	0.39	0.78	0.23	0.29	0.44	0.79	0.45	0.63	0.40	0.34
Control Delay	59.8	34.0	15.5	60.1	25.6	5.0	60.2	56.8	1.0	53.4	47.4	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.8	34.0	15.5	60.1	25.6	5.0	60.2	56.8	1.0	53.4	47.4	18.4
LOS	E	C	B	E	C	A	E	E	A	D	D	B
Approach Delay		36.8			35.7			27.5			42.6	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	38.8	83.2	18.6	43.5	24.1	0.0	10.8	55.8	0.0	22.9	34.6	5.7
Queue Length 95th (m)	52.0	110.2	42.0	57.6	36.7	14.5	18.9	69.8	0.0	35.3	44.9	22.9
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Base Capacity (vph)	507	1266	635	535	1302	689	229	696	1413	356	829	471
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.64	0.39	0.70	0.23	0.29	0.40	0.68	0.45	0.55	0.34	0.31

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 34.7 Intersection LOS: C
Intersection Capacity Utilization 66.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 18: Metis Trail & Garry Drive



Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Garry Drive Entrance 2	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Intersection 23 (East Leg)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Garry Drive Entrance 2	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Intersection 84 (West Leg)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Garry Drive Entrance 2	40.00	5.00	1	5.00	1	4.50	1
2	Intersection 23 (East Leg)	40.00	5.00	1	5.00	1	4.00	1
3	Garry Drive Entrance 2	40.00	5.00	1	5.00	1	4.00	1
4	Intersection 84 (West Leg)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Garry Drive Entrance 2	None	174		34		110	1189		0.1463	
2	Intersection 23 (East Leg)	None	73		185		23	1106		0.0660	
3	Garry Drive Entrance 2	None	67		53		205	1178		0.0569	
4	Intersection 84 (West Leg)	None	51		93		27	1157		0.0441	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Garry Drive Entrance 2	None	3.45		3.45	0.51		A		A
2	Intersection 23 (East Leg)	None	3.40		3.40	0.21		A		A
3	Garry Drive Entrance 2	None	3.15		3.15	0.18		A		A
4	Intersection 84 (West Leg)	None	3.17		3.17	0.14		A		A

43: Garry Drive Entrance 2 & Circulating Collector (South Section)

12/18/2018

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	39	45	77	14	18	116
Future Vol, veh/h	39	45	77	14	18	116
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	51	88	16	20	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	278	106	0	0	109	0
Stage 1	101	-	-	-	-	-
Stage 2	177	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	712	948	-	-	1481	-
Stage 1	923	-	-	-	-	-
Stage 2	854	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	693	937	-	-	1473	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	849	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	10.1		0		1	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	805	1473	-
HCM Lane V/C Ratio	-	-	0.119	0.014	-
HCM Control Delay (s)	-	-	10.1	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

46: Circulating Collector (South Section) & Circulating Collector (East Section)

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	8	23	8	33	45	3
Future Vol, veh/h	8	23	8	33	45	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	9	26	9	38	51	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	47	0	-	0	72	28
Stage 1	-	-	-	-	28	-
Stage 2	-	-	-	-	44	-
Critical Hdwy	4.15	-	-	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	2.245	-	-	-	3.545	3.345
Pot Cap-1 Maneuver	1541	-	-	-	925	1039
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	971	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1541	-	-	-	919	1039
Mov Cap-2 Maneuver	-	-	-	-	919	-
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	971	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1541	-	-	-	926
HCM Lane V/C Ratio	0.006	-	-	-	0.059
HCM Control Delay (s)	7.3	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Intersection 47 (East Leg)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Garry Drive Entrance 1	180	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Intersection 47 (West Leg)	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Intersection 47 (East Leg)	40.00	5.00	1	5.00	1	4.00	1
2	Garry Drive Entrance 1	40.00	5.00	1	5.00	1	4.00	1
3	Intersection 47 (West Leg)	40.00	5.00	1	5.00	1	4.00	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Intersection 47 (East Leg)	None	129		7		238	1203		0.1072	
2	Garry Drive Entrance 1	None	112		110		26	1147		0.0977	
3	Intersection 47 (West Leg)	None	178		67		155	1170		0.1521	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Intersection 47 (East Leg)	None	3.26		3.26	0.35		A		A
2	Garry Drive Entrance 1	None	3.39		3.39	0.32		A		A
3	Intersection 47 (West Leg)	None	3.53		3.53	0.53		A		A

Intersection	
Int Delay, s/veh	6.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	132	108	174	49	41	157
Future Vol, veh/h	132	108	174	49	41	157
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	5	5	5	5
Mvmt Flow	150	123	198	56	47	178

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	508	236	0	0	259	0
Stage 1	231	-	-	-	-	-
Stage 2	277	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	525	803	-	-	1288	-
Stage 1	807	-	-	-	-	-
Stage 2	770	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	498	794	-	-	1281	-
Mov Cap-2 Maneuver	498	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	765	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	1.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	598	1281	-
HCM Lane V/C Ratio	-	-	0.456	0.036	-
HCM Control Delay (s)	-	-	16	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.4	0.1	-

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Circulating Collector (West Section)	0	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Circulating Collector (West Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Chinook Trail Entrance	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
2	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
3	Chinook Trail Entrance	40.00	5.00	1	5.00	1	4.00	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Circulating Collector (West Section)	None	108		18		138	1197		0.0902	
2	Circulating Collector (West Section)	None	120		72		54	1168		0.1028	
3	Chinook Trail Entrance	None	62		94		98	1156		0.0537	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Circulating Collector (West Section)	None	3.22		3.22	0.29		A		A
2	Circulating Collector (West Section)	None	3.34		3.34	0.34		A		A
3	Chinook Trail Entrance	None	3.21		3.21	0.17		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Walsh Drive Entrance	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Circulating Collector (North Section)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Circulating Collector (West Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Intersection 84 (West Leg)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Walsh Drive Entrance	40.00	5.00	1	5.00	1	4.50	1
2	Circulating Collector (North Section)	40.00	5.00	1	5.00	1	4.00	1
3	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
4	Intersection 84 (West Leg)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Walsh Drive Entrance	None	79		117		139	1144		0.0691	
2	Circulating Collector (North Section)	None	114		115		81	1144		0.0996	
3	Circulating Collector (West Section)	None	128		67		162	1170		0.1094	
4	Intersection 84 (West Leg)	None	127		129		66	1137		0.1117	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Walsh Drive Entrance	None	3.29		3.29	0.22		A		A
2	Circulating Collector (North Section)	None	3.40		3.40	0.33		A		A
3	Circulating Collector (West Section)	None	3.36		3.36	0.36		A		A
4	Intersection 84 (West Leg)	None	3.47		3.47	0.37		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Intersection 86 (North Leg)	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Metis Trail Entrance	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Circulating Collector (East Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Circulating Collector (Norht Section)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Intersection 86 (North Leg)	40.00	5.00	1	5.00	1	4.50	1
2	Metis Trail Entrance	40.00	5.00	1	5.00	1	4.00	1
3	Circulating Collector (East Section)	40.00	5.00	1	5.00	1	4.00	1
4	Circulating Collector (Norht Section)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Intersection 86 (North Leg)	None	44		123		62	1140		0.0386	
2	Metis Trail Entrance	None	103		43		124	1183		0.0870	
3	Circulating Collector (East Section)	None	153		123		23	1140		0.1342	
4	Circulating Collector (Norht Section)	None	119		66		210	1171		0.1016	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Intersection 86 (North Leg)	None	3.20		3.20	0.12		A		A
2	Metis Trail Entrance	None	3.24		3.24	0.28		A		A
3	Circulating Collector (East Section)	None	3.55		3.55	0.46		A		A
4	Circulating Collector (Norht Section)	None	3.33		3.33	0.33		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Metis Trail	0	0	7.00	2	8.50	2	20.00	30.00	30.00
2	Metis Trail	180	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Metis Trail Entrance	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Metis Trail	60.00	5.00	1	10.00	2	7.00	2
2	Metis Trail	60.00	5.00	1	10.00	2	7.00	2
3	Metis Trail Entrance	60.00	10.00	2	5.00	1	4.00	1

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Metis Trail	None	448		120		200	2185		0.2050	
2	Metis Trail	None	881		401		167	1922		0.4584	
3	Metis Trail Entrance	None	267		53		1229	1188		0.2247	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Metis Trail	None	2.17		2.17	0.83		A		A
2	Metis Trail	None	3.43		3.43	2.76		A		A
3	Metis Trail Entrance	None	3.80		3.80	0.86		A		A

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	20	0	10	63	4	35	10	145	199	25	125	20
Future Vol, veh/h	20	0	10	63	4	35	10	145	199	25	125	20
Conflicting Peds, #/hr	5	0	5	5	0	5	5	0	5	5	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	23	0	11	72	5	40	11	165	226	28	142	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	543	633	164	525	531	288	170	0	0	396	0	0
Stage 1	215	215	-	305	305	-	-	-	-	-	-	-
Stage 2	328	418	-	220	226	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	446	393	873	458	450	744	1389	-	-	1146	-	-
Stage 1	780	719	-	698	657	-	-	-	-	-	-	-
Stage 2	679	585	-	776	711	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	402	374	863	434	428	736	1381	-	-	1140	-	-
Mov Cap-2 Maneuver	402	374	-	434	428	-	-	-	-	-	-	-
Stage 1	767	695	-	686	646	-	-	-	-	-	-	-
Stage 2	627	575	-	741	688	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.9	14.2	0.2	1.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1381	-	-	489	505	1140	-	-
HCM Lane V/C Ratio	0.008	-	-	0.07	0.23	0.025	-	-
HCM Control Delay (s)	7.6	0	-	12.9	14.2	8.2	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.9	0.1	-	-

94: Walsh Drive Entrance & Walsh Drive

Intersection	
Int Delay, s/veh	5.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⅄	
Traffic Vol, veh/h	210	14	65	84	18	198
Future Vol, veh/h	210	14	65	84	18	198
Conflicting Peds, #/hr	0	5	5	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	239	16	74	95	20	225

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	260	0	500	257
Stage 1	-	-	-	-	252	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1287	-	530	782
Stage 1	-	-	-	-	790	-
Stage 2	-	-	-	-	793	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1280	-	492	773
Mov Cap-2 Maneuver	-	-	-	-	492	-
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	788	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1280	-
HCM Lane V/C Ratio	0.333	-	-	0.058	-
HCM Control Delay (s)	12.3	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1.5	-	-	0.2	-

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Metis Trail	0	0	7.00	2	8.50	2	20.00	30.00	30.00
2	Walsh Drive	90	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Metis Trail	180	0	7.00	2	8.50	2	20.00	30.00	30.00
4	Walsh Drive	270	0	7.00	2	8.50	2	20.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Metis Trail	60.00	10.00	2	8.50	2	7.00	2
2	Walsh Drive	60.00	10.00	2	8.50	2	7.00	2
3	Metis Trail	60.00	10.00	2	8.50	2	7.00	2
4	Walsh Drive	60.00	10.00	2	8.50	2	7.00	2

Operational Results

2031 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Metis Trail	None	355		390		750	2031		0.1748	
2	Walsh Drive	None	383		414		331	2015		0.1901	
3	Metis Trail	None	861		293		504	2096		0.4107	
4	Walsh Drive	None	408		732		422	1802		0.2265	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Metis Trail	None	2.70		2.70	0.82		A		A
2	Walsh Drive	None	3.88		3.88	1.27		A		A
3	Metis Trail	None	3.89		3.89	2.94		A		A
4	Walsh Drive	None	3.07		3.07	1.10		A		A

Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱			↰↑
Traffic Vol, veh/h	42	142	203	50	85	285
Future Vol, veh/h	42	142	203	50	85	285
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	48	161	231	57	97	324

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	788	270	0	0	293	0
Stage 1	265	-	-	-	-	-
Stage 2	523	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	356	761	-	-	1252	-
Stage 1	772	-	-	-	-	-
Stage 2	589	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	318	752	-	-	1245	-
Mov Cap-2 Maneuver	318	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	585	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.8	0	1.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	573	1245	-
HCM Lane V/C Ratio	-	-	0.365	0.078	-
HCM Control Delay (s)	-	-	14.8	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.7	0.3	-

13: Garry Drive & Garry Drive Entrance 2

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	10	125	177	228	143	7
Future Vol, veh/h	10	125	177	228	143	7
Conflicting Peds, #/hr	5	0	0	5	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	11	142	201	259	163	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	465	0	-	0	505	341
Stage 1	-	-	-	-	336	-
Stage 2	-	-	-	-	169	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1081	-	-	-	527	701
Stage 1	-	-	-	-	724	-
Stage 2	-	-	-	-	861	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1075	-	-	-	515	693
Mov Cap-2 Maneuver	-	-	-	-	515	-
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	856	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1075	-	-	-	521
HCM Lane V/C Ratio	0.011	-	-	-	0.327
HCM Control Delay (s)	8.4	0	-	-	15.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	1.4

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Garry Drive Entrance 1	0	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Garry Drive	90	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Garry Drive	270	0	7.00	2	8.50	2	20.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Garry Drive Entrance 1	60.00	10.00	2	5.00	1	4.00	1
2	Garry Drive	60.00	5.00	1	10.00	2	7.00	2
3	Garry Drive	60.00	5.00	1	10.00	2	7.00	2

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Garry Drive Entrance 1	None	187		15		1719	1202		0.1556	
2	Garry Drive	None	1359		178		24	2133		0.6371	
3	Garry Drive	None	662		1072		465	1301		0.5088	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Garry Drive Entrance 1	None	3.45		3.45	0.54		A		A
2	Garry Drive	None	5.39		5.39	6.78		A		A
3	Garry Drive	None	5.68		5.68	3.89		A		A

Country Meadows TIA - Full Build Post- Development Traffic Volumes
18: Metis Trail & Garry Drive

PM Peak
12/18/2018

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Traffic Volume (vph)	208	470	144	553	754	319	244	439	534	227	450	361
Future Volume (vph)	208	470	144	553	754	319	244	439	534	227	450	361
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3038	3202	1432	3038	3202	1432	3038	3202	1432	3038	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3038	3202	1404	3038	3202	1404	3038	3202	1413	3038	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			132			321			343			233
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		379.0			226.3			790.4			606.3	
Travel Time (s)		22.7			13.6			47.4			36.4	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	236	534	164	628	857	363	277	499	607	258	511	410
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	534	164	628	857	363	277	499	607	258	511	410
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.0			7.0			7.0			7.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.13	1.10	1.10	1.13	1.10	1.10	1.13	1.10	1.10	1.13	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	8.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	6.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	16.0	31.0	31.0	37.0	52.0	52.0	18.0	34.0		18.0	34.0	34.0
Total Split (%)	13.3%	25.8%	25.8%	30.8%	43.3%	43.3%	15.0%	28.3%		15.0%	28.3%	28.3%
Maximum Green (s)	12.0	25.5	25.5	33.0	46.5	46.5	14.0	28.5		14.0	28.5	28.5
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	12.5	33.2	33.2	29.1	49.7	49.7	14.1	25.1	120.0	13.7	24.6	24.6
Actuated g/C Ratio	0.10	0.28	0.28	0.24	0.41	0.41	0.12	0.21	1.00	0.11	0.20	0.20
v/c Ratio	0.74	0.60	0.34	0.85	0.65	0.47	0.78	0.75	0.43	0.75	0.78	0.87
Control Delay	67.2	43.1	12.6	55.2	31.8	6.6	66.8	51.6	1.0	61.3	33.8	33.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.2	43.1	12.6	55.2	31.8	6.6	66.8	51.6	1.0	61.3	33.8	33.2
LOS	E	D	B	E	C	A	E	D	A	E	C	C
Approach Delay		43.8			34.8			32.4			39.6	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	27.6	59.8	5.8	72.6	89.7	6.3	32.4	58.0	0.0	32.4	63.1	46.9
Queue Length 95th (m)	#44.7	80.7	23.8	88.0	107.0	26.1	#50.2	72.4	0.0	m42.4	m67.8	m99.5
Internal Link Dist (m)		355.0			202.3			766.4			582.3	
Turn Bay Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Base Capacity (vph)	323	884	483	835	1334	772	368	760	1413	362	760	511
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.60	0.34	0.75	0.64	0.47	0.75	0.66	0.43	0.71	0.67	0.80

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 36.8 Intersection LOS: D

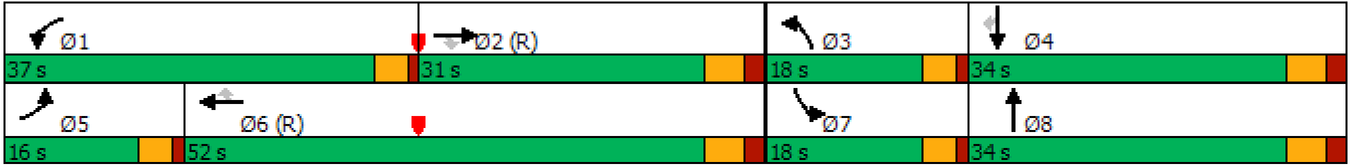
Intersection Capacity Utilization 74.1% ICU Level of Service D

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: Metis Trail & Garry Drive



Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Garry Drive Entrance 2	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Intersection 23 (East Leg)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Garry Drive Entrance 2	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Intersection 84 (West Leg)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Garry Drive Entrance 2	40.00	5.00	1	5.00	1	4.50	1
2	Intersection 23 (East Leg)	40.00	5.00	1	5.00	1	4.00	1
3	Garry Drive Entrance 2	40.00	5.00	1	5.00	1	4.00	1
4	Intersection 84 (West Leg)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Garry Drive Entrance 2	None	153		46		207	1182		0.1294	
2	Intersection 23 (East Leg)	None	50		145		54	1128		0.0443	
3	Garry Drive Entrance 2	None	238		61		134	1174		0.2028	
4	Intersection 84 (West Leg)	None	36		217		82	1089		0.0331	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Garry Drive Entrance 2	None	3.40		3.40	0.44		A		A
2	Intersection 23 (East Leg)	None	3.25		3.25	0.14		A		A
3	Garry Drive Entrance 2	None	3.74		3.74	0.76		A		A
4	Intersection 84 (West Leg)	None	3.33		3.33	0.10		A		A

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	25	30	126	44	49	116
Future Vol, veh/h	25	30	126	44	49	116
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	34	143	50	56	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	422	178	0	0	198	0
Stage 1	173	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	588	865	-	-	1375	-
Stage 1	857	-	-	-	-	-
Stage 2	792	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	556	855	-	-	1367	-
Mov Cap-2 Maneuver	556	-	-	-	-	-
Stage 1	814	-	-	-	-	-
Stage 2	787	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	2.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	687	1367	-
HCM Lane V/C Ratio	-	-	0.091	0.041	-
HCM Control Delay (s)	-	-	10.8	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Country Meadows TIA - Full Build Post- Development Traffic Volumes
46: Circulating Collector (South Section) & Circulating Collector (East Section)

PM Peak
01/14/2019

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Traffic Vol, veh/h	5	15	27	56	47	9
Future Vol, veh/h	5	15	27	56	47	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	6	17	31	64	53	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	95	0	-	0	92	63
Stage 1	-	-	-	-	63	-
Stage 2	-	-	-	-	29	-
Critical Hdwy	4.15	-	-	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	2.245	-	-	-	3.545	3.345
Pot Cap-1 Maneuver	1480	-	-	-	901	993
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	986	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1480	-	-	-	897	993
Mov Cap-2 Maneuver	-	-	-	-	897	-
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	986	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1480	-	-	-	911
HCM Lane V/C Ratio	0.004	-	-	-	0.07
HCM Control Delay (s)	7.4	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Intersection 47 (East Leg)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Garry Drive Entrance 1	180	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Intersection 47 (West Leg)	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Intersection 47 (East Leg)	40.00	5.00	1	5.00	1	4.00	1
2	Garry Drive Entrance 1	40.00	5.00	1	5.00	1	4.00	1
3	Intersection 47 (West Leg)	40.00	5.00	1	5.00	1	4.00	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Intersection 47 (East Leg)	None	86		22		300	1195		0.0720	
2	Garry Drive Entrance 1	None	302		74		34	1167		0.2589	
3	Intersection 47 (West Leg)	None	136		186		190	1105		0.1231	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Intersection 47 (East Leg)	None	3.16		3.16	0.23		A		A
2	Garry Drive Entrance 1	None	4.05		4.05	1.05		A		A
3	Intersection 47 (West Leg)	None	3.62		3.62	0.42		A		A

51: Chinook Trail & Chinook Trail Entrance

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	87	81	200	145	122	283
Future Vol, veh/h	87	81	200	145	122	283
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	5	5	5	5
Mvmt Flow	99	92	227	165	139	322

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	920	320	0	0	397	0
Stage 1	315	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	301	721	-	-	1145	-
Stage 1	740	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	253	713	-	-	1139	-
Mov Cap-2 Maneuver	253	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	542	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25	0	2.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	367	1139	-
HCM Lane V/C Ratio	-	-	0.52	0.122	-
HCM Control Delay (s)	-	-	25	8.6	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	2.9	0.4	-

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Circulating Collector (West Section)	0	0	4.00	1	5.00	1	10.00	30.00	30.00
2	Circulating Collector (West Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Chinook Trail Entrance	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
2	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
3	Chinook Trail Entrance	40.00	5.00	1	5.00	1	4.00	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Circulating Collector (West Section)	None	126		93		187	1156		0.1090	
2	Circulating Collector (West Section)	None	158		53		166	1178		0.1341	
3	Chinook Trail Entrance	None	202		78		133	1164		0.1735	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Circulating Collector (West Section)	None	3.40		3.40	0.36		A		A
2	Circulating Collector (West Section)	None	3.43		3.43	0.46		A		A
3	Chinook Trail Entrance	None	3.64		3.64	0.62		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Walsh Drive Entrance	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Circulating Collector (North Section)	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Circulating Collector (West Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Intersection 84 (West Leg)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Walsh Drive Entrance	40.00	5.00	1	5.00	1	4.50	1
2	Circulating Collector (North Section)	40.00	5.00	1	5.00	1	4.00	1
3	Circulating Collector (West Section)	40.00	5.00	1	5.00	1	4.00	1
4	Intersection 84 (West Leg)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Walsh Drive Entrance	None	279		103		139	1151		0.2423	
2	Circulating Collector (North Section)	None	140		239		143	1076		0.1301	
3	Circulating Collector (West Section)	None	135		146		233	1127		0.1198	
4	Intersection 84 (West Leg)	None	84		158		123	1121		0.0749	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Walsh Drive Entrance	None	4.01		4.01	0.96		A		A
2	Circulating Collector (North Section)	None	3.75		3.75	0.45		A		A
3	Circulating Collector (West Section)	None	3.53		3.53	0.40		A		A
4	Intersection 84 (West Leg)	None	3.38		3.38	0.24		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Intersection 86 (North Leg)	0	0	4.50	1	5.00	1	10.00	30.00	30.00
2	Metis Trail Entrance	90	0	4.00	1	5.00	1	10.00	30.00	30.00
3	Circulating Collector (East Section)	180	0	4.00	1	5.00	1	10.00	30.00	30.00
4	Circulating Collector (Norht Section)	270	0	4.50	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Intersection 86 (North Leg)	40.00	5.00	1	5.00	1	4.50	1
2	Metis Trail Entrance	40.00	5.00	1	5.00	1	4.00	1
3	Circulating Collector (East Section)	40.00	5.00	1	5.00	1	4.00	1
4	Circulating Collector (Norht Section)	40.00	5.00	1	5.00	1	4.50	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Intersection 86 (North Leg)	None	34		104		167	1151		0.0295	
2	Metis Trail Entrance	None	303		34		104	1188		0.2550	
3	Circulating Collector (East Section)	None	119		290		47	1048		0.1135	
4	Circulating Collector (Norht Section)	None	99		172		237	1113		0.0889	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Intersection 86 (North Leg)	None	3.14		3.14	0.09		A		A
2	Metis Trail Entrance	None	3.95		3.95	1.02		A		A
3	Circulating Collector (East Section)	None	3.78		3.78	0.39		A		A
4	Circulating Collector (Norht Section)	None	3.46		3.46	0.29		A		A

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Metis Trail	0	0	7.00	2	8.50	2	20.00	30.00	30.00
2	Metis Trail	180	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Metis Trail Entrance	270	0	4.00	1	5.00	1	10.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Metis Trail	60.00	5.00	1	10.00	2	7.00	2
2	Metis Trail	60.00	5.00	1	10.00	2	7.00	2
3	Metis Trail Entrance	60.00	10.00	2	5.00	1	4.00	1

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Metis Trail	None	1121		79		253	2222		0.5045	
2	Metis Trail	None	966		982		218	1385		0.6977	
3	Metis Trail Entrance	None	175		157		1790	1151		0.1520	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Metis Trail	None	3.43		3.43	3.43		A		A
2	Metis Trail	None	10.66		10.66	11.44		B		B
3	Metis Trail Entrance	None	3.59		3.59	0.53		A		A

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	20	0	10	178	1	35	10	145	126	26	217	20
Future Vol, veh/h	20	0	10	178	1	35	10	145	126	26	217	20
Conflicting Peds, #/hr	5	0	5	5	0	5	5	0	5	5	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	23	0	11	202	1	40	11	165	143	30	247	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	608	659	269	593	599	247	275	0	0	313	0	0
Stage 1	324	324	-	264	264	-	-	-	-	-	-	-
Stage 2	284	335	-	329	335	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.15	6.55	6.25	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.545	4.045	3.345	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	403	380	762	413	411	784	1271	-	-	1230	-	-
Stage 1	682	644	-	735	685	-	-	-	-	-	-	-
Stage 2	717	637	-	678	637	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	366	361	753	390	390	775	1264	-	-	1223	-	-
Mov Cap-2 Maneuver	366	361	-	390	390	-	-	-	-	-	-	-
Stage 1	670	621	-	723	673	-	-	-	-	-	-	-
Stage 2	668	626	-	645	615	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.8	24.3	0.3	0.8
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1264	-	-	442	424	1223	-	-
HCM Lane V/C Ratio	0.009	-	-	0.077	0.574	0.024	-	-
HCM Control Delay (s)	7.9	0	-	13.8	24.3	8	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	3.5	0.1	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Traffic Vol, veh/h	134	17	262	192	22	152
Future Vol, veh/h	134	17	262	192	22	152
Conflicting Peds, #/hr	0	5	5	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	152	19	298	218	25	173

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	176	0	986	172
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	819	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1382	-	275	872
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	433	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1374	-	205	862
Mov Cap-2 Maneuver	-	-	-	-	205	-
Stage 1	-	-	-	-	646	-
Stage 2	-	-	-	-	430	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.8	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	613	-	-	1374	-
HCM Lane V/C Ratio	0.323	-	-	0.217	-
HCM Control Delay (s)	13.6	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1.4	-	-	0.8	-

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Metis Trail	0	0	7.00	2	8.50	2	20.00	30.00	30.00
2	Walsh Drive	90	0	7.00	2	8.50	2	20.00	30.00	30.00
3	Metis Trail	180	0	7.00	2	8.50	2	20.00	30.00	30.00
4	Walsh Drive	270	0	7.00	2	8.50	2	20.00	30.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Metis Trail	60.00	10.00	2	8.50	2	7.00	2
2	Walsh Drive	60.00	10.00	2	8.50	2	7.00	2
3	Metis Trail	60.00	10.00	2	8.50	2	7.00	2
4	Walsh Drive	60.00	10.00	2	8.50	2	7.00	2

Operational Results

2031 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Metis Trail	None	998		436		888	2000		0.4989	
2	Walsh Drive	None	769		994		440	1626		0.4730	
3	Metis Trail	None	740		954		809	1653		0.4477	
4	Walsh Drive	None	286		1038		656	1596		0.1792	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Metis Trail	None	4.74		4.74	4.26		A		A
2	Walsh Drive	None	6.81		6.81	4.87		A		A
3	Metis Trail	None	4.96		4.96	3.43		A		A
4	Walsh Drive	None	3.26		3.26	0.83		A		A

Country Meadows
Updated
Transportation Impact Assessment
November 18, 2011

Prepared for:
Southgate Commercial Lands Corp.

Prepared by:
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Calgary, AB T2A 7H8

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Project No. 1129 45195

November 18, 2011

Corporate Authorization

This document entitled "Country Meadows Updated Transportation Impact Assessment – November 18, 2011" was prepared by Stantec Consulting Ltd. for the account of Southgate Commercial Lands Corp. The material in it reflects Stantec Consulting Ltd.'s best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

PERMIT TO PRACTICE
STANTEC CONSULTING LTD.
Signature
Date November 18, 2011
PERMIT NUMBER: P 0258
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

CORPORATE AUTHORIZATION

DAVID THATCHER
11/18/11

RESPONSIBLE ENGINEER

Executive Summary

Southgate Commercial Lands Corp. proposes to develop approximately 120 hectares of land in West Lethbridge. The proposed development, known as Country Meadows, will consist of 1079 low density residential units and 1039 medium density residential units and approximately 34,400 square feet of neighborhood commercial space. These uses have been accounted for in the transportation analysis.

The proposed development is consistent with the policies and intent of the Country Meadows Area Structure Plan, approved by Lethbridge City Council as By-law 5629. The land owners have retained Stantec Consulting Ltd. to conduct a transportation impact assessment to evaluate transportation impacts of the Outline Plan application.

The development has been assessed for a ten-year (2021) and a full-build (assumed 2031) horizon. Three intersections accessing the outline plan area (off of Garry Drive, Métis Trail and Walsh Drive) have been analyzed for the ten-year horizon. The full build horizon analysis includes all five community access points, as defined in the Country Meadows Outline Plan (Garry Drive Entrance 1, Garry Drive Entrance 2, Metis Trail, Walsh Drive as well as the access point off of the future Chinook Trail).

The objectives of the analysis included estimating the impacts of vehicular traffic on the roadway system at both horizons, and recommending appropriate improvements to accommodate the associated traffic volumes. The scope of the study was established through consultation with the City of Lethbridge Traffic Engineering and Transportation Planning Manager using the City of Lethbridge TIA guidelines as a reference.

The analysis contained within this TIA demonstrates that, with some conventional infrastructure additions, the surrounding road network will be able to support the development of the Country Meadows Outline Plan area at both the ten-year and full-build horizons.

Table of Contents

COUNTRY MEADOWS
UPDATED TRANSPORTATION IMPACT ASSESSMENT - NOVEMBER 1, 2011

List of Figures

List of Tables

1.0 Introduction

1.1 BACKGROUND

Southgate Commercial Lands Corp. proposes to develop approximately 120 hectares of land in West Lethbridge. The proposed development, known as Country Meadows, will consist of 1079 low density residential units and 1039 medium density residential units, and approximately 34,400 square feet of neighborhood commercial space. The proposed development is consistent with the intent and land uses proposed in Country Meadows Area Structure Plan.

Country Meadows is bound to the north by Walsh Drive, to the east by Métis Trail, to the south by Garry Drive, and to the west by the future Chinook Trail. **Figure 1.1** illustrates the location of the development area. Southgate Commercial Lands Corp. has retained Stantec Consulting Ltd. (‘Stantec’) to conduct a transportation impact assessment to evaluate transportation impacts resulting from the development proposed in the Outline Plan.

1.2 OBJECTIVES

The City of Lethbridge TIA Guidelines were used as a reference in developing the scope for the transportation impact assessment; the objectives of the study, as agreed to with the City of Lethbridge Traffic Engineering and Transportation Planning Manager are to:

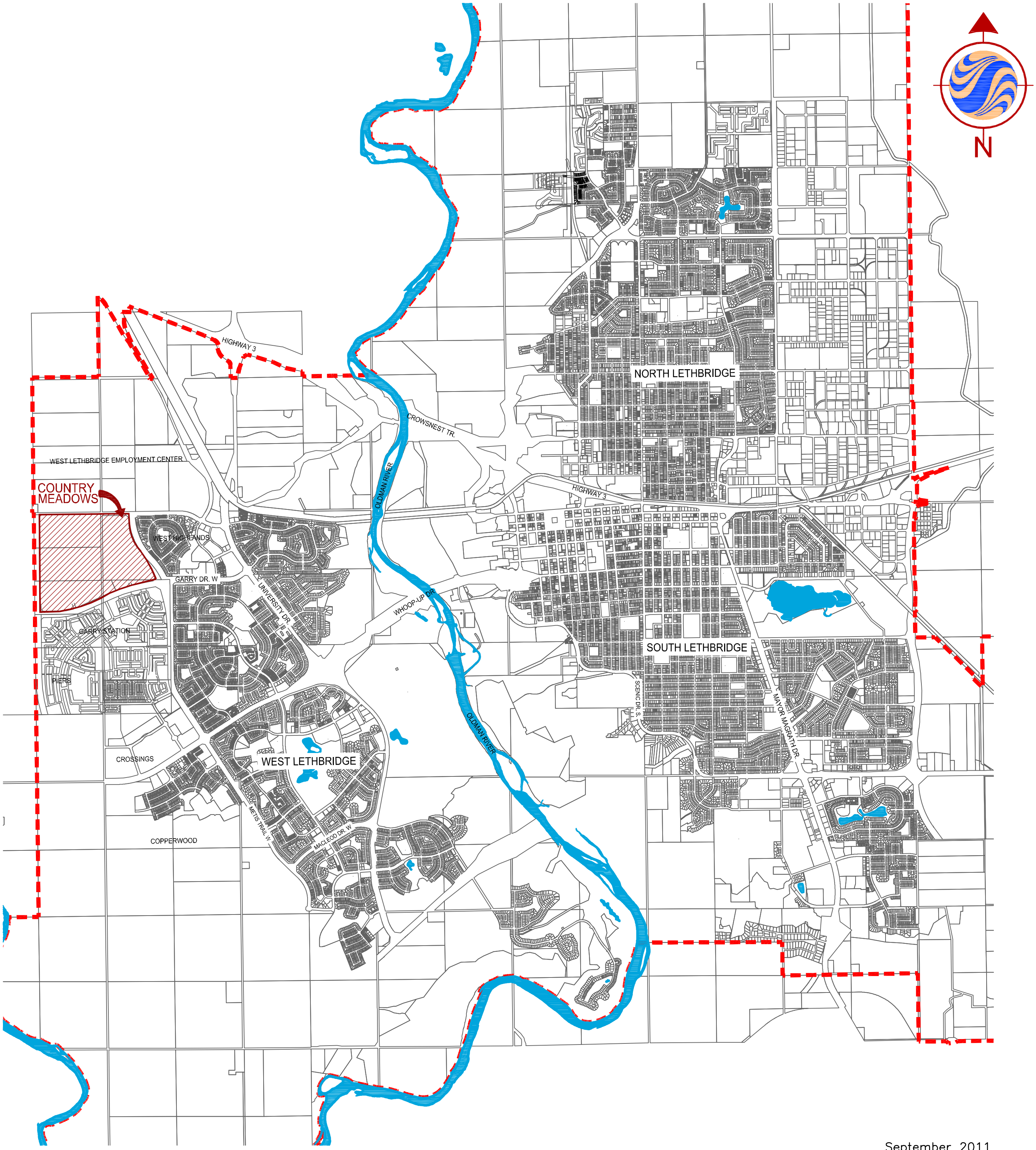
- Establish future ten-year (2021) and full-build (assumed 2031) background traffic conditions in the vicinity of the proposed development
- Estimate the magnitude and characteristics of peak hour traffic generated by the proposed development at the ten-year and full-build horizons
- Evaluate the impacts of vehicular traffic generated by the proposed development on the roadway system at the ten-year and full-build horizons
- Identify and recommend appropriate traffic operation and/or infrastructure improvements necessary to accommodate the ten-year and full-build horizon traffic volumes
- Estimate the future ten-year and full-build daily traffic volumes to confirm the classification of the road network within the Country Meadows Outline Plan area.

1.3 STUDY AREA

The Study area as agreed to by the City of Lethbridge Infrastructure Services department is illustrated in **Figure 1.2**. Correspondence with Infrastructure Services regarding the scope of this study is documented in **Appendix A**. The intersections included in the study are as follows:

- Garry Drive / Chinook Trail (Intersection 11)
- Garry Drive / Garry Drive Entrance 2 (Intersection 13)
- Garry Drive / Garry Drive Entrance 1 (Intersection 17)

- Metis Trail / Garry Drive (Intersection 18)
- Chinook Trail / Chinook Trail Entrance Road (Intersection 51)
- Metis Trail / Metis Trail Entrance Road (Intersection 88)
- Chinook Trail / Walsh Drive (Intersection 91)
- Walsh Drive / Walsh Drive Entrance Road (Intersection 94)
- Metis Trail / Walsh Drive (Intersection 98)
- Internal intersections (labeled intersection 23, 43, 46, 47, 53, 84, 86)



NTS

September 2011
112945195

Legend

▬ ▬ City of Lethbridge Limits
▨ Country Meadows

Stantec

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.

COUNTRY MEADOWS OUTLINE PLAN

Figure No.

1.1

Title

Site Context

V:\1129\active\112945195\drawings\Planning Drawings\gate 4\tia_context plan.dwg
2011-09-07 11:34AM By: bschmidtke

NTS

October 2011
112945195

Legend

▬ ▬ ▬ Country Meadows

Roundabout

Conceptual Entrance

Intersection Evaluation

Daily Volumes/Road Classification

Stantec

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.

COUNTRY MEADOWS
OUTLINE PLAN

Figure No.
1.2

Title
Study Area

2.0 Development Proposal

2.1 PROPOSED DEVELOPMENT

Southgate Commercial Lands Corp. proposes to develop an approximately 120 hectare site in West Lethbridge. After excluding the area for the proposed roadway network, the storm management facilities and reserve lands, the development yields approximately 65 hectares of developable land. **Outline Plan Figure 7.1** is included in **Appendix B** to illustrate the proposed land use designations for Country Meadows

Table 2.1 summarizes the proposed composition of the community within the Outline Plan area. The development intensities shown in **Table 2.1** reflect the full build-out of the community. The development will consist of a mix of low and medium density residential uses, and a small area of commercial neighborhood space.

Table 2.1 – Development Summary

Use	Intensity
Low Density Residential	1079 units (including 88 secondary suites)
Medium Density Residential	1009 units
Urban Innovations (Medium Density) Residential	30 units
Neighborhood Commercial	34,400 ft^2 gross floor area (GFA)

Areas designated “Low Density R-L” zoning have been included with an assumed density of 25 units per hectare to account for the potential development of secondary suites (as per current City of Lethbridge policy). As stated in the outline plan, the R-L zoning within Country Meadows is anticipated to yield 340 lots with the potential for 428 units. These units have all been included as Low Density Residential.

For the approximately 1.28 hectare parcel zoned C-N, we have assumed a floor area ratio of 0.25, which yields slightly more than 34,400 square feet of neighborhood commercial space.

Traffic generated by the proposed development will primarily take access/egress from the five community entrance roads (one entrance is provided from each of the arterial roadways which form the site bounds, with two entrances being provided from Garry Drive).

2.2 PLANNING HORIZONS AND PROPOSED DEVELOPMENT STAGING

As established in scope discussions Infrastructure Services, a ten-year horizon and a full-build horizon were to be analyzed within the scope of this study.

Figure 12.1 from the Country Meadows Outline Plan is included in **Appendix B.** This figure illustrates the proposed phasing of development within the outline plan area. Phases 1 -7 are anticipated to be completed at the ten year horizon, with the remaining phases (phase 8 to 16) anticipated to be completed in the following ten year period.

Table 2.2 summarizes the number of units anticipated to be completed during each phase of development. These unit counts were used in establishing the trip-generating potential for the ten-year and full-build horizons.

Table 2.2 – Development Staging

Development Phase	Low Density Residential Units	Medium Density Residential Units
1	170	
2	71	
3	38	30
4	122	12
5	81	
6	92	164
7*	0	414
Total – Ten-Year Horizon	**574**	**620**
8	60	99
9	75	
10	40	
11	85	10
12	40	120
13	50	20
14	55	
15	45	
16	55	170
Additional – Full-Build Horizon	**505**	**419**
Total – Full-Build OP Area	**1079**	**1039**

*Neighborhood Commercial Included in Phase 7

3.0 Traffic Volumes

3.1 BACKGROUND TRAFFIC VOLUMES

A combination of the available information from approved TIA reports and outline plans within West Lethbridge was used to establish the background traffic volumes.

The post-development volumes established in the Garry Station TIA (prepared by Stantec Consulting Ltd., April 25, 2011) were used as the basis for the background volumes. The volumes established in the Garry Station TIA accounted for developments anticipated to be constructed in West Lethbridge during an approximately 20 year time frame. These developments included Country Meadows, Indian Battle Heights, Copperwood, the Piers, the Crossings, and Garry Station.

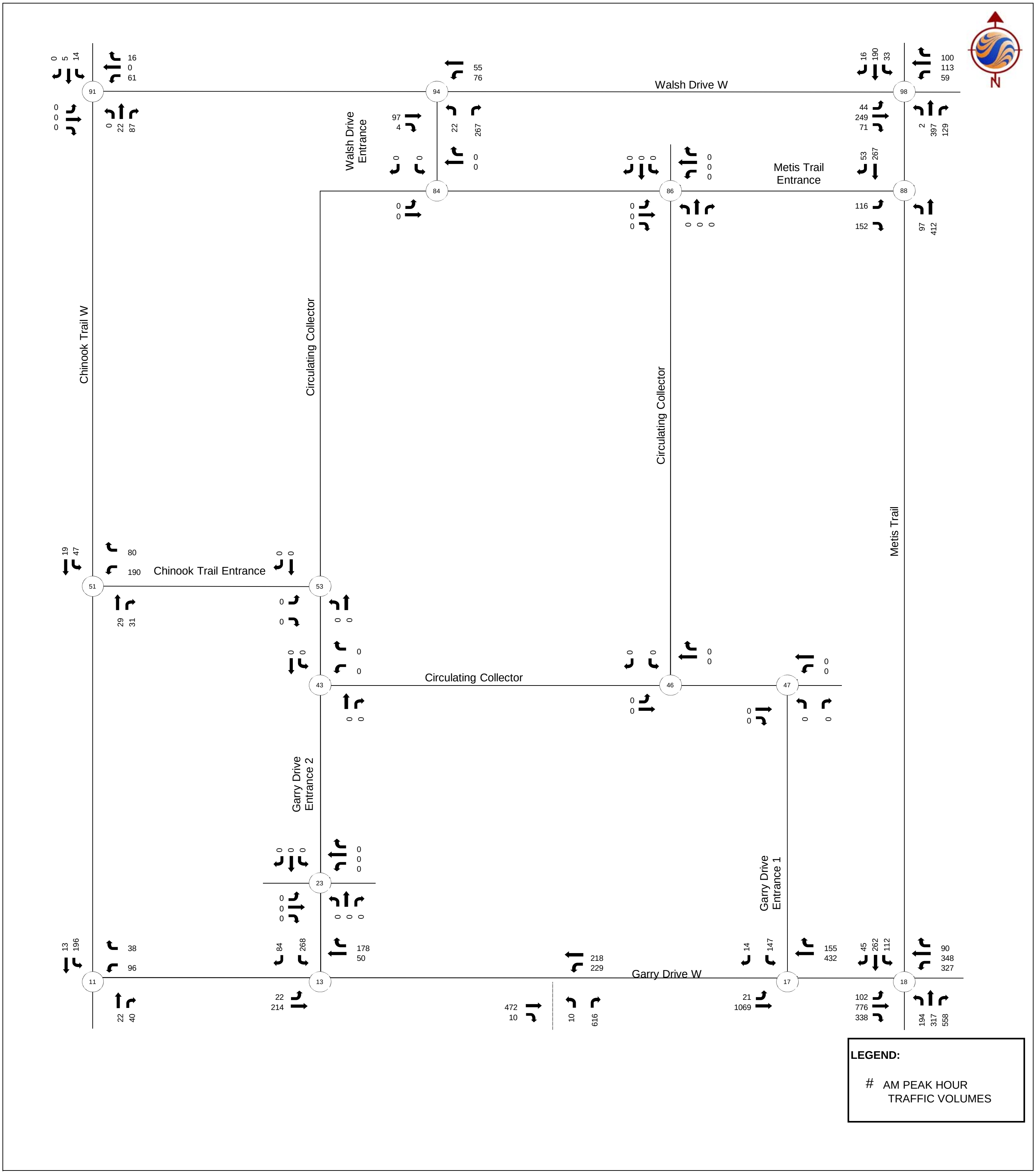
Because Country Meadows and Garry Station are serviced by the same arterial road network and are anticipated to follow similar development schedules (commencing in 2012 with completion in approximately 2031), the Garry Station TIA post-development volumes needed only minor adjustments to establish a background condition for Country Meadows. These adjustments included the removal of the traffic assumed to be generated by the land uses within the Country Meadows Outline Plan, and the addition of traffic associated with the West Lethbridge Employment Centre (located on the north side of Walsh Drive).

A specific breakdown of the approach to developing the background traffic volumes for the analysis of Country Meadows is summarized below.

1. The Garry Station TIA full-build horizon post-development volumes were used to establish the background traffic volumes at the intersection of Garry Drive and Metis Trail and the in and out movements at the intersection of Garry Drive and the Garry Station access road (*Figures 3.13 and 3.14* from the Garry Station TIA are included in **Appendix C**). The Country Meadows (ASP) Residential Development TIA (completed by Martin Geomatic Consultants Ltd., September 2009) was used to establish the turning movements at the access points to Country Meadows and the turning movements at the intersection of Walsh Drive and Metis Trail. (See *Figure 7-1* from the Country Meadows (ASP) TIA included in **Appendix D**). Upward adjustments were made to the through volumes on Walsh Drive, Chinook Trail and Metis Trail (north of Garry Drive) to balance traffic volumes between the two source TIAs. The Initial Background Traffic Volumes are illustrated on **Figures 3.1 and 3.2**.
2. The traffic assumed to be generated by the land uses within the Country Meadows Outline Plan in *Figure 7-1* from the Country Meadows (ASP) Residential Development TIA are illustrated on **Figures 3.3 and 3.4.** The volumes shown in these figures were manually assigned to the intersections of Chinook Trail with Garry Drive and Walsh Drive, since

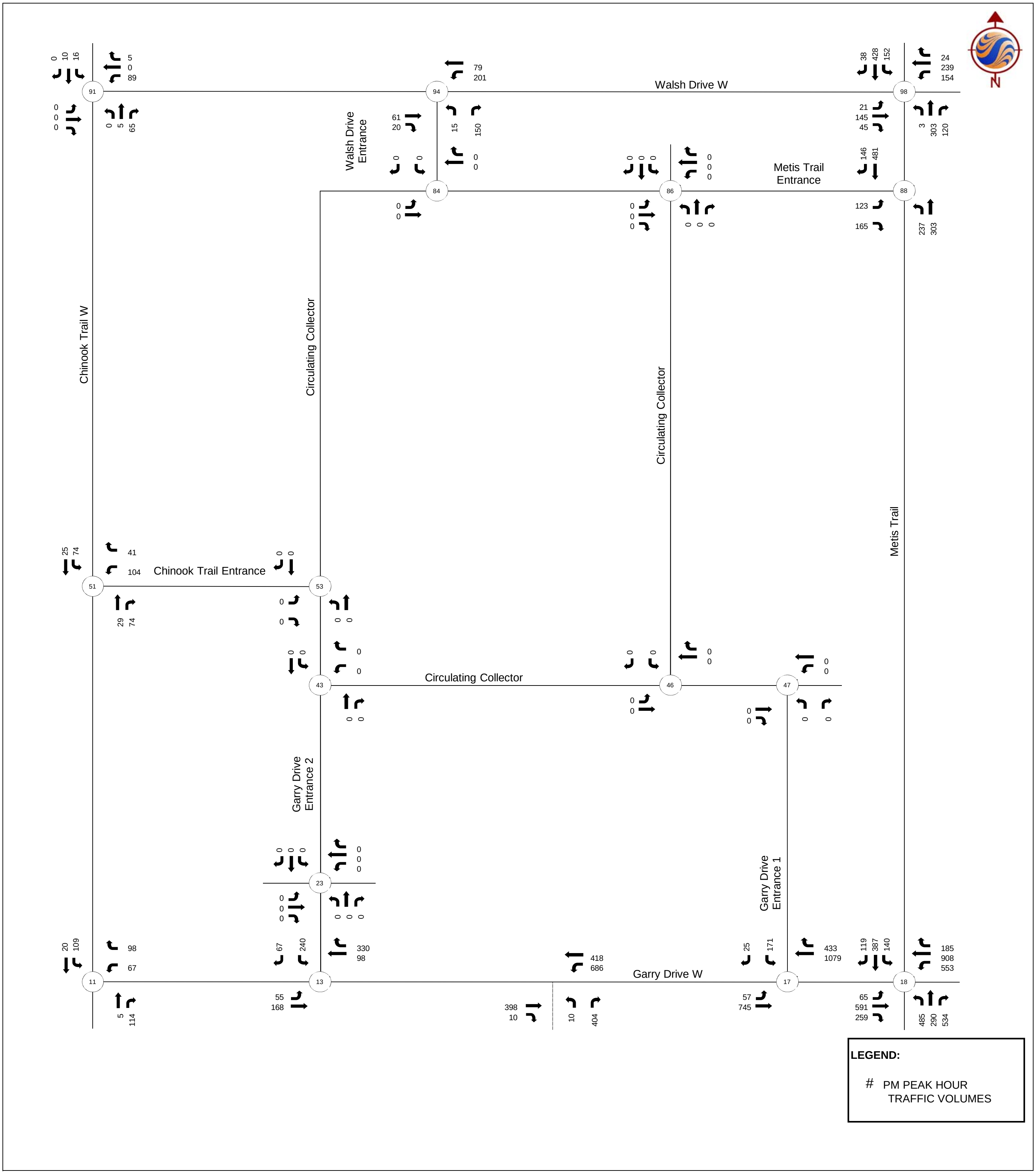
volumes for these intersections were not shown on *Figure 7-1* from the Country Meadows TIA. Further, some minor adjustments were made to balance volumes.

3. The traffic associated with the West Lethbridge Employment Centre (WLEC) was established using information provided by the City. The City provided background and post-development volumes for the WLEC. These volumes are included in **Appendix E**. The site traffic associated with the WLEC was isolated by subtracting the background volumes from the post-development volumes. As the access into Country Meadows located off of Walsh Drive is assumed to be a T-intersection, the traffic shown accessing WLEC off of Walsh Drive at this location has been moved to the intersection of Chinook Trail/Walsh Drive. Some other minor adjustments were also made to balance volumes. The WLEC Site Traffic Volumes are illustrated on **Figures 3.5 and 3.6.**
4. An additional 100 vehicles per hour was added in each direction (northbound and southbound) to account for some additional development potential within west Lethbridge at the full-build horizon.
5. The Country Meadows Site Traffic Volumes (**Figures 3.3 and 3.4**) were removed from the Initial Background Traffic Volumes (**Figures 3.1 and 3.2**). The WLEC Site Traffic Volumes (**Figures 3.5 and 3.**6) were then added to the Initial Background Traffic Volumes. The resulting Full-Build Horizon Background Traffic Volumes are illustrated on **Figures 3.7 and 3.8.**
6. To establish background volumes for the ten-year horizon, the background traffic at the full-build horizon was divided in half. The volumes utilizing Chinook Trail were also moved to Metis Trail for the ten-year horizon. The resulting traffic is a conservative estimate of the background traffic anticipated at our ten-year horizon which assumes that approximately 50% of the neighborhoods in the area have been developed. The Ten-Year Horizon Background Traffic Volumes are illustrated on **Figures 3.9 and 3.10**.



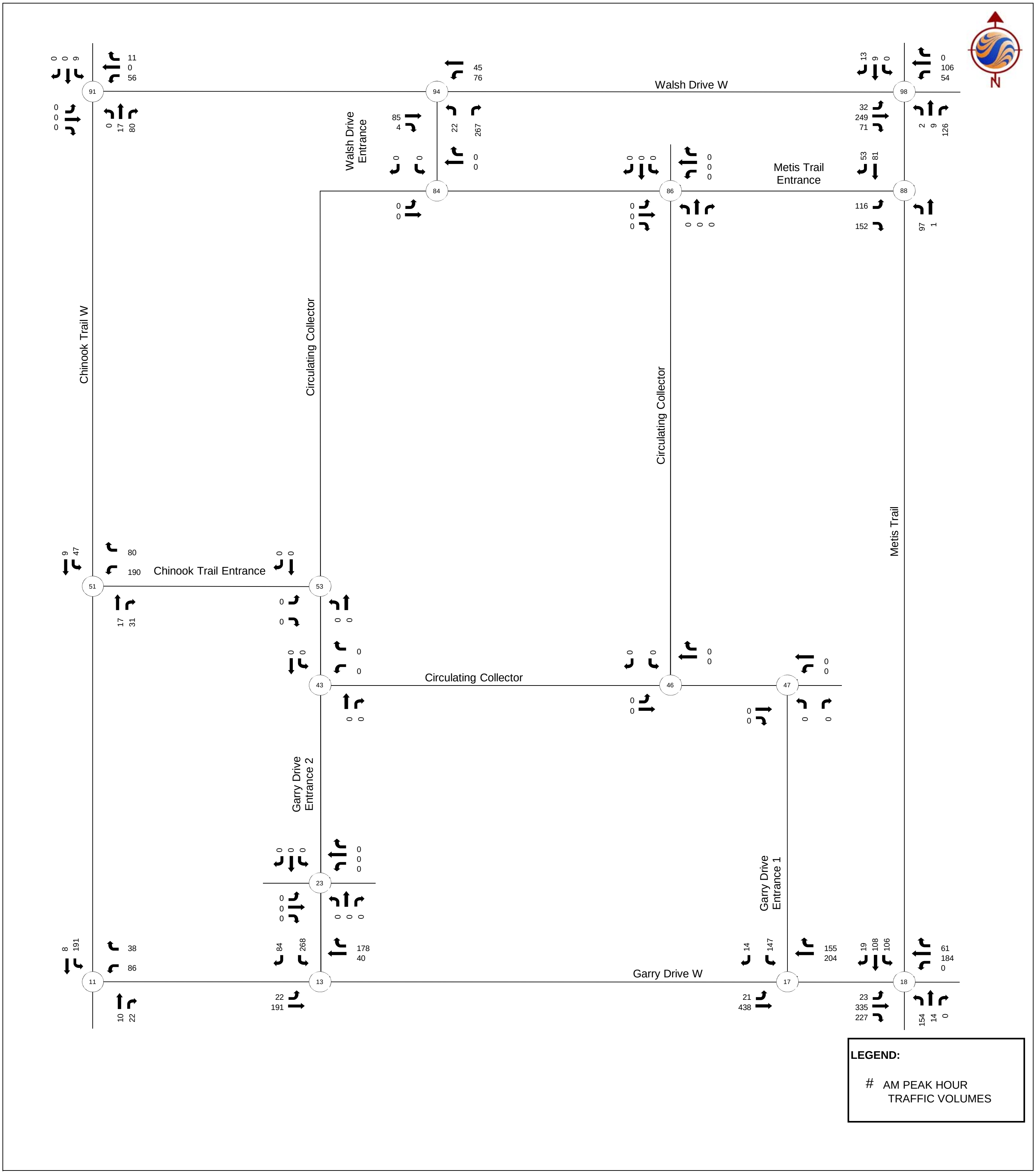
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.1
Garry Station Post-Development Volumes
AM Peak Hour



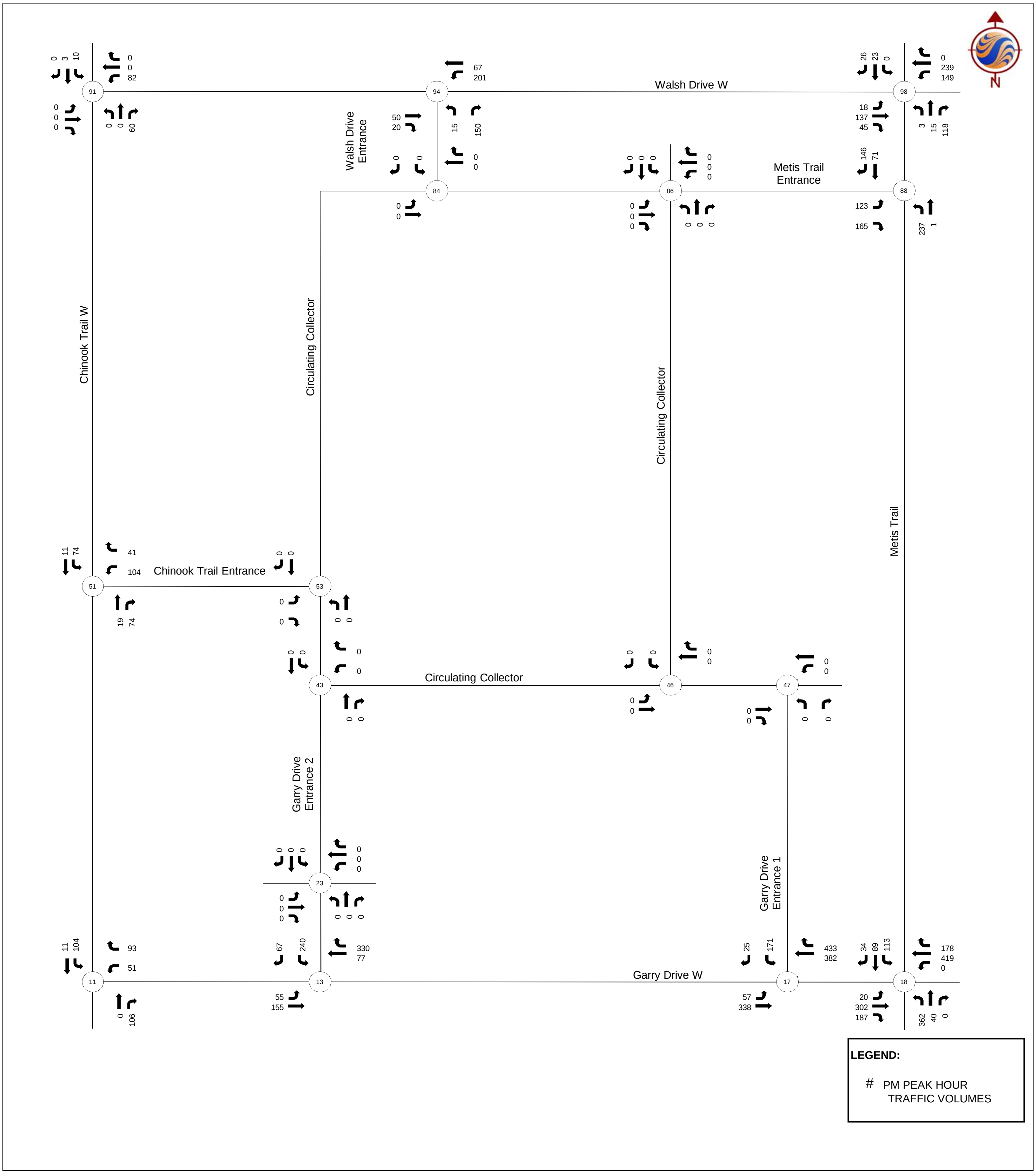
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.2
Garry Station Post-Development Volumes
PM Peak Hour



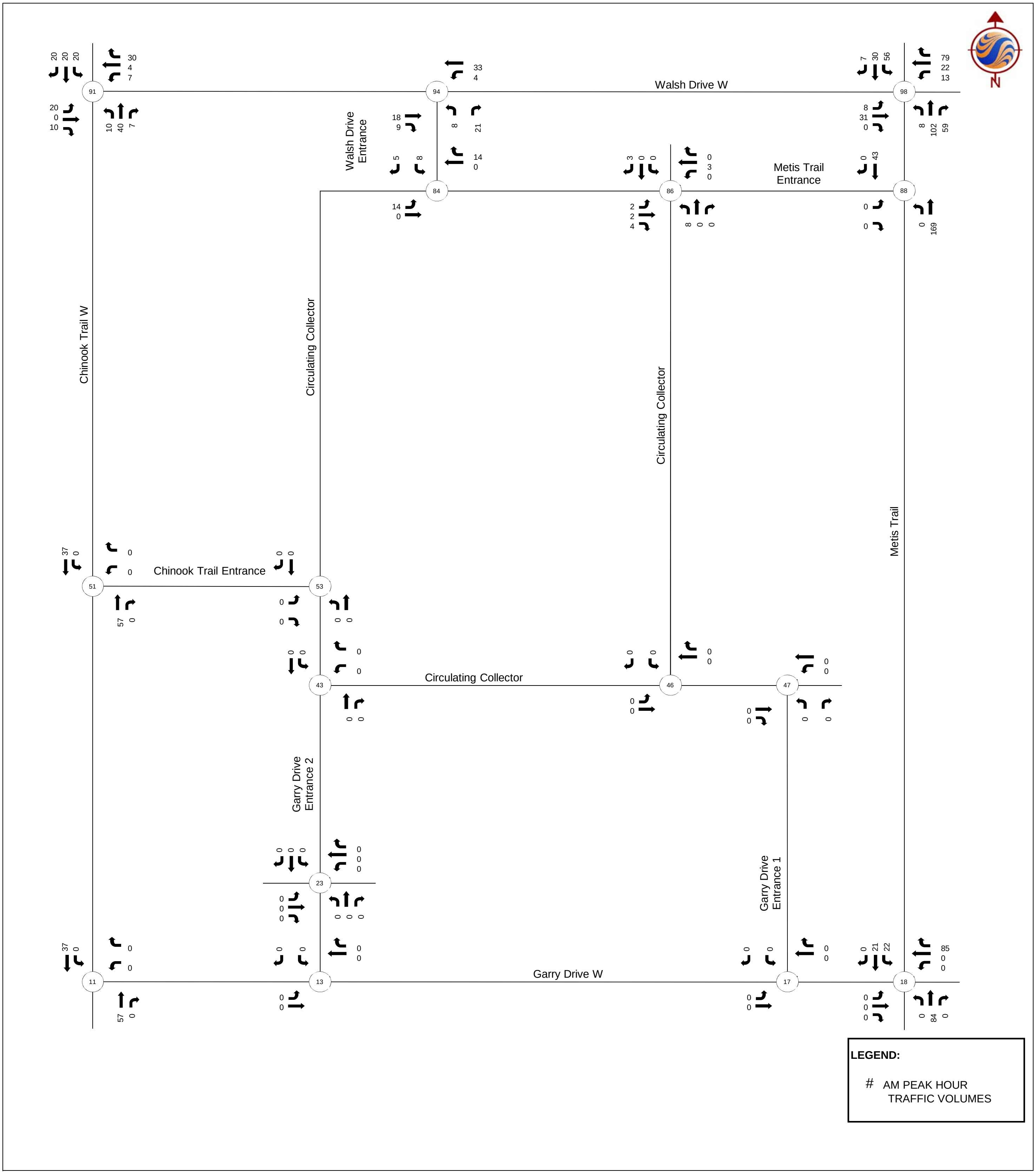
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.3
Country Meadows Site Traffic Volumes
AM Peak Hour



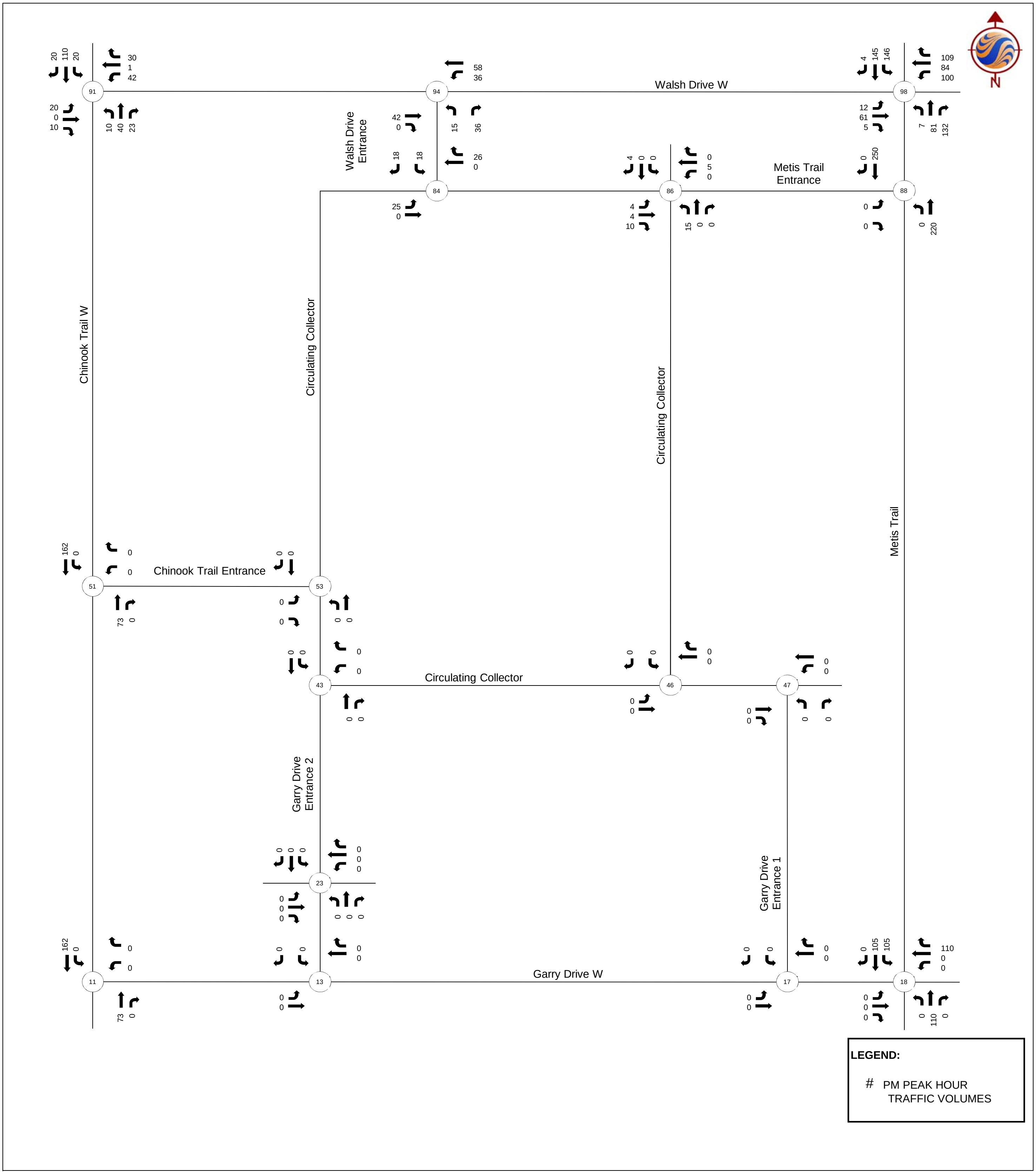
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.4
Country Meadows Site Traffic Volumes
PM Peak Hour



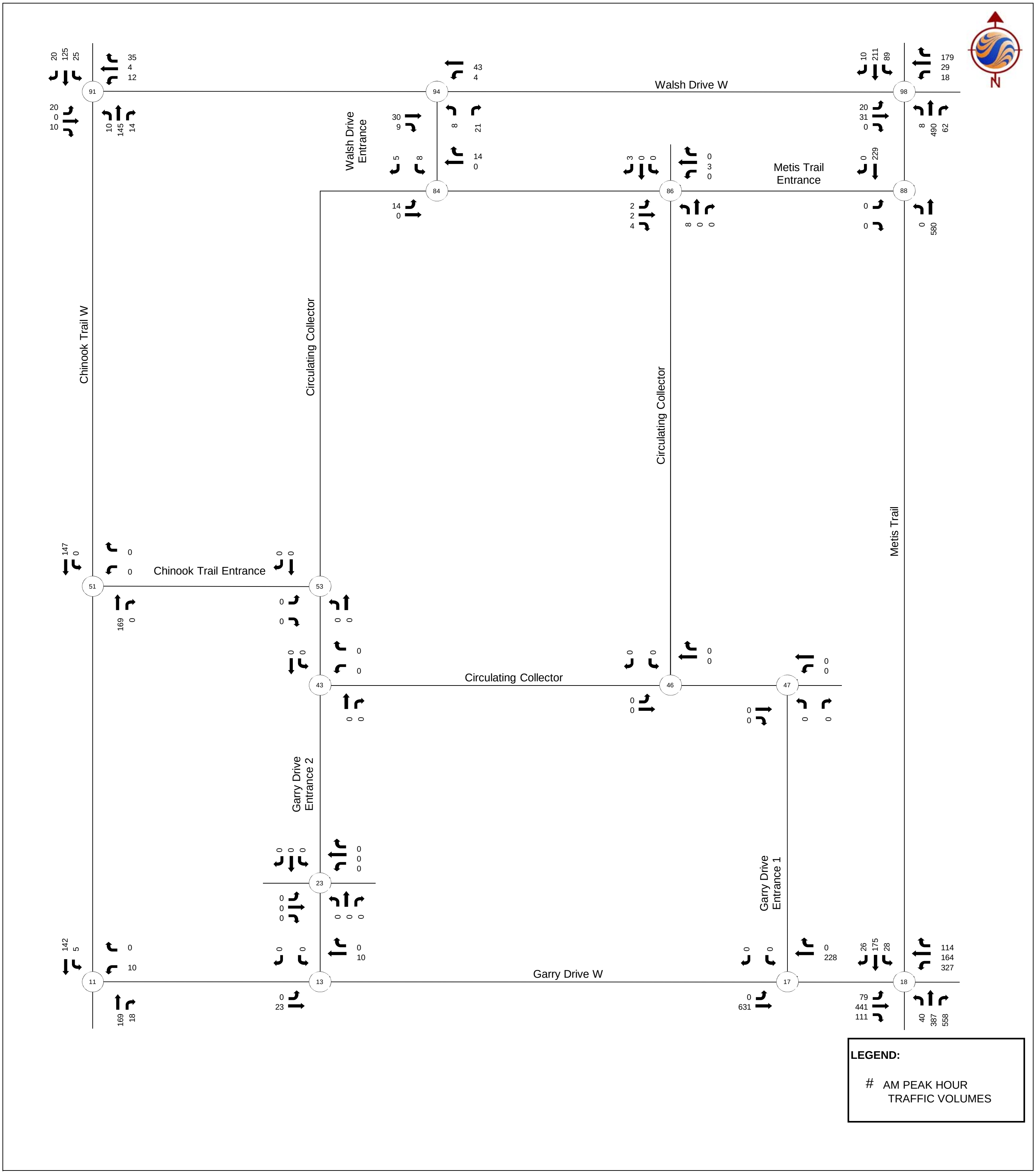
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.5
WLEC Site Traffic Volumes
AM Peak Hour



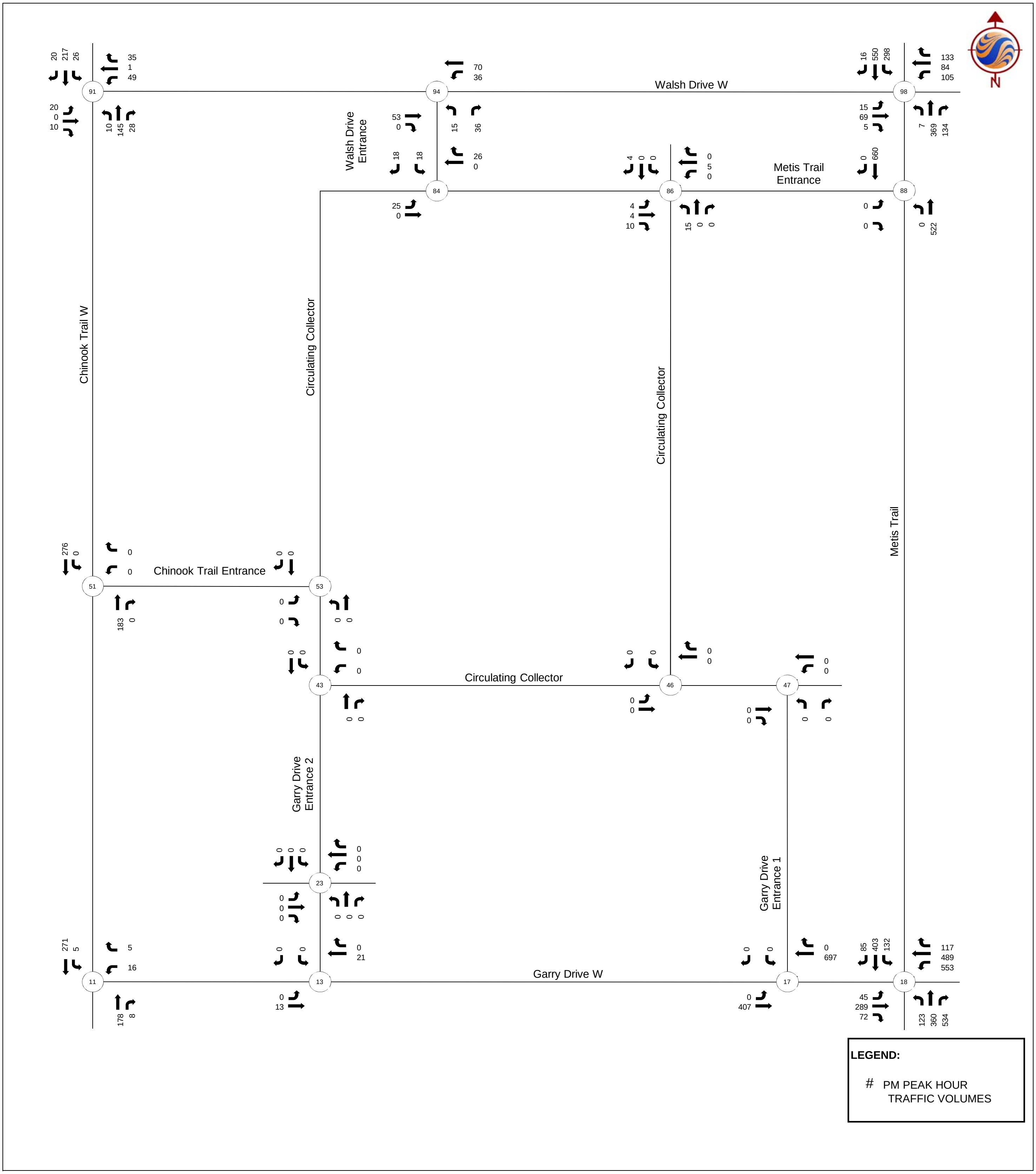
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.6
WLEC Site Traffic Volumes
PM Peak Hour



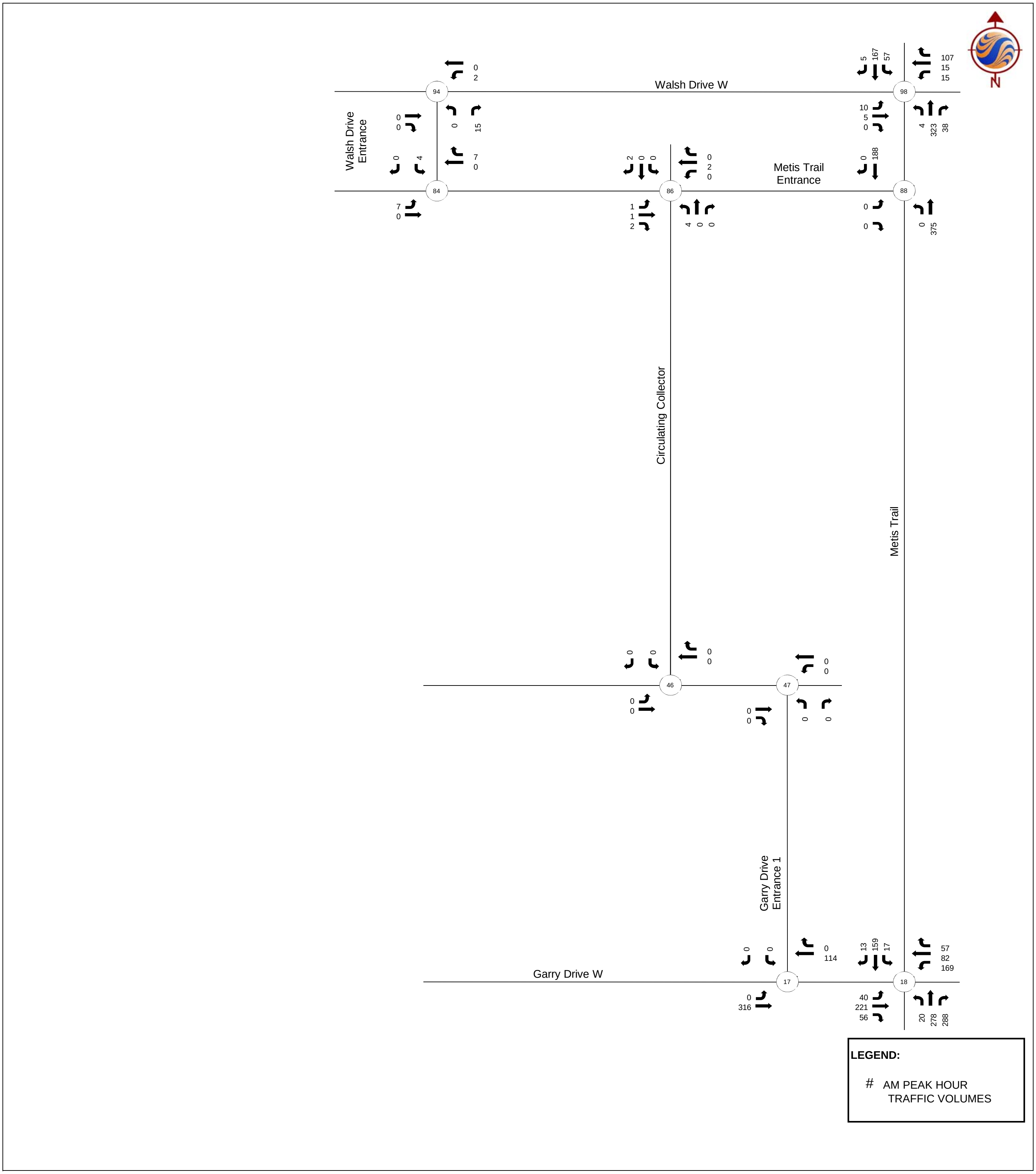
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.7
Full-Build Horizon Background Traffic Volumes
AM Peak Hour



SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.8
Full-Build Horizon Background Traffic Volumes
PM Peak Hour



SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.9
Ten-Year Horizon Background Traffic Volumes
AM Peak Hour

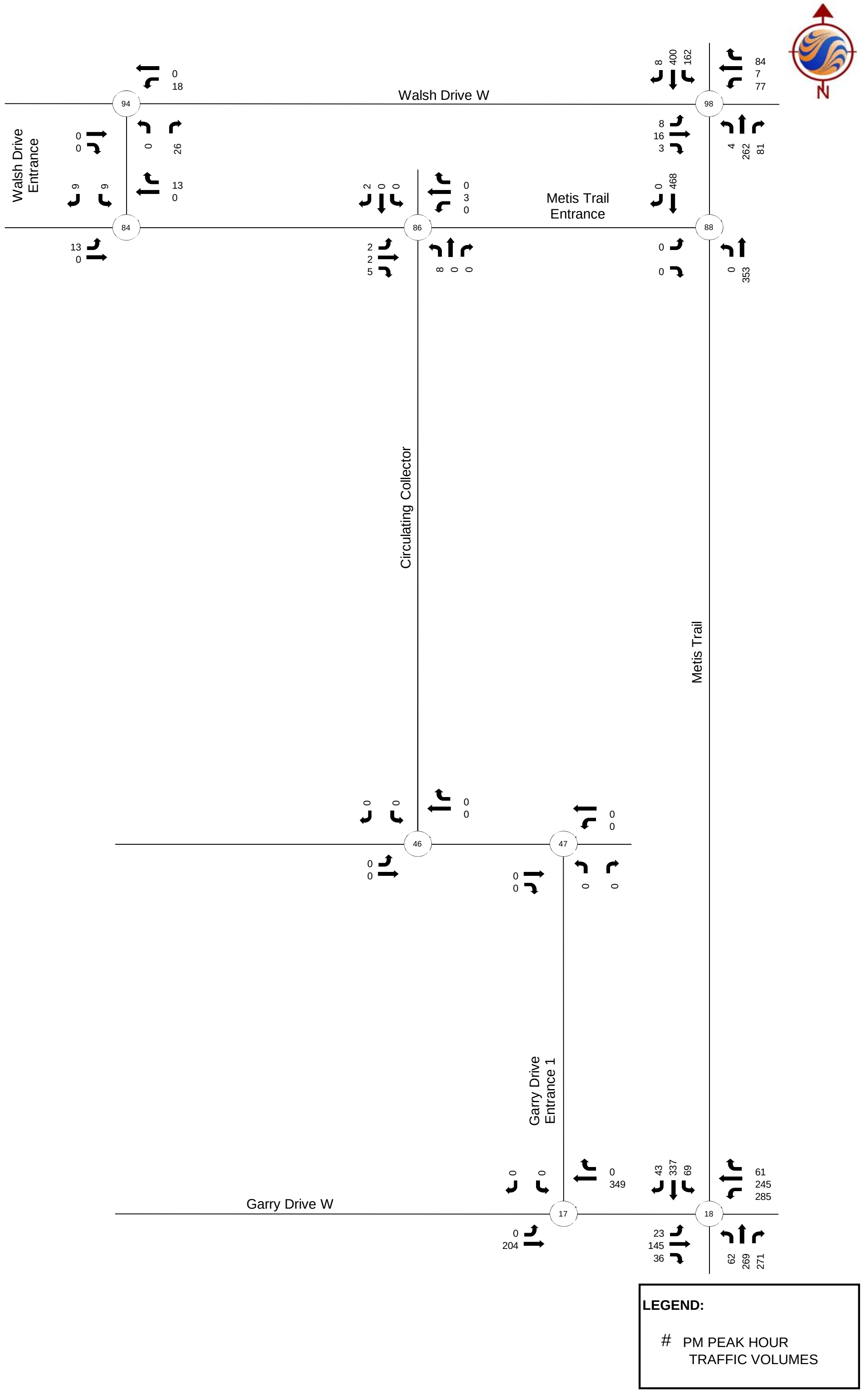


Figure 3.10
Ten-Year Horizon Background Traffic Volumes
PM Peak Hour

3.2 TRIP GENERATION

In assessing the trip-generating potential of the proposed development, we have applied the City of Lethbridge trip generation rates for the low and medium density residential units. For the neighborhood commercial uses within the development, we have utilized the rate for ITE Land Use 824 – Shopping Centre. The trip generation rates are summarized in **Table 3.1**.

Table 3.1 – Trip Generation Rates

Use	AM Peak Hour			PM Peak Hour		
		In	Out		In	Out
Low Density Residential	0.77 vph/unit	26%	74%	1.02 vph/unit	64%	36%
Medium Density Residential	0.75 vph/unit	29%	71%	0.92 vph/unit	61%	39%
Shopping Centre	1.00 vph/1,000 ft^2	61%	39%	3.73 vph/1,000 ft^2	51%	49%

The resulting site traffic generated by the proposed development for both the ten-year and full-build horizons is summarized in **Table 3.2**.

Table 3.2 – Trip Generation

Development Phase	Composition			Trip Generation					
	Residential (Units)		Commercial Neighborhood (sq. ft.)	AM Peak Hour			PM Peak Hour		
	LD	MD		Total	In	Out	Total	In	Out
Ten-Year	574	620	34,400	942	271	671	1285	789	496
Full Build	1079	1039	0	1610	442	1168	2056	1287	769

3.3 TRIP DISTRIBTUTION AND ASSIGNMENT

The directional distribution patterns for trips generated by the development were established during the initial TIA sign-off period. **Table 3.3** summarizes the distribution patterns for the residential components of the development:

Table 3.3 – Trip Distribution

Development Phase	Métis Trail North	Métis Trail South	Garry Drive East	Walsh Drive East	Chinook Trail South	Chinook Trail North
Ten-Year	5%	-	55%	40%	-	-
Full-Build	10%	15%	35%	35%	5%	-

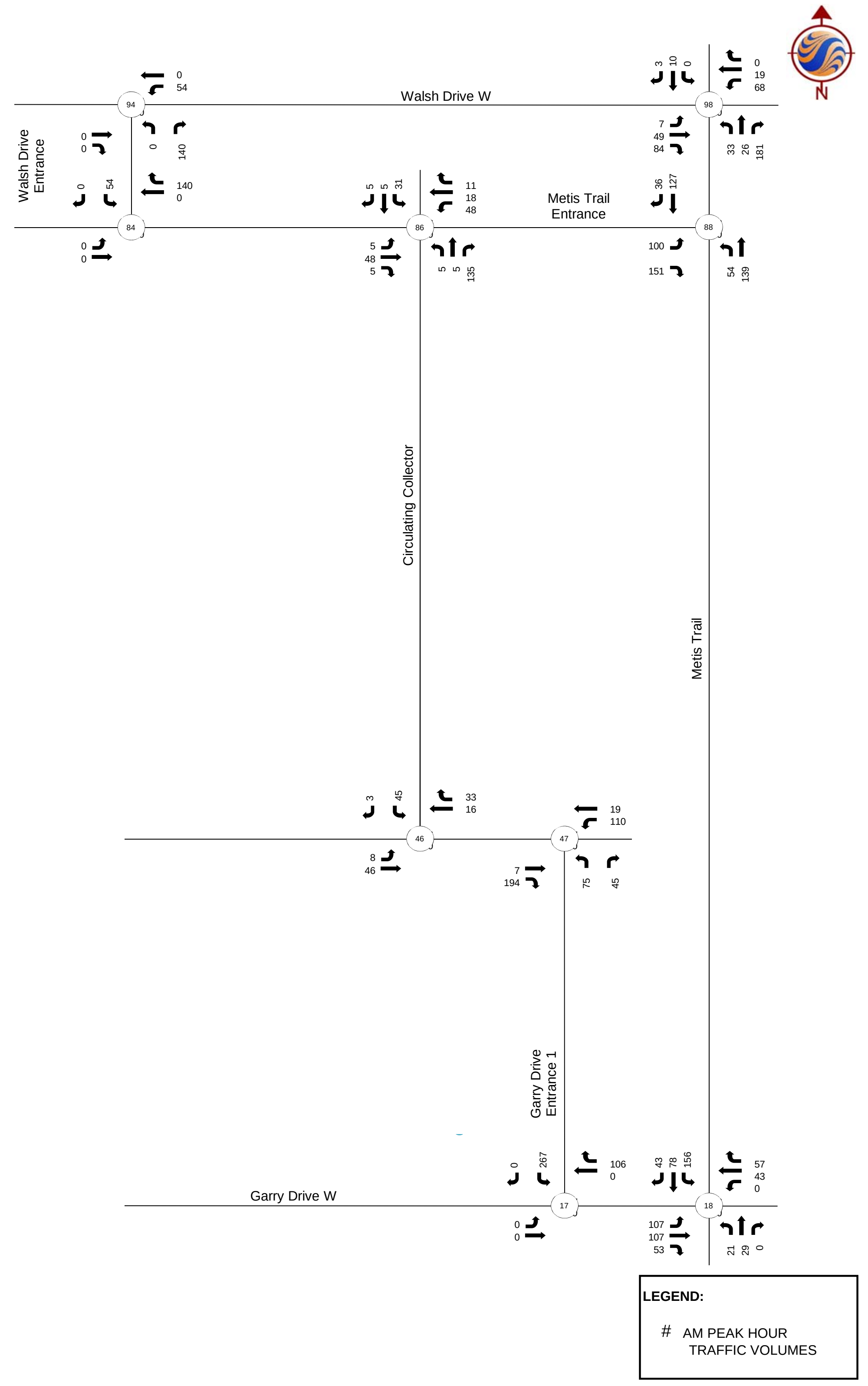
The morning and afternoon peak hour traffic generated by the residential components of Country Meadows was assigned to the area road network based on the distribution patterns shown in **Table 3.3**. **Figures 3.11 and 3.12** illustrate the residential site-generated traffic volumes for the ten-year horizon. **Figures 3.13 and 3.14** illustrate the residential site-generated traffic volumes for the full-build horizon.

Although the neighborhood commercial area is primarily expected to service residents of Country Meadows and could be considered ancillary, it has been included as a separate generator as this allows for a small buffer within the analysis. Trips generated by the neighborhood commercial area were assigned as follows:

- 50% internal (distributed along the road network based on the location of units)
- 50% external (distributed to the arterial road network using the patterns shown in Table 3.3)

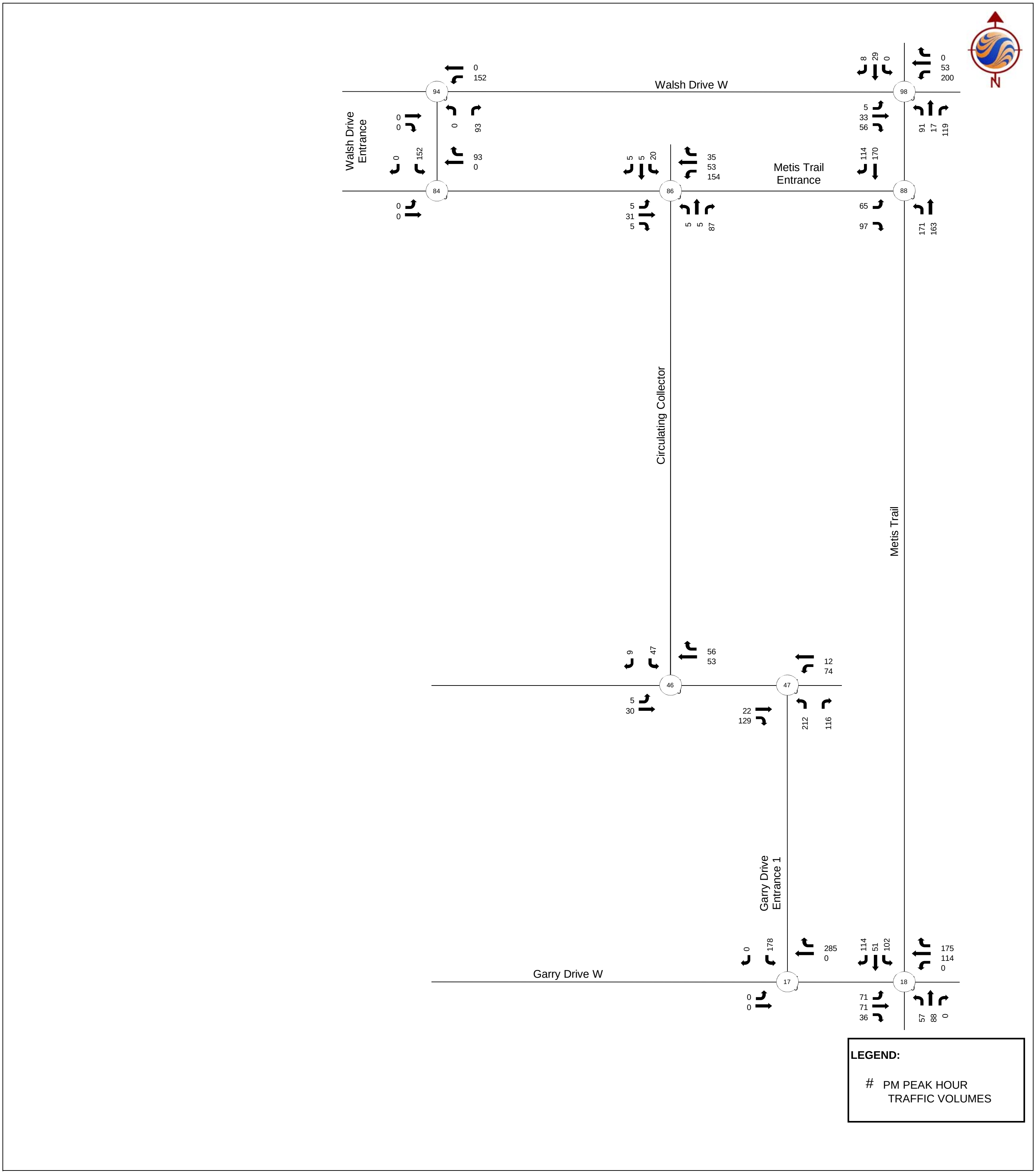
Table 3.3. **Figures 3.15 and 3.16** illustrate the neighborhood commercial site-generated traffic volumes for the ten-year horizon. **Figures 3.17 and 3.18** illustrate the neighborhood commercial site-generated traffic volumes for the full-build horizon.

The residential and neighborhood commercial site-generated traffic volumes were added to the relevant (based on horizon) background traffic volumes. The resulting ten-year and full-build post-development traffic volumes are illustrated in **Figures 3.19 to 3.22.**



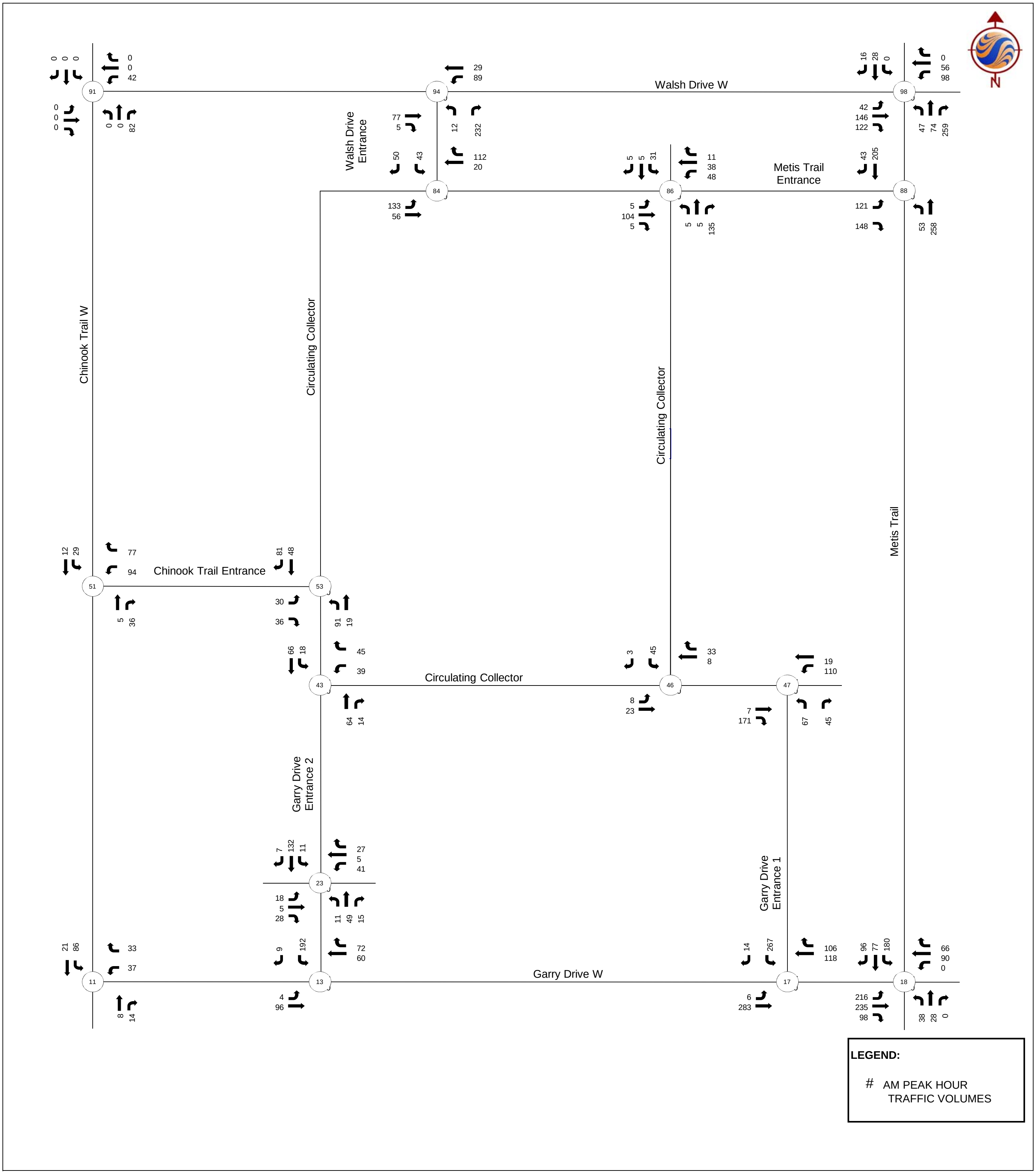
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.11
Ten-Year Horizon Residential Traffic Volumes
AM Peak Hour



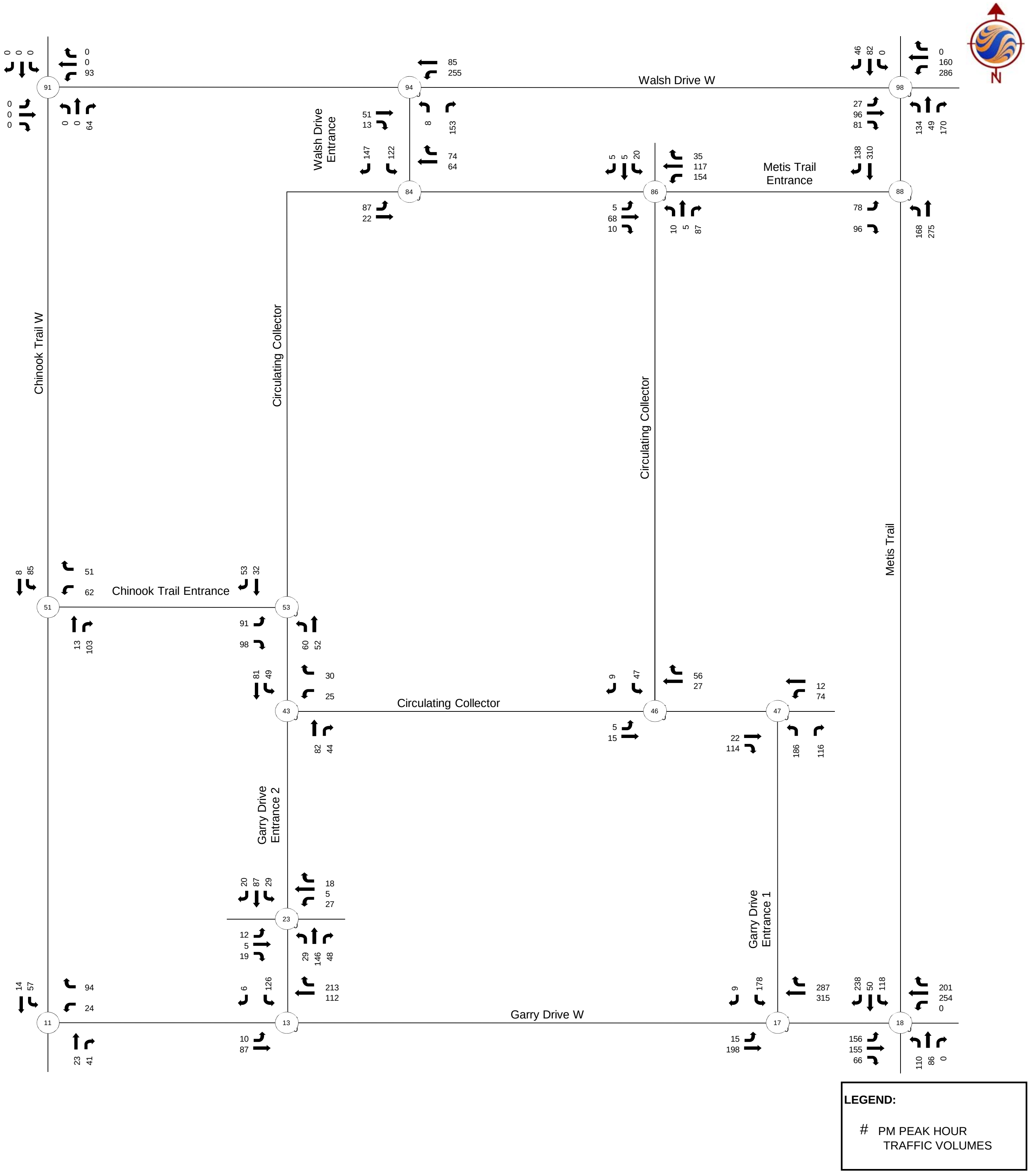
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.12
Ten-Year Residential Site-Generated Traffic Volumes
PM Peak Hour



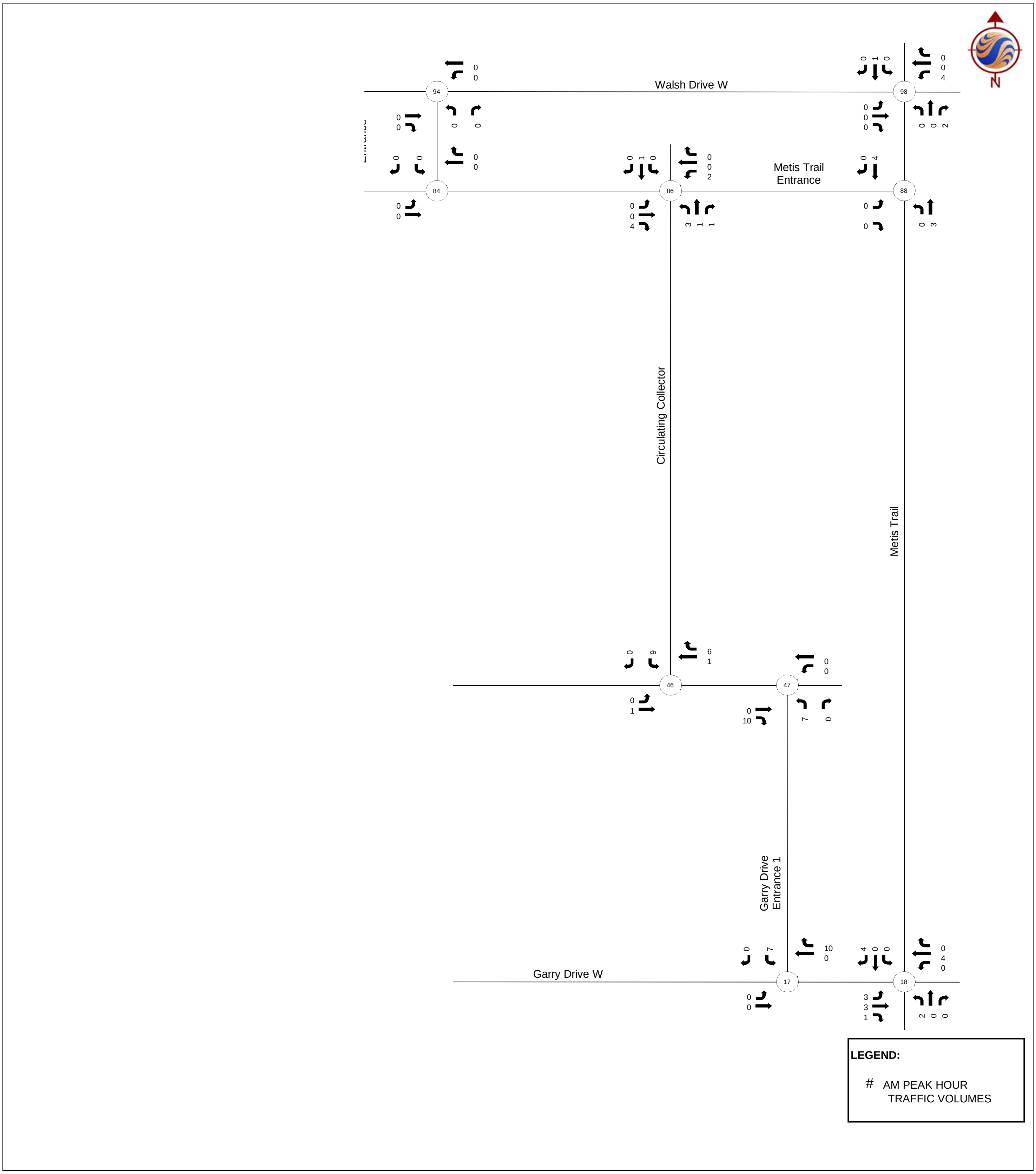
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.13
Full-Build Residential Site-Generated Traffic Volumes
AM Peak Hour



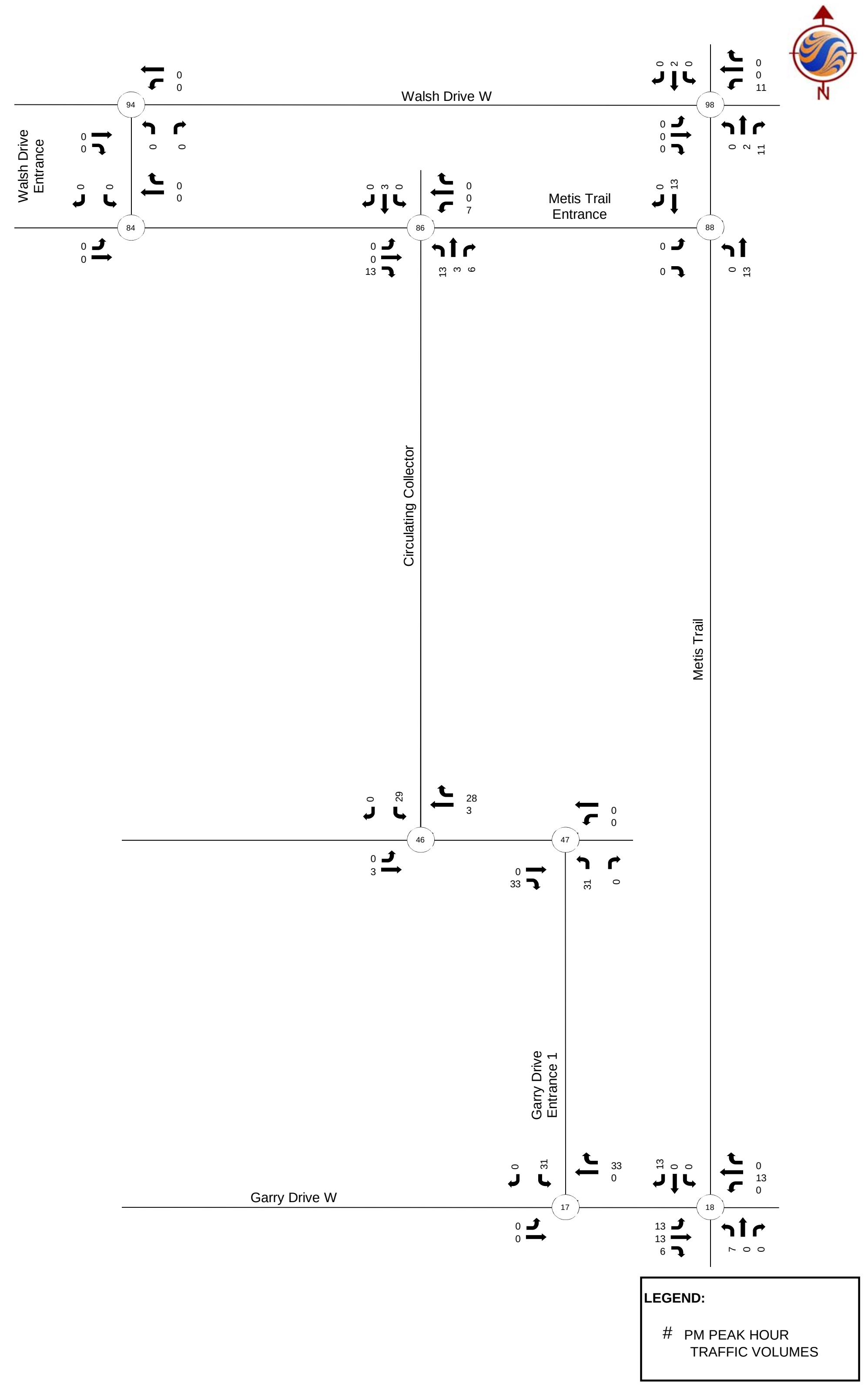
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.14
Full-Build Residential Site-Generated Traffic Volumes
PM Peak Hour



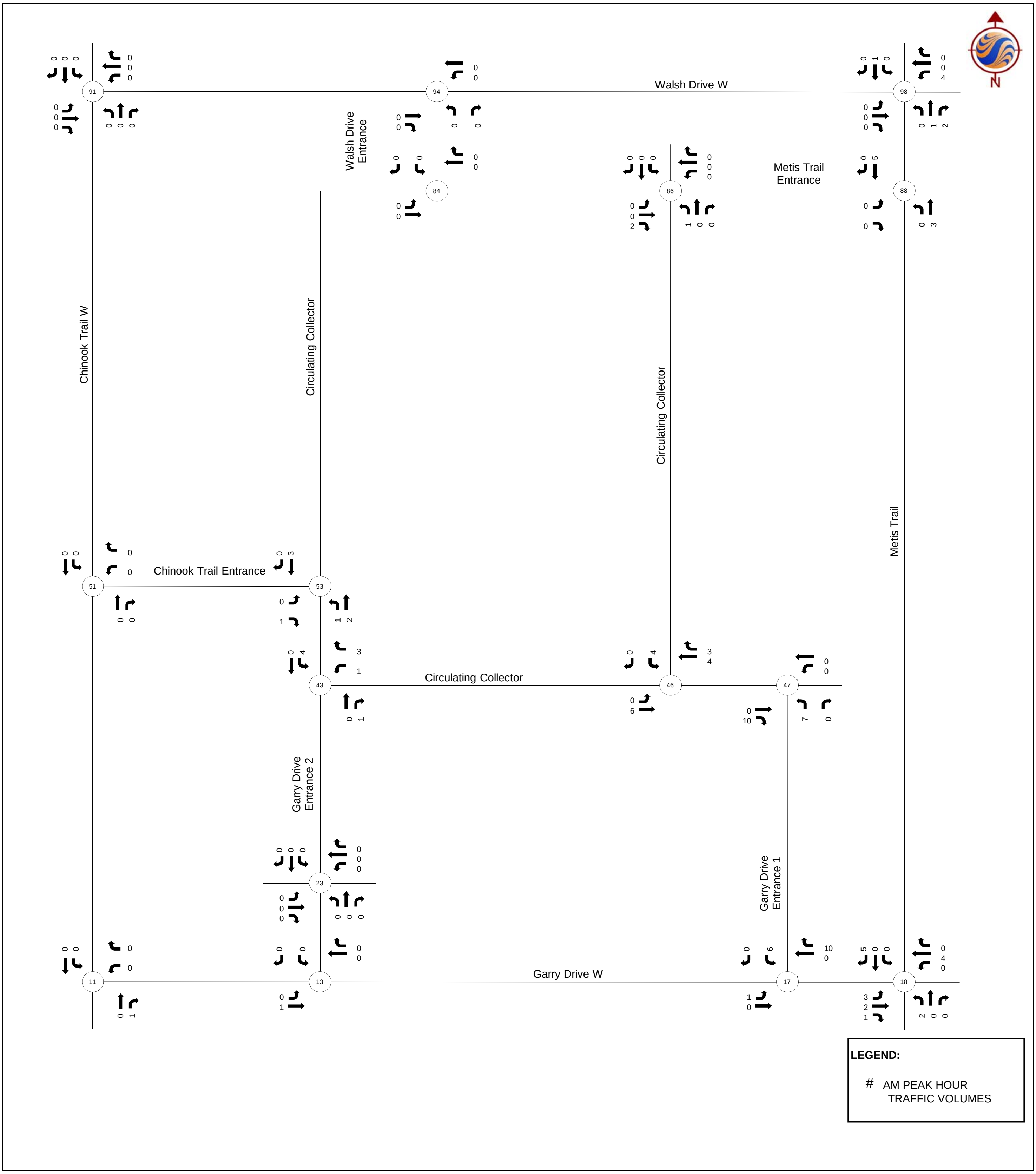
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.15
Ten-Year Neighbourhood Commercial Site-Generated Traffic Volumes
AM Peak Hour



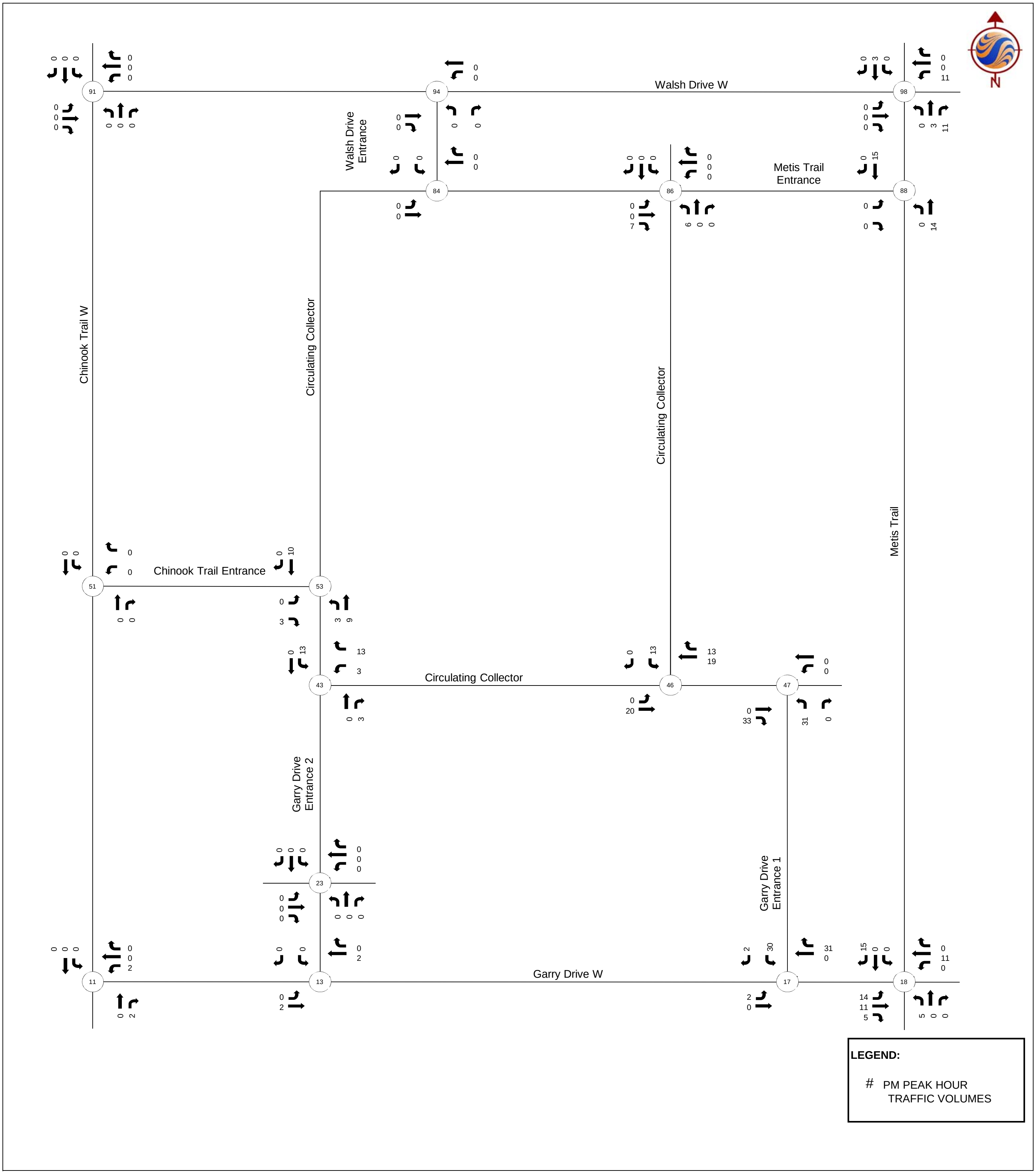
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.16
Ten-Year Neighbourhood Commercial Site-Generated Traffic Volumes
PM Peak Hour



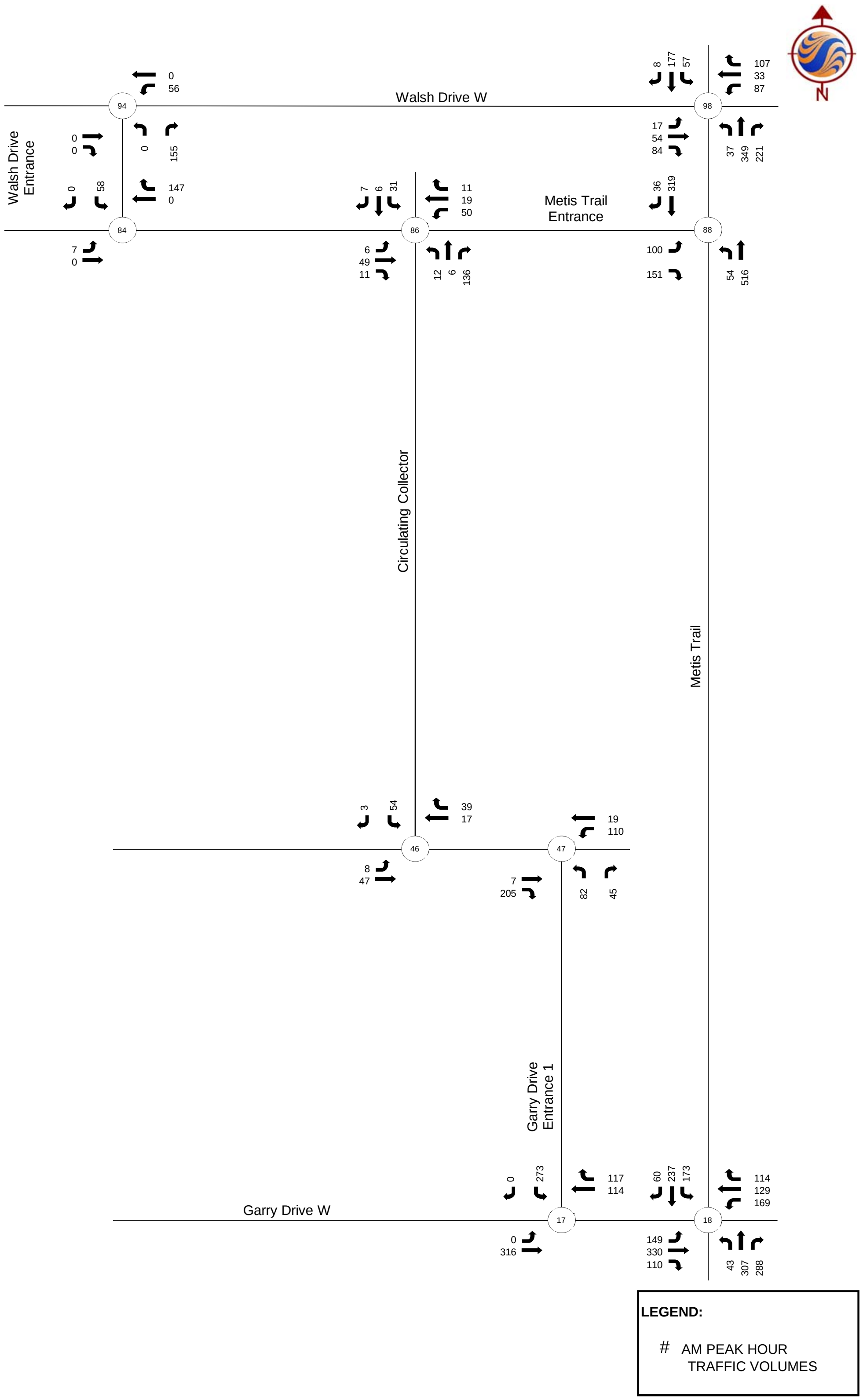
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.17
Full-Build Neighbourhood Commercial Site-Generated Traffic Volumes
AM Peak Hour



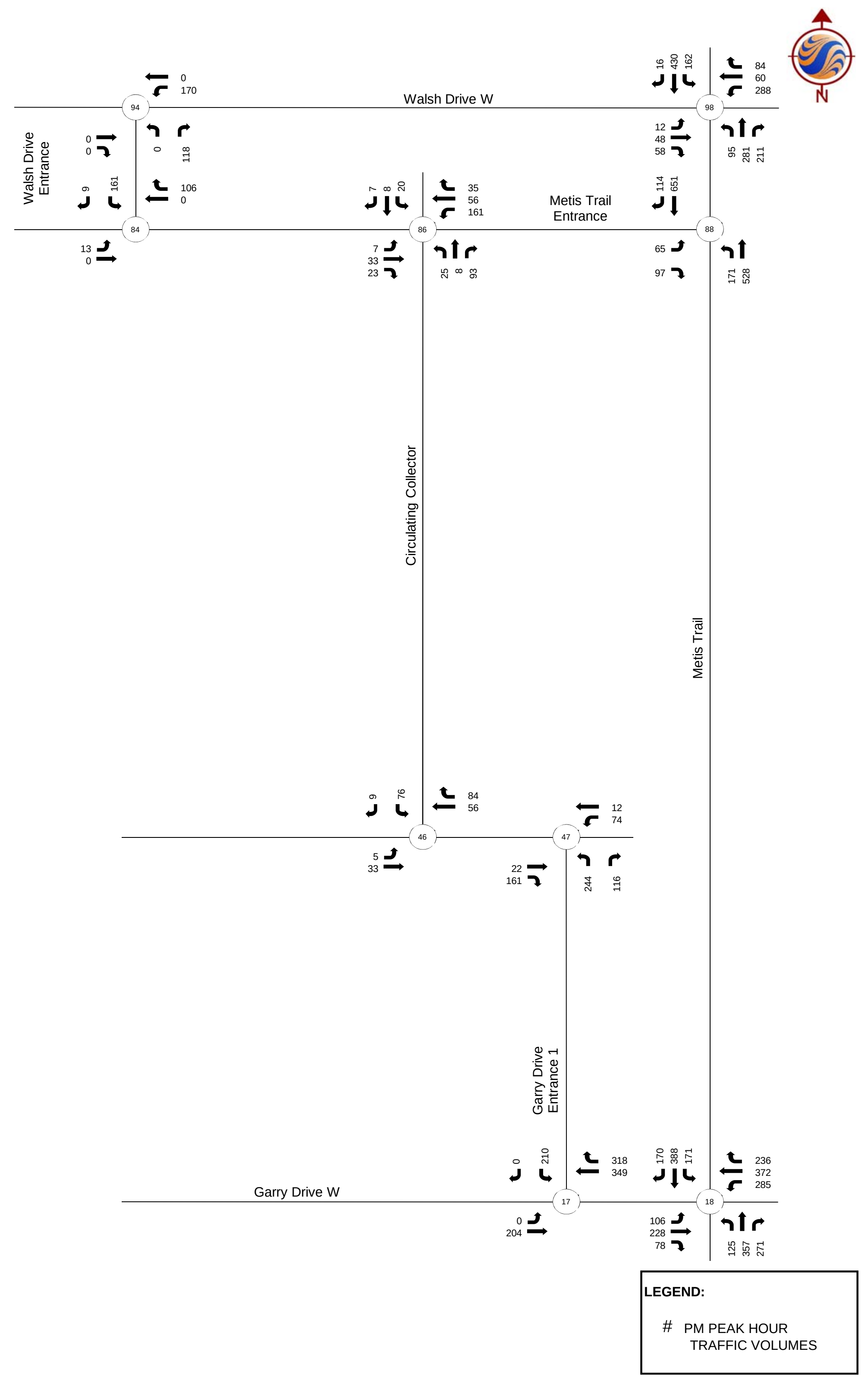
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.18
Full-Build Neighbourhood Commercial Site-Generated Traffic Volumes
PM Peak Hour



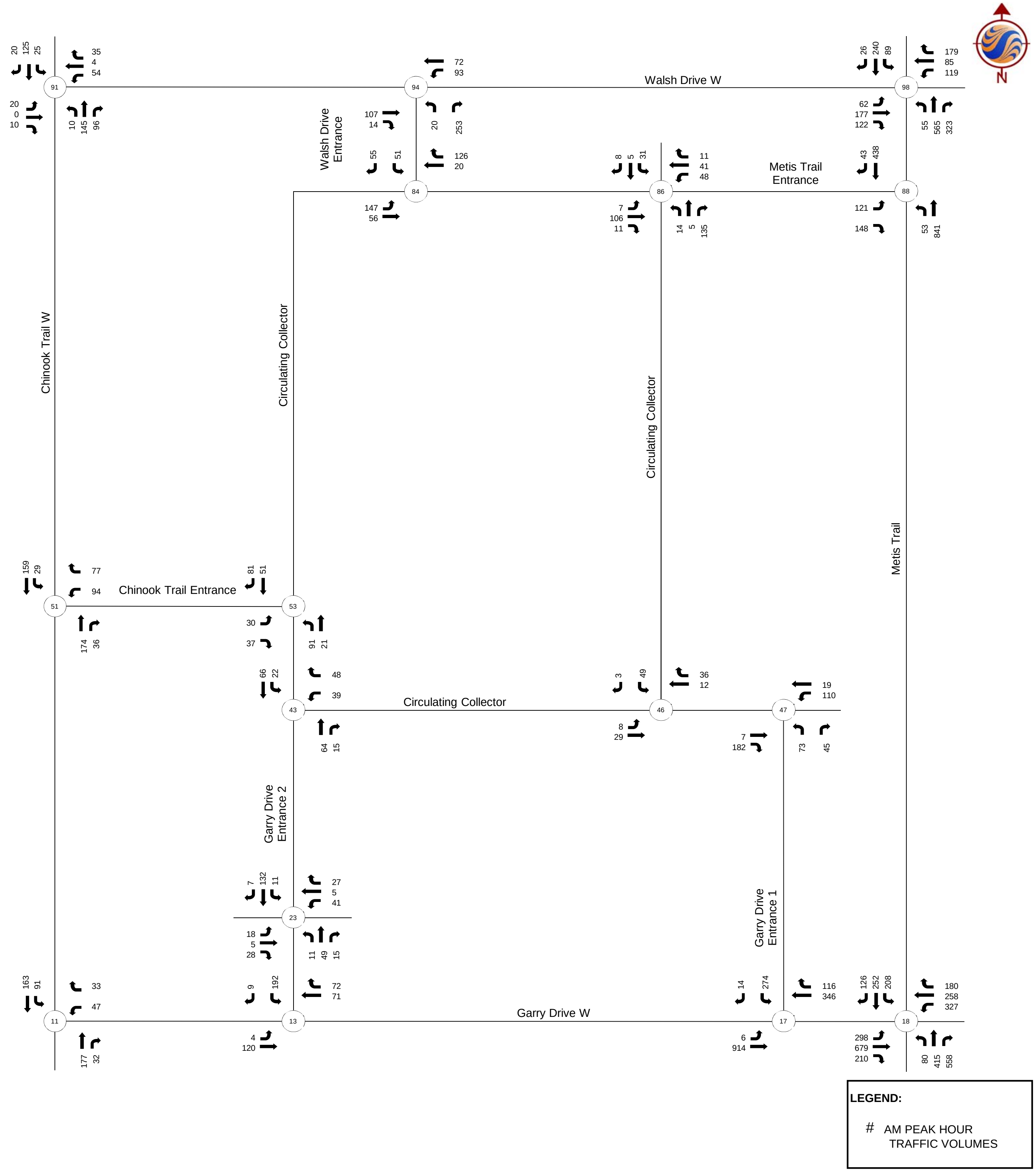
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.19
Ten-Year Post-Development Traffic Volumes
PM Peak Hour



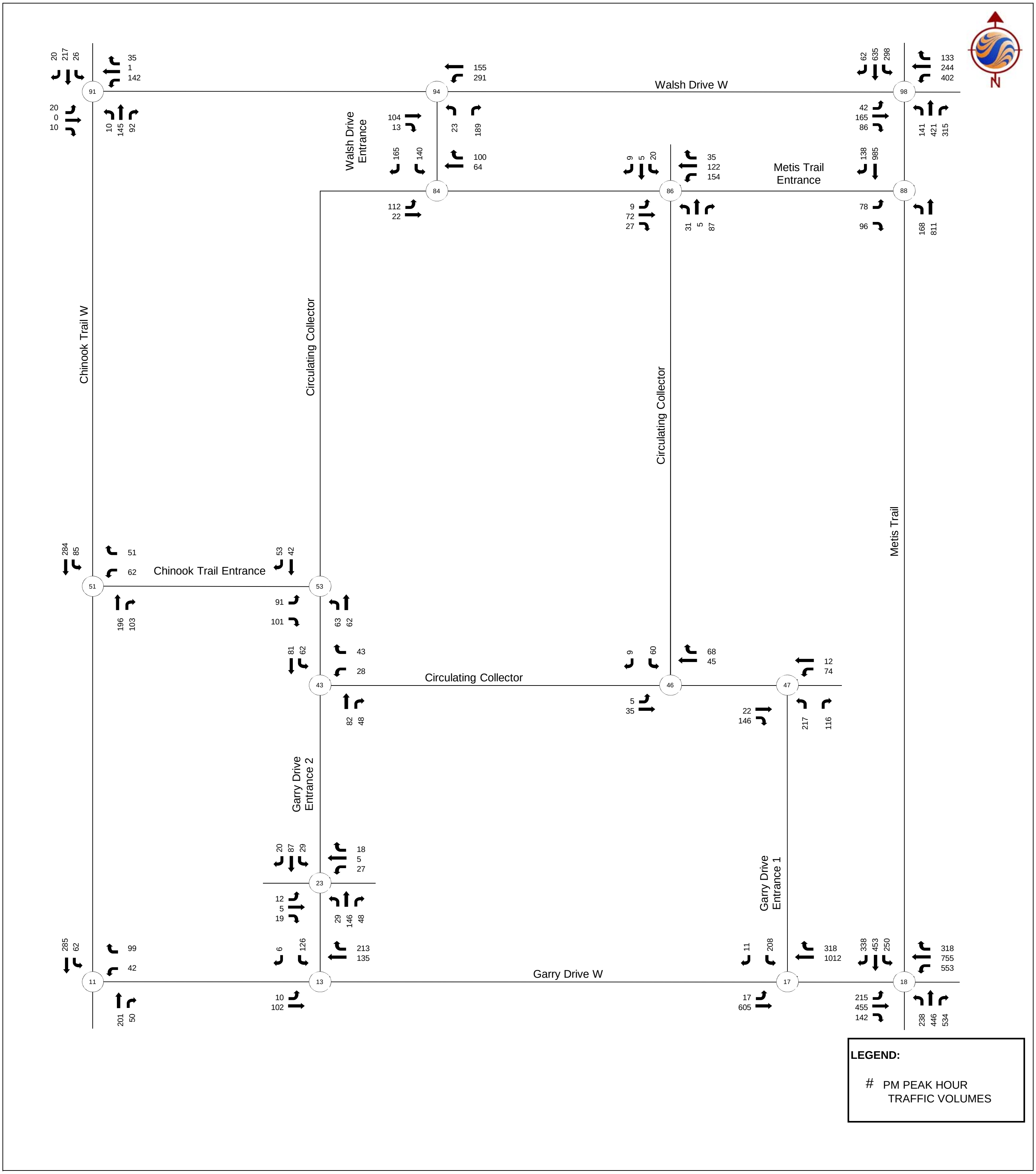
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.20
Ten-Year Post-Development Traffic Volumes
PM Peak Hour



SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.21
Full-Build Post-Development Traffic Volumes
AM Peak Hour



SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 3.22
Full-Build Post-Deveopment Traffic Volumes
PM Peak Hour

4.0 Intersection analysis

4.1 ANALYSIS CRITERIA

Analysis for roundabout intersections was undertaken using the SIDRA Intersection 5.0 software package, which is based on the Highway Capacity Manual (HCM 2000). For roundabouts, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, the gap-acceptance behavior of drivers and pedestrian effects. The average delay for each lane group and the overall intersection are calculated. An operation level of service is then assigned based on the calculated average delay.

Analysis for conventional signalized/unsignalized intersections was undertaken using the Synchro 7 software package, which is based on the Highway Capacity Manual (HCM 2000). For unsignalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit and the type of intersection control. The average delay for each individual movement from the minor street, the major street left-turn movements and the overall intersection are calculated. An operation level of service (LOS) is then assigned based on the calculated average delay.

For signalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, the traffic signal phasing / timing plan as well as pedestrian volumes. The average delay for each lane group and the overall intersection are calculated. An operation LOS is then assigned based on the calculated average delay.

The level of service criteria for both signalized and unsignalized intersections is described in **Table 4.1**.

Table 4.1 – Level of Service Criteria

Level of Service	**Average Control Delay (seconds per vehicle)**		**Comment**
	Signalized Intersection	**Unsignalized Intersection**	
A	10.0 or less	10.0 or less	Very good operation
B	10.1 to 20.0	10.1 to 15.0	Good operation
C	20.1 to 35.0	15.1 to 25.0	Acceptable operation
D	35.1 to 55.0	25.1 to 35.0	Congestion
E	55.1 to 80.0	35.1 to 50.0	Significant congestion
F	More than 80.0	More than 50.0	Unacceptable operation
Breakdown	Very high	Very high	Conditions so poor that capacity calculations are meaningless

The volume-to-capacity (v / c) ratio was also considered. If the v / c ratio for a movement is greater than 1.00, then that movement has technically exceeded capacity. The City's threshold for the v / c ratio is 0.80 for through movements and 0.90 for critical movements.

4.2 FUTURE DEVELOPMENT OF WEST LETHBRIDGE

The full-build horizon studied in this report assumes the full development of Country Meadows as well as the Garry Station subdivision immediately to the south and the West Lethbridge Employment Centre to the north. The full-build horizon does not account for appreciable developments to the west of Country Meadows as the areas to the west of the future Chinook Trail are not anticipated to be developed by this (approximately 2031) horizon.

Based on these assumptions, it is recommended that the capacity of the future Chinook Trail be reviewed in conjunction with future developments to the west. Although this analysis has been undertaken assuming single-lane entrance roads to Country Meadows, the plans presented in the Country Meadows Outline Plan application have provided sufficient right of way at all access points to allow for larger entrance roads should they be required in the future.

4.3 TEN-YEAR HORIZON (2021) BACKGROUND OPERATING CONDITIONS

For the ten-year horizon Metis Trail, Garry Drive, and Walsh Drive are assumed to be constructed with two-lane cross-sections. These assumptions are consistent with the Garry Station TIA. Chinook Trail is not assumed to be constructed at this horizon.

The ten-year horizon background operating conditions during the AM and PM peak hours were reviewed using the volumes shown in **Figures 3.9 and 3.10**. Analysis of the internal intersections and entrance roads was not conducted as it was not warranted based on the background volumes. **Table 4.2** summarizes the results of our analysis for the ten-year horizon background morning and afternoon peak hour volumes. The outputs for the ten-year horizon background analysis are included in **Appendix F**. The recommended lane configurations for the ten-year horizon background scenario are illustrated in **Figure 4.1**. Unless otherwise noted all dedicated right turn lanes are assumed to have 30 meter storage.

The results of the ten-year horizon background analysis summarized in **Table 4.2** indicate the following:

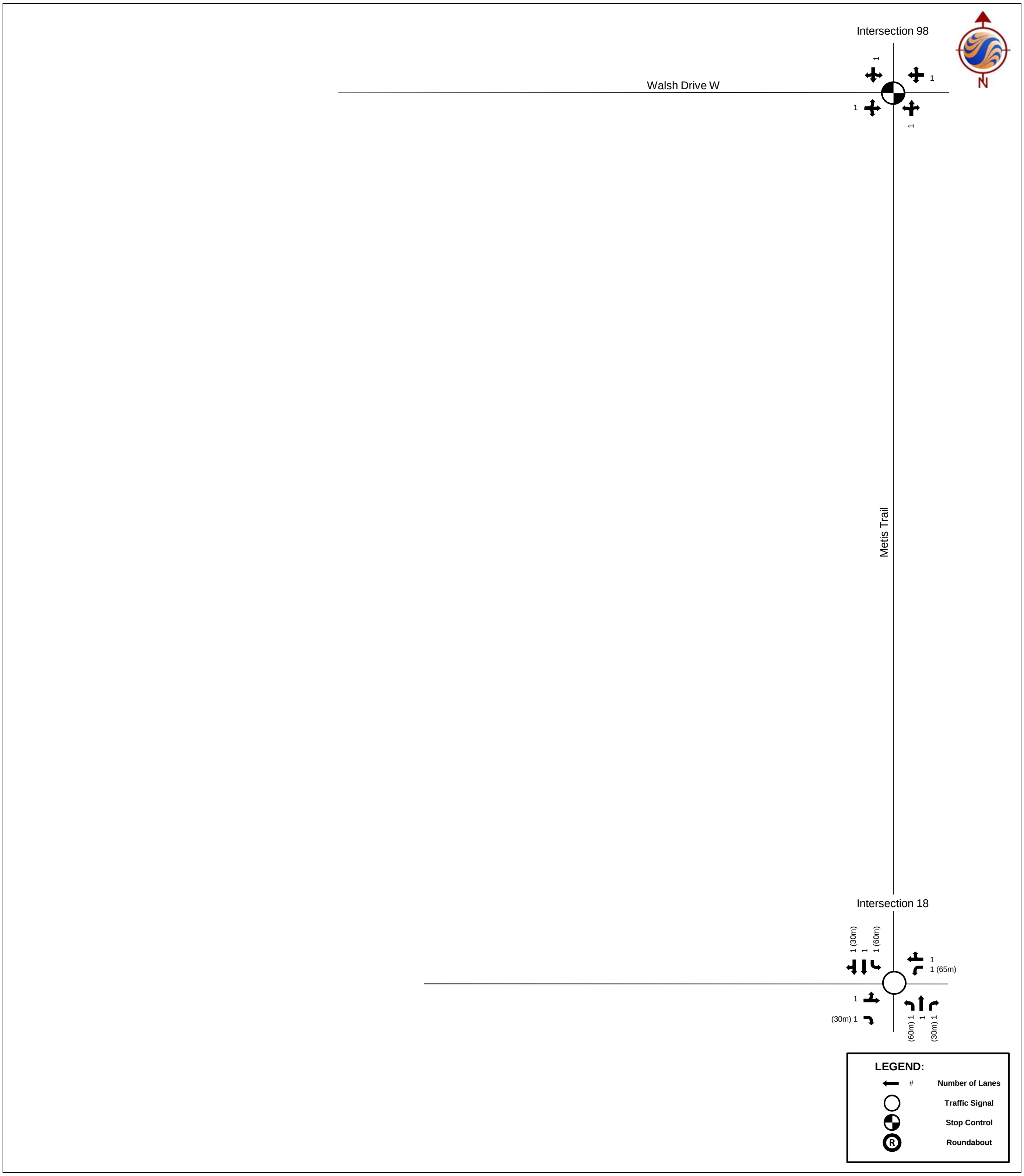
- Garry Drive / Métis Trail W (intersection 18): based on the recommendations of the Garry Station TIA that a roundabout would not perform sufficiently at this location, the intersection was analyzed as a conventional four-legged signalized intersection. Based on the recommendations stated in the Garry Station TIA, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds. Based on the queuing analysis the following minimum storage lengths are recommended:
    - Northbound left turn lane – 60 meters
    - Southbound left turn lane – 60 meters
    - Westbound left turn lane – 60 meters
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized (four-way stop-controlled) intersection.

Table 4.2 - Ten-Year Horizon (2021) Background Operating Conditions

Intersection	Intersection ID#	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
					Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Garry Drive / Metis Trail	18	Signals	AM Peak Hour	Volumes (vph)	40	221	56	166	82	60	20	226	288	17	109	13	B
				Level of Service	C		A	A	A		B	C	B	B	C		
				V/C Ratio by Movement	0.55		0.12	0.36	0.19		0.06	0.57	0.59	0.06	0.31		
				95th Percentile Queue (m)	55		7	23	16		6	58	33	5	30		
			PM Peak Hour	Volumes (vph)	23	145	36	285	245	61	62	219	271	69	287	43	C
				Level of Service	D		B	C	B		B	C	A	B	D		
				V/C Ratio by Movement	0.48		0.11	0.59	0.44		0.24	0.51	0.51	0.20	0.77		
				95th Percentile Queue (m)	53		8	63	67		14	58	22	16	91		
Walsh Drive / Metis Trail	98	Four-Way Stop Control	AM Peak Hour	Volumes (vph)	10	5	0	15	15	107	4	273	38	57	117	5	B
				Level of Service	A			A			B			A			
				V/C Ratio by Movement	0.03			0.21			0.46			0.28			
				95th Percentile Queue (m)	-			-			-			-			
			PM Peak Hour	Volumes (vph)	8	16	3	77	7	84	4	212	81	162	350	8	C
				Level of Service	B			B			B			D			
				V/C Ratio by Movement	0.06			0.33			0.51			0.87			
				95th Percentile Queue (m)	-			-			-			-			

Notes:

1. Queues are based on Synchro results.
2. Bold indicates movements with v/c ratios > 0.90 or LOS F.
3. The roundabout analysis was conducted using SIDRA Intersection 5.



SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure 4.1
Ten Year Horizon Post-Development
Recommended Lane Configurations

4.4 TEN-YEAR HORIZON (2021) POST-DEVELOPMENT OPERATING CONDITIONS

For the ten-year horizon Metis Trail, Garry Drive, and Walsh Drive are assumed to be constructed with two-lane cross-sections. These assumptions are consistent with the Garry Station TIA. Chinook Trail is not assumed to be constructed at this horizon. The community entrance roads were reviewed to determine whether the two-lane cross-section would be sufficient. The circulating collector is assumed to be a two-lane cross-section.

The ten-year horizon post-development operating conditions during the AM and PM peak hours were reviewed using the volumes shown in **Figures 3.19 and 3.20**. **Table 4.3** summarizes the results of our analysis for the ten-year horizon post-development morning and afternoon peak hour volumes. The outputs for the ten-year horizon post-development analysis are included in **Appendix G**. The recommended lane configurations for the ten-year horizon post-development scenario are illustrated in **Figure 4.2**. Unless otherwise noted all dedicated right turn lanes are assumed to have 30 meter storage.

The results of the ten-year horizon post-development analysis summarized in **Table 4.3** indicate the following:

- Garry Drive / Métis Trail W (intersection 18): based on the recommendations of the Garry Station TIA that a roundabout would not perform adequately at this location, the intersection was analyzed as a conventional four-legged signalized intersection. Based on the recommendations stated in the Garry Station TIA, the intersection is expected to fail. With the addition of a designated eastbound left turn lane and designated southbound, eastbound, and westbound right turn lanes, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds. Based on the queuing analysis the following minimum storage lengths are recommended:
    - Northbound left turn lane – 60 meters
    - Northbound right turn lane – 50 meters
    - Southbound left turn lane – 60 meters
    - Eastbound left turn lane – 60 meters
    - Westbound left turn lane – 60 meters
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to fail as a four-way stop-controlled intersection. The intersection was therefore analyzed as a roundabout. As a single-lane roundabout with a southbound right turn slip (yield) ramp, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as a single-lane roundabout.

- Garry Drive W / Entrance 1 (intersection 17): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City’s thresholds as an unsignalized intersection (stop-controlled at the entrance road) with a single lane approach on the entrance road.
- Walsh Drive / Entrance Road (intersection 94): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City’s thresholds as an unsignalized intersection (stop-controlled at the entrance road) with a single lane approach on the entrance road.
- Métis Trail W / Entrance Road (intersection 88): the intersection is expected to fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a single-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City’s thresholds.
- Internal Intersections 46, 47, 84, 86: were identified as potential roundabout locations during the Outline Plan gate 3 submission. All four intersections are expected to operate at acceptable level of service with v/c ratios below the City’s threshold as single-lane roundabouts.

Table 4.3 - Ten-Year Horizon (2021) Post-Development Operating Conditions

Intersection	Intersection ID#	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
					Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Garry Drive / Metis Trail	18	Signals	AM Peak Hour	Volumes (vph)	149	330	208	166	129	117	43	254	288	173	187	60	C
				Level of Service	B	D	B	B	C	A	B	D	B	C	C	A	
				V/C Ratio by Movement	0.32	0.73	0.45	0.52	0.27	0.25	0.13	0.74	0.65	0.51	0.36	0.13	
				95th Percentile Queue (m)	33	101	33	37	37	11	13	83	43	43	57	9	
			PM Peak Hour	Volumes (vph)	106	228	78	285	372	236	125	307	271	171	338	170	C
				Level of Service	B	D	B	C	D	B	C	D	B	C	D	B	
				V/C Ratio by Movement	0.36	0.62	0.23	0.67	0.73	0.47	0.49	0.79	0.61	0.59	0.80	0.41	
				95th Percentile Queue (m)	25	79	16	67	114	40	32	104	47	43	111	32	
Walsh Drive / Metis Trail	98	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	17	54	84	87	33	107	37	299	221	57	127	8	A
				Level of Service	B	A	A	B	A	A	B	A	A	B	A	A	
				V/C Ratio by Movement	0.22	0.22	0.22	0.37	0.37	0.37	0.61	0.61	0.61	0.19	0.19	0.01	
				95th Percentile Queue (m)	9	9	9	18	18	18	42	42	42	9	9	0	
			PM Peak Hour	Volumes (vph)	12	48	58	288	60	84	95	231	211	162	380	16	B
				Level of Service	C	B	B	B	B	B	B	B	B	C	B	A	
				V/C Ratio by Movement	0.39	0.39	0.39	0.70	0.70	0.70	0.70	0.70	0.70	0.79	0.79	0.02	
				95th Percentile Queue (m)	21	21	21	61	61	61	8	8	8	11	11	0	
Garry Drive Entrance Road 1	17	Stop-Controlled on Entrance Road	AM Peak Hour	Volumes (vph)	0	316			114	117				273		0	A
				Level of Service	A				A					D			
				V/C Ratio by Movement	0.00				0.15					0.65			
				95th Percentile Queue (m)	0				0					34			
			PM Peak Hour	Volumes (vph)	0	204			349	318				210		0	B
				Level of Service	A				A					E			
				V/C Ratio by Movement	0.00				0.45					0.70			
				95th Percentile Queue (m)	0				0					38			
Walsh Drive Entrance Road	94	Stop-Controlled on Entrance Road	AM Peak Hour	Volumes (vph)		0	0	56	0		0		155				A
				Level of Service		A		A			A						
				V/C Ratio by Movement		0.00		0.04			0.17						
				95th Percentile Queue (m)		0		1			5						
			PM Peak Hour	Volumes (vph)		0	0	170	0		0		118				A
				Level of Service		A		A			A						
				V/C Ratio by Movement		0.00		0.12			0.13						
				95th Percentile Queue (m)		0		3			3						
Metis Trail Entrance Road	88	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	100		151				54	466			269	36	A
				Level of Service	B		A				B	A			A	A	
				V/C Ratio by Movement	0.36		0.36				0.54	0.54			0.30	0.30	
				95th Percentile Queue (m)	17		17				38	38			15	15	
			PM Peak Hour	Volumes (vph)	65		97				171	478			601	114	B
				Level of Service	B		B				B	A			B	B	
				V/C Ratio by Movement	0.40		0.40				0.62	0.62			0.83	0.83	
				95th Percentile Queue (m)	22		22				54	54			112	112	
Intersection 46	46	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	8	47			17	39				54		3	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.06	0.06			0.05	0.05				0.05		0.05	
				95th Percentile Queue (m)	2	2			2	2				2		2	
			PM Peak Hour	Volumes (vph)	5	33			56	84				76		9	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.04	0.04			0.11	0.11				0.09		0.09	
				95th Percentile Queue (m)	2	2			4	4				3		3	
Intersection 47	47	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)		7	205	110	19		82		45				A
				Level of Service		A	A	A	A		A		A				
				V/C Ratio by Movement		0.23	0.23	0.13	0.13		0.10		0.10				
				95th Percentile Queue (m)		5	5	10	10		4		4				
			PM Peak Hour	Volumes (vph)		22	161	74	12		244		116				A
				Level of Service		A	A	B	A		A		A				
				V/C Ratio by Movement		0.18	0.18	0.11	0.11		0.30		0.30				
				95th Percentile Queue (m)		8	8	4	4		15		15				
Intersection 84	84	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	7	0			0	147				58		0	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.01	0.01			0.12	0.12				0.04		0.04	
				95th Percentile Queue (m)	0	0			5	5				2		2	
			PM Peak Hour	Volumes (vph)	13	0			0	106				161		9	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.02	0.02			0.09	0.09				0.12		0.12	
				95th Percentile Queue (m)	1	1			4	4				5		5	
Intersection 86	86	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	6	49	11	50	19	11	12	6	136	31	6	7	A
				Level of Service	A	A	A	A	A	A	A	A	A	A	A	A	
				V/C Ratio by Movement	0.07	0.07	0.07	0.07	0.07	0.07	0.16	0.16	0.16	0.05	0.05	0.05	
				95th Percentile Queue (m)	3	3	3	3	3	3	6	6	6	2	2	2	
			PM Peak Hour	Volumes (vph)	7	33	23	161	56	35	25	8	93	20	8	7	A
				Level of Service	B	A	A	A	A	A	A	A	A	B	A	A	
				V/C Ratio by Movement	0.08	0.08	0.08	0.23	0.23	0.23	0.13	0.13	0.13	0.05	0.05	0.05	
				95th Percentile Queue (m)	3	3	3	10	10	10	5	5	5	2	2	2	

Notes:

1. Queues are based on Synchro results.
2. Bold indicates movements with v/c ratios > 0.90 or LOS F.
3. The roundabout analysis was conducted using SIDRA Intersection 5.

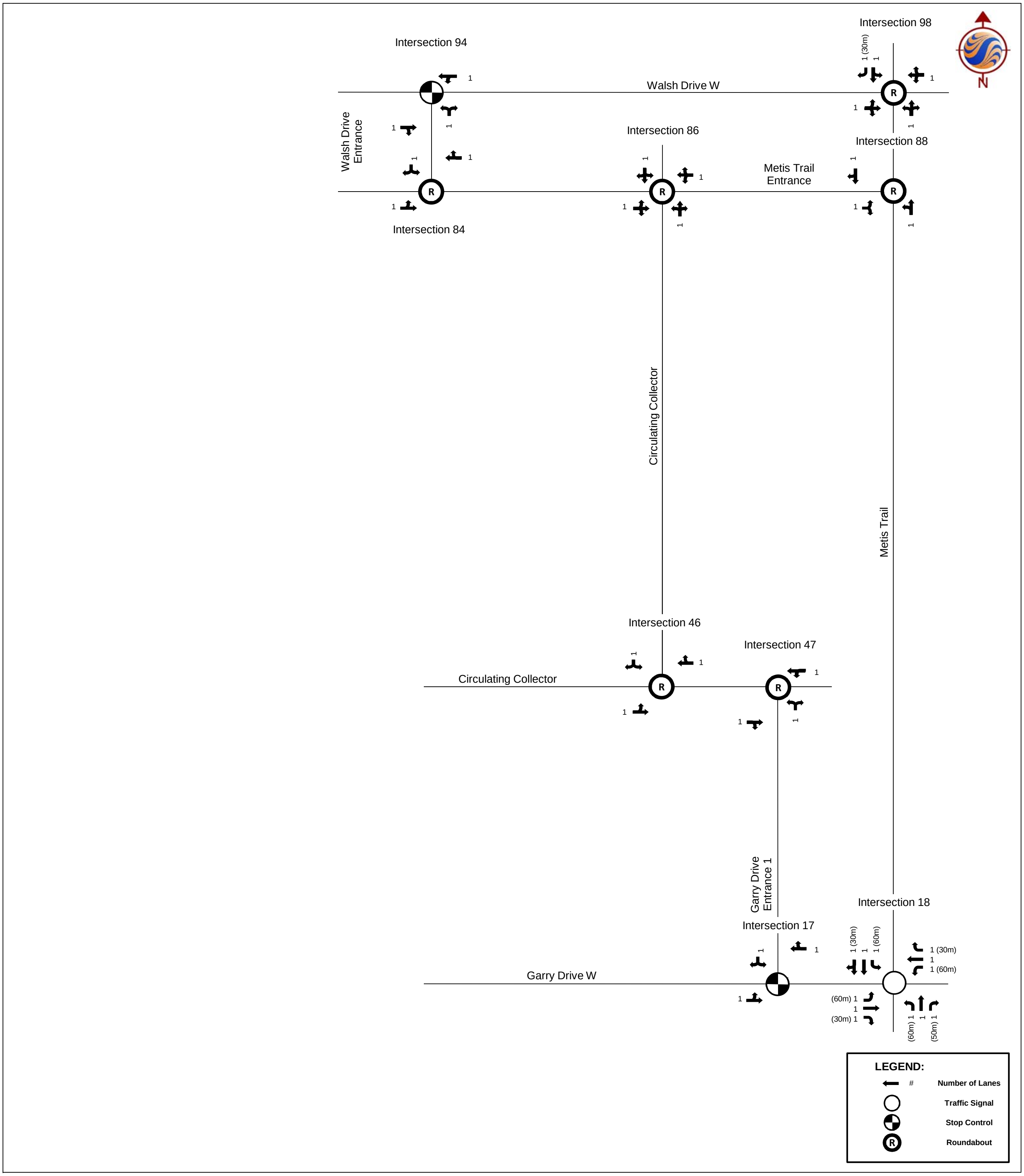


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Figure 4.2
Ten Year Horizon Post-Development Recommended Lane Configurations

4.5 FULL-BUILD HORIZON (2031) BACKGROUND OPERATING CONDITIONS

For the full-build horizon, Metis Trail is assumed to be constructed as a four-lane cross-section. Garry Drive is assumed to be constructed with a four-lane cross-section to the northern access to Garry Station. Walsh Drive is assumed to be constructed with a four-lane cross-section to Metis Trail. These assumptions are consistent with the Garry Station TIA. Chinook Trail is assumed to be constructed with a two-lane cross-section.

The full-build horizon background operating conditions during the AM and PM peak hours were reviewed using the volumes shown in **Figures 3.7 and 3.8**. Analysis of the internal intersections and entrance roads was not conducted as it was not warranted based on the background volumes. **Table 4.4** summarizes the results of our analysis for the full-build horizon background morning and afternoon peak hour volumes. The outputs for the full-build horizon background analysis are included in **Appendix H**. The recommended lane configurations for the full-build horizon background scenario are illustrated in **Figure 4.3**. Unless otherwise noted all dedicated right turn lanes are assumed to have 30 meter storage.

The results of the full-build horizon background operating conditions summarized in **Table 4.4** indicate the following:

- Garry Drive W / Chinook Trail (intersection 11): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with stop-control on Garry Drive.
- Garry Drive / Métis Trail W (intersection 18): based on the recommendations of the Garry Station TIA that a roundabout would not perform adequately at this location, the intersection was analyzed as a conventional four-legged signalized intersection. Based on the recommendations stated in the Garry Station TIA, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds. Based on the queuing analysis the following minimum storage lengths are recommended:
    - Northbound dual left turn lanes – 60 meters per lane
    - Southbound left turn lane – 65 meters
    - Westbound dual left turn lanes – 90 meters per lane
    - Eastbound left turn lane – 60 meters
- Chinook Trail / Walsh Drive (intersection 91): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with stop-control on Walsh Drive.
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a two-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds.

Table 4.4 - Full-Build Horizon (2031) Background Operating Conditions

Intersection	Intersection ID#	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
					Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Garry Drive / Chinook Trail	11	Stop Control on Garry Drive	AM Peak Hour	Volumes (vph)				10		0		169	18	5	142		A
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.02				0.13		0.00			
				95th Percentile Queue (m)				0				0		0			
			PM Peak Hour	Volumes (vph)				16		5		178	8	5	271		A
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.04				0.12		0.00			
				95th Percentile Queue (m)				1				0		0			
Garry Drive / Metis Trail	18	Signals	AM Peak Hour	Volumes (vph)	79	441	111	327	164	114	40	387	558	28	175	26	C
				Level of Service	D	C	B	C	C	A	D	C	A	D	C	B	
				V/C Ratio by Movement	0.43	0.53	0.26	0.61	0.15	0.20	0.16	0.64	0.45	0.21	0.28	0.09	
				95th Percentile Queue (m)	31	61	17	48	22	12	10	56	0	15	26	7	
			PM Peak Hour	Volumes (vph)	45	289	72	553	489	117	123	360	534	132	403	85	C
				Level of Service	D	D	B	D	C	A	D	D	A	E	D	B	
				V/C Ratio by Movement	0.37	0.47	0.22	0.81	0.43	0.21	0.44	0.67	0.43	0.70	0.64	0.26	
				95th Percentile Queue (m)	23	49	12	85	64	15	25	58	0	66	65	16	
Walsh Drive / Chinook Trail	91	Stop Control on Walsh Drive	AM Peak Hour	Volumes (vph)	20	0	10	12	4	35	10	145	14	25	125	20	A
				Level of Service	B			B			A			A			
				V/C Ratio by Movement	0.06			0.08			0.01			0.02			
				95th Percentile Queue (m)	2			2			0			1			
			PM Peak Hour	Volumes (vph)	20	0	10	49	1	35	10	145	28	26	217	20	A
				Level of Service	B			B			A			A			
				V/C Ratio by Movement	0.07			0.18			0.01			0.02			
				95th Percentile Queue (m)	2			5			0			1			
Walsh Drive / Metis Trail	98	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	20	31	0	18	29	179	8	490	62	89	211	10	A
				Level of Service	B	A	A	B	A	A	B	A	A	B	A	A	
				V/C Ratio by Movement	0.03	0.03	0.03	0.12	0.12	0.25	0.29	0.29	0.29	0.15	0.15	0.15	
				95th Percentile Queue (m)	1	1	1	3	3	8	11	11	11	5	5	5	
			PM Peak Hour	Volumes (vph)	15	69	5	105	84	133	7	369	134	298	550	16	A
				Level of Service	B	A	A	B	A	A	B	A	A	B	A	A	
				V/C Ratio by Movement	0.09	0.09	0.09	0.21	0.21	0.21	0.34	0.34	0.34	0.47	0.47	0.47	
				95th Percentile Queue (m)	3	3	3	8	8	8	14	14	14	23	23	23	

Notes:

1. Queues are based on Synchro results.
2. Bold indicates movements with v/c ratios > 0.90 or LOS F.
3. The roundabout analysis was conducted using SIDRA Intersection 5.

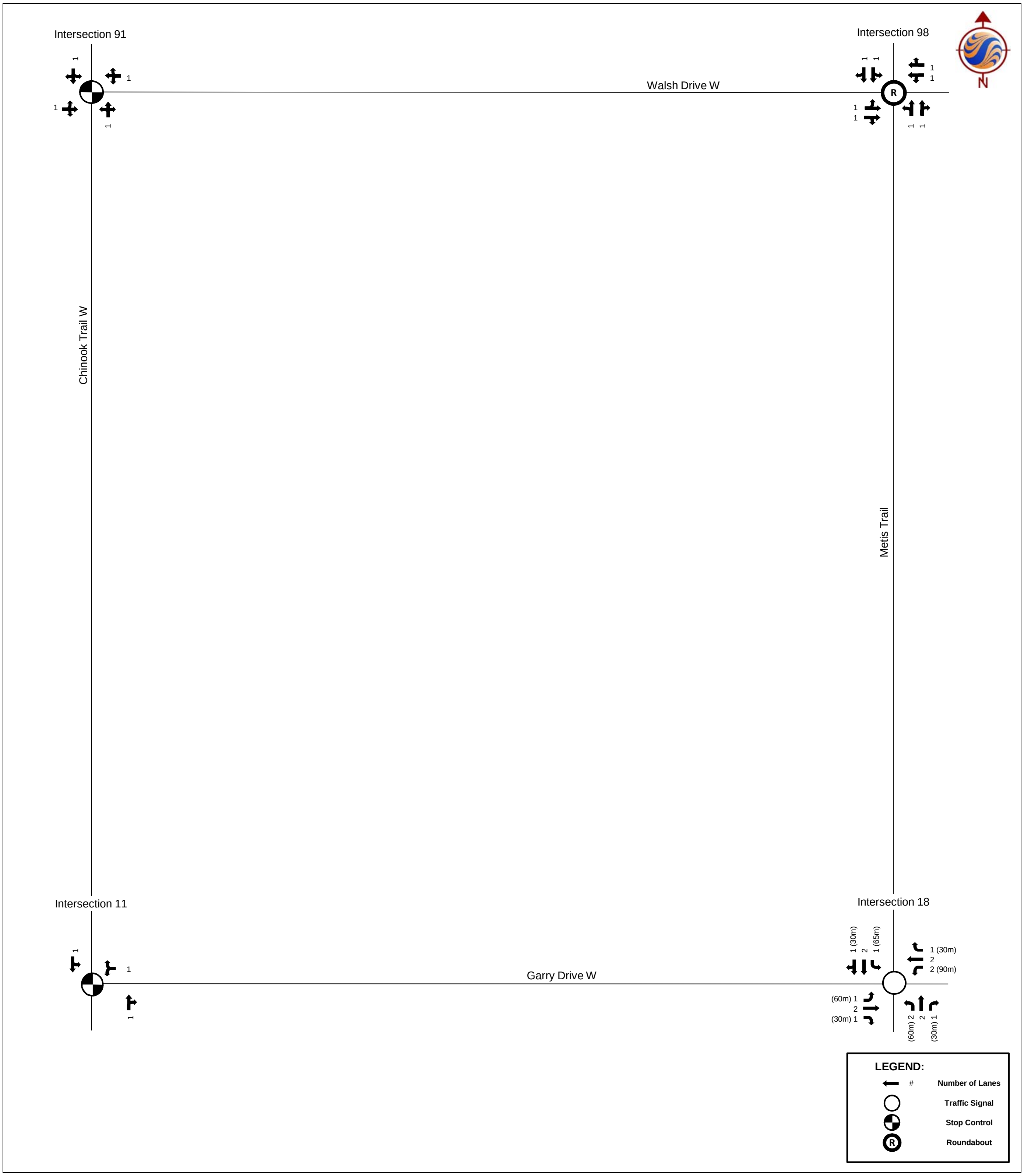

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Figure 4.3
Full-Build Horizon Background
Recommended Lane Configurations

4.6 FULL-BUILD HORIZON (2031) POST-DEVELOPMENT OPERATING CONDITIONS

For the full-build horizon, Metis Trail is assumed to be constructed as a four-lane cross-section. Garry Drive is assumed to be constructed with a four-lane cross-section to the Garry Station access. Walsh Drive is assumed to be constructed with a four-lane cross-section to Metis Trail. These assumptions are consistent with the Garry Station TIA. Chinook Trail is also assumed to be constructed with a two-lane cross-section. The community entrance roads were reviewed to determine whether the two-lane cross-section would be sufficient. The circulating collector is assumed to be a two-lane cross-section.

The full-build horizon post-development operating conditions during the AM and PM peak hours were reviewed using the volumes shown in **Figures 3.21 and 3.22**. **Table 4.5** summarizes the results of our analysis for the full-build horizon post-development morning and afternoon peak hour volumes. The outputs for the full-build horizon post-development analysis are included in **Appendix I**. The recommended lane configurations for the full-build horizon post-development scenario are illustrated in **Figure 4.4**. Unless otherwise noted all dedicated right turn lanes are assumed to have 30 meter storage.

The results of the full-build horizon post-development operating conditions summarized in **Table 4.5** indicate the following:

- Garry Drive W / Chinook Trail (intersection 11): the intersection is expected to continue to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection.
- Garry Drive / Métis Trail W (intersection 18): with the addition of additional (dual) left turn lanes on the southbound and eastbound approaches, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds. Based on the queuing analysis the following minimum storage lengths are recommended:
    - Northbound dual left turn lanes – 60 meters per lane
    - Southbound dual left turn lanes – 60 meters per lane
    - Southbound right turn lane – 75 meters
    - Westbound dual left turn lanes – 90 meters per lane
    - Eastbound dual left turn lanes – 60 meters per lane
- Chinook Trail / Walsh Drive (intersection 91): the intersection is expected to continue to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection.

- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to continue to operate at an acceptable level of service with v/c ratios below the City's thresholds as a two-lane roundabout with the addition of a southbound right turn slip (yield) ramp. Based on the queuing analysis the following minimum storage lengths are recommended:
    - Southbound right turn lane – 50 meters
- Garry Drive W / Entrance 1 (intersection 17): the intersection is expected to fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a two-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds.
- Garry Drive W / Entrance 2 (intersection 13): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with a single-lane approach (stop-controlled on the approach).
- Chinook Trail W / Entrance Road (intersection 51): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with a single-lane approach (stop-controlled on the approach).
- Walsh Drive / Entrance Road (intersection 94): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with a single-lane approach (stop-controlled on the approach).
- Métis Trail W / Entrance Road (intersection 88): the intersection is expected fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a two-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds.
- Internal Intersections 23, 46, 47, 53, 84, 86: were identified as potential roundabout locations during the Outline Plan gate 3 submission. All six intersections are expected to operate at acceptable level of service with v/c ratios below the City's threshold as single-lane roundabouts.
- Internal Intersection 43: the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection.

Table 4.5 - Full-Build Horizon (2031) Post-Development Operating Conditions

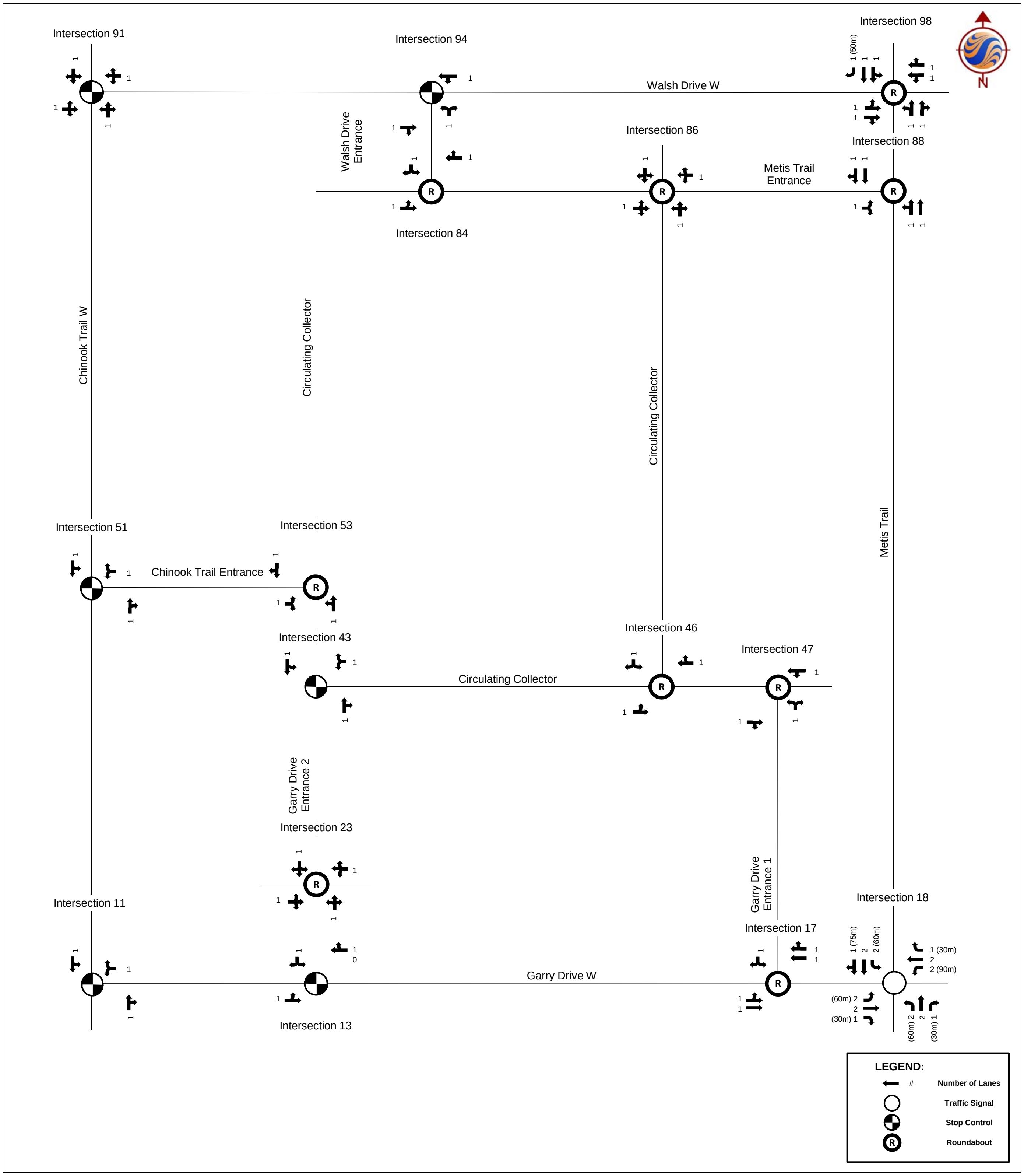
Intersection	Intersection ID#	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
					Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Garry Drive / Chinook Trail	11	Stop Control on Garry Drive	AM Peak Hour	Volumes (vph)				47		33		177	32	91	163		A
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.18				0.14		0.08			
				95th Percentile Queue (m)				5				0		2			
			PM Peak Hour	Volumes (vph)				42		99		201	50	62	285		B
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.28				0.17		0.06			
				95th Percentile Queue (m)				9				0		1			
Garry Drive / Metis Trail	18	Signals	AM Peak Hour	Volumes (vph)	299	668	208	327	255	180	79	415	558	208	252	126	C
				Level of Service	E	C	B	E	C	A	E	E	A	D	D	B	
				V/C Ratio by Movement	0.75	0.62	0.38	0.78	0.23	0.30	0.43	0.79	0.45	0.69	0.39	0.33	
				95th Percentile Queue (m)	53	103	39	58	36	15	19	70	0	41	46	21	
			PM Peak Hour	Volumes (vph)	215	455	142	553	755	318	238	446	534	250	453	338	D
				Level of Service	E	D	B	E	C	A	E	D	A	D	D	D	
				V/C Ratio by Movement	0.75	0.58	0.34	0.85	0.65	0.47	0.76	0.78	0.43	0.78	0.78	0.81	
				95th Percentile Queue (m)	47	78	28	88	107	26	48	74	0	48	83	75	
Walsh Drive / Chinook Trail	91	Stop Control on Walsh Drive	AM Peak Hour	Volumes (vph)	20	0	10	54	4	35	10	145	96	25	125	20	A
				Level of Service	B			B			A			A			
				V/C Ratio by Movement	0.07			0.19			0.01			0.02			
				95th Percentile Queue (m)	2			5			0			1			
			PM Peak Hour	Volumes (vph)	20	0	10	142	1	35	10	145	92	26	217	7	A
				Level of Service	B			C			A			A			
				V/C Ratio by Movement	0.08			0.46			0.01			0.02			
				95th Percentile Queue (m)	2			18			0			1			
Walsh Drive / Metis Trail	98	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	62	177	122	119	85	179	55	565	323	89	240	26	A
				Level of Service	B	A	A	B	A	A	B	A	A	B	A	A	
				V/C Ratio by Movement	0.24	0.24	0.24	0.33	0.33	0.33	0.59	0.59	0.59	0.17	0.17	0.02	
				95th Percentile Queue (m)	8	9	9	13	13	13	34	34	34	6	7	1	
			PM Peak Hour	Volumes (vph)	42	165	86	402	244	133	141	421	315	298	635	62	C
				Level of Service	C	B	B	B	B	B	B	B	B	C	B	A	
				V/C Ratio by Movement	0.50	0.50	0.50	0.66	0.64	0.64	0.66	0.66	0.66	0.73	0.73	0.07	
				95th Percentile Queue (m)	23	25	25	42	39	39	45	45	45	50	54	3	
Garry Drive Entrance Road 1	17	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	6	901			342	116				274		14	A
				Level of Service	B	A			A	A				B		A	
				V/C Ratio by Movement	0.55	0.55			0.18	0.18				0.43		0.43	
				95th Percentile Queue (m)	32	32			8	8				17		17	
			PM Peak Hour	Volumes (vph)	17	597			997	318				208		11	A
				Level of Service	B	A			A	A				B		B	
				V/C Ratio by Movement	0.36	0.36			0.53	0.53				0.50		0.50	
				95th Percentile Queue (m)	17	17			33	33				21		21	
Garry Drive Entrance Road 2	13	Stop Control on Entrance Road	AM Peak Hour	Volumes (vph)	4	120			71	72				192		9	A
				Level of Service	A				A					B			
				V/C Ratio by Movement	0.00				0.10					0.32			
				95th Percentile Queue (m)	0				0					11			
			PM Peak Hour	Volumes (vph)	10	102			135	213				126		6	A
				Level of Service	A				A					B			
				V/C Ratio by Movement	0.01				0.23					0.26			
				95th Percentile Queue (m)	0				0					8			
Chinook Trail Entrance Road	51	Stop Control on Entrance Road	AM Peak Hour	Volumes (vph)				94		77		174	36	29	159		A
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.31				0.14		0.03			
				95th Percentile Queue (m)				10				0		1			
			PM Peak Hour	Volumes (vph)				62		51		196	103	85	284		B
				Level of Service				C				A		A			
				V/C Ratio by Movement				0.30				0.20		0.08			
				95th Percentile Queue (m)				9				0		2			
Walsh Drive Entrance Road	94	Stop-Control on Entrance Road	AM Peak Hour	Volumes (vph)		107	14	93	72		20		253				A
				Level of Service		A		A			B						
				V/C Ratio by Movement		0.08		0.07			0.36						
				95th Percentile Queue (m)		0		2			13						
			PM Peak Hour	Volumes (vph)		104	13	291	135		23		189				A
				Level of Service		A		A			B						
				V/C Ratio by Movement		0.08		0.23			0.36						
				95th Percentile Queue (m)		0		7			12						

Table 4.5 - Full-Build Horizon (2031) Post-Development Operating Conditions

Intersection	Intersection ID#	Intersection Control	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
					Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Metis Trail Entrance Road	88	Two-Lane Roundabout	AM Peak Hour	Volumes (vph)	121		148				53	841			438	43	A
				Level of Service	B		A				B	A			A	A	
				V/C Ratio by Movement	0.44		0.44				0.45	0.45			0.22	0.22	
				95th Percentile Queue (m)	17		17				23	23			9	9	
			PM Peak Hour	Volumes (vph)	78		96				168	811			985	138	A
				Level of Service	B		B				B	A			A	A	
				V/C Ratio by Movement	0.44		0.44				0.46	0.46			0.58	0.58	
				95th Percentile Queue (m)	17		17				25	25			33	33	
Intersection 23	23	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	18	5	28	41	5	27	11	45	15	11	119	7	A
				Level of Service	B	A	A	A	A	A	A	A	A	A	A	A	
				V/C Ratio by Movement	0.06	0.06	0.06	0.08	0.08	0.08	0.07	0.07	0.07	0.15	0.15	0.15	
				95th Percentile Queue (m)	2	2	2	3	3	3	3	3	3	6	6	6	
			PM Peak Hour	Volumes (vph)	12	5	19	27	5	18	29	131	48	29	79	20	A
				Level of Service	A	A	A	B	A	A	A	A	A	A	A	A	
				V/C Ratio by Movement	0.04	0.04	0.04	0.06	0.06	0.06	0.21	0.21	0.21	0.14	0.14	0.14	
				95th Percentile Queue (m)	2	2	2	2	2	2	9	9	9	5	5	5	
Intersection 46	46	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	8	29			12	36				49		3	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.04	0.04			0.04	0.04				0.05		0.05	
				95th Percentile Queue (m)	1	1			2	2				2		2	
			PM Peak Hour	Volumes (vph)	5	35			45	68				60		9	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.04	0.04			0.09	0.09				0.07		0.07	
				95th Percentile Queue (m)	2	2			4	4				3		3	
Intersection 47	47	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)		7	182	110	19		73		45				A
				Level of Service		A	A	A	A		A		A				
				V/C Ratio by Movement		0.20	0.20	0.13	0.13		0.10		0.10				
				95th Percentile Queue (m)		9	9	5	5		4		4				
			PM Peak Hour	Volumes (vph)		22	146	74	12		217		116				A
				Level of Service		A	A	B	A		A		A				
				V/C Ratio by Movement		0.17	0.17	0.11	0.11		0.27		0.27				
				95th Percentile Queue (m)		7	7	4	4		13		13				
Intersection 53	53	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	30		37				91	21			51	81	A
				Level of Service	A		A				A	A			A	A	
				V/C Ratio by Movement	0.07		0.07				0.10	0.10			0.14	0.14	
				95th Percentile Queue (m)	3		3				4	4			6	6	
			PM Peak Hour	Volumes (vph)	91		101				63	62			42	53	A
				Level of Service	A		A				A	A			A	A	
				V/C Ratio by Movement	0.18		0.18				0.13	0.13			0.10	0.10	
				95th Percentile Queue (m)	8		8				5	5			4	4	
Intersection 84	84	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	147	56			20	126				51		55	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.19	0.19			0.17	0.17				0.09		0.09	
				95th Percentile Queue (m)	8	8			7	7				4		4	
			PM Peak Hour	Volumes (vph)	112	22			64	100				140		165	A
				Level of Service	A	A			A	A				A		A	
				V/C Ratio by Movement	0.15	0.15			0.18	0.18				0.29		0.29	
				95th Percentile Queue (m)	6	6			8	8				14		14	
Intersection 86	86	Single-Lane Roundabout	AM Peak Hour	Volumes (vph)	7	106	11	48	41	11	14	5	135	31	5	8	A
				Level of Service	A	A	A	A	A	A	B	A	A	A	A	A	
				V/C Ratio by Movement	0.13	0.13	0.13	0.09	0.09	0.09	0.18	0.18	0.18	0.05	0.05	0.05	
				95th Percentile Queue (m)	5	5	5	4	4	4	7	7	7	2	2	2	
			PM Peak Hour	Volumes (vph)	9	72	27	154	122	35	31	5	87	20	5	9	A
				Level of Service	B	A	A	A	A	A	A	A	A	B	A	A	
				V/C Ratio by Movement	0.13	0.13	0.13	0.28	0.28	0.28	0.05	0.05	0.05	0.13	0.13	0.13	
				95th Percentile Queue (m)	5	5	5	13	13	13	5	5	5	2	2	2	
Intersection 43	43	Stop-Control East-Leg	AM Peak Hour	Volumes (vph)				39		48		64	15	22	66		A
				Level of Service				A				A		A			
				V/C Ratio by Movement				0.12				0.05		0.02			
				95th Percentile Queue (m)				3				0		0			
			PM Peak Hour	Volumes (vph)				28		43		82	48	62	81		A
				Level of Service				B				A		A			
				V/C Ratio by Movement				0.11				0.09		0.05			
				95th Percentile Queue (m)				3				0		1			

Notes:

1. Queues are based on Synchro results.
2. Bold indicates movements with v/c ratios > 0.90 or LOS F.
3. The roundabout analysis was conducted using SIDRA Intersection 5.



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OUTLINE PLAN

Figure 4.4
Full-Build Horizon Post-Development Recommended Lane Configurations

4.7 INTERNAL ROAD NETWORK CLASSIFICATION

In order to determine the daily volumes on the proposed road network within the Country Meadows outline plan area, we first determined the PM peak hour link volumes and then factored the PM link volumes up by 10 to obtain the daily traffic volumes.

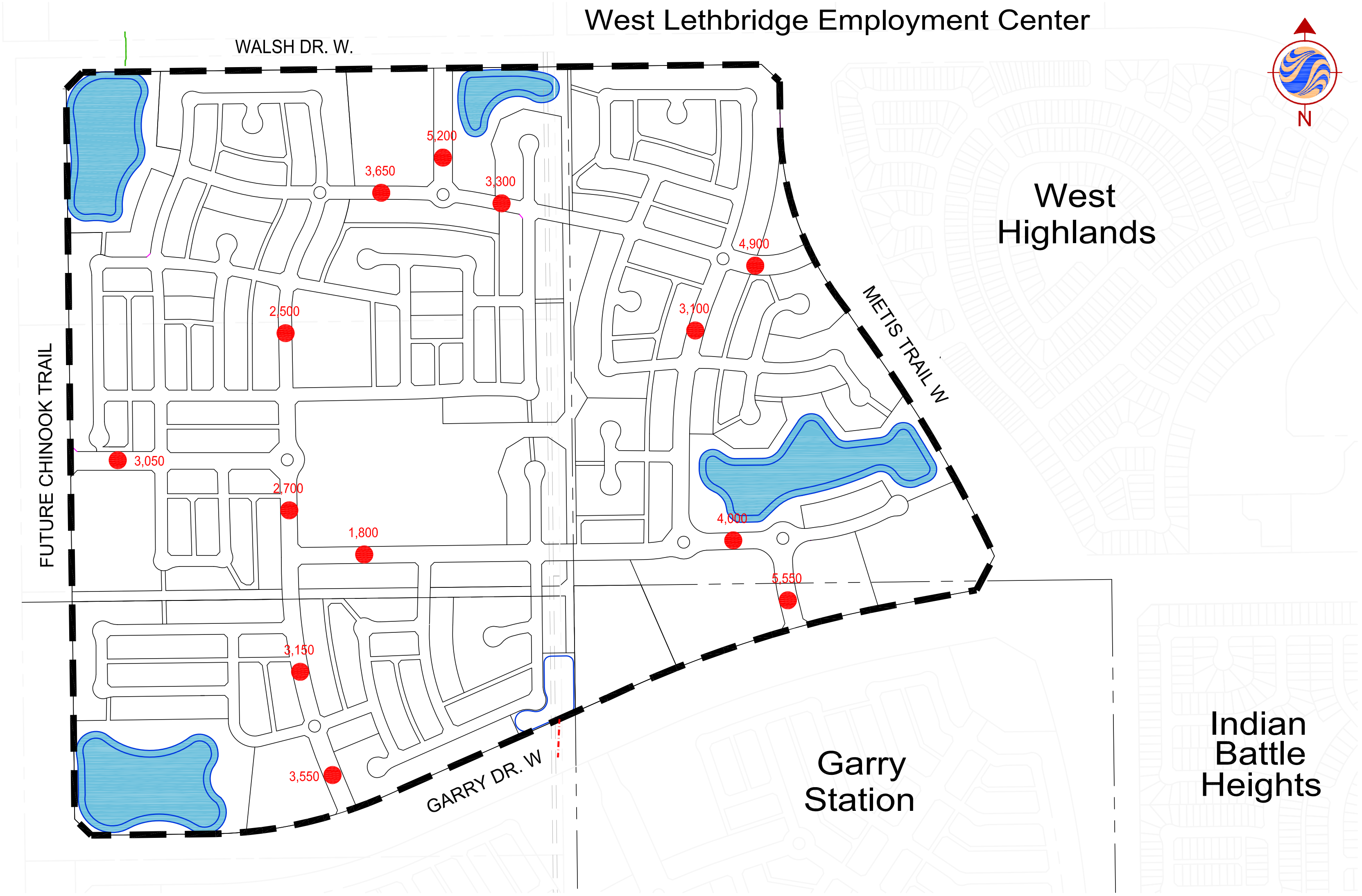
Figure 4.5 illustrates the projected daily volumes on the road network reviewed as part of the Country Meadows TIA.

The City of Lethbridge Design Guidelines classifies roadways into designations with the following daily vehicular traffic volumes:

- Arterial: > 15,000 vehicles per day (vpd)
- Super Collector: 2,000 – 15,000 vpd
- Community Entrance Road: 2,000 – 8,000 vpd
- Major Collector: 2,000 – 8,000 vpd
- Minor Collector Road: < 4,000 vpd
- Local Road: < 2,000 vpd

Based on the Outline Plan and the projected daily traffic volumes, the recommended roadway classifications are shown in **Figure 4.6**.

The projected daily volumes shown on **Figure 4.5** are within the design guidelines for all the roadways in the plan area.



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112945195

Legend

╍ Country Meadows

● #### Estimated Daily Two-Way Traffic Volumes
(Vehicles Per Day)

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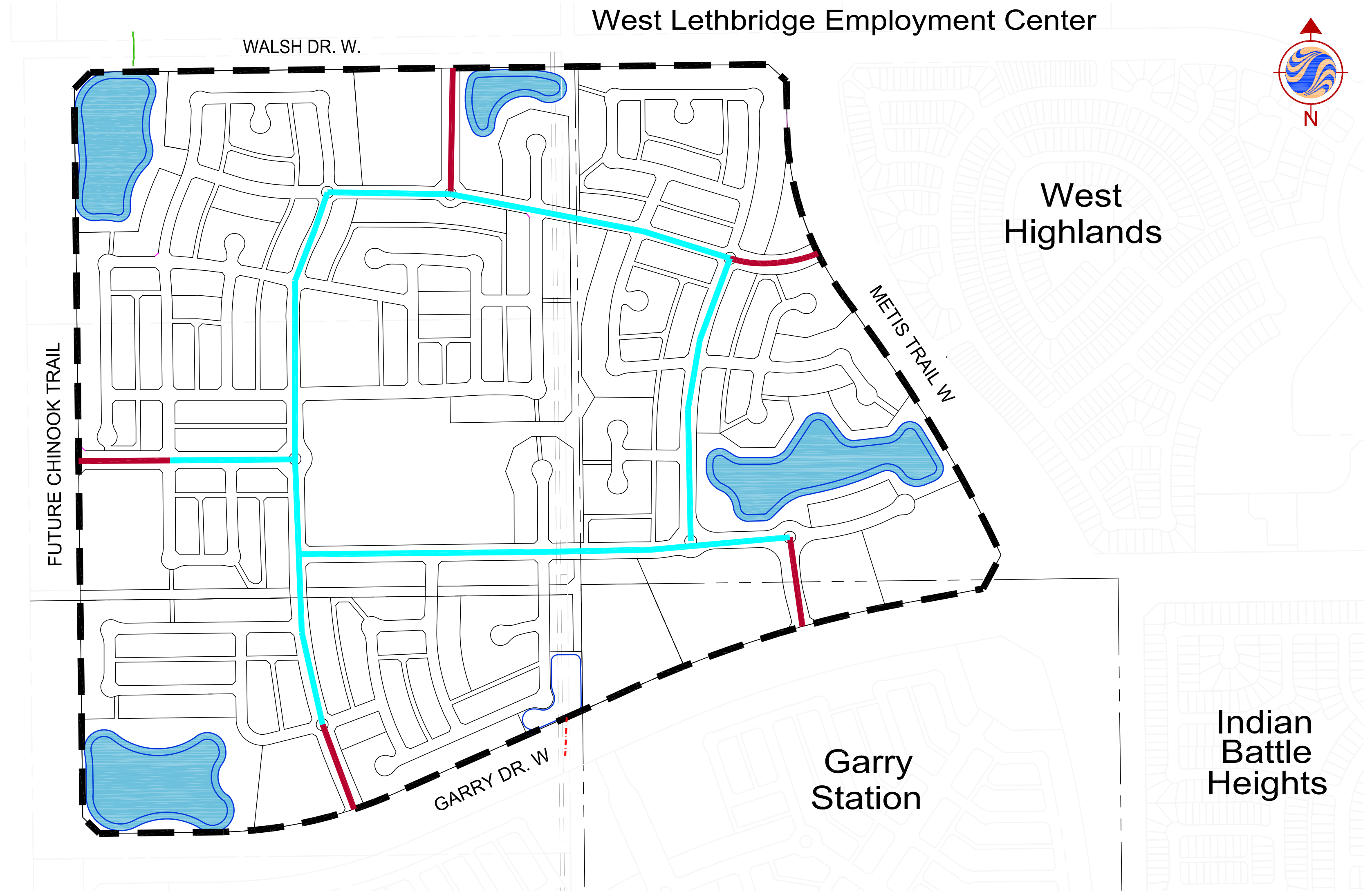
Figure No.

4.5

Title

Internal Daily Traffic Volumes



NTS

October 2011
112945195

Legend

🟥 Country Meadows
🟦 Major Collector
🟥 Community Entrance

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COUNTRY MEADOWS
OUTLINE PLAN

Figure No.
4.6

Title
Internal Road Network Classification

5.0 Conclusions

The internal collector roadway and the five entrance roads have been classified according to the requirements established in the City of Lethbridge Design Guidelines.

The six internal intersections specified as roundabouts during the gate three submission were analyzed for both the ten-year and full-build horizons. All three are anticipated to operate at acceptable levels of service with volume to capacity ratios below the City's thresholds (0.80 for through movements, 0.90 for critical movements).

For the ten-year horizon, the arterial roadways were analyzed assuming two-lane cross-sections and unsignalized intersections. Based on the analysis of the ten-year horizon background traffic volumes, the following infrastructure recommendations were identified:

- Garry Drive / Métis Trail W (intersection 18): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds based on the recommendations stated in the Garry Station TIA.
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized (four-way stop-controlled) intersection.

For the ten-year horizon post-development traffic volumes, the following improvements to the infrastructure requirements for the background volumes were recommended:

- Garry Drive / Métis Trail W (intersection 18): the addition of a designated eastbound left turn lane and designated southbound, eastbound, and westbound right turn lanes.
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to fail as a four-way stop-controlled intersection. The intersection was therefore analyzed as a roundabout. As a single-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as a single-lane roundabout.

For the full-build horizon, Metis Trail is assumed to be constructed as a four-lane cross-section. Garry Drive is assumed to be constructed with a four-lane cross-section to the northern access to Garry Station. Walsh Drive is assumed to be constructed with a four-lane cross-section to Metis Trail.

Based on the analysis of the full-build background traffic volumes, the following infrastructure requirements were identified:

- Garry Drive W / Chinook Trail (intersection 11): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with stop-control on Garry Drive.

- Garry Drive / Métis Trail W (intersection 18): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds based on the recommendations stated in the Garry Station TIA.
- Chinook Trail / Walsh Drive (intersection 91): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as an unsignalized intersection with stop-control on Walsh Drive.
- Metis Trail / Walsh Drive (intersection 98): the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds as a two-lane roundabout.

For the full-build post-development traffic volumes, the following improvements to the infrastructure requirements for the background volumes were recommended:

- Garry Drive / Métis Trail W (intersection 18): the addition of dual left turn lanes on the southbound and eastbound approaches.
- Garry Drive W / Entrance 1 (intersection 17): the intersection is expected to fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a two-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds.
- Métis Trail W / Entrance Road (intersection 88): the intersection is expected fail as an unsignalized intersection. The intersection was therefore analyzed as a roundabout. As a two-lane roundabout, the intersection is expected to operate at an acceptable level of service with v/c ratios below the City's thresholds.

All internal intersections and approaches are expected to operate sufficiently based on the assumptions stated in the report.

Appendix A – Correspondence with City of Lethbridge

From: Ahmed.Ali@lethbridge.ca
Sent: Monday, October 17, 2011 1:38 PM
To: Schmidtke, Brad; Piechotta, Cole
Cc: Barry.Peat@lethbridge.ca; Joe Meszaros
Subject: Country Meadows TIA coments

Brad,
Attached are a few comments on the report, please address them in the final version.

- Figure 1.2: please label the intersection numbers.
- Section 4.1: The roundabout capacity analysis shall be based on HCM 2010 (I do not required, the analysis to be repeated for this study, however, please note this for future TIAs such as Copperwood 2 outline plan)
- Section 4.4, page 4.6, second paragraph: Please correct the word 'background' with 'post development', the appendix G contains post-dev analysis.
- Figure 4.2: The intersection of Gary Dr W/and Entrance 1 is identified as STOP controlled intersection elsewhere.
- Figure 4.6: replace with revised Fig 9.1 of outline plan based on earlier comment
- It would be a good idea to indicate the intersection numbers on the graphics to relate to the analysis tables.

Please let me know if you have any questions.
Thank you,

Ahmed Ali, P.Eng., PTOE
Transportation Engineering Manager
Infrastructure Services
City of Lethbridge

304 Stafford Dr N, Lethbridge, Alberta, Canada T1H 2A6
Phone:403-320-4038, Cell: 403-393-4685, Fax: 403-329-4657
ahmed.ali@lethbridge.ca, www.lethbridge.ca

From: Ahmed.Ali@lethbridge.ca
Sent: Wednesday, August 17, 2011 10:19 AM
To: Piechotta, Cole
Cc: Schmidtke, Brad; Thatcher, David
Subject: RE: WLEC TIA Information

Cole,
The following figure shows the 20 year horizon background and post dev (for West Lethbridge emp area WLEC) traffic. I do not have a graphics showing the WLEC traffic, you should be able to get that by using the figures. Pertaining to your other questions, please see below:

1. Chinook Trail (full-build horizon) – in the initial TIA sign-off the assumption was that Chinook Trail is in place at the full-build (approximately 20 year) horizon. I'm not entirely sure how realistic an assumption this is. Should we perhaps be assuming that Chinook Trail is not in place at the Country Meadows full-build horizon?

   The implication of changing this assumption would be that we could not assign any of our site traffic to the entry located off of Chinook Trail (i.e. we would have to account for all traffic generated by Country Meadows at the four other entrances).

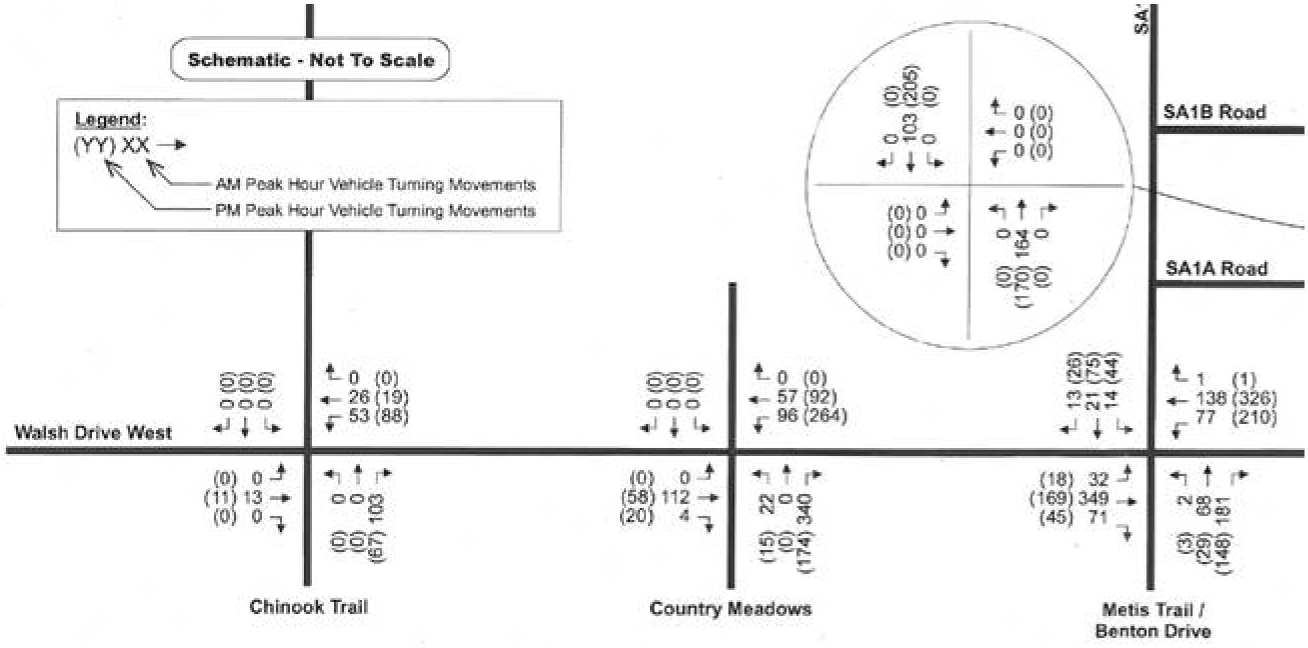
We will assume 2 lane Chinook Trail in place in the Ultimate, please assign the traffic accordingly.

2. Garry Station (ten-year horizon) – the assumption that the connection of Metis Trail to Whoop-Up Drive to the south appears inconsistent with our background volumes. The background volumes include an appreciable amount of traffic accessing SB Metis Trail via Garry Drive and vice-versa which suggests connection to Whoop-Up Drive.

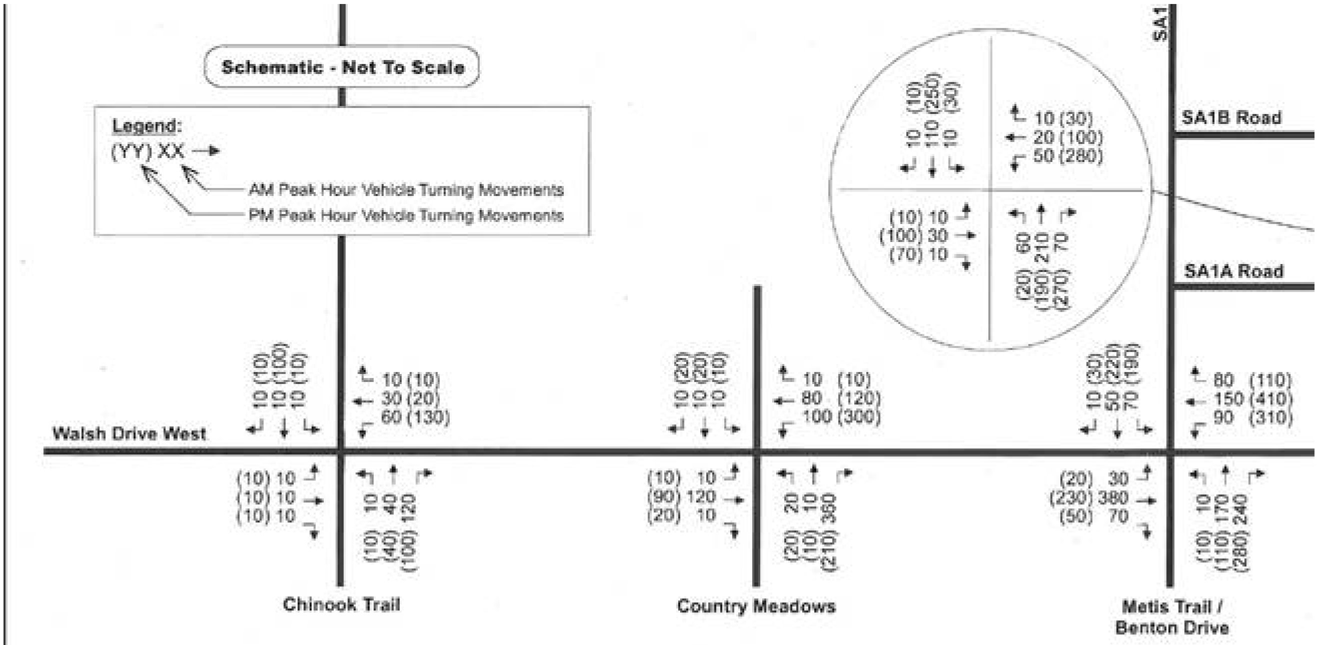
Based on our current capital program, 2 lanes of Metis Trail for the entire length between Temple to Whoopup
Dr to Gary Drive should be in place by 2018.

Please call me if you have further questions.

Ahmed



NTERIM BACKGROUND TRAFFIC VOLUMES



INTERIM HORIZON POST-DEVELOPMENT TRAFFIC VOLUMES

From: Piechotta, Cole [mailto:Cole.Piechotta@stantec.com]
Sent: Tuesday, August 16, 2011 2:37 PM
To: Ahmed Ali
Cc: Schmidtke, Brad; Thatcher, David
Subject: RE: WLEC TIA Information

Ahmed,

Just to follow up Brad's email regarding the WLEC traffic, I was wondering if you had a chance to think about our additional questions/comments (1 & 2 below) regarding the background traffic.

Cole

From: Piechotta, Cole
Sent: Thursday, August 11, 2011 11:53 AM
To: 'Ahmed.Ali@lethbridge.ca'
Cc: Schmidtke, Brad; Thatcher, David
Subject: RE: WLEC TIA Information

Ahmed,

As per our phone conversation, any draft volumes or information regarding WLEC you can send me would be greatly appreciated. We would like to finalize the WLEC assumptions as soon as possible as the intent is still to finalize the gate 4 submission at the end of August.

I also wanted to chat a little bit about the background assumptions. I have the following questions/comments in particular:

3. Chinook Trail (full-build horizon) – in the initial TIA sign-off the assumption was that Chinook Trail is in place at the full-build (approximately 20 year) horizon. I'm not entirely sure how realistic an assumption this is. Should we perhaps be assuming that Chinook Trail is not in place at the Country Meadows full-build horizon?

   The implication of changing this assumption would be that we could not assign any of our site traffic to the entry located off of Chinook Trail (i.e. we would have to account for all traffic generated by Country Meadows at the four other entrances).

4. Garry Station (ten-year horizon) – the assumption that the connection of Metis Trail to Whoop-Up Drive to the south appears inconsistent with our background volumes. The background volumes include an appreciable amount of traffic accessing SB Metis Trail via Garry Drive and vice-versa which suggests connection to Whoop-Up Drive.

   Are we okay to use the background volumes as is, including the leg of Metis Trail directly south of Garry Drive is constructed (though not necessarily as far south as Whoop-Up Drive?

Cole

From: Ahmed.Ali@lethbridge.ca [mailto:Ahmed.Ali@lethbridge.ca]
Sent: Monday, August 08, 2011 10:42 AM
To: Piechotta, Cole
Cc: Schmidtke, Brad
Subject: RE: WLEC TIA Information

Let me know what you propose, we could probably discuss over the phone.

Ahmed

From: Piechotta, Cole [mailto:Cole.Piechotta@stantec.com]
Sent: Friday, August 05, 2011 2:41 PM

To: Ahmed Ali
Cc: Schmidtke, Brad
Subject: RE: WLEC TIA Information

Ahmed,

To follow up Brad's email, in the interest of getting the TIA for Country Meadows finalized in line with the gate 4 submission, we are open to using a different set of assumptions for WLEC. Perhaps we could use the assumptions from the previous Country Meadows ASP TIA, or apply some base assumptions as far as land-use / size of development / timing / trip distribution for WLEC.

Cole

From: Schmidtke, Brad
Sent: Thursday, August 04, 2011 2:51 PM
To: Ahmed.Ali@lethbridge.ca
Cc: Piechotta, Cole; Barry Peat (barry.peat@lethbridge.ca); Joe Meszaros; mitchell.comb@lethbridge.ca
Subject: RE: WLEC TIA Information

Ahmed,

Given the unknown time table for completion of the WLEC TIA, we are requesting to complete our TIA without this information. The WLEC TIA was not indicated as a required item during the initiation of our Outline Plan; we had considered reviewing the WLEC TIA at the end of July prior to completing our TIA in August as it was indicated to us that the document would be available. However, given the unknown timeline of this future TIA, our client's development schedule would be unfairly impacted if we were wait for it prior to completing Gate 4.

I would be happy to meet with DRC to discuss this issue during the week of August 15 in the hopes of keeping us on track for OLP Approval this Fall.

Thanks
Brad

From: Ahmed.Ali@lethbridge.ca [mailto:Ahmed.Ali@lethbridge.ca]
Sent: Thursday, August 04, 2011 2:27 PM
To: Schmidtke, Brad
Cc: Tyson.Boylan@lethbridge.ca
Subject: RE: WLEC TIA Information

Brad,
The study is still ongoing and we expect to have it soon. Unfortunately I do not have a time frame available with me. I would request Tyson Boylan, who is project managing the study to give you an update.
Ahmed

From: Schmidtke, Brad [mailto:Brad.Schmidtke@stantec.com]
Sent: Wednesday, July 27, 2011 10:51 AM
To: Ahmed Ali
Cc: Piechotta, Cole; Joe Meszaros; Barry Peat
Subject: WLEC TIA Information
Importance: High

Morning Ahmed,

We are working on our TIA for Country Meadows and would like to have a draft to you within the next couple of weeks. Cole had mentioned to me that we were to review a draft copy of the West Lethbridge Employment Center (WLEC) TIA and reference this for our work. This was to be available July 20 and we have yet to receive a copy.

Please advise as to the status of WLEC TIA, as the delivery of this document to us will affect our Gate 4 submission and OLP schedule.

Thanks,

Brad Schmidtke
Senior Civil Technologist
Stantec
Ph: (403) 329-3344 Ext. 242
Fx: (403) 328-0664
brad.schmidtke@stantec.com
stantec.com

From:	Piechotta, Cole [Cole.Piechotta@stantec.com]
Sent:	Thursday, June 09, 2011 2:25 PM
To:	Ahmed Ali
Cc:	Thatcher, David; Schmidtke, Brad
Subject:	Country Meadows Initial TIA Sign-Off
Attachments:	figure_A.pdf; asp_figure_7.0.pdf; cm_gt3-fig_6.1.pdf; cm_gt3-fig_7.1.pdf; cm_gt3-fig_10.1.pdf

Ahmed,

please review our proposed scope for the TIA in support of the Country Meadows Outline Plan application. Once again, any comments, questions, and suggestions are welcome. In particular we would like to confirm the scope intersections to be analyzed and the trip distribution assumptions we've stated. Further, please review our comments regarding the background traffic for the West Lethbridge Employment Centre. We have suggested using the assumptions from the previous Country Meadows ASP TIA, however if there is some better information for the employment centre we would be open to using it.

Review Subject

1. Site plan, development statistics:

   Characteristics of the development are as follows:

   - 403 low density units under R-L land use designation (note that the 403 units based on a density of 25 UPH for the R-L land use, to account for the potential for builders to construct secondary suites; the area designated R-L has been subdivided into 322 lots).
   - 645 low density units (R-CL land use)
   - 58 low density units (R-SL land use)
   - 81 medium density units (R-37 land use)
   - 940 medium density units (R-75 land use)
   - 0.83 hectares designated as Urban Innovations (anticipated to result in an additional 31 medium density units)

   - **1,106 low density units**
   - **1,052 medium density units**

   Attached for reference is **Figure 7.1 – Proposed Land Use Designations** (from our gate 3 submission).

2. Traffic impact study area:

   The proposed site is bound by Metis Trail to the east, Chinook Trail to the west, Walsh Drive to the north, and Garry Drive to the south.

   The attached "**Figure A – Transportation Impact Assessment Study Area**" illustrates the intersections we are proposing to review, as well as the links on which roadway classifications will be confirmed. As suggested by the City of Lethbridge during review of our gate 3 submission, the roadway classifications for the entrance roads, community collector roadway, and the road adjacent the school site will be reviewed.

3. Traffic analysis period(s):

The weekday AM and PM peak hour periods will be analyzed. Daily Traffic Volumes will also be considered in order to confirm roadway classifications.

4. Planning horizons:

The ten-year and full-build horizons for the development will be studied. The development is expected to proceed as per the phasing plan in presented in the area structure plan (see attached “**Figure 7.0 – Phasing Strategy**”). It is anticipated that phases 1-4 will be completed by the ten-year horizon, with the remaining phases 5-9 being completed by full-build.

5. Trip generation factors: (review also pass-by, diverted and synergy trip rates):

The following trip generation rates will be used:

Use	AM Peak Hour			PM Peak Hour		
		In	Out		In	Out
Low Density Residential	0.77 vph/unit	26%	74%	1.02 vph/unit	64%	36%
Medium Density Residential	0.75 vph/unit	29%	71%	0.92 vph/unit	61%	39%

As the development is made up of nearly entirely residential land use, the trips generated are anticipated to be primary in nature. Therefore pass-by trips / diverted link trips are not anticipated. The 3.14 acre neighborhood commercial parcel is intended to be ancillary to the residential land uses and therefore no additional trips (beyond the primary trips generated by the residential land uses) are anticipated.

Daily traffic volumes will be estimated by applying a factor of 10 to the PM peak hour volumes.

6. Basis for Trip Distribution:

For the ten-year horizon, we have assumed the draw is still primarily to the Centre of the City. Based on the location of the development in the northern end of west Lethbridge, the Highway 3 river crossing is the more desireable of the two available. Since the ten year horizon is located primarily in the SE corner of the Outline Plan area, it is assumed that the majority of residents will utilize Garry Drive as the start/end point of their primary route to the crossing. Based on this, the following distribution is proposed for the ten-year horizon.

- 5% - Metis Drive North
- 15% - Walsh Drive East
- 50% Garry Drive East
- 30% Metis Trail South

For the full-build horizon, the draw is still primarily to the Centre of the City. It has been assumed that Chinook Trail has been partially constructed, primarily as a means of providing access for residents of west Lethbridge to Whoop-Up Drive and the West Lethbridge Employment Centre. Walsh Drive and Garry Drive remain as the primary start/end of routes to the Centre of the City. The following distribution has been assumed:

- 5% - Metis Drive North
- 5% Chinook Trail North
- 10% Chinook Trail South
- 25% - Walsh Drive East
- 35% Garry Drive East
- 20% Metis Trail South

7. Source for Future Background Traffic:

As a starting point, we propose to use the post-development volumes from our recent Garry Station TIA. The methodology used in developing background volumes for that report included utilizing a combination of the outline plan information for the Piers and Benton Crossing as well as the available TIA reports for West Lethbridge.

The traffic associated with Country Meadows will be removed from the Garry Station TIA post-development volumes (both for the ten-year and full-build horizons).

The traffic associated with the West Lethbridge Employment Centre (WLEC) as illustrated in the previous Country Meadows ASP TIA will also be added back into the full-build horizon background traffic volumes. The assumptions in that report suggest that the WLEC was added using a rate of 7.51 vph/acre and 7.26 vph/acre for the AM and PM peak hours respectively. Based on review of ITE Trip Generation 8th Edition, these are the rates for Land Use 110 (Light Industrial) for peak hour of adjacent street traffic. Although the rate referenced in the report is potentially appropriate (depending how closely the WLEC matches the description of Land Use 110), the report doesn't provide specific details regarding the size of the WLEC.

8. Assumed Road Improvements:

Assumed the following road network at the ten-year horizon:

- Metis Trail constructed with four-lane cross-section (similar to our assumption in the recently completed Garry Station TIA)
- Garry Drive constructed to Chinook Trail alignment; four-lane cross-section until the first access to Country Meadows (first intersection west of Metis Trail), two-lane cross-section to Chinook Trail (similar to our assumption in the recently completed Garry Station TIA)
- Walsh Drive constructed with a two-lane cross-section
- Future Chinook Trail not constructed

Assumed the following additions to the road network at the full-build horizon:

- Garry Drive and Walsh Drive upgraded to four-lane cross-sections to the Chinook Trail alignment
- Construction of Chinook Trail complete from north of Walsh Drive to Whoop-Up Drive

9. Traffic Analysis Software:

Synchro 7 will be used to analyze signalized and unsignalized intersections; SIDRA Intersection 5.0 will be used to analyze roundabouts.

Data Collection

1. Existing Traffic Counts:

The subdivision is located on an undeveloped parcel of land in west Lethbridge, and therefore it is not anticipated that counts of existing intersections will be required for analysis purposes.

2. Signal Timings:

It is not anticipated that existing signal timings will be required for the study.

3. Bicycle Route Map:

See attached "**Figure 6.1 – Open Space Network**" from our gate 3 submission, which illustrates the local pathway system with connections to the regional system.

4. Bus Routes and Signs:

See attached "**Figure 10.1 – Preliminary Transit & Bus Stops**" from our gate 3 submission, which illustrates the proposed transit routing and bus stop locations within the development.

5. Local Parking Issues:

   Some residential properties are proposed to have frontage along roundabouts in the area. The potential for queuing at the roundabout intersections will be reviewed and “no parking” zones will be recommended where necessary to ensure roundabouts are accessible.

6. Local Traffic Issues:

   No Local Traffic issues anticipated.

Please review the above sumbission at your earliest convenience. If you have any questions or comments, please do not hesitate to contact myself or David Thatcher.

Cole Piechotta, E.I.T.
Stantec
200-325 25th Street SE
Calgary AB T2A 7H8
Ph: (403) 716-1462
Fx: (403) 716-8129
cole.piechotta@stantec.com
stantec.com

Include these intersections as well

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June 2011
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Legend

Country Meadows

Roundabout

Conceptual Entrance

Intersection Evaluation

Daily Volumes/Road Classification

Stantec

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COUNTRY MEADOWS
OUTLINE PLAN

Figure No.
A

Title
Transportation Impact Assessment
Study Area

Appendix B – Outline Plan Figures

▨	Low Density Residential (R-SL)
🟨	Low Density Residential (R-CL)
▨	Low Density Residential (R-L)
🟧	Medium Density Residential (R-37)
🟥	Medium Density Residential (R-75)
🟪	Commercial Neighbourhood (C-N)
🟥	Urban Innovation (U-I)
🟩	Public Building, Parks & Recreation (P-B)
🟩	Parks and Recreation (P-R)
🟩	Open Space - Non Credit (OS n/c)
🟦	Storm Water Management (TO HWL)
▨	Future Gas Line Utility Corridor
—·—	HP Gas Line
- - -	15.25m HP Gas Line Offset

Gross Area	121.35 ha± (299.86 ac±)
Environmental Reserve	0.00 ha± (0.00 ac±)
Gross Developable Area (GDA)	121.35 ha± (299.86 ac±)

Public Land Use	Area
Public Right of Ways (R/W)	25.22 ha± (62.32 ac±)
Open Space (P-R)	6.96 ha± (17.20 ac±)
O-S (non-credit) incl. HWL	11.97 ha± (29.58 ac±)
O-S (non-credit) ATCO Pipelines	2.67 ha± (6.60 ac±)
Open Space (P-B)	6.50 ha± (16.06 ac±)
PUL - Water Reservoir (non-credit)	2.06 ha± (5.09 ac±)
Comm. Neighbourhood (C-N)	1.28 ha± (3.16 ac±)
Public Sub Total	56.66 ha± (140.01 ac±)

Net Developable Area (NDA) 64.69 ha± (159.85 ac±)

Residential Land Use	Area	UPH	Total Units
Low Density (R-L)	17.13 ha± (42.33 ac±)	25	428
Low Density (R-CL)	29.79 ha± (73.61 ac±)	20	596
Low Density (R-SL)	2.76 ha± (6.82 ac±)	20	55
Medium Density (R-37)	1.47 ha± (3.63 ac±)	37	54
Medium Density (R-75)	12.73 ha± (31.46 ac±)	75	955
Urban Innovation (U-I)	0.81 ha± (2.00 ac±)	37	30
Residential Sub Total	64.69 ha± (159.85 ac±)		2118
Total	121.35 ha± (299.86 ac±)		

People/GDA = 42.1/ha 17.0/ac
People/NDA = 78.9/ha 31.9/ac
Density/GDA = 17.5/ha 7.1/ac
Density/NDA = 32.7/ha 13.2/ac

NTS

October 2011
112945195

Stantec

Client/Project
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure No.
7.1

Title
Proposed Land Use Designations

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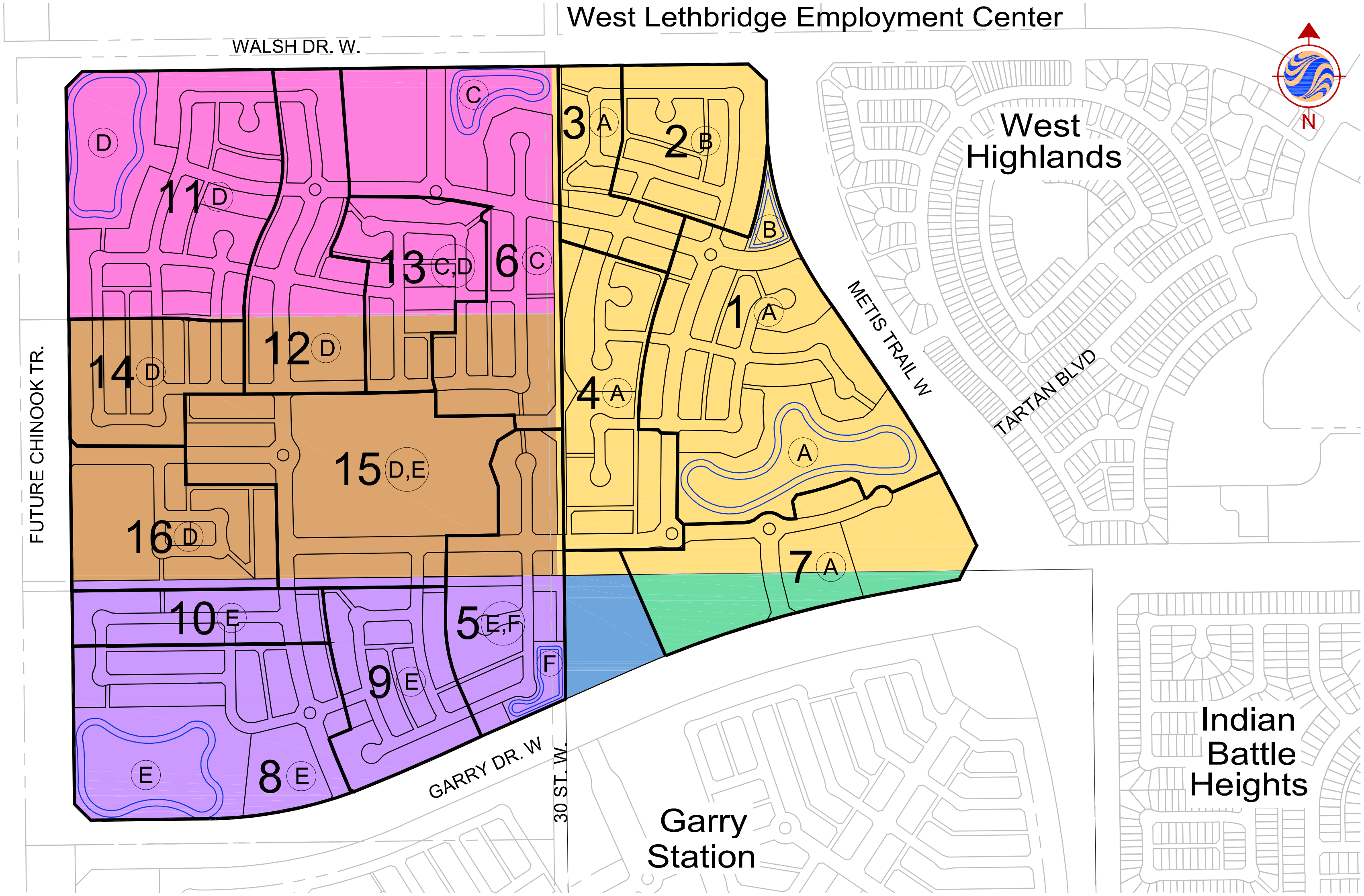

NTS

October 2011
112945195

Legend

🟩	MELCOR DEVELOPMENTS LTD.
🟦	CITY OF LETHBRIDGE
🟪	OLAFSON
🟫	HIEBERT/MACKEY
🟥	BROWN
🟨	SOUTHGATE COMMERCIAL LANDS CORP.

2	PHASE SEQUENCE
(A,B)	POND(S) REQUIRED

Stantec

Client/Project
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure No.
12.1

Title
Proposed Phasing

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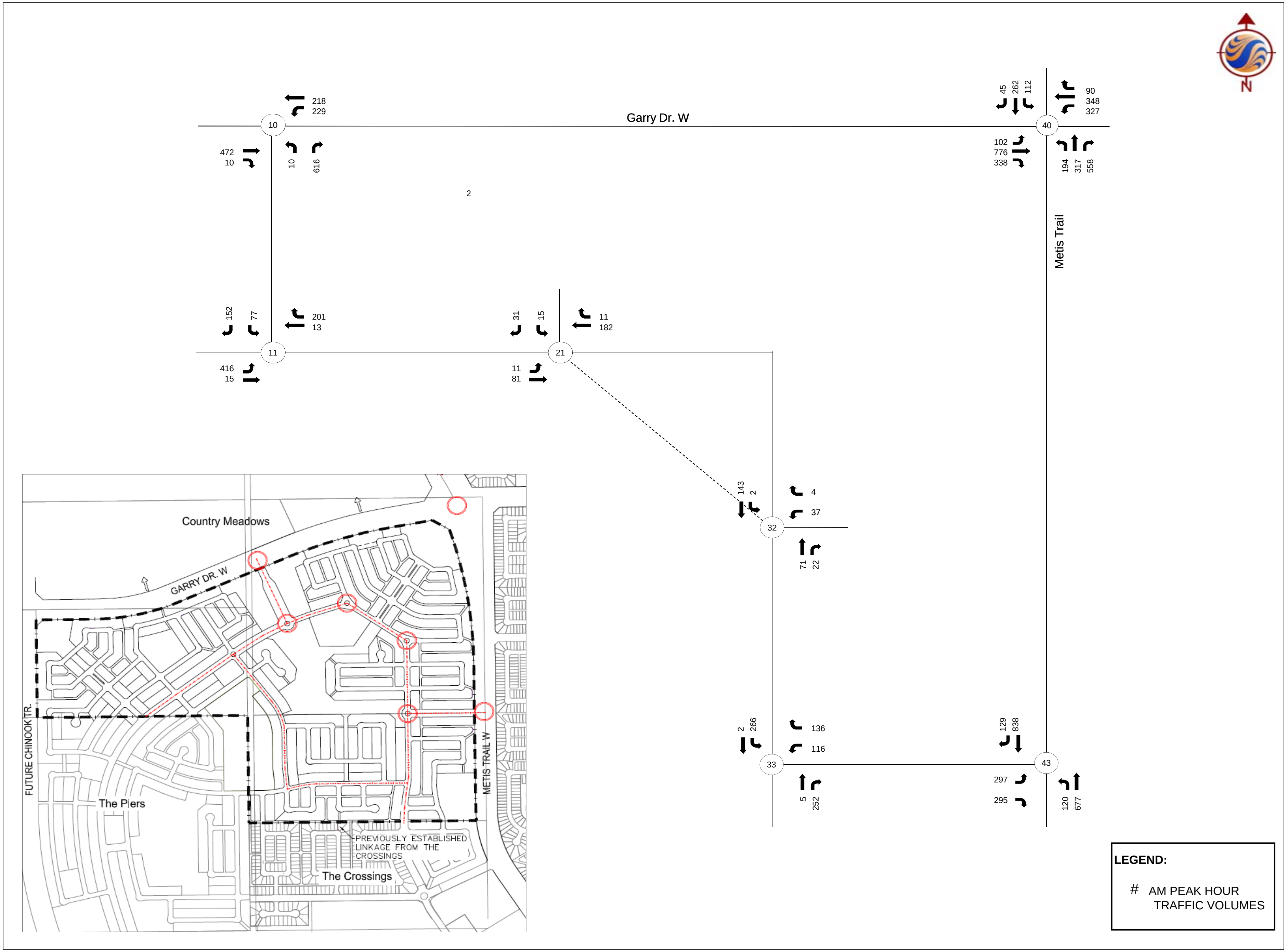
Appendix C – Garry Station TIA Volumes



MELCOR DEVELOPMENTS LTD., GEMINI
City of Lethbridge RELD
GARRY STATION OUTLINE PLAN

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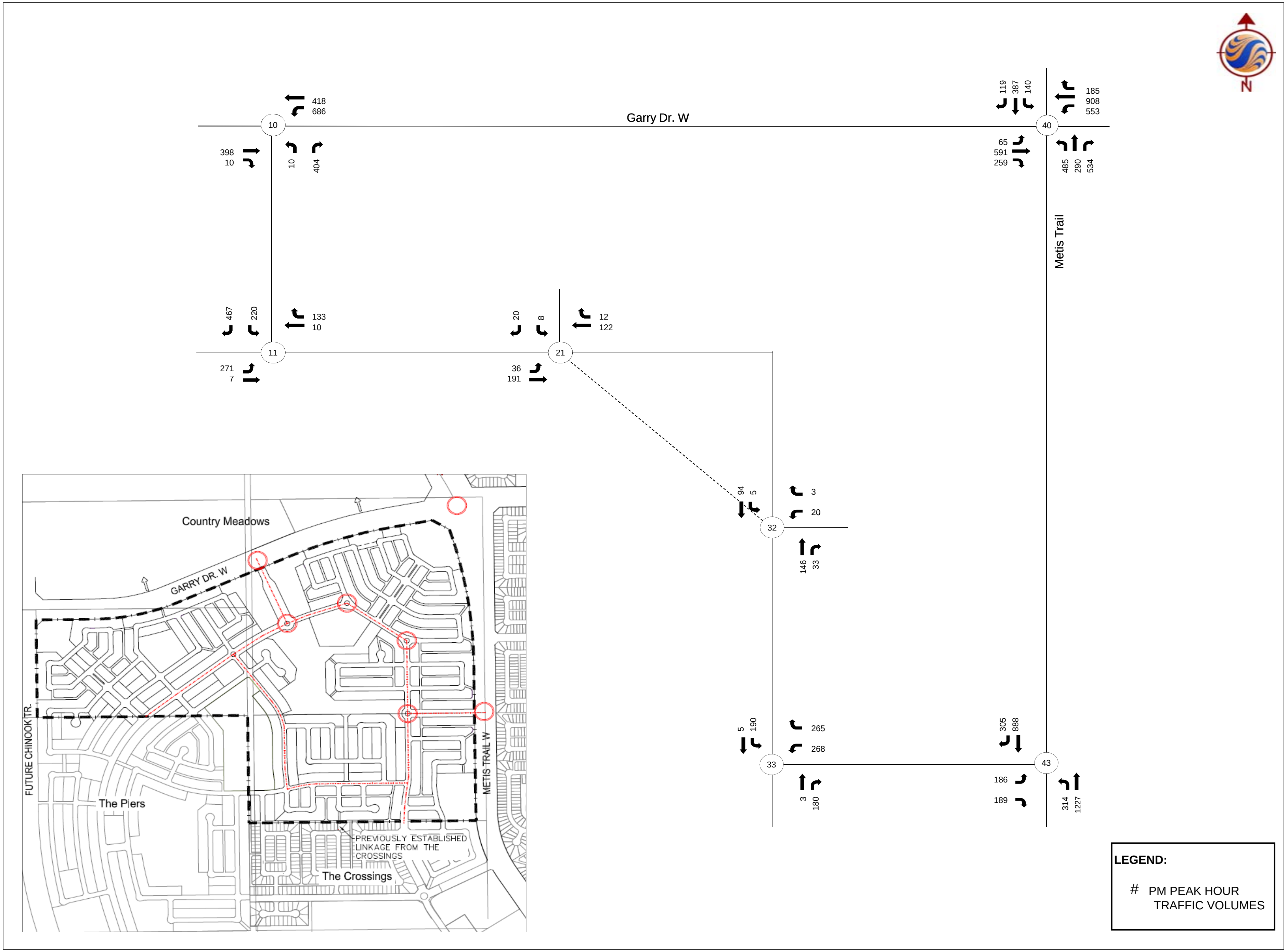
Figure 3.13
Full-Build Horizon
Post-Development Volumes
AM Peak Hour



MELCOR DEVELOPMENTS LTD., GEMINI
City of Lethbridge RELD
GARRY STATION OUTLINE PLAN

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Figure 3.14
Full-Build Horizon
Post-Development Volumes
PM Peak Hour

Appendix D – Country Meadows ASP TIA Volumes

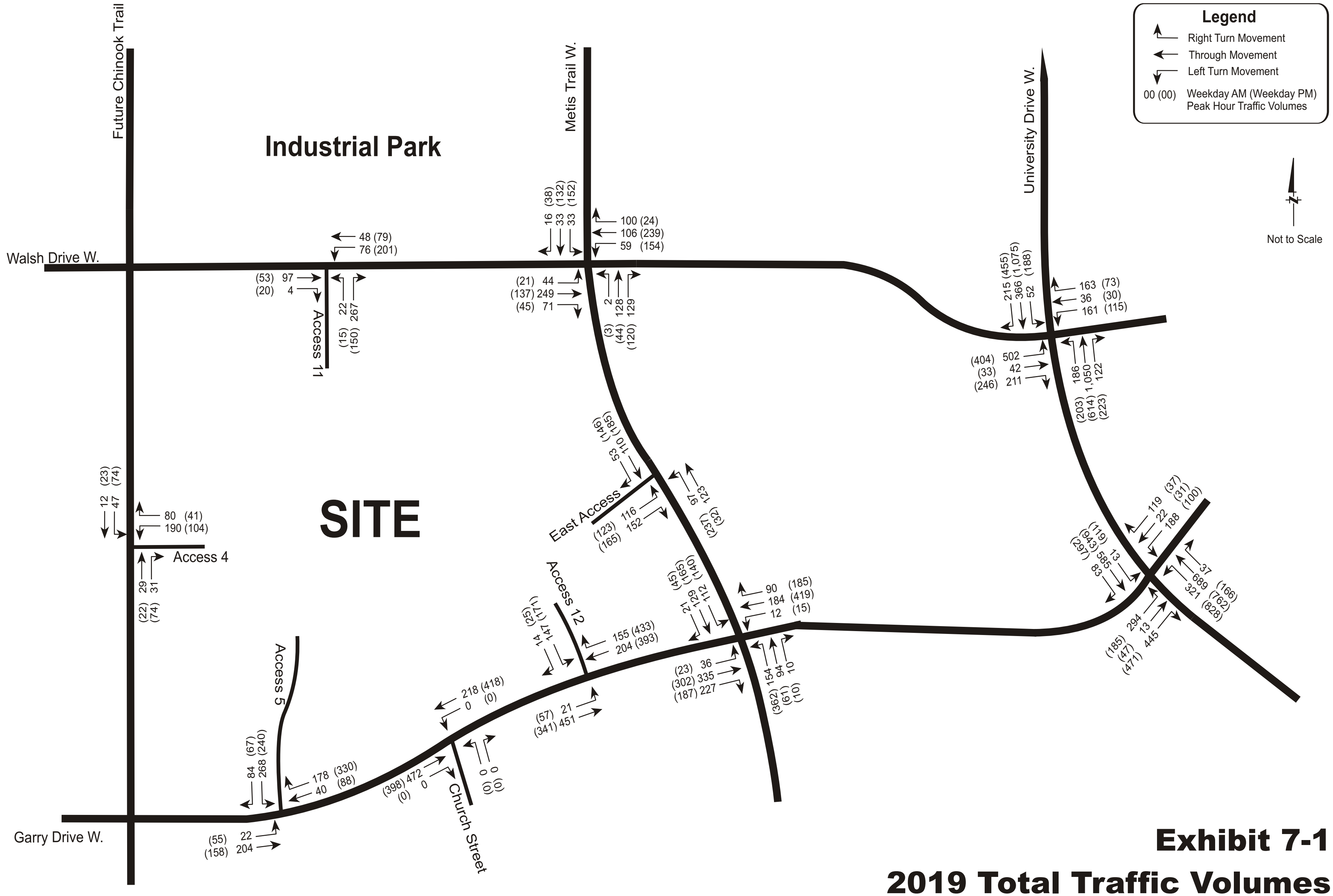
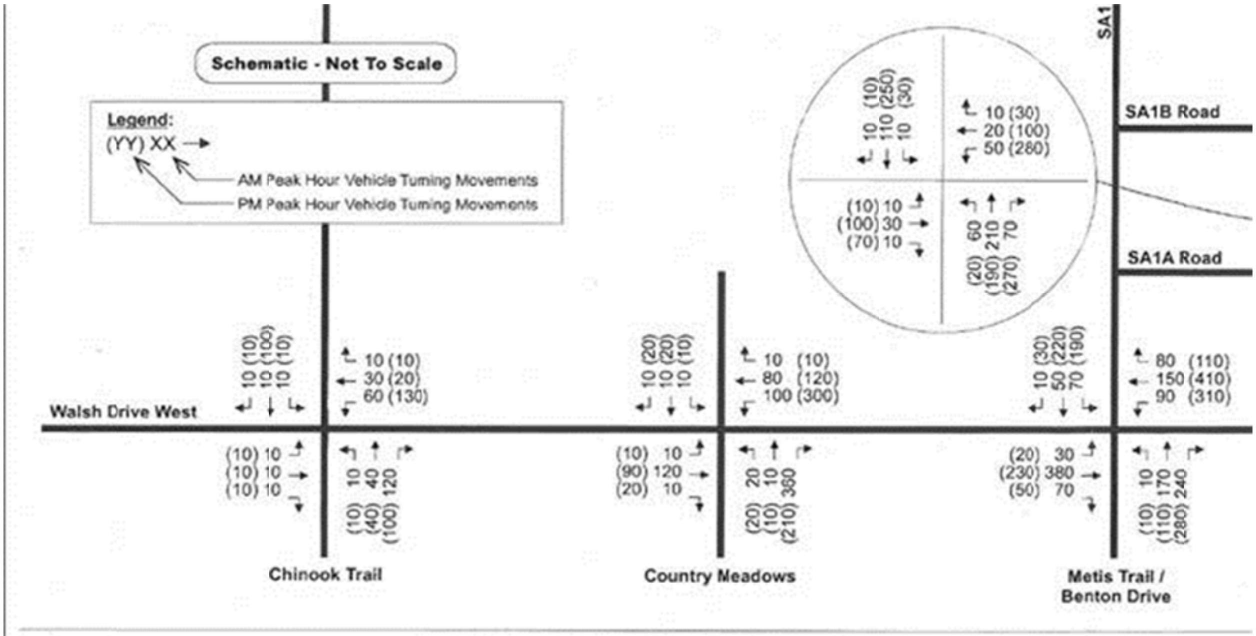


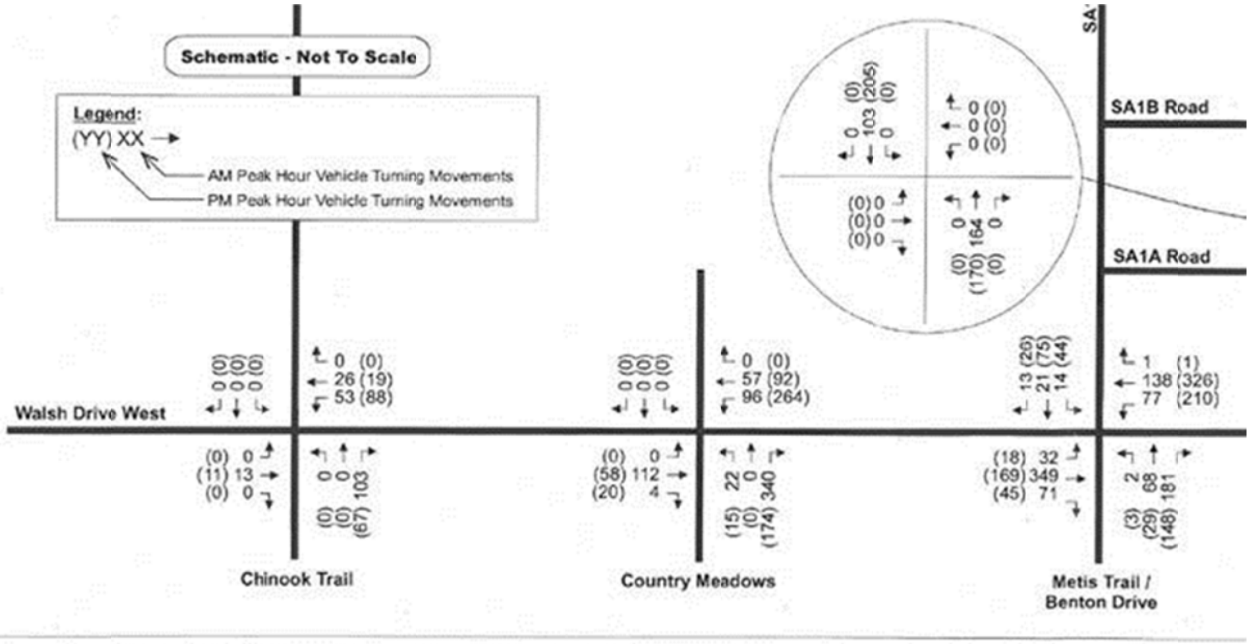
Exhibit 7-1

2019 Total Traffic Volumes

Appendix E – West Lethbridge Employment Centre Volumes



INTERIM HORIZON POST-DEVELOPMENT TRAFFIC VOLUMES



NTERIM BACKGROUND TRAFFIC VOLUMES

Appendix F – Ten-Year Background Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	221	56	166	82	60	20	226	288	17	109	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	0.0		30.0	60.0		0.0	60.0		30.0	60.0		30.0
Storage Lanes	0		1	1		0	1		1	1		0
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	0.96	0.99	0.98		0.99		0.98	1.00	1.00	
Frt			0.850		0.937				0.850		0.984	
Flt Protected		0.992		0.950			0.950			0.950		
Satd. Flow (prot)	0	1672	1432	1566	1554	0	1566	1685	1432	1566	1652	0
Flt Permitted		0.933		0.427			0.664			0.501		
Satd. Flow (perm)	0	1569	1380	696	1554	0	1080	1685	1401	822	1652	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			64		51				241		5	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	45	251	64	189	93	68	23	257	327	19	124	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	296	64	189	161	0	23	257	327	19	139	0
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0		8.0	4.0	4.0	8.0	4.0	
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0		6.0	2.0	2.0	6.0	2.0	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Detector Phase	5	2	2	1	6		3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0		5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	13.0	25.0	25.0	13.0	25.0		13.0	21.0	21.0	13.0	21.0	
Total Split (s)	13.0	63.0	63.0	13.0	63.0	0.0	13.0	21.0	21.0	13.0	21.0	0.0
Total Split (%)	11.8%	57.3%	57.3%	11.8%	57.3%	0.0%	11.8%	19.1%	19.1%	11.8%	19.1%	0.0%
Maximum Green (s)	10.0	58.0	58.0	10.0	58.0		10.0	16.0	16.0	10.0	16.0	
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5		0.0	1.5	1.5	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	4.0	3.0	5.0	5.0	3.0	5.0	4.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None	None	None	None	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		10.0	10.0		10.0			10.0	10.0		10.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effct Green (s)		20.9	20.9	34.6	32.6		19.4	16.2	16.2	19.3	16.2	
Actuated g/C Ratio		0.35	0.35	0.57	0.54		0.32	0.27	0.27	0.32	0.27	
v/c Ratio		0.55	0.12	0.36	0.19		0.06	0.57	0.59	0.06	0.31	
Control Delay		21.6	5.6	9.0	6.1		14.7	26.8	11.7	14.7	21.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		21.6	5.6	9.0	6.1		14.7	26.8	11.7	14.7	21.2	
LOS		C	A	A	A		B	C	B	B	C	
Approach Delay		18.7			7.7			18.2			20.4	
Approach LOS		B			A			B			C	
Queue Length 50th (m)		24.3	0.0	8.2	5.0		1.7	22.8	6.9	1.4	11.0	
Queue Length 95th (m)		54.9	7.0	22.6	16.2		5.9	#58.4	32.7	5.2	29.9	
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)			30.0	60.0			60.0		30.0	60.0		
Base Capacity (vph)		1499	1321	543	1487		436	452	552	394	445	
Starvation Cap Reductn		0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.20	0.05	0.35	0.11		0.05	0.57	0.59	0.05	0.31	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 60.5
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 16.1 Intersection LOS: B
Intersection Capacity Utilization 63.9% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 18: Garry Drive & Metis Trail

Country Meadows Outline Plan - 10 Year Horizon Background Volumes AM Peak Hour
98: Walsh Drive & Metis Trail 9/7/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	5	0	15	15	107	4	273	38	57	117	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	11	6	0	17	17	122	5	310	43	65	133	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	17	156	358	203
Volume Left (vph)	11	17	5	65
Volume Right (vph)	0	122	43	6
Hadj (s)	0.22	-0.36	0.02	0.13
Departure Headway (s)	5.7	4.9	4.6	4.9
Degree Utilization, x	0.03	0.21	0.46	0.28
Capacity (veh/h)	545	662	752	695
Control Delay (s)	8.9	9.2	11.5	9.8
Approach Delay (s)	8.9	9.2	11.5	9.8
Approach LOS	A	A	B	A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

18: Garry Drive & Metis Trail

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↑↱		↰	↑	↱	↰	↑↱	
Volume (vph)	23	145	36	285	245	61	62	219	271	69	287	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	0.0		30.0	60.0		0.0	60.0		30.0	60.0		30.0
Storage Lanes	0		1	1		0	1		1	1		0
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	0.96	0.99	0.99				0.98	0.99	0.99	
Frt			0.850		0.970				0.850		0.980	
Flt Protected		0.993		0.950			0.950			0.950		
Satd. Flow (prot)	0	1673	1432	1566	1622	0	1566	1685	1432	1566	1643	0
Flt Permitted		0.918		0.497			0.310			0.485		
Satd. Flow (perm)	0	1545	1377	807	1622	0	511	1685	1399	793	1643	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41		12				275		6	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	26	165	41	324	278	69	70	249	308	78	326	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	191	41	324	347	0	70	249	308	78	375	0
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0		8.0	4.0	4.0	8.0	4.0	
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0		6.0	2.0	2.0	6.0	2.0	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Detector Phase	5	2	2	1	6		3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0		5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	13.0	25.0	25.0	13.0	25.0		13.0	21.0	21.0	13.0	21.0	
Total Split (s)	13.0	41.0	41.0	21.0	49.0	0.0	20.0	45.0	45.0	13.0	38.0	0.0
Total Split (%)	10.8%	34.2%	34.2%	17.5%	40.8%	0.0%	16.7%	37.5%	37.5%	10.8%	31.7%	0.0%
Maximum Green (s)	10.0	36.0	36.0	18.0	44.0		17.0	40.0	40.0	10.0	33.0	
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5		0.0	1.5	1.5	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	4.0	3.0	5.0	5.0	3.0	5.0	4.0

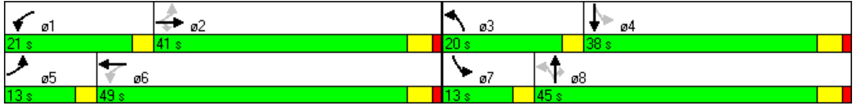
18: Garry Drive & Metis Trail

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None	None	None	None	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		10.0	10.0		10.0			10.0	10.0		10.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effct Green (s)		21.3	21.3	42.0	40.0		32.2	24.1	24.1	32.9	24.5	
Actuated g/C Ratio		0.26	0.26	0.51	0.48		0.39	0.29	0.29	0.40	0.29	
v/c Ratio		0.48	0.11	0.59	0.44		0.24	0.51	0.51	0.20	0.77	
Control Delay		35.2	10.6	20.3	18.1		16.3	29.7	8.0	15.6	38.9	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		35.2	10.6	20.3	18.1		16.3	29.7	8.0	15.6	38.9	
LOS		D	B	C	B		B	C	A	B	D	
Approach Delay		30.8			19.2			17.6			34.9	
Approach LOS		C			B			B			C	
Queue Length 50th (m)		28.1	0.0	32.7	35.7		6.7	34.8	4.0	7.5	56.0	
Queue Length 95th (m)		53.1	7.9	62.5	67.3		14.4	58.2	22.4	15.6	91.0	
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)			30.0	60.0			60.0		30.0	60.0		
Base Capacity (vph)		694	641	579	896		438	841	836	421	680	
Starvation Cap Reductn		0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.28	0.06	0.56	0.39		0.16	0.30	0.37	0.19	0.55	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 83.1
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 23.6 Intersection LOS: C
Intersection Capacity Utilization 74.1% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 18: Garry Drive & Metis Trail



Country Meadows Outline Plan - 10 Year Horizon Background Volumes PM Peak Hour

98: Walsh Drive & Metis Trail

9/7/2011

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	8	16	3	77	7	84	4	212	81	162	350	8
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	9	18	3	88	8	95	5	241	92	184	398	9

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	31	191	338	591
Volume Left (vph)	9	88	5	184
Volume Right (vph)	3	95	92	9
Hadj (s)	0.08	-0.12	-0.08	0.14
Departure Headway (s)	7.0	6.2	5.4	5.3
Degree Utilization, x	0.06	0.33	0.51	0.87
Capacity (veh/h)	458	535	624	661
Control Delay (s)	10.4	12.3	13.9	32.9
Approach Delay (s)	10.4	12.3	13.9	32.9
Approach LOS	B	B	B	D

Intersection Summary			
Delay	23.3		
HCM Level of Service	C		
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

Appendix G – Ten-Year Post-Development Analysis

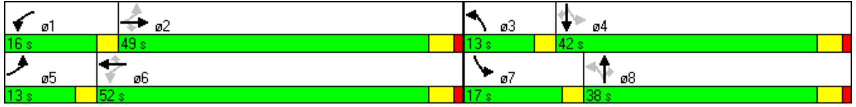
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Volume (vph)	149	330	208	166	129	117	43	254	288	173	187	60
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	85.0		30.0	85.0		50.0	60.0		30.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98		0.96			0.96	0.99		0.98	1.00		0.96
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1566	1685	1432	1566	1685	1432	1566	1685	1432	1566	1685	1432
Flt Permitted	0.663			0.295			0.625			0.332		
Satd. Flow (perm)	1076	1685	1377	486	1685	1377	1017	1685	1399	545	1685	1377
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147			133			327			68
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	169	375	236	189	147	133	49	289	327	197	212	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	169	375	236	189	147	133	49	289	327	197	212	68
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	13.0	25.0	25.0	13.0	25.0	25.0	13.0	21.0	21.0	13.0	21.0	21.0
Total Split (s)	13.0	49.0	49.0	16.0	52.0	52.0	13.0	38.0	38.0	17.0	42.0	42.0
Total Split (%)	10.8%	40.8%	40.8%	13.3%	43.3%	43.3%	10.8%	31.7%	31.7%	14.2%	35.0%	35.0%
Maximum Green (s)	10.0	44.0	44.0	13.0	47.0	47.0	10.0	33.0	33.0	14.0	37.0	37.0
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5	3.5
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5	1.5	0.0	1.5	1.5	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Flash Dont Walk (s)		10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)		5	5		5	5		5	5		5	5
Act Effct Green (s)	38.6	26.9	26.9	41.5	28.3	28.3	29.8	20.5	20.5	38.8	30.8	30.8
Actuated g/C Ratio	0.44	0.30	0.30	0.47	0.32	0.32	0.34	0.23	0.23	0.44	0.35	0.35
v/c Ratio	0.32	0.73	0.45	0.52	0.27	0.25	0.13	0.74	0.57	0.51	0.36	0.13
Control Delay	16.4	38.2	13.6	19.8	25.1	5.6	17.3	44.6	7.8	21.9	26.8	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.4	38.2	13.6	19.8	25.1	5.6	17.3	44.6	7.8	21.9	26.8	7.5
LOS	B	D	B	B	C	A	B	D	A	C	C	A
Approach Delay		26.1			17.4			24.5			22.1	
Approach LOS		C			B			C			C	
Queue Length 50th (m)	15.7	57.3	11.3	17.9	18.5	0.0	4.5	44.8	0.0	19.9	27.5	0.0
Queue Length 95th (m)	33.1	101.0	33.3	36.9	37.1	11.4	13.1	83.3	19.2	43.3	57.3	9.4
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)	60.0		30.0	85.0		30.0	85.0		50.0	60.0		30.0
Base Capacity (vph)	539	878	788	404	938	825	446	658	746	409	739	642
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.43	0.30	0.47	0.16	0.16	0.11	0.44	0.44	0.48	0.29	0.11

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 88.2
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 23.1 Intersection LOS: C
Intersection Capacity Utilization 68.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 18: Garry Drive & Metis Trail



MOVEMENT SUMMARY

Site: Intersection 98 AM 10 Year Post-Development

Intersection 98 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Trail											
3	L	42	5.0	0.606	13.1	LOS B	5.3	42.3	0.59	0.77	41.4
8	T	340	5.0	0.606	6.7	LOS A	5.3	42.3	0.59	0.56	44.1
18	R	251	5.0	0.606	7.9	LOS A	5.3	42.3	0.59	0.61	43.9
Approach		633	5.0	0.606	7.6	LOS A	5.3	42.3	0.59	0.59	43.9
East: Walsh Drive											
1	L	99	5.0	0.365	15.1	LOS B	2.3	17.9	0.69	0.86	39.0
6	T	38	5.0	0.365	8.7	LOS A	2.3	17.9	0.69	0.73	42.5
16	R	122	5.0	0.365	9.9	LOS A	2.3	17.9	0.69	0.77	42.5
Approach		258	5.0	0.365	11.7	LOS B	2.3	17.9	0.69	0.80	41.0
North: Metis Trail											
7	L	65	5.0	0.193	12.4	LOS B	1.1	8.7	0.41	0.79	41.8
4	T	144	5.0	0.193	5.9	LOS A	1.1	8.7	0.41	0.49	45.7
14	R	9	5.0	0.008	6.1	LOS A	0.0	0.3	0.23	0.45	46.9
Approach		218	5.0	0.193	7.9	LOS A	1.1	8.7	0.40	0.58	44.4
West: Walsh Drive											
5	L	19	5.0	0.221	13.9	LOS B	1.2	9.4	0.54	0.83	40.4
2	T	61	5.0	0.221	7.4	LOS A	1.2	9.4	0.54	0.61	44.4
12	R	95	5.0	0.221	8.7	LOS A	1.2	9.4	0.54	0.67	44.0
Approach		176	5.0	0.221	8.8	LOS A	1.2	9.4	0.54	0.66	43.7
All Vehicles		1285	5.0	0.606	8.6	LOS A	5.3	42.3	0.57	0.64	43.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

17: Garry Drive & Garry Drive Entrance 1

	↗	→	←	↖	↘	↙
Movement	**EBL**	**EBT**	**WBT**	**WBR**	**SBL**	**SBR**
Lane Configurations		↰	↱		↔	
Volume (veh/h)	0	316	114	117	273	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	359	130	133	310	0
Pedestrians		5	5		5	
Lane Width (m)		4.8	4.8		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			401			
pX, platoon unblocked						
vC, conflicting volume	268				565	206
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	268				565	206
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				35	100
cM capacity (veh/h)	1272				481	825

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	359	262	310
Volume Left	0	0	310
Volume Right	0	133	0
cSH	1272	1700	481
Volume to Capacity	0.00	0.15	0.65
Queue Length 95th (m)	0.0	0.0	34.2
Control Delay (s)	0.0	0.0	25.1
Lane LOS			D
Approach Delay (s)	0.0	0.0	25.1
Approach LOS			D

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

94: Walsh Drive & Walsh Drive Entrance

	→	↘	↙	←	↖	↗
Movement	**EBT**	**EBR**	**WBL**	**WBT**	**NBL**	**NBR**
Lane Configurations	↱			↰	↔	
Volume (veh/h)	0	0	56	0	0	155
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	64	0	0	176
Pedestrians	5			5	5	
Lane Width (m)	4.8			4.8	4.8	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			5		137	10
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			5		137	10
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		100	83
cM capacity (veh/h)			1588		813	1059

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	64	176
Volume Left	0	64	0
Volume Right	0	0	176
cSH	1700	1588	1059
Volume to Capacity	0.00	0.04	0.17
Queue Length 95th (m)	0.0	1.0	4.5
Control Delay (s)	0.0	7.4	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	7.4	9.1
Approach LOS			A

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Intersection 88 AM 10 Year Post-Development

Intersection 88 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Trail											
3	L	61	5.0	0.543	12.5	LOS B	4.7	37.5	0.51	0.78	42.1
8	T	530	5.0	0.543	6.1	LOS A	4.7	37.5	0.51	0.51	45.1
Approach		591	5.0	0.543	6.8	LOS A	4.7	37.5	0.51	0.54	44.8
North: Metis Trail											
4	T	306	5.0	0.297	5.3	LOS A	1.9	15.3	0.27	0.43	47.4
14	R	41	5.0	0.297	6.6	LOS A	1.9	15.3	0.27	0.54	46.3
Approach		347	5.0	0.297	5.5	LOS A	1.9	15.3	0.27	0.44	47.3
West: Metis Trail Entrance											
5	L	114	5.0	0.357	11.9	LOS B	2.1	16.9	0.60	0.80	32.4
12	R	172	5.0	0.357	9.0	LOS A	2.1	16.9	0.60	0.69	43.1
Approach		285	5.0	0.357	10.2	LOS B	2.1	16.9	0.60	0.73	39.0
All Vehicles		1223	5.0	0.543	7.2	LOS A	4.7	37.5	0.46	0.56	44.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Friday, September 02, 2011 12:37:22 PM
SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\10_year\110828_10_year_post-development_external_intersections.sip
8001103, STANTEC CONSULTING LTD., SINGLE

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 46 AM 10 Year Post-Development

Intersection 46 - AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Intersection 46 (East Leg)											
6	T	19	2.0	0.048	2.9	LOS A	0.2	1.8	0.06	0.28	41.6
16	R	44	2.0	0.048	4.0	LOS A	0.2	1.8	0.06	0.41	39.4
Approach		64	2.0	0.048	3.7	LOS A	0.2	1.8	0.06	0.37	40.0
North: Circulating Collector (East Section)											
7	L	61	2.0	0.052	9.0	LOS A	0.2	1.9	0.10	0.62	34.3
14	R	3	2.0	0.052	4.0	LOS A	0.2	1.9	0.10	0.35	39.5
Approach		65	2.0	0.052	8.7	LOS A	0.2	1.9	0.10	0.61	34.5
West: Circulating Collector (South Section)											
5	L	9	2.0	0.057	9.3	LOS A	0.3	2.0	0.20	0.83	36.5
2	T	53	2.0	0.057	3.2	LOS A	0.3	2.0	0.20	0.31	41.9
Approach		63	2.0	0.057	4.1	LOS A	0.3	2.0	0.20	0.39	40.9
All Vehicles		191	2.0	0.057	5.5	LOS A	0.3	2.0	0.12	0.46	38.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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8001103, STANTEC CONSULTING LTD., SINGLE

MOVEMENT SUMMARY

Site: Intersection 47 AM 10 Year Post-Development

Intersection 47 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Garry Drive Entrance 1											
3	L	93	2.0	0.102	8.9	LOS A	0.5	4.1	0.06	0.68	34.8
18	R	51	2.0	0.102	4.0	LOS A	0.5	4.1	0.06	0.36	40.2
Approach		144	2.0	0.102	7.2	LOS A	0.5	4.1	0.06	0.57	36.3
East: Intersection 47 (East Leg)											
1	L	125	2.0	0.134	9.5	LOS A	0.7	5.2	0.26	0.64	28.7
6	T	22	2.0	0.134	3.4	LOS A	0.7	5.2	0.26	0.31	34.0
Approach		147	2.0	0.134	8.6	LOS A	0.7	5.2	0.26	0.59	29.3
West: Intersection 47 (West Leg)											
2	T	8	2.0	0.226	3.7	LOS A	1.3	9.8	0.35	0.38	37.5
12	R	233	2.0	0.226	4.9	LOS A	1.3	9.8	0.35	0.47	36.5
Approach		241	2.0	0.226	4.8	LOS A	1.3	9.8	0.35	0.46	36.6
All Vehicles		532	2.0	0.226	6.5	LOS A	1.3	9.8	0.25	0.53	34.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 84 AM 10 Year Post-Development

Intersection 84 - AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Circulating Collector (North Section)											
6	T	1	2.0	0.117	2.8	LOS A	0.6	4.7	0.06	0.27	41.1
16	R	167	2.0	0.117	4.0	LOS A	0.6	4.7	0.06	0.40	38.8
Approach		168	2.0	0.117	4.0	LOS A	0.6	4.7	0.06	0.40	38.8
North: Walsh Drive Entrance											
7	L	66	2.0	0.044	8.9	LOS A	0.2	1.6	0.02	0.65	36.3
14	R	1	2.0	0.044	3.9	LOS A	0.2	1.6	0.02	0.36	41.8
Approach		67	2.0	0.044	8.8	LOS A	0.2	1.6	0.02	0.64	36.3
West: Circulating Collector (North Section)											
5	L	8	2.0	0.008	9.3	LOS A	0.0	0.3	0.20	0.62	34.5
2	T	1	2.0	0.008	3.2	LOS A	0.0	0.3	0.20	0.26	40.3
Approach		9	2.0	0.008	8.5	LOS A	0.0	0.3	0.20	0.58	35.1
All Vehicles		244	2.0	0.117	5.5	LOS A	0.6	4.7	0.05	0.47	37.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Intersection 86 AM 10 Year Post-Development

Intersection 86 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Circulating Collector (East Section)											
3	L	14	2.0	0.160	9.5	LOS A	0.8	6.4	0.28	0.73	33.2
8	T	7	2.0	0.160	3.5	LOS A	0.8	6.4	0.28	0.34	38.0
18	R	155	2.0	0.160	4.6	LOS A	0.8	6.4	0.28	0.44	36.9
Approach		175	2.0	0.160	5.0	LOS A	0.8	6.4	0.28	0.45	36.5
East: Metis Trail Entrance											
1	L	57	2.0	0.074	9.0	LOS A	0.4	2.8	0.13	0.69	34.8
6	T	22	2.0	0.074	3.0	LOS A	0.4	2.8	0.13	0.26	41.3
16	R	13	2.0	0.074	4.1	LOS A	0.4	2.8	0.13	0.37	39.6
Approach		91	2.0	0.074	6.9	LOS A	0.4	2.8	0.13	0.54	36.6
North: Intersection 86 (North Leg)											
7	L	35	2.0	0.047	9.4	LOS A	0.2	1.7	0.25	0.65	29.0
4	T	7	2.0	0.047	3.4	LOS A	0.2	1.7	0.25	0.30	34.4
14	R	8	2.0	0.047	4.5	LOS A	0.2	1.7	0.25	0.39	32.8
Approach		50	2.0	0.047	7.8	LOS A	0.2	1.7	0.25	0.56	30.0
West: Circulating Collector (North Section)											
5	L	7	2.0	0.071	9.5	LOS A	0.3	2.6	0.26	0.81	33.7
2	T	56	2.0	0.071	3.5	LOS A	0.3	2.6	0.26	0.34	38.7
12	R	13	2.0	0.071	4.6	LOS A	0.3	2.6	0.26	0.45	37.4
Approach		75	2.0	0.071	4.2	LOS A	0.3	2.6	0.26	0.40	37.9
All Vehicles		391	2.0	0.160	5.6	LOS A	0.8	6.4	0.24	0.48	36.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

Country Meadows Outline Plan - 10 Year Horizon Post-Development Volumes PM Peak Hour

18: Metis Trail & Garry Drive

9/7/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Volume (vph)	106	228	78	285	372	236	125	307	271	171	338	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	85.0		30.0	85.0		50.0	60.0		30.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.96	0.99		0.96	0.99		0.98			0.96
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1583	1667	1417	1583	1667	1417	1583	1667	1417	1583	1667	1417
Flt Permitted	0.408			0.377			0.299			0.273		
Satd. Flow (perm)	674	1667	1362	623	1667	1362	495	1667	1384	455	1667	1362
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			69			150			290			111
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	120	259	89	324	423	268	142	349	308	194	384	193
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	259	89	324	423	268	142	349	308	194	384	193
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	13.0	25.0	25.0	13.0	25.0	25.0	13.0	21.0	21.0	13.0	21.0	21.0
Total Split (s)	13.0	36.0	36.0	27.0	50.0	50.0	13.0	42.0	42.0	15.0	44.0	44.0
Total Split (%)	10.8%	30.0%	30.0%	22.5%	41.7%	41.7%	10.8%	35.0%	35.0%	12.5%	36.7%	36.7%
Maximum Green (s)	10.0	31.0	31.0	24.0	45.0	45.0	10.0	37.0	37.0	12.0	39.0	39.0
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5	3.5
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5	1.5	0.0	1.5	1.5	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0

Country Meadows Outline Plan - 10 Year Horizon Post-Development Volumes PM Peak Hour

18: Metis Trail & Garry Drive

9/7/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Flash Dont Walk (s)		10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)		5	5		5	5		5	5		5	5
Act Effct Green (s)	34.4	23.3	23.3	46.4	32.2	32.2	36.2	24.8	24.8	40.3	26.9	26.9
Actuated g/C Ratio	0.37	0.25	0.25	0.49	0.34	0.34	0.39	0.26	0.26	0.43	0.29	0.29
v/c Ratio	0.36	0.63	0.23	0.66	0.74	0.47	0.48	0.79	0.53	0.59	0.81	0.41
Control Delay	19.0	41.9	13.8	23.5	37.5	14.5	23.3	47.1	8.2	26.0	46.0	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.0	41.9	13.8	23.5	37.5	14.5	23.3	47.1	8.2	26.0	46.0	15.6
LOS	B	D	B	C	D	B	C	D	A	C	D	B
Approach Delay		30.7			26.9			27.9			33.3	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	11.5	42.4	2.8	36.0	67.9	15.5	14.3	56.5	2.3	20.4	61.7	10.8
Queue Length 95th (m)	25.1	79.3	15.7	66.9	114.8	40.4	32.2	101.8	22.6	43.4	111.2	32.0
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)	60.0		30.0	85.0		30.0	85.0		50.0	60.0		30.0
Base Capacity (vph)	357	570	511	562	828	752	317	681	737	347	717	650
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.45	0.17	0.58	0.51	0.36	0.45	0.51	0.42	0.56	0.54	0.30

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 94

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

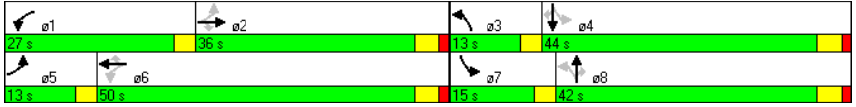
Maximum v/c Ratio: 0.81

Intersection Signal Delay: 29.4 Intersection LOS: C

Intersection Capacity Utilization 76.6% ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 18: Metis Trail & Garry Drive



MOVEMENT SUMMARY

Site: Intersection 98 PM 10 Year Post-Development

Intersection 98 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Trail											
3	L	108	5.0	0.702	16.7	LOS B	8.2	65.3	0.84	0.90	38.1
8	T	263	5.0	0.702	10.3	LOS B	8.2	65.3	0.84	0.81	41.6
18	R	240	5.0	0.702	11.5	LOS B	8.2	65.3	0.84	0.84	41.2
Approach		610	5.0	0.702	11.9	LOS B	8.2	65.3	0.84	0.84	40.7
East: Walsh Drive											
1	L	327	5.0	0.697	19.7	LOS B	7.7	61.2	0.90	1.03	34.9
6	T	68	5.0	0.697	13.3	LOS B	7.7	61.2	0.90	0.99	37.4
16	R	95	5.0	0.697	14.5	LOS B	7.7	61.2	0.90	1.01	37.2
Approach		491	5.0	0.697	17.8	LOS B	7.7	61.2	0.90	1.02	35.6
North: Metis Trail											
7	L	184	5.0	0.792	23.2	LOS C	11.3	89.9	1.00	1.17	33.2
4	T	432	5.0	0.792	16.8	LOS B	11.3	89.9	1.00	1.17	35.1
14	R	18	5.0	0.017	6.5	LOS A	0.1	0.7	0.36	0.48	45.7
Approach		634	5.0	0.792	18.3	LOS B	11.3	89.9	0.98	1.15	34.7
West: Walsh Drive											
5	L	14	5.0	0.393	24.2	LOS C	2.7	21.0	0.93	1.03	32.4
2	T	55	5.0	0.393	17.8	LOS B	2.7	21.0	0.93	1.00	34.3
12	R	66	5.0	0.393	19.0	LOS B	2.7	21.0	0.93	1.01	34.0
Approach		134	5.0	0.393	19.0	LOS B	2.7	21.0	0.93	1.01	34.0
All Vehicles		1869	5.0	0.792	16.1	LOS B	11.3	89.9	0.91	1.00	36.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Country Meadows Outline Plan - 10 Year Horizon Post-Development Volumes PM Peak Hour
17: Garry Drive & Garry Drive Entrance 1
9/7/2011

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰↱	
Volume (veh/h)	0	204	349	318	210	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	232	397	361	239	0
Pedestrians		5	5		5	
Lane Width (m)		4.8	4.8		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			401			
pX, platoon unblocked	0.81				0.81	0.81
vC, conflicting volume	763				819	587
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	586				656	368
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				30	100
cM capacity (veh/h)	781				343	540

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	232	758	239
Volume Left	0	0	239
Volume Right	0	361	0
cSH	781	1700	343
Volume to Capacity	0.00	0.45	0.70
Queue Length 95th (m)	0.0	0.0	37.7
Control Delay (s)	0.0	0.0	36.3
Lane LOS			E
Approach Delay (s)	0.0	0.0	36.3
Approach LOS			E

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Country Meadows Outline Plan - 10 Year Horizon Post-Development Volumes PM Peak Hour
94: Walsh Drive & Walsh Drive Entrance
9/7/2011

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Volume (veh/h)	0	0	170	0	0	118
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	193	0	0	134
Pedestrians	5			5	5	
Lane Width (m)	4.8			4.8	4.8	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			5		396	10
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			5		396	10
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		100	87
cM capacity (veh/h)			1588		529	1059

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	193	134
Volume Left	0	193	0
Volume Right	0	0	134
cSH	1700	1588	1059
Volume to Capacity	0.00	0.12	0.13
Queue Length 95th (m)	0.0	3.2	3.3
Control Delay (s)	0.0	7.6	8.9
Lane LOS		A	A
Approach Delay (s)	0.0	7.6	8.9
Approach LOS			A

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Intersection 88 PM 10 Year Post-Development

Intersection 88 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Metis Trail											
3	L	194	5.0	0.619	12.2	LOS B	6.8	53.9	0.49	0.72	41.8
8	T	543	5.0	0.619	5.8	LOS A	6.8	53.9	0.49	0.46	45.0
Approach		737	5.0	0.619	7.5	LOS A	6.8	53.9	0.49	0.53	44.1
North: Metis Trail											
4	T	683	5.0	0.828	11.8	LOS B	14.2	112.4	0.95	0.84	40.5
14	R	130	5.0	0.828	13.0	LOS B	14.2	112.4	0.95	0.85	40.2
Approach		813	5.0	0.828	12.0	LOS B	14.2	112.4	0.95	0.84	40.4
West: Metis Trail Entrance											
5	L	74	5.0	0.402	16.5	LOS B	2.8	21.9	0.88	1.00	28.5
12	R	110	5.0	0.402	13.7	LOS B	2.8	21.9	0.88	0.96	38.2
Approach		184	5.0	0.402	14.8	LOS B	2.8	21.9	0.88	0.98	34.4
All Vehicles		1734	5.0	0.828	10.4	LOS B	14.2	112.4	0.75	0.72	41.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Friday, September 02, 2011 12:38:57 PM
SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\10_year\110828_10_year_post-development_external_intersections.sip
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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 46 PM 10 Year Post-Development

Intersection 46 - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Intersection 46 (East Leg)											
6	T	64	2.0	0.109	2.9	LOS A	0.6	4.3	0.05	0.28	41.8
16	R	95	2.0	0.109	4.0	LOS A	0.6	4.3	0.05	0.42	39.6
Approach		159	2.0	0.109	3.5	LOS A	0.6	4.3	0.05	0.36	40.4
North: Circulating Collector (East Section)											
7	L	86	2.0	0.086	9.3	LOS A	0.4	3.2	0.21	0.62	33.8
14	R	10	2.0	0.086	4.4	LOS A	0.4	3.2	0.21	0.37	38.2
Approach		97	2.0	0.086	8.8	LOS A	0.4	3.2	0.21	0.59	34.2
West: Circulating Collector (South Section)											
5	L	6	2.0	0.040	9.4	LOS A	0.2	1.5	0.24	0.82	36.5
2	T	38	2.0	0.040	3.4	LOS A	0.2	1.5	0.24	0.33	41.4
Approach		43	2.0	0.040	4.2	LOS A	0.2	1.5	0.24	0.39	40.6
All Vehicles		299	2.0	0.109	5.3	LOS A	0.6	4.3	0.13	0.44	38.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Intersection 47 PM 10 Year Post-Development

Intersection 47 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Garry Drive Entrance 1											
3	L	277	2.0	0.295	9.0	LOS A	1.9	14.5	0.14	0.65	34.4
18	R	132	2.0	0.295	4.1	LOS A	1.9	14.5	0.14	0.36	39.2
Approach		409	2.0	0.295	7.4	LOS A	1.9	14.5	0.14	0.56	35.7
East: Intersection 47 (East Leg)											
1	L	84	2.0	0.109	10.7	LOS B	0.5	4.2	0.46	0.69	27.9
6	T	14	2.0	0.109	4.7	LOS A	0.5	4.2	0.46	0.45	30.8
Approach		98	2.0	0.109	9.9	LOS A	0.5	4.2	0.46	0.66	28.2
West: Intersection 47 (West Leg)											
2	T	25	2.0	0.184	3.4	LOS A	1.0	8.1	0.28	0.33	38.4
12	R	183	2.0	0.184	4.5	LOS A	1.0	8.1	0.28	0.43	37.2
Approach		208	2.0	0.184	4.4	LOS A	1.0	8.1	0.28	0.42	37.3
All Vehicles		715	2.0	0.295	6.9	LOS A	1.9	14.5	0.23	0.53	35.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION 5.1.5.2006
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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 84 PM 10 Year Post-Development

Intersection 84 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Circulating Collector (North Section)											
6	T	1	2.0	0.091	2.9	LOS A	0.5	3.7	0.09	0.27	40.6
16	R	120	2.0	0.091	4.0	LOS A	0.5	3.7	0.09	0.39	38.5
Approach		122	2.0	0.091	4.0	LOS A	0.5	3.7	0.09	0.39	38.5
North: Walsh Drive Entrance											
7	L	183	2.0	0.122	8.9	LOS A	0.6	4.7	0.02	0.65	36.3
14	R	10	2.0	0.122	4.0	LOS A	0.6	4.7	0.02	0.36	41.8
Approach		193	2.0	0.122	8.6	LOS A	0.6	4.7	0.02	0.64	36.5
West: Circulating Collector (North Section)											
5	L	15	2.0	0.016	9.9	LOS A	0.1	0.6	0.34	0.62	33.8
2	T	1	2.0	0.016	3.9	LOS A	0.1	0.6	0.34	0.33	38.2
Approach		16	2.0	0.016	9.5	LOS A	0.1	0.6	0.34	0.60	34.0
All Vehicles		331	2.0	0.122	7.0	LOS A	0.6	4.7	0.06	0.55	36.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION 5.1.5.2006
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MOVEMENT SUMMARY

Site: Intersection 86 PM 10 Year Post-Development

Intersection 86 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Circulating Collector (East Section)											
3	L	28	2.0	0.126	9.3	LOS A	0.7	5.0	0.23	0.72	33.3
8	T	9	2.0	0.126	3.3	LOS A	0.7	5.0	0.23	0.31	38.7
18	R	106	2.0	0.126	4.4	LOS A	0.7	5.0	0.23	0.41	37.3
Approach		143	2.0	0.126	5.3	LOS A	0.7	5.0	0.23	0.46	36.4
East: Metis Trail Entrance											
1	L	183	2.0	0.226	9.2	LOS A	1.3	9.9	0.19	0.67	34.5
6	T	64	2.0	0.226	3.1	LOS A	1.3	9.9	0.19	0.28	40.4
16	R	40	2.0	0.226	4.3	LOS A	1.3	9.9	0.19	0.38	38.9
Approach		286	2.0	0.226	7.1	LOS A	1.3	9.9	0.19	0.55	36.1
North: Intersection 86 (North Leg)											
7	L	23	2.0	0.045	10.6	LOS B	0.2	1.6	0.44	0.70	28.3
4	T	9	2.0	0.045	4.5	LOS A	0.2	1.6	0.44	0.42	31.5
14	R	8	2.0	0.045	5.7	LOS A	0.2	1.6	0.44	0.49	30.7
Approach		40	2.0	0.045	8.2	LOS A	0.2	1.6	0.44	0.60	29.3
West: Circulating Collector (North Section)											
5	L	8	2.0	0.076	10.2	LOS B	0.4	2.8	0.40	0.78	33.0
2	T	38	2.0	0.076	4.2	LOS A	0.4	2.8	0.40	0.42	36.9
12	R	26	2.0	0.076	5.3	LOS A	0.4	2.8	0.40	0.50	36.1
Approach		72	2.0	0.076	5.3	LOS A	0.4	2.8	0.40	0.49	36.0
All Vehicles		541	2.0	0.226	6.5	LOS A	1.3	9.9	0.25	0.52	35.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

Appendix H – Full-Build Background Analysis

Country Meadows Outline Plan - Full-Build Background Volumes
11: Garry Drive & Chinook Trail

AM Peak Hour
9/7/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Volume (veh/h)	10	0	169	18	5	142
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	11	0	192	20	6	161
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	385	212			218	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	385	212			218	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	603	811			1327	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	212	167
Volume Left	11	0	6
Volume Right	0	20	0
cSH	603	1700	1327
Volume to Capacity	0.02	0.13	0.00
Queue Length 95th (m)	0.4	0.0	0.1
Control Delay (s)	11.1	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	11.1	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Background Volumes
91: Walsh Drive & Chinook Trail

AM Peak Hour
9/7/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	20	0	10	12	4	35	10	145	14	25	125	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	23	0	11	14	5	40	11	165	16	28	142	23
Pedestrians		5			5			5			5	
Lane Width (m)		4.8			4.8			4.8			4.8	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	458	424	163	427	427	183	170			186		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	458	424	163	427	427	183	170			186		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	99	97	99	95	99			98		
cM capacity (veh/h)	461	497	864	504	495	843	1382			1363		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	34	58	192	193
Volume Left	23	14	11	28
Volume Right	11	40	16	23
cSH	546	695	1382	1363
Volume to Capacity	0.06	0.08	0.01	0.02
Queue Length 95th (m)	1.5	2.1	0.2	0.5
Control Delay (s)	12.0	10.7	0.5	1.3
Lane LOS	B	B	A	A
Approach Delay (s)	12.0	10.7	0.5	1.3
Approach LOS	B	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

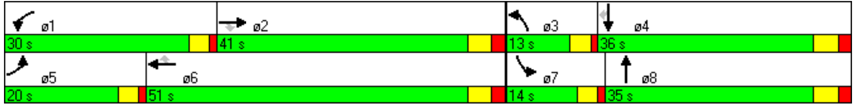
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	79	441	111	327	164	114	40	387	558	28	175	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		30.0	60.0		30.0	60.0		30.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1566	3202	1432	3038	3202	1432	3038	3202	1432	1566	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1566	3202	1404	3038	3202	1404	3038	3202	1413	1566	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			101			130			406			30
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	90	501	126	372	186	130	45	440	634	32	199	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	501	126	372	186	130	45	440	634	32	199	30
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	20.0	41.0	41.0	30.0	51.0	51.0	13.0	35.0	0.0	14.0	36.0	36.0
Total Split (%)	16.7%	34.2%	34.2%	25.0%	42.5%	42.5%	10.8%	29.2%	0.0%	11.7%	30.0%	30.0%
Maximum Green (s)	16.0	35.5	35.5	26.0	45.5	45.5	9.0	29.5		10.0	30.5	30.5
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5	4.0	4.0	5.5	5.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	10.3	22.4	22.4	15.3	30.3	30.3	6.9	16.4	76.4	7.4	16.9	16.9
Actuated g/C Ratio	0.13	0.29	0.29	0.20	0.40	0.40	0.09	0.21	1.00	0.10	0.22	0.22
v/c Ratio	0.43	0.53	0.26	0.61	0.15	0.20	0.16	0.64	0.45	0.21	0.28	0.09
Control Delay	41.2	28.1	10.6	34.5	20.1	5.6	39.9	33.7	1.0	41.8	27.7	11.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.2	28.1	10.6	34.5	20.1	5.6	39.9	33.7	1.0	41.8	27.7	11.4
LOS	D	C	B	C	C	A	D	C	A	D	C	B
Approach Delay		26.7			25.1			15.4			27.6	
Approach LOS		C			C			B			C	
Queue Length 50th (m)	12.4	34.1	2.8	26.0	10.2	0.0	3.2	31.3	0.0	4.5	12.9	0.0
Queue Length 95th (m)	30.8	61.4	17.0	48.0	21.6	11.5	9.7	56.0	0.0	15.0	26.0	6.8
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)	60.0		30.0	90.0		30.0	60.0		30.0	60.0		30.0
Base Capacity (vph)	346	1569	739	1090	2011	930	377	1304	1413	216	1348	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.32	0.17	0.34	0.09	0.14	0.12	0.34	0.45	0.15	0.15	0.05

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 76.4
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 21.9 Intersection LOS: C
Intersection Capacity Utilization 60.0% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 18: Garry Drive & Metis Trail



MOVEMENT SUMMARY

Site: Intersection 98 AM Full-Build Background

Intersection 98 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Metis Trail											
3	L	9	5.0	0.288	12.2	LOS B	1.4	10.8	0.33	0.87	42.5
8	T	557	5.0	0.288	5.3	LOS A	1.4	10.8	0.33	0.47	47.3
18	R	70	5.0	0.288	6.6	LOS A	1.4	10.8	0.33	0.57	46.3
Approach		636	5.0	0.288	5.5	LOS A	1.4	10.8	0.33	0.49	47.1
East: Walsh Drive											
1	L	20	5.0	0.120	16.3	LOS B	0.4	3.4	0.57	0.94	38.5
6	T	33	5.0	0.120	9.4	LOS A	0.4	3.4	0.57	0.73	42.9
16	R	203	5.0	0.250	8.2	LOS A	1.1	8.4	0.55	0.71	44.1
Approach		257	5.0	0.250	9.0	LOS A	1.1	8.4	0.56	0.73	43.4
North: Metis Trail											
7	L	101	5.0	0.145	11.6	LOS B	0.7	5.3	0.19	0.73	42.1
4	T	240	5.0	0.145	4.7	LOS A	0.7	5.4	0.19	0.39	48.7
14	R	11	5.0	0.145	6.0	LOS A	0.7	5.4	0.19	0.52	47.4
Approach		352	5.0	0.145	6.8	LOS A	0.7	5.4	0.19	0.49	46.4
West: Walsh Drive											
5	L	23	5.0	0.032	12.6	LOS B	0.1	0.9	0.39	0.72	41.2
2	T	35	5.0	0.032	5.8	LOS A	0.1	0.9	0.39	0.50	46.6
12	R	1	5.0	0.032	6.9	LOS A	0.1	0.9	0.39	0.59	46.1
Approach		59	5.0	0.032	8.4	LOS A	0.1	0.9	0.39	0.59	44.2
All Vehicles		1305	5.0	0.288	6.7	LOS A	1.4	10.8	0.34	0.54	46.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION 5.1.5.2006
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Country Meadows Outline Plan - Full-Build Background Volumes

PM Peak Hour

11: Garry Drive & Chinook Trail

9/7/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	16	5	178	8	5	271
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	18	6	202	9	6	308
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	536	217			216	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	536	217			216	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			100	
cM capacity (veh/h)	493	806			1328	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	24	211	314
Volume Left	18	0	6
Volume Right	6	9	0
cSH	543	1700	1328
Volume to Capacity	0.04	0.12	0.00
Queue Length 95th (m)	1.0	0.0	0.1
Control Delay (s)	11.9	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	11.9	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Background Volumes

PM Peak Hour

91: Walsh Drive & Chinook Trail

9/7/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	20	0	10	49	1	35	10	145	28	26	217	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	23	0	11	56	1	40	11	165	32	30	247	23
Pedestrians		5			5			5			5	
Lane Width (m)		4.8			4.8			4.8			4.8	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	571	546	268	542	542	191	274			202		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	571	546	268	542	542	191	274			202		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	98	87	100	95	99			98		
cM capacity (veh/h)	389	422	755	421	425	834	1265			1345		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	34	97	208	299
Volume Left	23	56	11	30
Volume Right	11	40	32	23
cSH	464	529	1265	1345
Volume to Capacity	0.07	0.18	0.01	0.02
Queue Length 95th (m)	1.8	5.0	0.2	0.5
Control Delay (s)	13.4	13.3	0.5	0.9
Lane LOS	B	B	A	A
Approach Delay (s)	13.4	13.3	0.5	0.9
Approach LOS	B	B		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

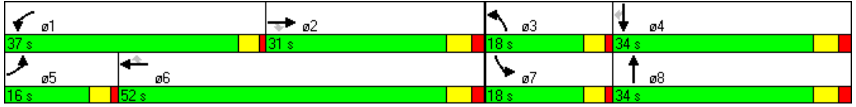
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	45	289	72	553	489	117	123	360	534	132	403	85
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		30.0	60.0		30.0	60.0		30.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1566	3202	1432	3038	3202	1432	3038	3202	1432	1566	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1566	3202	1404	3038	3202	1404	3038	3202	1413	1566	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			110			419			78
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		379.0			226.3			790.4			606.3	
Travel Time (s)		22.7			13.6			47.4			36.4	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	51	328	82	628	556	133	140	409	607	150	458	97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	328	82	628	556	133	140	409	607	150	458	97
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	16.0	31.0	31.0	37.0	52.0	52.0	18.0	34.0	0.0	18.0	34.0	34.0
Total Split (%)	13.3%	25.8%	25.8%	30.8%	43.3%	43.3%	15.0%	28.3%	0.0%	15.0%	28.3%	28.3%
Maximum Green (s)	12.0	25.5	25.5	33.0	46.5	46.5	14.0	28.5		14.0	28.5	28.5
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5	4.0	4.0	5.5	5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	8.5	20.9	20.9	24.7	39.4	39.4	10.0	18.4	96.6	13.2	21.6	21.6
Actuated g/C Ratio	0.09	0.22	0.22	0.26	0.41	0.41	0.10	0.19	1.00	0.14	0.22	0.22
v/c Ratio	0.37	0.47	0.22	0.81	0.43	0.21	0.44	0.67	0.43	0.70	0.64	0.26
Control Delay	52.8	38.0	10.3	43.2	23.7	7.4	47.6	42.7	1.0	61.0	39.4	13.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.8	38.0	10.3	43.2	23.7	7.4	47.6	42.7	1.0	61.0	39.4	13.1
LOS	D	D	B	D	C	A	D	D	A	E	D	B
Approach Delay		34.7			31.4			21.4			40.4	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	9.0	28.2	0.0	55.8	39.8	2.6	12.7	37.3	0.0	26.5	40.2	2.8
Queue Length 95th (m)	22.9	49.2	12.3	85.2	64.3	15.2	24.9	57.5	0.0	#65.8	64.5	16.2
Internal Link Dist (m)		355.0			202.3			766.4			582.3	
Turn Bay Length (m)	60.0		30.0	90.0		30.0	60.0		30.0	60.0		30.0
Base Capacity (vph)	198	861	438	1057	1570	744	448	962	1413	231	962	476
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.38	0.19	0.59	0.35	0.18	0.31	0.43	0.43	0.65	0.48	0.20

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 96.6
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 30.4 Intersection LOS: C
Intersection Capacity Utilization 70.0% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 18: Garry Drive & Metis Trail



MOVEMENT SUMMARY

Site: Intersection 98 PM Full-Build Background

Intersection 98 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Trail											
3	L	8	5.0	0.338	13.8	LOS B	1.8	14.0	0.58	0.92	41.4
8	T	419	5.0	0.338	6.9	LOS A	1.8	14.0	0.58	0.62	44.8
18	R	152	5.0	0.338	8.2	LOS A	1.8	14.0	0.58	0.71	44.3
Approach		580	5.0	0.338	7.4	LOS A	1.8	14.0	0.58	0.65	44.7
East: Walsh Drive											
1	L	119	5.0	0.214	13.3	LOS B	1.0	7.7	0.53	0.83	41.0
6	T	95	5.0	0.214	6.4	LOS A	1.0	7.7	0.53	0.57	44.5
16	R	151	5.0	0.214	7.7	LOS A	1.0	7.7	0.53	0.66	44.5
Approach		366	5.0	0.214	9.2	LOS A	1.0	7.7	0.53	0.69	43.2
North: Metis Trail											
7	L	339	5.0	0.473	12.8	LOS B	2.9	23.3	0.51	0.76	40.9
4	T	625	5.0	0.473	5.9	LOS A	2.9	23.3	0.51	0.52	45.4
14	R	18	5.0	0.473	7.1	LOS A	2.9	23.3	0.51	0.62	45.3
Approach		982	5.0	0.473	8.3	LOS A	2.9	23.3	0.51	0.61	43.6
West: Walsh Drive											
5	L	17	5.0	0.087	15.4	LOS B	0.4	2.8	0.65	0.95	39.5
2	T	78	5.0	0.087	8.3	LOS A	0.4	2.8	0.65	0.74	44.1
12	R	6	5.0	0.087	9.4	LOS A	0.4	2.8	0.65	0.82	44.3
Approach		101	5.0	0.087	9.5	LOS A	0.4	2.8	0.65	0.78	43.1
All Vehicles		2028	5.0	0.473	8.2	LOS A	2.9	23.3	0.54	0.64	43.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\full_build\110828_full-build_background_external_intersections.sip
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SIDRA INTERSECTION

Appendix I – Full-Build Post-Development Analysis

Country Meadows Outline Plan - Full-Build Post-Development Volumes

AM Peak Hour

11: Garry Drive & Chinook Trail

10/31/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	47	33	177	32	91	163
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	53	38	201	36	103	185
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	621	229			242	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	621	229			242	
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	95			92	
cM capacity (veh/h)	406	794			1299	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	91	238	289
Volume Left	53	0	103
Volume Right	38	36	0
cSH	508	1700	1299
Volume to Capacity	0.18	0.14	0.08
Queue Length 95th (m)	4.9	0.0	2.0
Control Delay (s)	13.6	0.0	3.3
Lane LOS	B		A
Approach Delay (s)	13.6	0.0	3.3
Approach LOS	B		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes

AM Peak Hour

13: Garry Drive & Garry Drive Entrance 2

10/31/2011

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Volume (veh/h)	4	120	71	72	192	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	5	136	81	82	218	10
Pedestrians		5	5		5	
Lane Width (m)		4.8	4.8		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	168				277	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168				277	132
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				69	99
cM capacity (veh/h)	1385				702	908

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	141	162	228
Volume Left	5	0	218
Volume Right	0	82	10
cSH	1385	1700	710
Volume to Capacity	0.00	0.10	0.32
Queue Length 95th (m)	0.1	0.0	10.6
Control Delay (s)	0.3	0.0	12.5
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	12.5
Approach LOS			B

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes
43: Circulating Collector (South Section) & Garry Drive Entrance 2

AM Peak Hour
10/31/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
	↙	↖	↑	↗	↘	↓
Lane Configurations	Y		↱			↰
Volume (veh/h)	39	48	64	15	22	66
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	44	55	73	17	25	75
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	216	91			95	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	216	91			95	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	94			98	
cM capacity (veh/h)	751	956			1491	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	99	90	100
Volume Left	44	0	25
Volume Right	55	17	0
cSH	851	1700	1491
Volume to Capacity	0.12	0.05	0.02
Queue Length 95th (m)	3.0	0.0	0.4
Control Delay (s)	9.8	0.0	2.0
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	2.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes
51: Chinook Trial Entrance & Chinook Trail

AM Peak Hour
10/31/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
	↙	↖	↑	↗	↘	↓
Lane Configurations	Y		↱			↰
Volume (veh/h)	94	77	174	36	29	159
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	107	88	198	41	33	181
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	475	228			244	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	475	228			244	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	89			97	
cM capacity (veh/h)	529	802			1298	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	194	239	214
Volume Left	107	0	33
Volume Right	88	41	0
cSH	625	1700	1298
Volume to Capacity	0.31	0.14	0.03
Queue Length 95th (m)	10.1	0.0	0.6
Control Delay (s)	13.3	0.0	1.4
Lane LOS	B		A
Approach Delay (s)	13.3	0.0	1.4
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes
91: Walsh Drive & Chinook Trail

AM Peak Hour
10/31/2011

	⤴	→	⤵	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	20	0	10	54	4	35	10	145	96	25	125	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	23	0	11	61	5	40	11	165	109	28	142	23
Pedestrians		5			5			5			5	
Lane Width (m)		4.8			4.8			4.8			4.8	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	504	517	163	474	474	229	170			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504	517	163	474	474	229	170			279		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	99	87	99	95	99			98		
cM capacity (veh/h)	427	439	864	469	465	794	1382			1260		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	34	106	285	193
Volume Left	23	61	11	28
Volume Right	11	40	109	23
cSH	514	554	1382	1260
Volume to Capacity	0.07	0.19	0.01	0.02
Queue Length 95th (m)	1.6	5.3	0.2	0.5
Control Delay (s)	12.5	13.0	0.4	1.3
Lane LOS	B	B	A	A
Approach Delay (s)	12.5	13.0	0.4	1.3
Approach LOS	B	B		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes
94: Walsh Drive & Walsh Drive Entrance

AM Peak Hour
10/31/2011

	→	⤵	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Volume (veh/h)	107	14	93	72	20	253
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	122	16	106	82	23	288
Pedestrians	5			5	5	
Lane Width (m)	4.8			4.8	4.8	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			142		433	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			142		433	140
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		96	68
cM capacity (veh/h)			1414		531	898

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	138	188	310
Volume Left	0	106	23
Volume Right	16	0	288
cSH	1700	1414	855
Volume to Capacity	0.08	0.07	0.36
Queue Length 95th (m)	0.0	1.8	12.7
Control Delay (s)	0.0	4.6	11.6
Lane LOS		A	B
Approach Delay (s)	0.0	4.6	11.6
Approach LOS			B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

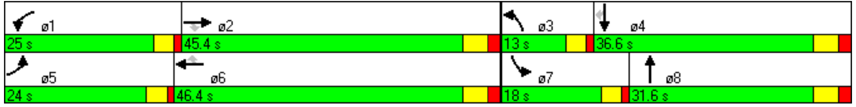
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	299	679	210	327	258	180	80	415	558	208	252	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3038	3202	1432	3038	3202	1432	3038	3202	1432	3038	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3038	3202	1404	3038	3202	1404	3038	3202	1413	3038	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			131			205			379			143
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		400.5			202.5			782.2			628.0	
Travel Time (s)		24.0			12.2			46.9			37.7	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	340	772	239	372	293	205	91	472	634	236	286	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	340	772	239	372	293	205	91	472	634	236	286	143
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	24.0	45.4	45.4	25.0	46.4	46.4	13.0	31.6	0.0	18.0	36.6	36.6
Total Split (%)	20.0%	37.8%	37.8%	20.8%	38.7%	38.7%	10.8%	26.3%	0.0%	15.0%	30.5%	30.5%
Maximum Green (s)	20.0	39.9	39.9	21.0	40.9	40.9	9.0	26.1		14.0	31.1	31.1
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5	4.0	4.0	5.5	5.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	17.8	46.3	46.3	18.9	47.4	47.4	8.4	22.3	120.0	13.5	27.4	27.4
Actuated g/C Ratio	0.15	0.39	0.39	0.16	0.40	0.40	0.07	0.19	1.00	0.11	0.23	0.23
v/c Ratio	0.75	0.62	0.38	0.78	0.23	0.30	0.43	0.79	0.45	0.69	0.39	0.33
Control Delay	60.0	34.1	15.2	60.0	26.4	5.1	59.6	56.9	1.0	55.1	45.4	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.0	34.1	15.2	60.0	26.4	5.1	59.6	56.9	1.0	55.1	45.4	16.4
LOS	E	C	B	E	C	A	E	E	A	E	D	B
Approach Delay		37.3			35.8			27.5			42.6	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	39.7	78.8	17.3	43.5	24.5	0.0	10.7	56.2	0.0	27.0	34.6	2.7
Queue Length 95th (m)	53.3	102.9	39.3	57.6	36.4	14.7	18.8	70.4	0.0	40.7	45.6	21.1
Internal Link Dist (m)		376.5			178.5			758.2			604.0	
Turn Bay Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Base Capacity (vph)	509	1245	626	536	1273	682	233	696	1413	366	830	470
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.62	0.38	0.69	0.23	0.30	0.39	0.68	0.45	0.64	0.34	0.30

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 35.0 Intersection LOS: C
Intersection Capacity Utilization 66.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 18: Garry Drive & Metis Trail



MOVEMENT SUMMARY

Site: Intersection 17 AM Full-Build Post-Development

Intersection 17 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Garry Drive											
6	T	393	5.0	0.183	4.5	LOS A	1.0	7.6	0.06	0.38	50.4
16	R	132	5.0	0.183	5.7	LOS A	1.0	7.6	0.05	0.50	48.4
Approach		525	5.0	0.183	4.8	LOS A	1.0	7.6	0.06	0.41	49.9
North: Garry Drive Entrance 1											
7	L	311	5.0	0.429	11.9	LOS B	2.1	16.6	0.56	0.82	32.3
14	R	16	5.0	0.429	6.5	LOS A	2.1	16.6	0.56	0.68	35.1
Approach		327	5.0	0.429	11.6	LOS B	2.1	16.6	0.56	0.82	32.4
West: Garry Drive											
5	L	7	5.0	0.553	14.1	LOS B	4.1	32.3	0.65	0.91	41.3
2	T	1039	5.0	0.553	7.2	LOS A	4.1	32.3	0.65	0.66	44.4
Approach		1045	5.0	0.553	7.2	LOS A	4.1	32.3	0.65	0.66	44.4
All Vehicles		1898	5.0	0.553	7.3	LOS A	4.1	32.3	0.47	0.62	43.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 88 AM Full-Build Post-Development

Intersection 88 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Metis Trail											
3	L	60	5.0	0.445	12.2	LOS B	2.9	22.9	0.41	0.82	42.4
8	T	956	5.0	0.445	5.3	LOS A	2.9	23.0	0.41	0.48	46.6
Approach		1016	5.0	0.445	5.8	LOS A	2.9	23.0	0.41	0.50	46.3
North: Metis Trail											
4	T	498	5.0	0.220	4.7	LOS A	1.1	8.6	0.20	0.40	48.8
14	R	49	5.0	0.220	6.0	LOS A	1.1	8.6	0.20	0.51	47.3
Approach		547	5.0	0.220	4.9	LOS A	1.1	8.6	0.20	0.41	48.7
West: Metis Trail Entrance											
5	L	138	5.0	0.435	12.6	LOS B	2.2	17.1	0.61	0.93	32.3
12	R	168	5.0	0.435	9.3	LOS A	2.2	17.1	0.61	0.81	43.2
Approach		306	5.0	0.435	10.8	LOS B	2.2	17.1	0.61	0.86	38.3
All Vehicles		1868	5.0	0.445	6.3	LOS A	2.9	23.0	0.38	0.53	45.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Monday, October 31, 2011 3:48:04 PM
SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\full_build\111031_update\111031_full-build_post-development_external_intersections.sip
8001103, STANTEC CONSULTING LTD., SINGLE

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 98 AM Full-Build Post-Development

Intersection 98 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Metis Trail											
3	L	63	5.0	0.585	14.7	LOS B	4.3	33.8	0.66	0.95	40.5
8	T	642	5.0	0.585	7.8	LOS A	4.3	33.8	0.66	0.74	43.9
18	R	367	5.0	0.585	9.1	LOS A	4.3	33.8	0.67	0.80	43.6
Approach		1072	5.0	0.585	8.7	LOS A	4.3	33.8	0.66	0.78	43.6
East: Walsh Drive											
1	L	135	5.0	0.330	15.2	LOS B	1.6	13.0	0.70	0.94	39.3
6	T	97	5.0	0.330	8.3	LOS A	1.7	13.2	0.70	0.74	42.7
16	R	203	5.0	0.330	9.4	LOS A	1.7	13.2	0.70	0.82	43.1
Approach		435	5.0	0.330	11.0	LOS B	1.7	13.2	0.70	0.84	41.6
North: Metis Trail											
7	L	101	5.0	0.169	12.5	LOS B	0.8	6.4	0.44	0.77	41.4
4	T	273	5.0	0.169	5.5	LOS A	0.8	6.6	0.43	0.49	46.2
14	R	30	5.0	0.023	5.8	LOS A	0.1	0.8	0.27	0.46	46.9
Approach		403	5.0	0.169	7.3	LOS A	0.8	6.6	0.42	0.56	44.9
West: Walsh Drive											
5	L	70	5.0	0.244	13.6	LOS B	1.1	8.4	0.54	0.89	41.1
2	T	201	5.0	0.244	6.7	LOS A	1.1	8.5	0.54	0.60	44.8
12	R	139	5.0	0.244	8.0	LOS A	1.1	8.5	0.54	0.69	44.5
Approach		410	5.0	0.244	8.3	LOS A	1.1	8.5	0.54	0.68	44.0
All Vehicles		2320	5.0	0.585	8.8	LOS A	4.3	33.8	0.61	0.73	43.5

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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MOVEMENT SUMMARY

Site: Intersection 23 AM Full-Build Post-Development

Intersection 23 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Garry Drive Entrance 2											
3	L	13	2.0	0.072	9.1	LOS A	0.4	2.8	0.16	0.82	34.9
8	T	56	2.0	0.072	3.1	LOS A	0.4	2.8	0.16	0.29	41.0
18	R	17	2.0	0.072	4.2	LOS A	0.4	2.8	0.16	0.42	39.4
Approach		85	2.0	0.072	4.2	LOS A	0.4	2.8	0.16	0.40	39.5
East: Intersection 23 (East Leg)											
1	L	47	2.0	0.077	9.4	LOS A	0.4	2.9	0.25	0.67	29.0
6	T	6	2.0	0.077	3.4	LOS A	0.4	2.9	0.25	0.31	34.4
16	R	31	2.0	0.077	4.5	LOS A	0.4	2.9	0.25	0.40	32.8
Approach		83	2.0	0.077	7.2	LOS A	0.4	2.9	0.25	0.54	30.4
North: Garry Drive Entrance 2											
7	L	13	2.0	0.146	9.3	LOS A	0.8	5.9	0.22	0.85	34.2
4	T	150	2.0	0.146	3.2	LOS A	0.8	5.9	0.22	0.33	39.7
14	R	8	2.0	0.146	4.4	LOS A	0.8	5.9	0.22	0.45	38.2
Approach		170	2.0	0.146	3.7	LOS A	0.8	5.9	0.22	0.37	39.1
West: Intersection 23 (West Leg)											
5	L	20	2.0	0.061	10.2	LOS B	0.3	2.2	0.39	0.71	28.8
2	T	6	2.0	0.061	4.1	LOS A	0.3	2.2	0.39	0.39	32.4
12	R	32	2.0	0.061	5.3	LOS A	0.3	2.2	0.39	0.47	31.4
Approach		58	2.0	0.061	6.9	LOS A	0.3	2.2	0.39	0.55	30.3
All Vehicles		397	2.0	0.146	5.0	LOS A	0.8	5.9	0.24	0.44	36.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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MOVEMENT SUMMARY

Site: Intersection 46 AM Full-Build Post-Development

Intersection 46 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Intersection 46 (East Leg)											
6	T	14	2.0	0.042	2.9	LOS A	0.2	1.5	0.06	0.28	41.6
16	R	41	2.0	0.042	4.0	LOS A	0.2	1.5	0.06	0.41	39.4
Approach		55	2.0	0.042	3.7	LOS A	0.2	1.5	0.06	0.37	39.9
North: Circulating Collector (East Section)											
7	L	56	2.0	0.046	8.9	LOS A	0.2	1.6	0.08	0.63	34.4
14	R	3	2.0	0.046	4.0	LOS A	0.2	1.6	0.08	0.35	39.7
Approach		59	2.0	0.046	8.7	LOS A	0.2	1.6	0.08	0.61	34.7
West: Circulating Collector (South Section)											
5	L	9	2.0	0.038	9.2	LOS A	0.2	1.3	0.19	0.81	36.5
2	T	33	2.0	0.038	3.2	LOS A	0.2	1.3	0.19	0.30	42.0
Approach		42	2.0	0.038	4.5	LOS A	0.2	1.3	0.19	0.41	40.5
All Vehicles		156	2.0	0.046	5.8	LOS A	0.2	1.6	0.10	0.48	37.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 47 AM Full-Build Post-Development

Intersection 47 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Garry Drive Entrance 1											
3	L	83	2.0	0.095	8.9	LOS A	0.5	3.8	0.06	0.69	34.8
18	R	51	2.0	0.095	4.0	LOS A	0.5	3.8	0.06	0.37	40.2
Approach		134	2.0	0.095	7.0	LOS A	0.5	3.8	0.06	0.56	36.5
East: Intersection 47 (East Leg)											
1	L	125	2.0	0.132	9.4	LOS A	0.7	5.1	0.25	0.64	28.8
6	T	22	2.0	0.132	3.4	LOS A	0.7	5.1	0.25	0.30	34.3
Approach		147	2.0	0.132	8.5	LOS A	0.7	5.1	0.25	0.59	29.4
West: Intersection 47 (West Leg)											
2	T	8	2.0	0.203	3.7	LOS A	1.1	8.6	0.34	0.37	37.6
12	R	207	2.0	0.203	4.9	LOS A	1.1	8.6	0.34	0.46	36.6
Approach		215	2.0	0.203	4.8	LOS A	1.1	8.6	0.34	0.46	36.6
All Vehicles		495	2.0	0.203	6.5	LOS A	1.1	8.6	0.24	0.53	34.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 53 AM Full-Build Post-Development

Intersection 53 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Circulating Collector (West Section)											
3	L	103	2.0	0.103	9.1	LOS A	0.5	4.0	0.15	0.65	33.2
8	T	24	2.0	0.103	3.0	LOS A	0.5	4.0	0.15	0.26	39.8
Approach		127	2.0	0.103	7.9	LOS A	0.5	4.0	0.15	0.58	34.1
North: Circulating Collector (West Section)											
4	T	58	2.0	0.140	3.5	LOS A	0.7	5.5	0.29	0.35	36.3
14	R	92	2.0	0.140	4.7	LOS A	0.7	5.5	0.29	0.45	35.0
Approach		150	2.0	0.140	4.2	LOS A	0.7	5.5	0.29	0.41	35.5
West: Chinook Trail Entrance											
5	L	34	2.0	0.068	9.2	LOS A	0.3	2.6	0.20	0.67	34.9
12	R	42	2.0	0.068	4.3	LOS A	0.3	2.6	0.20	0.39	39.2
Approach		76	2.0	0.068	6.5	LOS A	0.3	2.6	0.20	0.52	37.0
All Vehicles		353	2.0	0.140	6.1	LOS A	0.7	5.5	0.22	0.49	35.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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MOVEMENT SUMMARY

Site: Intersection 84 AM Full-Build Post-Development

Intersection 84 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Circulating Collector (North Section)											
6	T	23	2.0	0.168	4.0	LOS A	0.9	6.8	0.38	0.41	36.4
16	R	143	2.0	0.168	5.2	LOS A	0.9	6.8	0.38	0.49	35.6
Approach		166	2.0	0.168	5.0	LOS A	0.9	6.8	0.38	0.48	35.7
North: Walsh Drive Entrance											
7	L	58	2.0	0.094	9.0	LOS A	0.5	3.8	0.12	0.69	36.0
14	R	63	2.0	0.094	4.1	LOS A	0.5	3.8	0.12	0.37	40.7
Approach		120	2.0	0.094	6.5	LOS A	0.5	3.8	0.12	0.52	38.1
West: Circulating Collector (North Section)											
5	L	167	2.0	0.191	9.2	LOS A	1.0	7.9	0.21	0.67	34.6
2	T	64	2.0	0.191	3.2	LOS A	1.0	7.9	0.21	0.29	40.2
Approach		231	2.0	0.191	7.6	LOS A	1.0	7.9	0.21	0.56	35.9
All Vehicles		517	2.0	0.191	6.5	LOS A	1.0	7.9	0.24	0.53	36.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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MOVEMENT SUMMARY

Site: Intersection 86 AM Full-Build Post-Development

Intersection 86 - AM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Circulating Collector (East Section)											
3	L	16	2.0	0.177	10.1	LOS B	0.9	7.2	0.38	0.74	33.0
8	T	6	2.0	0.177	4.0	LOS A	0.9	7.2	0.38	0.40	36.7
18	R	153	2.0	0.177	5.1	LOS A	0.9	7.2	0.38	0.49	35.9
Approach		175	2.0	0.177	5.6	LOS A	0.9	7.2	0.38	0.51	35.6
East: Metis Trail Entrance											
1	L	55	2.0	0.092	9.0	LOS A	0.5	3.6	0.14	0.73	34.9
6	T	47	2.0	0.092	3.0	LOS A	0.5	3.6	0.14	0.27	41.3
16	R	13	2.0	0.092	4.1	LOS A	0.5	3.6	0.14	0.39	39.6
Approach		114	2.0	0.092	6.0	LOS A	0.5	3.6	0.14	0.51	37.5
North: Intersection 86 (North Leg)											
7	L	35	2.0	0.048	9.6	LOS A	0.2	1.7	0.28	0.65	28.8
4	T	6	2.0	0.048	3.5	LOS A	0.2	1.7	0.28	0.32	33.7
14	R	9	2.0	0.048	4.7	LOS A	0.2	1.7	0.28	0.41	32.3
Approach		50	2.0	0.048	8.0	LOS A	0.2	1.7	0.28	0.57	29.7
West: Circulating Collector (North Section)											
5	L	8	2.0	0.130	9.5	LOS A	0.7	5.0	0.27	0.84	33.8
2	T	120	2.0	0.130	3.5	LOS A	0.7	5.0	0.27	0.35	38.7
12	R	13	2.0	0.130	4.6	LOS A	0.7	5.0	0.27	0.46	37.4
Approach		141	2.0	0.130	3.9	LOS A	0.7	5.0	0.27	0.39	38.2
All Vehicles		480	2.0	0.177	5.4	LOS A	0.9	7.2	0.28	0.48	36.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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Country Meadows Outline Plan - Full-Build Post-Development Volumes
11: Garry Drive & Chinook Trail

PM Peak Hour
10/31/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Volume (veh/h)	42	99	201	50	62	285
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	48	112	228	57	70	324
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	732	267			290	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	732	267			290	
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	85			94	
cM capacity (veh/h)	358	756			1248	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	160	285	394
Volume Left	48	0	70
Volume Right	112	57	0
cSH	568	1700	1248
Volume to Capacity	0.28	0.17	0.06
Queue Length 95th (m)	8.8	0.0	1.4
Control Delay (s)	13.8	0.0	1.9
Lane LOS	B		A
Approach Delay (s)	13.8	0.0	1.9
Approach LOS	B		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes
13: Garry Drive & Garry Drive Entrance 2

PM Peak Hour
10/31/2011

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰↱	
Volume (veh/h)	10	102	135	213	126	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	11	116	153	242	143	7
Pedestrians		5	5		5	
Lane Width (m)		4.8	4.8		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	400				423	284
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	400				423	284
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				75	99
cM capacity (veh/h)	1136				575	746

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	127	395	150
Volume Left	11	0	143
Volume Right	0	242	7
cSH	1136	1700	581
Volume to Capacity	0.01	0.23	0.26
Queue Length 95th (m)	0.2	0.0	7.8
Control Delay (s)	0.8	0.0	13.3
Lane LOS	A		B
Approach Delay (s)	0.8	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		

43: Circulating Collector (South Section) & Garry Drive Entrance 2

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↲
Volume (veh/h)	28	43	82	48	62	81
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	32	49	93	55	70	92
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	363	130			153	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	363	130			153	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	95			95	
cM capacity (veh/h)	598	909			1420	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	81	148	162
Volume Left	32	0	70
Volume Right	49	55	0
cSH	754	1700	1420
Volume to Capacity	0.11	0.09	0.05
Queue Length 95th (m)	2.7	0.0	1.2
Control Delay (s)	10.3	0.0	3.6
Lane LOS	B		A
Approach Delay (s)	10.3	0.0	3.6
Approach LOS	B		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

51: Chinook Trial Entrance & Chinook Trail

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↲
Volume (veh/h)	62	51	196	103	85	284
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	70	58	223	117	97	323
Pedestrians	5		5			5
Lane Width (m)	4.8		4.8			4.8
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	807	291			345	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	807	291			345	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	92			92	
cM capacity (veh/h)	319	740			1191	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	128	340	419
Volume Left	70	0	97
Volume Right	58	117	0
cSH	429	1700	1191
Volume to Capacity	0.30	0.20	0.08
Queue Length 95th (m)	9.4	0.0	2.0
Control Delay (s)	16.9	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	16.9	0.0	2.5
Approach LOS	C		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes PM Peak Hour
91: Walsh Drive & Chinook Trail 10/31/2011

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	20	0	10	142	1	35	10	145	92	26	217	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	23	0	11	161	1	40	11	165	105	30	247	23
Pedestrians		5			5			5			5	
Lane Width (m)		4.8			4.8			4.8			4.8	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	607	619	268	578	578	227	274			274		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	607	619	268	578	578	227	274			274		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	98	59	100	95	99			98		
cM capacity (veh/h)	366	383	755	398	405	796	1265			1265		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	34	202	281	299
Volume Left	23	161	11	30
Volume Right	11	40	105	23
cSH	442	441	1265	1265
Volume to Capacity	0.08	0.46	0.01	0.02
Queue Length 95th (m)	1.9	17.9	0.2	0.5
Control Delay (s)	13.8	19.9	0.4	1.0
Lane LOS	B	C	A	A
Approach Delay (s)	13.8	19.9	0.4	1.0
Approach LOS	B	C		

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Country Meadows Outline Plan - Full-Build Post-Development Volumes PM Peak Hour
94: Walsh Drive & Walsh Drive Entrance 10/31/2011

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	104	13	291	135	23	189
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	118	15	331	153	26	215
Pedestrians	5			5	5	
Lane Width (m)	4.8			4.8	4.8	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			138		950	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			138		950	136
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			77		88	76
cM capacity (veh/h)			1420		219	903

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	133	484	241
Volume Left	0	331	26
Volume Right	15	0	215
cSH	1700	1420	674
Volume to Capacity	0.08	0.23	0.36
Queue Length 95th (m)	0.0	6.9	12.3
Control Delay (s)	0.0	6.3	13.3
Lane LOS		A	B
Approach Delay (s)	0.0	6.3	13.3
Approach LOS			B

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

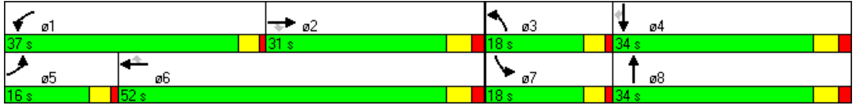
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	215	455	142	553	755	318	238	446	534	250	453	338
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.98			0.99			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3038	3202	1432	3038	3202	1432	3038	3202	1432	3038	3202	1432
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3038	3202	1404	3038	3202	1404	3038	3202	1413	3038	3202	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			112			319			337			234
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		379.0			226.3			790.4			606.3	
Travel Time (s)		22.7			13.6			47.4			36.4	
Confl. Peds. (#/hr)			5			5			5			5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	244	517	161	628	858	361	270	507	607	284	515	384
Shared Lane Traffic (%)												
Lane Group Flow (vph)	244	517	161	628	858	361	270	507	607	284	515	384
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	8.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	6.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	13.0	28.5	28.5	13.0	28.5	28.5	13.0	28.5		13.0	28.5	28.5
Total Split (s)	16.0	31.0	31.0	37.0	52.0	52.0	18.0	34.0	0.0	18.0	34.0	34.0
Total Split (%)	13.3%	25.8%	25.8%	30.8%	43.3%	43.3%	15.0%	28.3%	0.0%	15.0%	28.3%	28.3%
Maximum Green (s)	12.0	25.5	25.5	33.0	46.5	46.5	14.0	28.5		14.0	28.5	28.5
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	3.5		3.0	3.5	3.5
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5	4.0	4.0	5.5	5.5

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	17.0
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	12.8	33.2	33.2	29.1	49.5	49.5	14.0	24.3	120.0	14.4	24.7	24.7
Actuated g/C Ratio	0.11	0.28	0.28	0.24	0.41	0.41	0.12	0.20	1.00	0.12	0.21	0.21
v/c Ratio	0.75	0.58	0.34	0.85	0.65	0.47	0.76	0.78	0.43	0.78	0.78	0.81
Control Delay	67.4	42.5	15.9	55.2	32.0	6.6	65.9	54.0	1.0	46.8	50.8	39.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.4	42.5	15.9	55.2	32.0	6.6	65.9	54.0	1.0	46.8	50.8	39.0
LOS	E	D	B	E	C	A	E	D	A	D	D	D
Approach Delay		44.5			34.9			33.1			46.0	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	28.5	57.6	9.0	72.6	90.5	6.4	31.5	59.8	0.0	30.3	67.5	61.2
Queue Length 95th (m)	#47.2	77.8	27.6	88.0	107.1	25.8	#48.1	73.7	0.0	m#47.9	82.5	m74.6
Internal Link Dist (m)		355.0			202.3			766.4			582.3	
Turn Bay Length (m)	60.0		30.0	90.0		55.0	60.0		30.0	60.0		75.0
Base Capacity (vph)	329	886	469	835	1331	770	366	760	1413	373	760	512
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.58	0.34	0.75	0.64	0.47	0.74	0.67	0.43	0.76	0.68	0.75

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 38.6 Intersection LOS: D
Intersection Capacity Utilization 74.1% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: Garry Drive & Metis Trail



MOVEMENT SUMMARY

Site: Intersection 17 PM Full-Build Post-Development

Intersection 17 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Garry Drive											
6	T	1150	5.0	0.533	4.6	LOS A	4.2	33.4	0.16	0.37	49.2
16	R	361	5.0	0.533	5.8	LOS A	4.2	33.4	0.15	0.48	47.6
Approach		1511	5.0	0.533	4.9	LOS A	4.2	33.4	0.15	0.40	48.8
North: Garry Drive Entrance 1											
7	L	236	5.0	0.502	17.8	LOS B	2.6	20.6	0.75	1.01	27.5
14	R	13	5.0	0.502	12.4	LOS B	2.6	20.6	0.75	0.92	28.5
Approach		249	5.0	0.502	17.5	LOS B	2.6	20.6	0.75	1.00	27.5
West: Garry Drive											
5	L	19	5.0	0.358	12.8	LOS B	2.1	16.7	0.50	0.86	42.3
2	T	688	5.0	0.358	5.9	LOS A	2.1	16.7	0.50	0.53	45.8
Approach		707	5.0	0.358	6.1	LOS A	2.1	16.7	0.50	0.54	45.7
All Vehicles		2467	5.0	0.533	6.5	LOS A	4.2	33.4	0.31	0.50	45.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Intersection 88 PM Full-Build Post-Development

Intersection 88 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Metis Trail											
3	L	191	5.0	0.456	11.9	LOS B	3.2	25.4	0.35	0.76	42.1
8	T	922	5.0	0.456	5.0	LOS A	3.2	25.5	0.35	0.43	47.1
Approach		1113	5.0	0.456	6.2	LOS A	3.2	25.5	0.35	0.49	46.1
North: Metis Trail											
4	T	1119	5.0	0.582	6.0	LOS A	4.2	33.4	0.54	0.54	45.4
14	R	157	5.0	0.582	7.2	LOS A	4.2	33.4	0.53	0.63	44.9
Approach		1276	5.0	0.582	6.1	LOS A	4.2	33.4	0.54	0.55	45.3
West: Metis Trail Entrance											
5	L	89	5.0	0.443	16.2	LOS B	2.2	17.1	0.76	1.00	29.3
12	R	109	5.0	0.443	12.9	LOS B	2.2	17.1	0.76	0.92	39.0
Approach		198	5.0	0.443	14.4	LOS B	2.2	17.1	0.76	0.95	34.6
All Vehicles		2586	5.0	0.582	6.8	LOS A	4.2	33.4	0.47	0.55	44.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Monday, October 31, 2011 3:48:06 PM
SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\full_build\111031_update\111031_full-build_post-development_external_intersections.sip
8001103, STANTEC CONSULTING LTD., SINGLE

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 98 PM Full-Build Post-Development

Intersection 98 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Trail											
3	L	160	5.0	0.659	18.0	LOS B	5.7	44.8	0.82	1.08	37.5
8	T	478	5.0	0.659	11.0	LOS B	5.7	45.0	0.82	0.99	40.8
18	R	358	5.0	0.659	12.2	LOS B	5.7	45.0	0.82	1.01	40.5
Approach		997	5.0	0.659	12.6	LOS B	5.7	45.0	0.82	1.01	40.1
East: Walsh Drive											
1	L	457	5.0	0.658	18.0	LOS B	5.3	41.7	0.84	1.05	36.4
6	T	277	5.0	0.643	11.2	LOS B	4.9	39.2	0.83	0.99	41.0
16	R	151	5.0	0.643	12.4	LOS B	4.9	39.2	0.83	1.02	40.6
Approach		885	5.0	0.658	14.9	LOS B	5.3	41.7	0.84	1.03	38.3
North: Metis Trail											
7	L	339	5.0	0.730	20.3	LOS C	6.3	49.7	0.90	1.13	35.0
4	T	722	5.0	0.730	12.1	LOS B	6.9	54.4	0.91	1.09	40.1
14	R	70	5.0	0.067	6.9	LOS A	0.3	2.7	0.51	0.58	44.9
Approach		1131	5.0	0.730	14.2	LOS B	6.9	54.4	0.88	1.07	38.5
West: Walsh Drive											
5	L	48	5.0	0.495	25.9	LOS C	2.9	22.8	0.89	1.07	31.8
2	T	188	5.0	0.495	18.2	LOS B	3.1	24.5	0.90	1.02	34.1
12	R	98	5.0	0.495	18.4	LOS B	3.1	24.5	0.90	1.04	34.7
Approach		333	5.0	0.495	19.4	LOS B	3.1	24.5	0.90	1.03	33.9
All Vehicles		3345	5.0	0.730	14.4	LOS B	6.9	54.4	0.85	1.04	38.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Monday, October 31, 2011 3:48:09 PM
SIDRA INTERSECTION 5.1.5.2006
Project: V:\1136\Active\112945195\02_planning\01_analysis\sidra\full_build\111031_update\111031_full-build_post-development_external_intersections.sip
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MOVEMENT SUMMARY

Site: Intersection 23 PM Full-Build Post-Development

Intersection 23 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Garry Drive Entrance 2											
3	L	33	2.0	0.205	9.2	LOS A	1.1	8.7	0.20	0.81	34.8
8	T	166	2.0	0.205	3.2	LOS A	1.1	8.7	0.20	0.31	40.5
18	R	55	2.0	0.205	4.3	LOS A	1.1	8.7	0.20	0.43	39.0
Approach		253	2.0	0.205	4.2	LOS A	1.1	8.7	0.20	0.40	39.2
East: Intersection 23 (East Leg)											
1	L	31	2.0	0.060	10.2	LOS B	0.3	2.2	0.39	0.69	28.5
6	T	6	2.0	0.060	4.2	LOS A	0.3	2.2	0.39	0.39	32.1
16	R	20	2.0	0.060	5.3	LOS A	0.3	2.2	0.39	0.47	31.1
Approach		57	2.0	0.060	7.8	LOS A	0.3	2.2	0.39	0.58	29.6
North: Garry Drive Entrance 2											
7	L	33	2.0	0.135	9.3	LOS A	0.7	5.4	0.23	0.79	34.0
4	T	99	2.0	0.135	3.3	LOS A	0.7	5.4	0.23	0.32	39.4
14	R	23	2.0	0.135	4.4	LOS A	0.7	5.4	0.23	0.43	38.0
Approach		155	2.0	0.135	4.7	LOS A	0.7	5.4	0.23	0.44	37.7
West: Intersection 23 (West Leg)											
5	L	14	2.0	0.041	9.9	LOS A	0.2	1.5	0.34	0.70	29.0
2	T	6	2.0	0.041	3.8	LOS A	0.2	1.5	0.34	0.36	33.2
12	R	22	2.0	0.041	5.0	LOS A	0.2	1.5	0.34	0.44	32.0
Approach		41	2.0	0.041	6.4	LOS A	0.2	1.5	0.34	0.52	30.9
All Vehicles		506	2.0	0.205	4.9	LOS A	1.1	8.7	0.24	0.44	37.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Intersection 46 PM Full-Build Post-Development

Intersection 46 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Intersection 46 (East Leg)											
6	T	51	2.0	0.089	2.9	LOS A	0.4	3.5	0.05	0.28	41.8
16	R	77	2.0	0.089	4.0	LOS A	0.4	3.5	0.05	0.42	39.6
Approach		128	2.0	0.089	3.5	LOS A	0.4	3.5	0.05	0.36	40.4
North: Circulating Collector (East Section)											
7	L	68	2.0	0.069	9.2	LOS A	0.3	2.5	0.18	0.62	34.0
14	R	10	2.0	0.069	4.3	LOS A	0.3	2.5	0.18	0.37	38.6
Approach		78	2.0	0.069	8.6	LOS A	0.3	2.5	0.18	0.59	34.4
West: Circulating Collector (South Section)											
5	L	6	2.0	0.042	9.3	LOS A	0.2	1.5	0.21	0.83	36.6
2	T	40	2.0	0.042	3.2	LOS A	0.2	1.5	0.21	0.32	41.8
Approach		45	2.0	0.042	4.0	LOS A	0.2	1.5	0.21	0.38	40.9
All Vehicles		252	2.0	0.089	5.2	LOS A	0.4	3.5	0.12	0.44	38.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Intersection 47 PM Full-Build Post-Development

Intersection 47 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Garry Drive Entrance 1											
3	L	247	2.0	0.274	9.0	LOS A	1.7	13.1	0.14	0.65	34.4
18	R	132	2.0	0.274	4.1	LOS A	1.7	13.1	0.14	0.37	39.2
Approach		378	2.0	0.274	7.3	LOS A	1.7	13.1	0.14	0.55	35.8
East: Intersection 47 (East Leg)											
1	L	84	2.0	0.106	10.5	LOS B	0.5	4.0	0.43	0.68	28.0
6	T	14	2.0	0.106	4.5	LOS A	0.5	4.0	0.43	0.43	31.2
Approach		98	2.0	0.106	9.7	LOS A	0.5	4.0	0.43	0.65	28.3
West: Intersection 47 (West Leg)											
2	T	25	2.0	0.170	3.4	LOS A	0.9	7.3	0.28	0.33	38.4
12	R	166	2.0	0.170	4.5	LOS A	0.9	7.3	0.28	0.43	37.2
Approach		191	2.0	0.170	4.4	LOS A	0.9	7.3	0.28	0.42	37.4
All Vehicles		667	2.0	0.274	6.8	LOS A	1.7	13.1	0.22	0.53	35.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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MOVEMENT SUMMARY

Site: Intersection 53 PM Full-Build Post-Development

Intersection 53 - PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Circulating Collector (West Section)											
3	L	72	2.0	0.133	9.6	LOS A	0.7	5.2	0.29	0.72	33.1
8	T	70	2.0	0.133	3.5	LOS A	0.7	5.2	0.29	0.34	37.9
Approach		142	2.0	0.133	6.6	LOS A	0.7	5.2	0.29	0.53	35.1
North: Circulating Collector (West Section)											
4	T	48	2.0	0.097	3.3	LOS A	0.5	3.8	0.23	0.32	37.1
14	R	60	2.0	0.097	4.4	LOS A	0.5	3.8	0.23	0.43	35.6
Approach		108	2.0	0.097	3.9	LOS A	0.5	3.8	0.23	0.38	36.2
West: Chinook Trail Entrance											
5	L	103	2.0	0.177	9.2	LOS A	1.0	7.5	0.19	0.67	34.9
12	R	115	2.0	0.177	4.3	LOS A	1.0	7.5	0.19	0.38	39.3
Approach		218	2.0	0.177	6.6	LOS A	1.0	7.5	0.19	0.52	36.9
All Vehicles		468	2.0	0.177	6.0	LOS A	1.0	7.5	0.23	0.49	36.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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Country Meadows Outline Plan
Surface Traffic Noise Analysis Revised

Southgate Commercial Lands Corporation

Prepared by:

Stantec Consulting Ltd.

December 2011

1129 45195.240

Table of Contents

List of Tables

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1.0 INTRODUCTION

1.1 GENERAL

This report was prepared on behalf of Southgate Commercial Lands Corp., in accordance with the City of Lethbridge Transportation Planning Division requirements. It serves as a supplement to the Country Meadows Outline Plan prepared by Stantec Consulting Ltd.

The objective of this noise study is to provide noise attenuation design requirements at the 10-year and, if required, 20-year horizon for the surface traffic resulting from proposed Community Entrance Road connecting Metis Trail on the east side of Country Meadows.

The noise attenuation requirements along proposed Community Entrance Road connecting Metis Trail (a designated non-truck route) will be met by:

- Analyzing the 24-hour L_{EQ} values from a 10-year horizon, indicating whether noise attenuation is required.
- If noise attenuation is required in the 10-year horizon, analyze the 24-hour L_{EQ} values from a 20-year horizon to determine the required barrier height and location.

We have enclosed a noise analysis checklist and have included all applicable items with this report, as indicated on the checklist.

This report includes the following information:

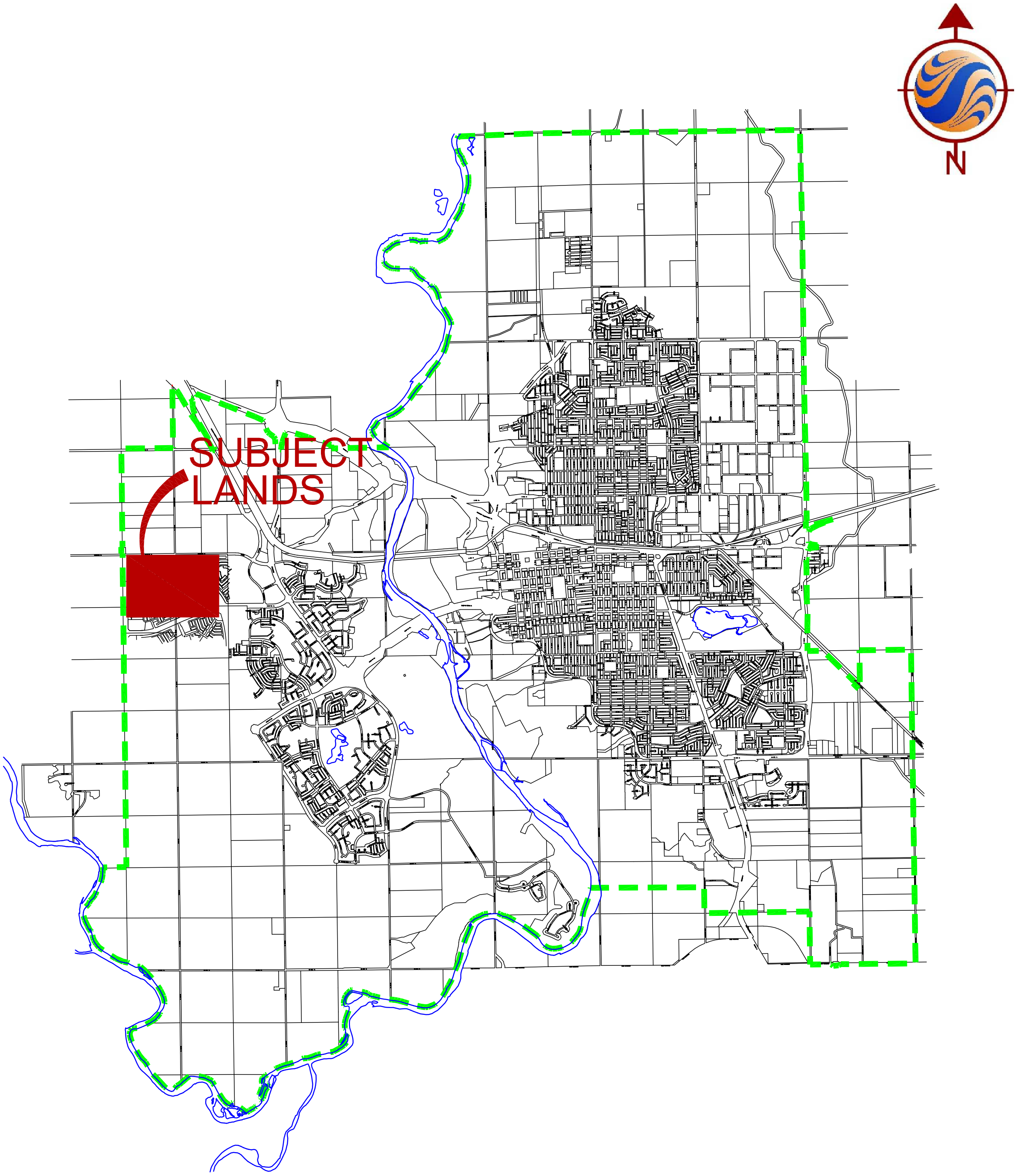
- Site plan of the Country Meadows Study Area
- Cross sections at receiver locations within private lots
- Assumed Country Meadows Building Grade Plan
- 10-year traffic volume forecast
- Printouts of the TNM 2.5 input and output tables

2.0 SITE DESCRIPTION

2.1 SITE DESCRIPTION

Country Meadows is located within southwest Lethbridge in the NW ¼ 34-8-22-W4, SW ¼ 34-8-22-W4, NE ¼ 33-8-22-W4 and SE ¼ 33-8-22-W4. The site location and study area analyzed in this report is shown in Figure 2.1 and Figure 2.2.

The analyzed proposed Community Entrance Road connecting Metis Trail is designated as a non-truck route. The design speed for this road is 50 km/h.



NTS

Legend

🟩 City of Lethbridge Boundary

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
2.1

Title

Surface Traffic Noise Analysis Revised Location Plan

Date: December 2011
Project Number: 112945195.240

Stantec

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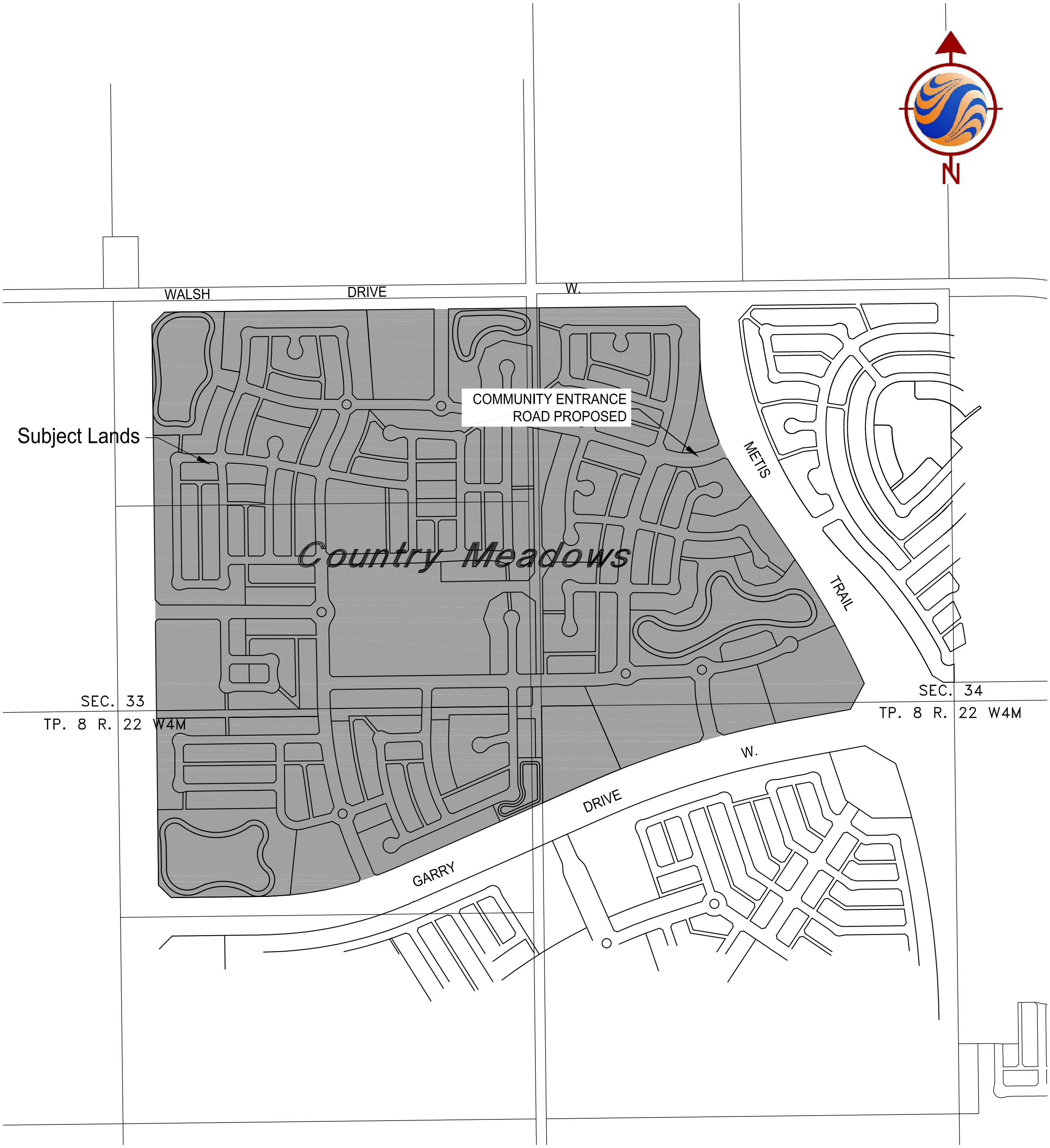

NTS

Legal Address

NW1/4 34-8-22-W4
SW1/4 34-8-22-W4
NE1/4 33-8-22-W4
SE1/4 33-8-22-W4

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
2.2

Title
Surface Traffic Noise Analysis Revised Study Area

Date: December 2011
Project Number: 112945195.240

Stantec

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3.0 METHODOLOGY AND INPUT DATA

3.1 GENERAL

The Country Meadows surface traffic noise analysis is based on the TNM 2.5 computer model. This analysis estimates the acoustic intensity at receiver locations based on traffic noise emission levels from a series of straight-line roadway segments (the source).

The source is characterized by the roadway noise emission levels and vehicle densities based on different vehicle types, as well as by the roadway speed and grade.

The source-to-receiver path is also considered by including the effects of intervening barriers, topography, trees, and atmospheric absorption.

TNM also accounts for the acoustical effects of traffic control devices including stop signs, traffic signals, and on-ramps. TNM reduces vehicle speeds at the traffic control device and then accelerates the vehicle back to its cruising speed. As vehicles accelerate, their noise emissions increase as compared to cruising vehicles at the same speed.

The TNM model calculates the need for, and effectiveness of, noise barriers based on the acoustic output.

3.2 TRAFFIC VOLUME INFORMATION

Ten-year traffic volume forecast is calculated according to Figure 3.20 Ten-Year Post-Development Traffic Volumes PM Peak Hour from Country Meadows Outline Plan Appendix B - Transportation Impact Assessment by Stantec Consulting Ltd. Table 3.1, shown below, summarizes the ten-year traffic volume assumptions adjacent to proposed Community Entrance Road connecting Metis Trail on the east side of the community. The detailed calculations for Ten-Year PM Peak & ADT Traffic Volume are included in Appendix A.

TABLE 3.1
REVISED TEN YEAR TRAFFIC VOLUME FORECASTS

ADT Volume 10 Year Forecast Assumption			
Horizon		**2021**	
Time	**Location**	**Westbound**	**Eastbound**
ADT	Community Entrance Road Connecting Metis Trail	2850	1620
	Total	4470	
	Truck Percentage Assumed	2%	2%
	M:H Truck Ratio Assumed	3:1	3:1

3.3 HOURLY TRAFFIC CONVERSIONS

The hourly traffic volume conversions for Peak, Off-Peak, and Night hour shown in Table 3.2 were calculated using the data provided in Tables 3.1 for proposed Community Entrance Road connecting Metis Trail. A more detailed table can be found in Appendix A.

TABLE 3.2
REVISED TEN-YEAR HOURLY TRAFFIC CONVERSIONS

10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Westbound No. Vehicles Per Direction			
Vehicle	**Peak Hour**	**Off - Peak Hour**	**Night Hour**
Cars	279	104	59
Medium Trucks	4	2	1
Heavy Trucks	1	1	0
10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Eastbound No. Vehicles Per Direction			
Vehicle	**Peak Hour**	**Off - Peak Hour**	**Night Hour**
Cars	159	59	33
Medium Trucks	2	1	1
Heavy Trucks	1	0	0

4.0 ANALYSIS

4.1 TEN-YEAR NOISE ANALYSIS SUMMARY

To ensure the roadway analyzed was sufficiently represented in the TNM noise model, the roadway points modeled were located every 20 metres along the center of both westbound and eastbound lanes along entire Community Entrance Road connecting Metis Trail. The noise assessment for proposed Community Entrance Road connecting Metis Trail was based on the design speed limit of 50 km/h.

Two scenarios were analyzed in this report. In Scenario 1, level lots layout was assumed. In Scenario 2, walkout lots were assumed to substitute some level lots in Scenario 1.

For each scenario, four receiver locations were evaluated at the locations shown on Figure 4.1 (Scenario 1) & Figure 5.1 (Scenario 2), the Surface Traffic Noise Analysis Site Plan. The receiver elevations were derived based on the receiver cross sections shown on Figure 4.2A and 4.2B (Scenario 1) & Figure 5.2A and 5.2B (Scenario 2). Figure 4.1, 4.2A & 4.2B were included in Appendix D. Figure 5.1, 5.2A & 5.2B were included in Appendix E.

In each scenario, two terrain lines were defined along the north and south property line running parallel to proposed Community Entrance Road connecting Metis Trail. If noise attenuation is required, the sound attenuation measures would be placed along these alignments.

The projected L_{EQ} for 10-year noise levels during Peak, Off-Peak, and Night hour for each scenario is summarized in Table 4.1 (Scenario 1) & Table 4.2 (Scenario 2) at each receiver without sound attenuation.

TABLE 4.1
REVISED TEN-YEAR NOISE ANALYSIS SUMMARY

Revised 10-Year Noise Analysis Summary for Scenario 1 Leq with No Barrier dB(A)				
Receiver	**Peak Hour**	**Off - Peak Hour**	**Night Hour**	**Leq (24-hour)**
1	57.1	52.9	50.3	53.3
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.7	52.8	49.8	53.0

Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 1

TABLE 4.2
REVISED TEN-YEAR NOISE ANALYSIS SUMMARY

Revised 10-Year Noise Analysis Summary for Scenario 2 Leq with No Barrier dB(A)				
Receiver	**Peak Hour**	**Off - Peak Hour**	**Night Hour**	**Leq (24-hour)**
1	56.8	52.5	50.0	53.0
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.6	52.7	49.7	52.9

Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 2

As shown in the above tables, for both scenarios, the 24-hour L_{EQ} for 10-year noise levels at all receivers is below the allowable 60 dB(A) for non-truck routes in the City of Lethbridge. Therefore, for both scenarios, sound attenuation measures are not required for this development and an analysis of the 20 year horizon data will not be required.

4.2 RESULTS AND RECOMMENDATIONS

For both scenarios, the four receiver locations evaluated are expected to have noise levels below the City of Lethbridge's L_{EQ} (24) noise limit of 60 dB(A) for roadways classified as non-truck routes in the 10-year horizon. Therefore, no sound attenuation measures are required for Country Meadows.

The results of the noise study for each scenario have also been summarized in Figure 4.3 (Scenario 1) & Figure 5.3 (Scenario 2) – Surface Traffic Noise Analysis Summary, which can be found in Appendix D (Figure 4.3) & Appendix E (Figure 5.3).

5.0 CORPORATE AUTHORIZATION

Stantec Consulting Ltd. prepared this document entitled “Country Meadows Surface Traffic Noise Analysis” on behalf of its client Southgate Commercial Lands Corp. The material in it reflects Stantec Consulting Ltd.’s best judgment in light of the information available to them at the time of preparation. Any uses, which a third party makes of this report, or reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

PERMIT TO PRACTICE
STANTEC CONSULTING LTD
Signature
Date DEC 19 2011
PERMIT NUMBER: P 258
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

CORPORATE AUTHORIZATION

FRANCISCO E. LOURIDO

Dec 19, 2011

RESPONSIBLE ENGINEER

APPENDIX A

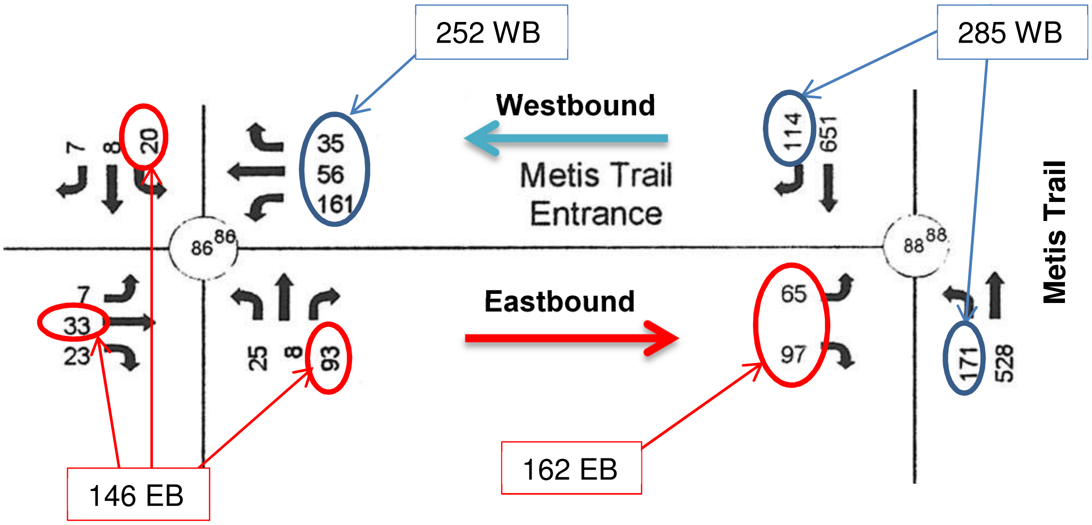
Traffic Volume Data

- Ten-Year Traffic Volume Calculations
- Vehicle Hourly Conversion
- Surface Analysis Point Coordinate Listing

Metis Trail/Country Meadows Entrance Road

Ten-Year Post-Development Traffic Volume Calculations

PM Peak Hour



Ten-Year Post-Development Traffic Volumes

PM Peak Hour

To calculate the Ten-Year PM Peak Hour Westbound and Eastbound Traffic Volume for Metis Trail Entrance Road, the higher volume on each direction is adopted.

Metis Trail/Country Meadows Entrance Road Ten-Year PM Peak Hour Traffic Volumes	
Westbound	285
Eastbound	162

Metis Trail/Country Meadows Entrance Road

Ten-Year Post-Development Traffic Volume Calculations

ADT Traffic Volume

	Westbound	Eastbound
PM Peak Hour	285	162
ADT	285 X 10=2850	162 X10=1620
ADT Total	(2850+1620)=4470	

Note: ADT Traffic Volume=10 X Ten-Year PM Peak Hour Volume

ADT Volume 10 Year Forecast Assumption			
Horizon		**2021**	
Time	**Location**	**Westbound**	**Eastbound**
ADT	Community Entrance Road Connecting Metis Trail	2850	1620
	Total	4470	
	Truck Percentage Assumed	2%	2%
	M:H Truck Ratio Assumed	3:1	3:1

10 Year Traffic Volume Conversions

Community Entrance Road Connecting Metis Trail Westbound - 10 Year Volumes

	INPUT
VPD =	2850
% TRUCKS=	2.0

USE THIS TABLE WHEN CALCULATING 3 TO 1 TRUCK RATIO

total hours	4 hrs	11 hrs	9 hrs
	PEAK	OFF-PEAK	NIGHT
TOT. VEH.	285	106	60
TOTAL TRUCKS	6	2	1
CARS	279	104	59
MED. TRUCKS	4	2	1
HEAVY TRUCKS	1	1	0

Community Entrance Road Connecting Metis Trail Eastbound - 10 Year Volumes

	INPUT
VPD =	1620
% TRUCKS=	2.0

USE THIS TABLE WHEN CALCULATING 3 TO 1 TRUCK RATIO

total hours	4 hrs	11 hrs	9 hrs
	PEAK	OFF-PEAK	NIGHT
TOT. VEH.	162	60	34
TOTAL TRUCKS	3	1	1
CARS	159	59	33
MED. TRUCKS	2	1	1
HEAVY TRUCKS	1	0	0

Notes:

1. VPD (Vehicles Per Day) = ADT (Westbound/Eastbound)
2. PEAK = VPD x10%
3. OFF-PEAK = 0.0373 x VPD
4. NIGHT = 0.0211 x VPD

Country Meadows Outline Plan Surface Traffic Noise Analysis Revised

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Date Created:	07-December-2011
User:	Lixin Xie

Points for Scenario 1

Point No.	Easting	Northing	Elevation	Description
1	78666.967	5506977.770	932.980	Receiver 1
2	78629.083	5506967.217	933.220	Receiver 2
3	78582.181	5506965.706	933.000	Receiver 3
4	78597.199	5507006.444	932.490	Receiver 4
100	78687.547	5507013.767	933.027	CER-Metis Tr-WB
101	78669.548	5507005.046	932.846	CER-Metis Tr-WB
102	78651.303	5506996.882	932.894	CER-Metis Tr-WB
103	78632.033	5506991.614	932.943	CER-Metis Tr-WB
104	78612.156	5506989.617	932.884	CER-Metis Tr-WB
105	78592.224	5506990.947	932.771	CER-Metis Tr-WB
106	78575.831	5506994.615	932.675	CER-Metis Tr-WB
200	78572.827	5506984.554	932.675	CER-Metis Tr-EB
201	78590.655	5506980.565	932.771	CER-Metis Tr-EB
202	78612.332	5506979.119	932.884	CER-Metis Tr-EB
203	78633.949	5506981.290	932.943	CER-Metis Tr-EB
204	78654.906	5506987.019	932.894	CER-Metis Tr-EB
205	78674.127	5506995.597	932.846	CER-Metis Tr-EB
206	78692.220	5507004.364	933.027	CER-Metis Tr-EB
1000	78668.302	5507014.390	932.400	R01-PL N
1001	78665.645	5507013.103	932.413	R01-PL N
1002	78648.240	5507005.266	932.494	R01-PL N
1003	78630.413	5507000.343	932.573	R01-PL N
1004	78612.009	5506998.442	932.746	R01-PL N
1005	78599.167	5506998.934	932.900	R01-PL N
1006	78593.535	5506999.622	932.877	R01-PL N
1007	78578.328	5507002.977	932.812	R01-PL N
1008	78568.870	5507005.801	932.898	R01-PL N
1009	78562.434	5507018.896	933.200	R01-PL N
2000	78551.332	5506970.653	932.940	R01-PL S
2001	78565.579	5506977.562	932.831	R01-PL S
2002	78589.484	5506971.916	932.850	R01-PL S

Points for Scenario 1

Point No.	Easting	Northing	Elevation	Description
2003	78603.230	5506970.578	932.979	R01-PL S
2004	78617.393	5506970.627	933.000	R01-PL S
2005	78627.837	5506971.591	933.100	R01-PL S
2006	78638.064	5506973.315	933.000	R01-PL S
2007	78655.416	5506978.098	932.920	R01-PL S
2008	78667.520	5506982.940	932.870	R01-PL S
2009	78679.735	5506988.817	932.800	R01-PL S

Country Meadows Outline Plan Surface Traffic Noise Analysis Revised

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Date Created: 07-December-2011

User: Lixin Xie

Points for Scenario 2

Point No.	Northing	Elevation	Easting	Description
1	78666.829	5506976.473	935.950	Receiver 1
2	78629.083	5506967.217	933.210	Receiver 2
3	78582.181	5506965.706	933.000	Receiver 3
4	78597.199	5507006.444	932.250	Receiver 4
100	78687.547	5507013.767	933.027	CER-Metis Tr-WB
101	78669.548	5507005.046	932.846	CER-Metis Tr-WB
102	78651.303	5506996.882	932.894	CER-Metis Tr-WB
103	78632.033	5506991.614	932.943	CER-Metis Tr-WB
104	78612.156	5506989.617	932.884	CER-Metis Tr-WB
105	78592.224	5506990.947	932.771	CER-Metis Tr-WB
106	78575.831	5506994.615	932.675	CER-Metis Tr-WB
200	78572.827	5506984.554	932.675	CER-Metis Tr-EB
201	78590.655	5506980.565	932.771	CER-Metis Tr-EB
202	78612.332	5506979.119	932.884	CER-Metis Tr-EB
203	78633.949	5506981.290	932.943	CER-Metis Tr-EB
204	78654.906	5506987.019	932.894	CER-Metis Tr-EB
205	78674.127	5506995.597	932.846	CER-Metis Tr-EB
206	78692.220	5507004.364	933.027	CER-Metis Tr-EB
1000	78668.302	5507014.390	932.400	R01-PL N
1001	78665.645	5507013.103	932.413	R01-PL N
1002	78648.240	5507005.266	932.494	R01-PL N
1003	78630.413	5507000.343	932.573	R01-PL N
1004	78612.009	5506998.442	932.746	R01-PL N
1005	78599.167	5506998.934	932.900	R01-PL N
1006	78593.535	5506999.622	932.877	R01-PL N
1007	78578.328	5507002.977	932.812	R01-PL N
1008	78568.870	5507005.801	932.898	R01-PL N
1009	78562.434	5507018.896	933.200	R01-PL N
2000	78551.332	5506970.653	932.940	R01-PL S
2001	78565.579	5506977.562	932.831	R01-PL S
2002	78589.484	5506971.916	932.850	R01-PL S
2003	78603.230	5506970.578	932.979	R01-PL S
2004	78617.393	5506970.627	933.000	R01-PL S

Points for Scenario 2

Point No.	Northing	Elevation	Easting	Description
2005	78627.837	5506971.591	933.100	R01-PL S
2006	78638.064	5506973.315	933.000	R01-PL S
2007	78655.416	5506978.098	932.920	R01-PL S
2008	78667.520	5506982.940	932.870	R01-PL S
2009	78679.735	5506988.817	932.800	R01-PL S

APPENDIX B

TNM 2.5 Model Data

For Scenario 1

- Revised10 – Year Analysis (No Barrier)
- L_{EQ} and L_{EQ} (24) Calculation Tables

Revised 10-Year Noise Analysis Summary for Scenario 1
Leq with No Barrier dB(A)

Receiver	Peak Hour	Off - Peak Hour	Night Hour	Leq (24-hour)
1	57.1	52.9	50.3	53.3
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.7	52.8	49.8	53.0

Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 1

Stantec Consulting Ltd		7 December 2011
Lixin Xie		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows	
RUN:	10 Year Peak No Barrier-Scenario 1	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	20 deg C, 50% RH	

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
Receiver2	2	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
Receiver3	3	1	0.0	54.7	66	54.7	10	----	54.7	0.0	8	-8.0
Receiver4	4	1	0.0	56.7	66	56.7	10	----	56.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd					16 December 2011						
Lixin Xie					TNM 2.5						
INPUT: ROADWAYS							Average pavement type shall be used unless				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows						a State highway agency substantiates the use				
RUN:	10 Year Peak No Barrier-Scenario 1						of a different type with the approval of FHWA				
Roadway		Points									
Name	Width	Name	No.	Coordinates (pavement)			Flow Control			Segment	
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

Stantec Consulting Ltd				**7 December 2011**								
Lixin Xie				**TNM 2.5**								
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**											
RUN:	**10 Year Peak No Barrier-Scenario 1**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	279	50	4	50	1	50	0	0	0	0
	101	2	279	50	4	50	1	50	0	0	0	0
	102	3	279	50	4	50	1	50	0	0	0	0
	103	4	279	50	4	50	1	50	0	0	0	0
	104	5	279	50	4	50	1	50	0	0	0	0
	105	6	279	50	4	50	1	50	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	159	50	2	50	1	50	0	0	0	0
	201	9	159	50	2	50	1	50	0	0	0	0
	202	10	159	50	2	50	1	50	0	0	0	0
	203	11	159	50	2	50	1	50	0	0	0	0
	204	12	159	50	2	50	1	50	0	0	0	0
	205	13	159	50	2	50	1	50	0	0	0	0
	206	14										

INPUT: TERRAIN LINES

Stantec Consulting Ltd			16 December 2011	
Lixin Xie			TNM 2.5	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows			
RUN:	10 Year Peak No Barrier-Scenario 1			
Terrain Line	Points			
Name	No.	Coordinates (ground)		
		X	Y	Z
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd						16 December 2011					
Lixin Xie						TNM 2.5					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows										
RUN:	10 Year Peak No Barrier-Scenario 1										
Receiver											
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria				Active
			X	Y	Z	above	Existing	Impact Criteria		NR	in
						Ground	LAeq1h	LAeq1h	Sub'l	Goal	Calc.
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,667.0	5,506,978.5	932.98	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.22	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.49	1.50	0.00	66	10.0	8.0	Y

RESULTS: SOUND LEVELS City of Lethbridge-Country Meadows

Stantec Consulting Ltd			7 December 2011	
Lixin Xie			TNM 2.5	
			Calculated with TNM 2.5	
RESULTS: SOUND LEVELS				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows			
RUN:	10 Year Off-Peak No Barrier-Scenario 1			
BARRIER DESIGN:	INPUT HEIGHTS			Average pavement type shall be used unless
				a State highway agency substantiates the use
ATMOSPHERICS:	20 deg C, 50% RH			of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	52.9	66	52.9	10	----	52.9	0.0	8	-8.0
Receiver2	2	1	0.0	52.9	66	52.9	10	----	52.9	0.0	8	-8.0
Receiver3	3	1	0.0	50.5	66	50.5	10	----	50.5	0.0	8	-8.0
Receiver4	4	1	0.0	52.8	66	52.8	10	----	52.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd					16 December 2011						
Lixin Xie					TNM 2.5						
INPUT: ROADWAYS							Average pavement type shall be used unless				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows						a State highway agency substantiates the use				
RUN:	10 Year Off-Peak No Barrier-Scenario 1						of a different type with the approval of FHWA				
Roadway		Points									
Name	Width	Name	No.	Coordinates (pavement)			Flow Control			Segment	
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

INPUT: TRAFFIC FOR LAeq1h Volumes | City of Lethbridge-Country Meadows

Stantec Consulting Ltd				**7 December 2011**								
Lixin Xie				**TNM 2.5**								
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**											
RUN:	**10 Year Off-Peak No Barrier-Scenario 1**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	104	50	2	50	1	50	0	0	0	0
	101	2	104	50	2	50	1	50	0	0	0	0
	102	3	104	50	2	50	1	50	0	0	0	0
	103	4	104	50	2	50	1	50	0	0	0	0
	104	5	104	50	2	50	1	50	0	0	0	0
	105	6	104	50	2	50	1	50	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	59	50	1	50	0	0	0	0	0	0
	201	9	59	50	1	50	0	0	0	0	0	0
	202	10	59	50	1	50	0	0	0	0	0	0
	203	11	59	50	1	50	0	0	0	0	0	0
	204	12	59	50	1	50	0	0	0	0	0	0
	205	13	59	50	1	50	0	0	0	0	0	0
	206	14										

Stantec Consulting Ltd			16 December 2011	
Lixin Xie			TNM 2.5	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows			
RUN:	10 Year Off-Peak No Barrier-Scenario 1			
Terrain Line	Points			
Name	No.	Coordinates (ground)		
		X	Y	Z
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd **16 December 2011**

Lixin Xie **TNM 2.5**

INPUT: RECEIVERS

PROJECT/CONTRACT: **City of Lethbridge-Country Meadows**

RUN: **10 Year Off-Peak No Barrier-Scenario 1**

Receiver											
Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**	**above**	**Existing**	**Impact Criteria**		**NR**	**in**
						Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,667.0	5,506,978.5	932.98	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.22	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.49	1.50	0.00	66	10.0	8.0	Y

Stantec Consulting Ltd							**7 December 2011**				
Lixin Xie							**TNM 2.5**				
							Calculated with TNM 2.5				
RESULTS: SOUND LEVELS											
PROJECT/CONTRACT:		**City of Lethbridge-Country Meadows**									
RUN:		**10 Year Night No Barrier-Scenario 1**									
BARRIER DESIGN:		**INPUT HEIGHTS**						**Average pavement type shall be used unless**			
								a State highway agency substantiates the use			
ATMOSPHERICS:		**20 deg C, 50% RH**						**of a different type with approval of FHWA.**			

Receiver												
Name	**No.**	**#DUs**	**Existing**	**No Barrier**					**With Barrier**			
			LAeq1h	**LAeq1h**		**Increase over existing**		**Type**	**Calculated**	**Noise Reduction**		
				Calculated	**Crit'n**	**Calculated**	**Crit'n**	**Impact**	**LAeq1h**	**Calculated**	**Goal**	**Calculated**
							Sub'l Inc					**minus**
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	50.3	66	50.3	10	----	50.3	0.0	8	-8.0
Receiver2	2	1	0.0	50.2	66	50.2	10	----	50.2	0.0	8	-8.0
Receiver3	3	1	0.0	47.9	66	47.9	10	----	47.9	0.0	8	-8.0
Receiver4	4	1	0.0	49.8	66	49.8	10	----	49.8	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd
Lixin Xie

16 December 2011
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: City of Lethbridge-Country Meadows
RUN: 10 Year Night No Barrier-Scenario 1

Average pavement type shall be used unless
a State highway agency substantiates the use
of a different type with the approval of FHWA

Roadway		Points									
Name	Width	Name	No.	Coordinates (pavement)			Flow Control			Segment	
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

Stantec Consulting Ltd				7 December 2011								
Lixin Xie				TNM 2.5								
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows											
RUN:	10 Year Night No Barrier-Scenario 1											
Roadway	Points											
Name	Name	No.	Segment									
			Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	59	50	1	50	0	0	0	0	0	0
	101	2	59	50	1	50	0	0	0	0	0	0
	102	3	59	50	1	50	0	0	0	0	0	0
	103	4	59	50	1	50	0	0	0	0	0	0
	104	5	59	50	1	50	0	0	0	0	0	0
	105	6	59	50	1	50	0	0	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	33	50	1	50	0	0	0	0	0	0
	201	9	33	50	1	50	0	0	0	0	0	0
	202	10	33	50	1	50	0	0	0	0	0	0
	203	11	33	50	1	50	0	0	0	0	0	0
	204	12	33	50	1	50	0	0	0	0	0	0
	205	13	33	50	1	50	0	0	0	0	0	0
	206	14										

Stantec Consulting Ltd			**16 December 2011**	
Lixin Xie			**TNM 2.5**	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**			
RUN:	**10 Year Night No Barrier-Scenario 1**			
Terrain Line	**Points**			
Name	**No.**	**Coordinates (ground)**		
		X	**Y**	**Z**
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd						**16 December 2011**					
Lixin Xie						**TNM 2.5**					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**										
RUN:	**10 Year Night No Barrier-Scenario 1**										
Receiver											
Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**	**above**	**Existing**	**Impact Criteria**		**NR**	**in**
						Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,667.0	5,506,978.5	932.98	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.22	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.49	1.50	0.00	66	10.0	8.0	Y

APPENDIX C

TNM 2.5 Model Data

For Scenario 2

- Revised 10 – Year Analysis (No Barrier)
- L_{EQ} and L_{EQ} (24) Calculation Tables

Revised 10-Year Noise Analysis Summary for Scenario 2
Leq with No Barrier dB(A)

Receiver	Peak Hour	Off - Peak Hour	Night Hour	Leq (24-hour)
1	56.8	52.5	50.0	53.0
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.6	52.7	49.7	52.9

Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 2

Stantec Consulting Ltd		7 December 2011	
Lixin Xie		TNM 2.5	
		Calculated with TNM 2.5	
RESULTS: SOUND LEVELS			
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows		
RUN:	10 Year Peak No Barrier-Scenario 2		
BARRIER DESIGN:	INPUT HEIGHTS		Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	20 deg C, 50% RH		

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	56.8	66	56.8	10	----	56.8	0.0	8	-8.0
Receiver2	2	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
Receiver3	3	1	0.0	54.7	66	54.7	10	----	54.7	0.0	8	-8.0
Receiver4	4	1	0.0	56.6	66	56.6	10	----	56.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd					16 December 2011						
Lixin Xie					TNM 2.5						
INPUT: ROADWAYS							Average pavement type shall be used unless				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows						a State highway agency substantiates the use				
RUN:	10 Year Peak No Barrier-Scenario 2						of a different type with the approval of FHWA				
Roadway		Points									
Name	Width	Name	No.	Coordinates (pavement)			Flow Control			Segment	
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

INPUT: TRAFFIC FOR LAeq1h Volumes — City of Lethbridge-Country Meadows

Stantec Consulting Ltd			**7 December 2011**									
Lixin Xie			**TNM 2.5**									
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**											
RUN:	**10 Year Peak No Barrier-Scenario 2**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	279	50	4	50	1	50	0	0	0	0
	101	2	279	50	4	50	1	50	0	0	0	0
	102	3	279	50	4	50	1	50	0	0	0	0
	103	4	279	50	4	50	1	50	0	0	0	0
	104	5	279	50	4	50	1	50	0	0	0	0
	105	6	279	50	4	50	1	50	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	159	50	2	50	1	50	0	0	0	0
	201	9	159	50	2	50	1	50	0	0	0	0
	202	10	159	50	2	50	1	50	0	0	0	0
	203	11	159	50	2	50	1	50	0	0	0	0
	204	12	159	50	2	50	1	50	0	0	0	0
	205	13	159	50	2	50	1	50	0	0	0	0
	206	14										

Stantec Consulting Ltd			**16 December 2011**	
Lixin Xie			**TNM 2.5**	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**			
RUN:	**10 Year Peak No Barrier-Scenario 2**			
Terrain Line	**Points**			
Name	**No.**	**Coordinates (ground)**		
		X	**Y**	**Z**
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd						16 December 2011					
Lixin Xie						TNM 2.5					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows										
RUN:	10 Year Peak No Barrier-Scenario 2										
Receiver											
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria				Active
			X	Y	Z	above	Existing	Impact Criteria		NR	in
						Ground	LAeq1h	LAeq1h	Sub'l	Goal	Calc.
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,666.8	5,506,976.5	935.95	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.21	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.25	1.50	0.00	66	10.0	8.0	Y

Stantec Consulting Ltd — 7 December 2011

Lixin Xie — TNM 2.5

Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: City of Lethbridge-Country Meadows

RUN: 10 Year Off-Peak No Barrier-Scenario 2

BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	 Crit'n	 Increase over existing Calculated	 Crit'n Sub'l Inc	 Type Impact	With Barrier Calculated LAeq1h	 Noise Reduction Calculated	 Goal	 Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	52.5	66	52.5	10	----	52.5	0.0	8	-8.0
Receiver2	2	1	0.0	52.9	66	52.9	10	----	52.9	0.0	8	-8.0
Receiver3	3	1	0.0	50.5	66	50.5	10	----	50.5	0.0	8	-8.0
Receiver4	4	1	0.0	52.7	66	52.7	10	----	52.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	 Avg	 Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd					**16 December 2011**						
Lixin Xie					**TNM 2.5**						
INPUT: ROADWAYS							**Average pavement type shall be used unless**				
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**						**a State highway agency substantiates the use**				
RUN:	**10 Year Off-Peak No Barrier-Scenario 2**						**of a different type with the approval of FHWA**				
Roadway		**Points**									
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**	
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

Stantec Consulting Ltd			**7 December 2011**									
Lixin Xie			**TNM 2.5**									
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**											
RUN:	**10 Year Off-Peak No Barrier-Scenario 2**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	104	50	2	50	1	50	0	0	0	0
	101	2	104	50	2	50	1	50	0	0	0	0
	102	3	104	50	2	50	1	50	0	0	0	0
	103	4	104	50	2	50	1	50	0	0	0	0
	104	5	104	50	2	50	1	50	0	0	0	0
	105	6	104	50	2	50	1	50	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	59	50	1	50	0	0	0	0	0	0
	201	9	59	50	1	50	0	0	0	0	0	0
	202	10	59	50	1	50	0	0	0	0	0	0
	203	11	59	50	1	50	0	0	0	0	0	0
	204	12	59	50	1	50	0	0	0	0	0	0
	205	13	59	50	1	50	0	0	0	0	0	0
	206	14										

Stantec Consulting Ltd			16 December 2011	
Lixin Xie			TNM 2.5	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows			
RUN:	10 Year Off-Peak No Barrier-Scenario 2			
Terrain Line	Points			
Name	No.	Coordinates (ground)		
		X	Y	Z
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd
Lixin Xie

16 December 2011
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: City of Lethbridge-Country Meadows
RUN: 10 Year Off-Peak No Barrier-Scenario 2

Receiver											
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria				Active
			X	Y	Z	above	Existing	Impact Criteria		NR	in
						Ground	LAeq1h	LAeq1h	Sub'l	Goal	Calc.
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,666.8	5,506,976.5	935.95	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.21	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.25	1.50	0.00	66	10.0	8.0	Y

Stantec Consulting Ltd		7 December 2011
Lixin Xie		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows	
RUN:	10 Year Night No Barrier-Scenario 2	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	20 deg C, 50% RH	

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	50.0	66	50.0	10	----	50.0	0.0	8	-8.0
Receiver2	2	1	0.0	50.2	66	50.2	10	----	50.2	0.0	8	-8.0
Receiver3	3	1	0.0	47.9	66	47.9	10	----	47.9	0.0	8	-8.0
Receiver4	4	1	0.0	49.7	66	49.7	10	----	49.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Stantec Consulting Ltd					16 December 2011						
Lixin Xie					TNM 2.5						
INPUT: ROADWAYS							Average pavement type shall be used unless				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows						a State highway agency substantiates the use				
RUN:	10 Year Night No Barrier-Scenario 2						of a different type with the approval of FHWA				
Roadway		Points									
Name	Width	Name	No.	Coordinates (pavement)			Flow Control			Segment	
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	m			m	m	m		km/h	%		
Community Entrance Rd01-WB	5.5	100	1	78,687.5	5,507,014.0	933.03				Average	
		101	2	78,669.5	5,507,005.0	932.85				Average	
		102	3	78,651.3	5,506,997.0	932.89				Average	
		103	4	78,632.0	5,506,991.5	932.94				Average	
		104	5	78,612.2	5,506,989.0	932.88				Average	
		105	6	78,592.2	5,506,991.0	932.77				Average	
		106	7	78,575.8	5,506,994.5	932.68					
Community Entrance Rd01-EB	5.5	200	8	78,572.8	5,506,984.5	932.70				Average	
		201	9	78,590.7	5,506,980.5	932.80				Average	
		202	10	78,612.3	5,506,979.0	932.90				Average	
		203	11	78,633.9	5,506,981.5	932.90				Average	
		204	12	78,654.9	5,506,987.0	932.90				Average	
		205	13	78,674.1	5,506,995.5	932.80				Average	
		206	14	78,692.2	5,507,004.5	933.00					

Stantec Consulting Ltd				**7 December 2011**								
Lixin Xie				**TNM 2.5**								
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**City of Lethbridge-Country Meadows**											
RUN:	**10 Year Night No Barrier-Scenario 2**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h	veh/hr	km/h
Community Entrance Rd01-WB	100	1	59	50	1	50	0	0	0	0	0	0
	101	2	59	50	1	50	0	0	0	0	0	0
	102	3	59	50	1	50	0	0	0	0	0	0
	103	4	59	50	1	50	0	0	0	0	0	0
	104	5	59	50	1	50	0	0	0	0	0	0
	105	6	59	50	1	50	0	0	0	0	0	0
	106	7										
Community Entrance Rd01-EB	200	8	33	50	1	50	0	0	0	0	0	0
	201	9	33	50	1	50	0	0	0	0	0	0
	202	10	33	50	1	50	0	0	0	0	0	0
	203	11	33	50	1	50	0	0	0	0	0	0
	204	12	33	50	1	50	0	0	0	0	0	0
	205	13	33	50	1	50	0	0	0	0	0	0
	206	14										

Stantec Consulting Ltd			16 December 2011	
Lixin Xie			TNM 2.5	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	City of Lethbridge-Country Meadows			
RUN:	10 Year Night No Barrier-Scenario 2			
Terrain Line	Points			
Name	No.	Coordinates (ground)		
		X	Y	Z
		m	m	m
PL N	1	78,668.3	5,507,014.0	932.40
	2	78,665.6	5,507,013.0	932.40
	3	78,648.2	5,507,005.5	932.50
	4	78,630.4	5,507,000.0	932.60
	5	78,612.0	5,506,998.5	932.70
	6	78,599.2	5,506,999.0	932.90
	7	78,593.5	5,506,999.5	932.90
	8	78,578.3	5,507,003.5	932.80
	9	78,568.9	5,507,005.5	932.90
	10	78,562.4	5,507,019.0	933.20
PL S	11	78,551.3	5,506,970.5	933.00
	12	78,565.6	5,506,977.5	932.80
	13	78,589.5	5,506,972.0	932.90
	14	78,603.2	5,506,970.5	933.00
	15	78,617.4	5,506,970.5	933.00
	16	78,627.8	5,506,971.5	933.10
	17	78,638.1	5,506,973.5	933.00
	18	78,655.4	5,506,978.5	932.90
	19	78,667.5	5,506,983.0	932.90
	20	78,679.7	5,506,989.0	932.80

Stantec Consulting Ltd | **16 December 2011**
Lixin Xie | **TNM 2.5**

INPUT: RECEIVERS
PROJECT/CONTRACT: **City of Lethbridge-Country Meadows**
RUN: **10 Year Night No Barrier-Scenario 2**

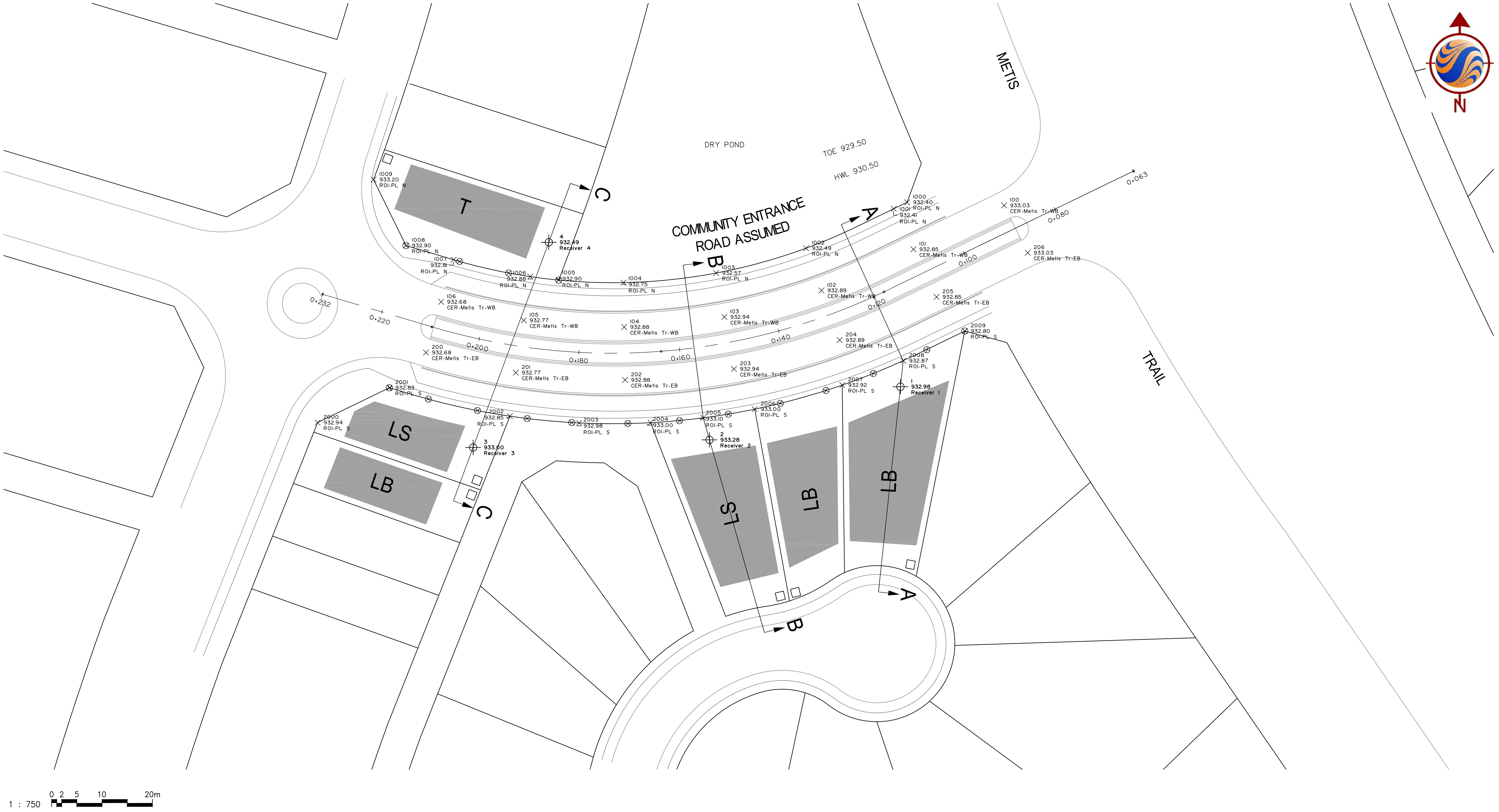
Receiver											
Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**	**above**	**Existing**	**Impact Criteria**		**NR**	**in**
						Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			m	m	m	m	dBA	dBA	dB	dB	
Receiver1	1	1	78,666.8	5,506,976.5	935.95	1.50	0.00	66	10.0	8.0	Y
Receiver2	2	1	78,629.1	5,506,967.5	933.21	1.50	0.00	66	10.0	8.0	Y
Receiver3	3	1	78,582.2	5,506,965.5	933.00	1.50	0.00	66	10.0	8.0	Y
Receiver4	4	1	78,597.2	5,507,006.5	932.25	1.50	0.00	66	10.0	8.0	Y

APPENDIX D

Surface Traffic Noise Analysis Plans

For Scenario 1

- Surface Traffic Noise Analysis Revised - Site Plan
- Surface Traffic Noise Analysis Revised - Cross Sections
- Surface Traffic Noise Analysis Revised - Summary
- Assumed Building Grade Plan



Legend

✕ 202 932.88 CER-Metis Tr-EB	Finished Grade Community Entrance Road Connecting Metis Trail Eastbound / Westbound
⊕ 1 932.98 Receiver 1	Receiver Elevation Receiver Location
LB	House Locations Lot Type
⊗——⊗	1.80m Wood Screen Fence
☐	Driveway Location

Community Entrance Road Connecting Metis Trail
Scenario 1

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
4.1

Title
Surface Traffic Noise Analysis Revised Site Plan

Date: December 2011
Project Number: 112945195.240

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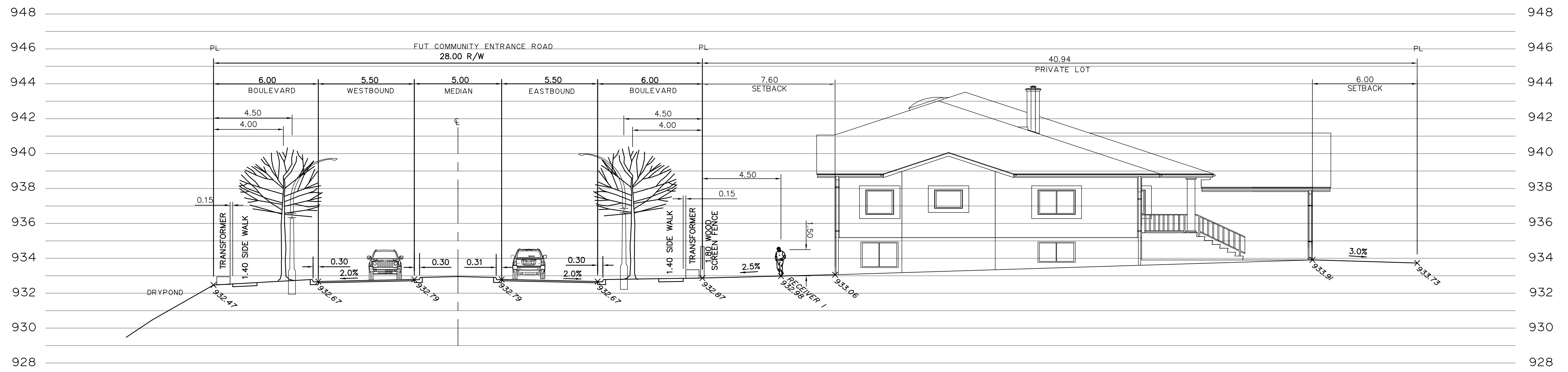
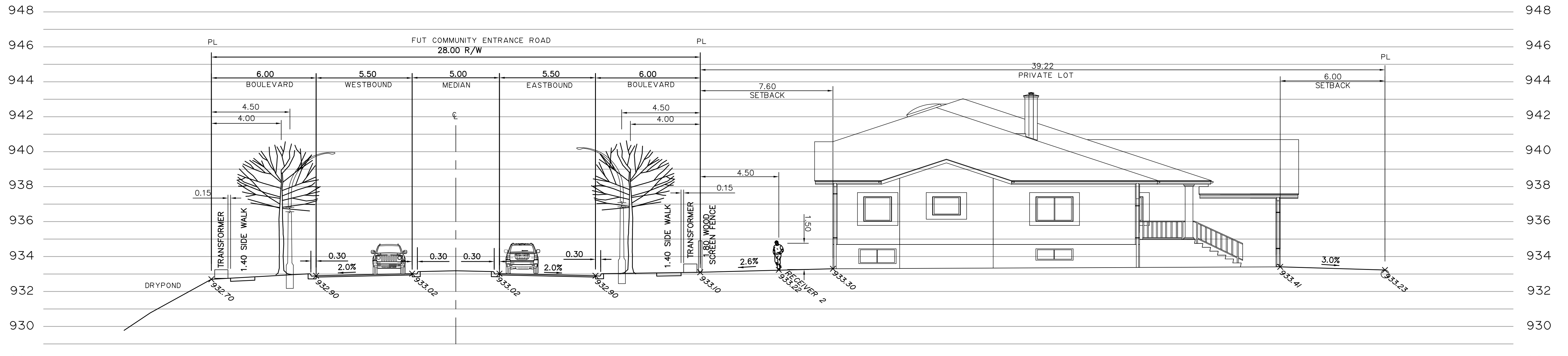


COMMUNITY ENTRANCE ROAD

SECTION A-A

STA 0+119.856



COMMUNITY ENTRANCE ROAD

SECTION B-B

STA 0+157.116

1 : 250 0 1 2.5 5 7.5m

Legend

× 932.90	Finished Grade
▯	1.80m Wood Screen Fence
	Receiver Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 1

Client/Project

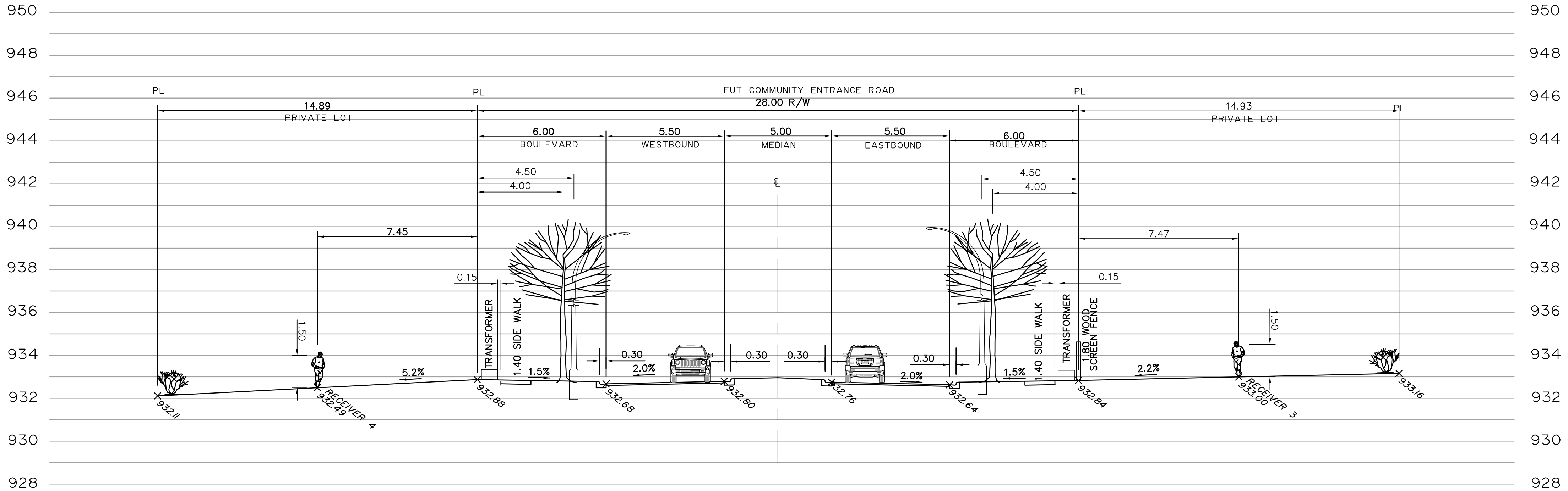
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
4.2A

Title
Surface Traffic Noise Analysis Revised Cross Sections

Date: December 2011
Project Number: 112945195.240

V:\1164\active\116499000\lethbridge_country_meadows\noise_study_revised\Scenario 1\Revised-Country_meadows_Noise_Study_Scenario_1.dwg



COMMUNITY ENTRANCE ROAD

SECTION C-C

STA 0+193.597

1 : 250

0 1 2.5 5 7.5m

Legend

X 932.90 Finished Grade

Receiver Location

1.80m Wood Screen Fence

Community Entrance Road Connecting Metis Trail
Scenario 1

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
4.2B

Title
Surface Traffic Noise Analysis Revised Cross Sections

Date: December 2011
Project Number: 112945195.240

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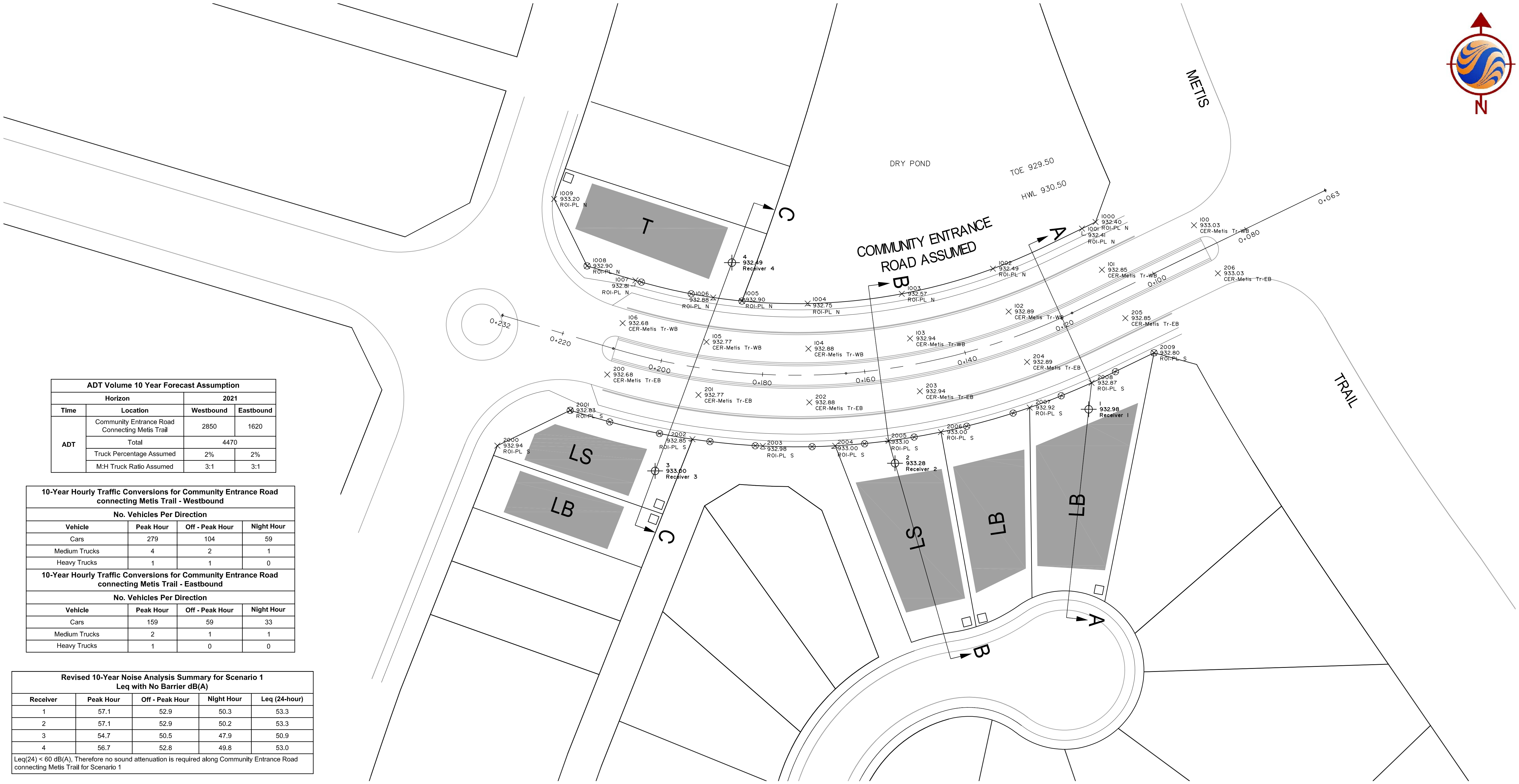

ADT Volume 10 Year Forecast Assumption			
Horizon		2021	
Time	Location	Westbound	Eastbound
ADT	Community Entrance Road Connecting Metis Trail	2850	1620
	Total	4470	
	Truck Percentage Assumed	2%	2%
	M:H Truck Ratio Assumed	3:1	3:1

10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Westbound			
No. Vehicles Per Direction			
Vehicle	Peak Hour	Off - Peak Hour	Night Hour
Cars	279	104	59
Medium Trucks	4	2	1
Heavy Trucks	1	1	0
10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Eastbound			
No. Vehicles Per Direction			
Vehicle	Peak Hour	Off - Peak Hour	Night Hour
Cars	159	59	33
Medium Trucks	2	1	1
Heavy Trucks	1	0	0

Revised 10-Year Noise Analysis Summary for Scenario 1 Leq with No Barrier dB(A)				
Receiver	Peak Hour	Off - Peak Hour	Night Hour	Leq (24-hour)
1	57.1	52.9	50.3	53.3
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.7	52.8	49.8	53.0
Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 1				

1 : 750 0 2 5 10 20m

Legend

202 932.88 CER-Metis Tr-EB	Finished Grade Community Entrance Road Connecting Metis Trail Eastbound / Westbound
1 932.98 Receiver 1	Receiver Elevation Receiver Location
LB	House Locations Lot Type
⊗	1.80m Wood Screen Fence
□	Driveway Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 1

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
4.3

Title
Surface Traffic Noise Analysis Revised Summary

Date: December 2011
Project Number: 112945195.240

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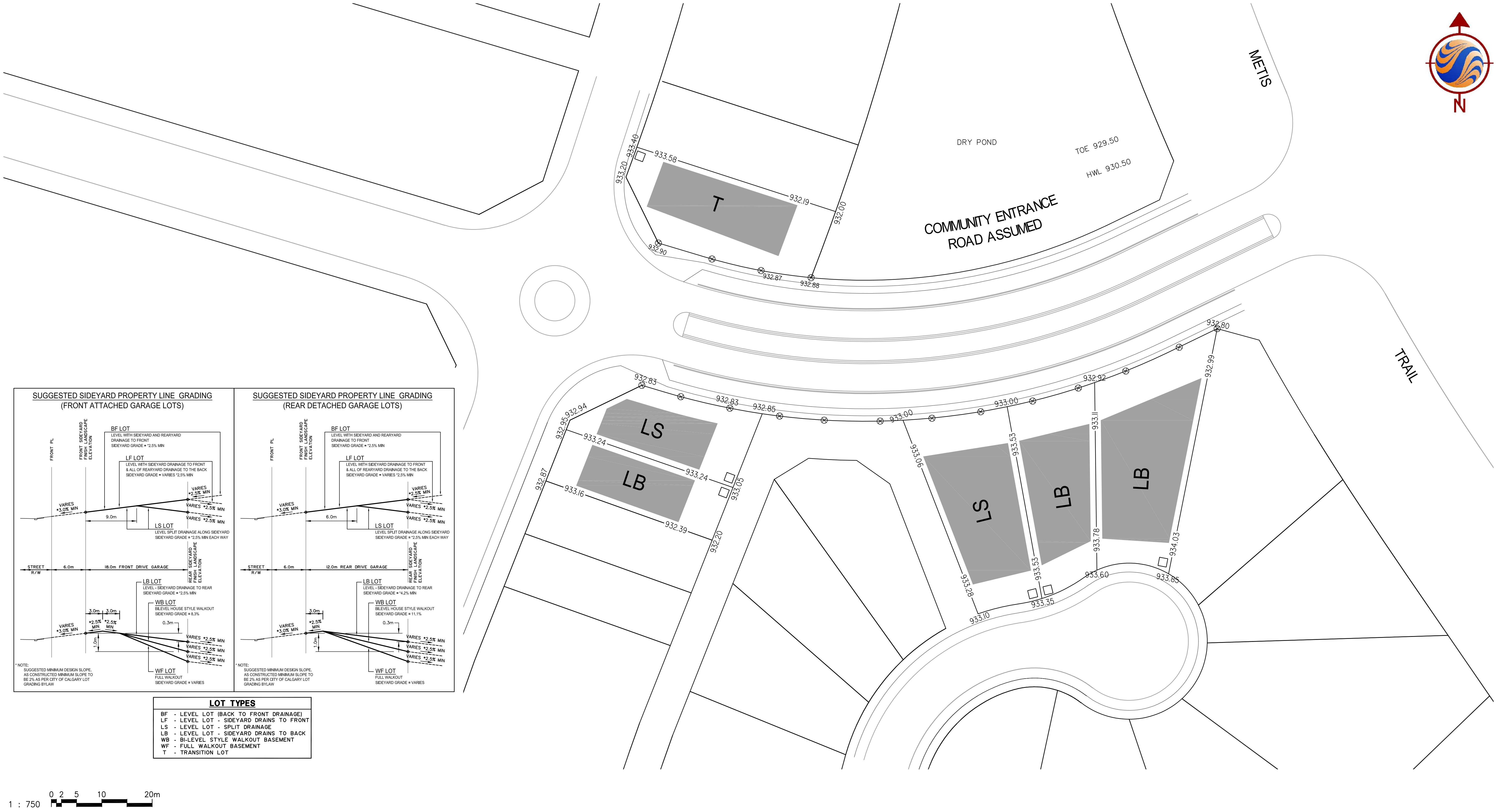

* NOTE:
SUGGESTED MINIMUM DESIGN SLOPE.
AS CONSTRUCTED MINIMUM SLOPE TO BE 2% AS PER CITY OF CALGARY LOT GRADING BYLAW

LOT TYPES

BF - LEVEL LOT (BACK TO FRONT DRAINAGE)
LF - LEVEL LOT - SIDEYARD DRAINS TO FRONT
LS - LEVEL LOT - SPLIT DRAINAGE
LB - LEVEL LOT - SIDEYARD DRAINS TO BACK
WB - BI-LEVEL STYLE WALKOUT BASEMENT
WF - FULL WALKOUT BASEMENT
T - TRANSITION LOT

Legend

▨ LB	House Locations Lot Type
—⊗——⊗—	1.80m Wood Screen Fence
☐	Driveway Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 1

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
4.4

Title
Surface Traffic Noise Analysis Revised
Assumed Building Grade Plan

Date: December 2011
Project Number: 112945195.240

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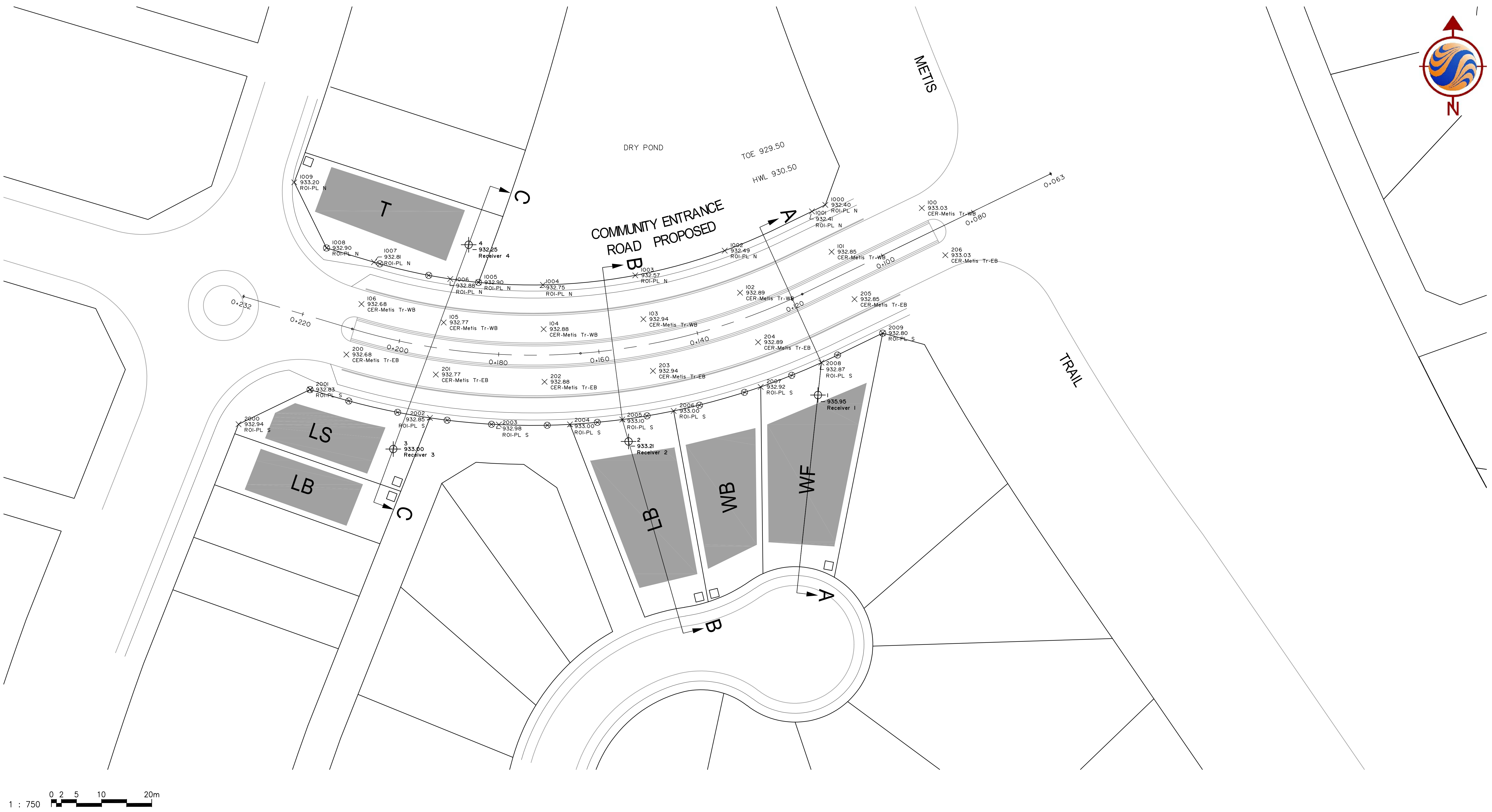
APPENDIX E

Surface Traffic Noise Analysis Plans

For Scenario 2

- Surface Traffic Noise Analysis Revised - Site Plan
- Surface Traffic Noise Analysis Revised - Cross Sections
- Surface Traffic Noise Analysis Revised – Summary
- Assumed Building Grade Plan



Legend

╳ 202 932.88 CER-Metis Tr-EB	Finished Grade Community Entrance Road Connecting Metis Trail Eastbound / Westbound	LB	House Locations Lot Type
⊕ 1 935.95 Receiver 1	Receiver Elevation Receiver Location	⊗—⊗	1.80m Wood Screen Fence
		☐	Driveway Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 2

Client/Project

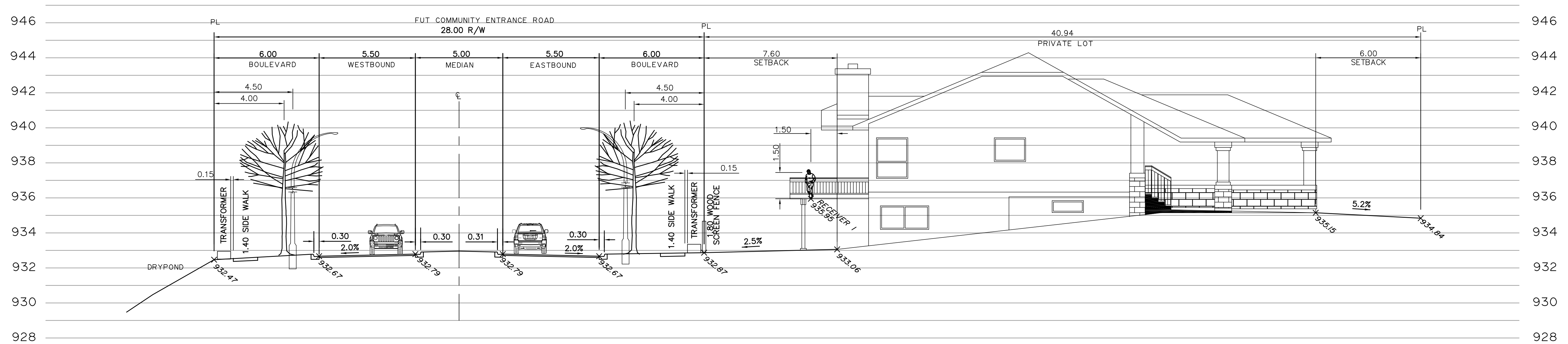
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
5.1

Title
Surface Traffic Noise Analysis Revised Site Plan

Date: December 2011
Project Number: 112945195.240

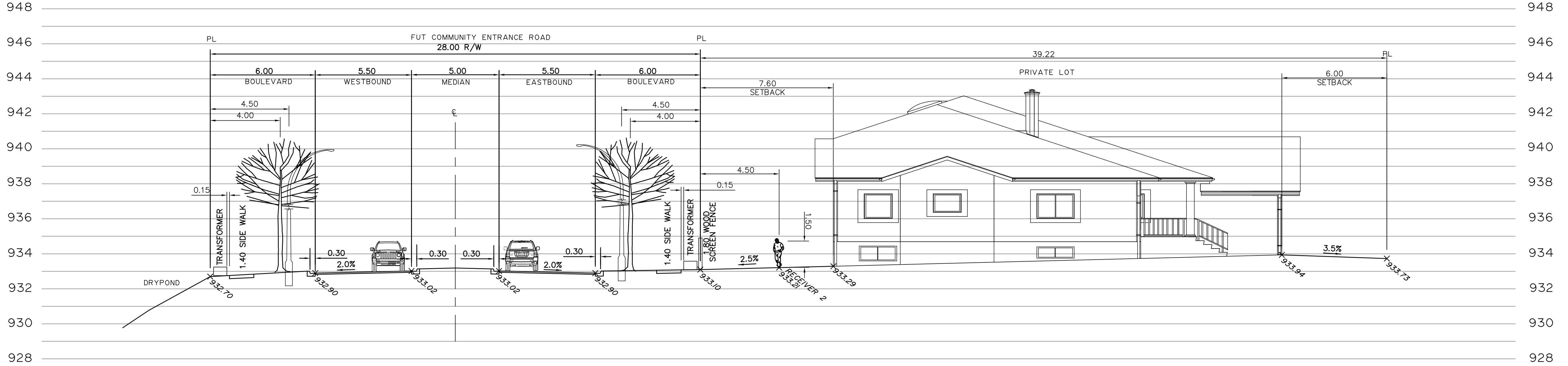
V:\1164\active\116499000\lethbridge_country_meadows\noise_study_revised\Scenario 2\Revised-Country_meadows_Noise_Study_Scenario_2.dwg



COMMUNITY ENTRANCE ROAD

SECTION A-A

STA 0+119.856



COMMUNITY ENTRANCE ROAD

SECTION B-B

STA 0+157.116

1 : 250 0 1 2.5 5 7.5m

Legend

X 932.90 Finished Grade

1.80m Wood Screen Fence

Receiver Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 2

Client/Project

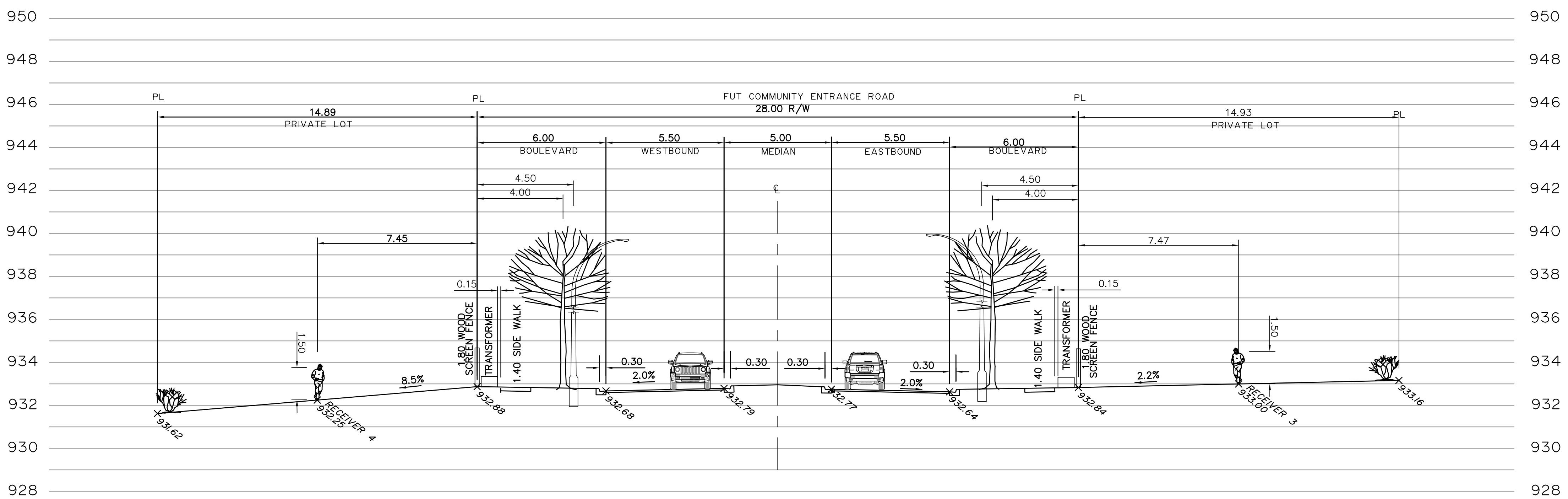
SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
5.2A

Title
Surface Traffic Noise Analysis Revised Cross Sections

Date: December 2011
Project Number: 112945195.240

V:\1164\active\116499000\lethbridge_country_meadows\noise_study_revised\Scenario 2\Revised-Country_meadows_Noise_Study_Scenario_2.dwg



COMMUNITY ENTRANCE ROAD

SECTION C-C

STA 0+193.597

1 : 250

Legend

× 932.90 Finished Grade

Receiver Location

▯ 1.80m Wood Screen Fence

Stantec

V:\1164\active\116499000\lethbridge_country_meadows\noise_study_revised\Scenario 2\Revised–Country_meadows_Noise_Study_Scenario_2.dwg

Community Entrance Road Connecting Metis Trail
Scenario 2

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
5.2B

Title
Surface Traffic Noise Analysis Revised Cross Sections

Date: December 2011
Project Number: 112945195.240

ADT Volume 10 Year Forecast Assumption			
Horizon		2021	
Time	Location	Westbound	Eastbound
ADT	Community Entrance Road Connecting Metis Trail	2850	1620
	Total	4470	
	Truck Percentage Assumed	2%	2%
	M:H Truck Ratio Assumed	3:1	3:1

10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Westbound			
No. Vehicles Per Direction			
Vehicle	Peak Hour	Off - Peak Hour	Night Hour
Cars	279	104	59
Medium Trucks	4	2	1
Heavy Trucks	1	1	0
10-Year Hourly Traffic Conversions for Community Entrance Road connecting Metis Trail - Eastbound			
No. Vehicles Per Direction			
Vehicle	Peak Hour	Off - Peak Hour	Night Hour
Cars	159	59	33
Medium Trucks	2	1	1
Heavy Trucks	1	0	0

Revised 10-Year Noise Analysis Summary for Scenario 2 Leq with No Barrier dB(A)				
Receiver	Peak Hour	Off - Peak Hour	Night Hour	Leq (24-hour)
1	56.8	52.5	50.0	53.0
2	57.1	52.9	50.2	53.3
3	54.7	50.5	47.9	50.9
4	56.6	52.7	49.7	52.9
Leq(24) < 60 dB(A), Therefore no sound attenuation is required along Community Entrance Road connecting Metis Trail for Scenario 2				

1 : 750 0 2 5 10 20m

Legend

202 932.88 CER-Metis Tr-EB	Finished Grade Community Entrance Road Connecting Metis Trail Eastbound / Westbound
1 935.95 Receiver 1	Receiver Elevation Receiver Location
LB	House Locations Lot Type
⊗——⊗	1.80m Wood Screen Fence
□	Driveway Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 2

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
5.3

Title
Surface Traffic Noise Analysis Revised Summary

Date: December 2011
Project Number: 112945195.240

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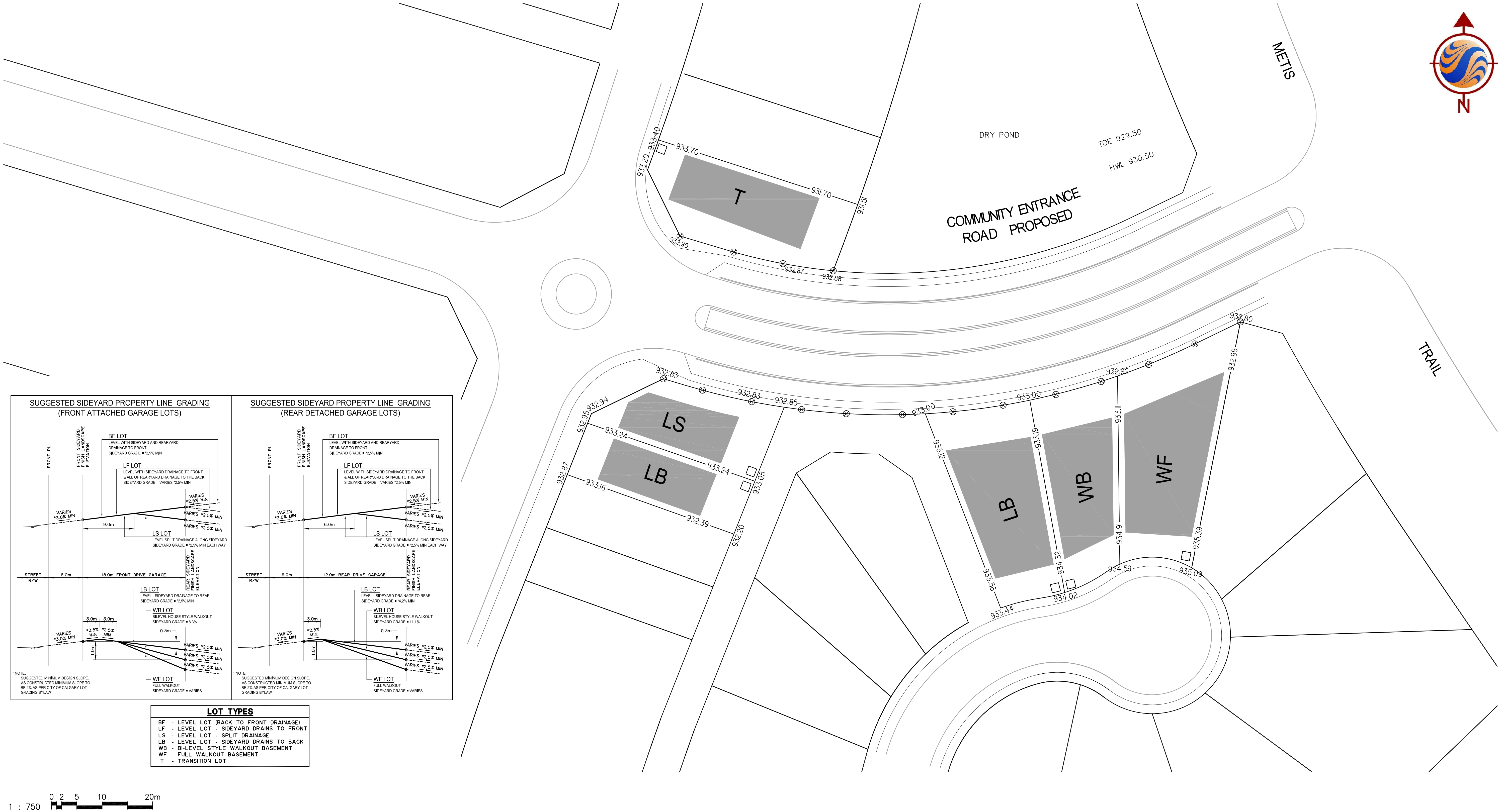

LOT TYPES

BF - LEVEL LOT (BACK TO FRONT DRAINAGE)
LF - LEVEL LOT - SIDEYARD DRAINS TO FRONT
LS - LEVEL LOT - SPLIT DRAINAGE
LB - LEVEL LOT - SIDEYARD DRAINS TO BACK
WB - BI-LEVEL STYLE WALKOUT BASEMENT
WF - FULL WALKOUT BASEMENT
T - TRANSITION LOT

Legend

LB	House Locations Lot Type
⊗—⊗	1.80m Wood Screen Fence
☐	Driveway Location

Stantec

Community Entrance Road Connecting Metis Trail
Scenario 2

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS OUTLINE PLAN

Figure No.
5.4

Title
Surface Traffic Noise Analysis Revised
Assumed Building Grade Plan

Date: December 2011
Project Number: 112945195.240

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NOISE ANALYSIS CHECKLIST

REQUIREMENTS	YES	NO	COMMENT
Report			
Application number(s) Tentative Plan or Development Permit, as well as Outline Plan No.	X		
Summary of recommendations	X		
Assumptions used	X		
81/2 x 11 Site Plan including application no., traffic vols, truck %, and barrier dimensions	X		
81/2 x 11 Site Location Plan including adjacent roadways and phases of development	X		
Check list	X		
Site Plan (must include the following:)			
Building footprints and grades	X		Building Grade Plan
Property line elevations	X		
Barrier and/or ground points	X		
Receiver locations and elevations	X		
Road points and grades	X		
Cross-section locations	X		
1:500 metric scale		X	1:750
Block Profiles (all modeling must include 100m beyond development)	N/A		
Road points and their station numbers			
Receiver points (Identify receiver locations on the block profiles)			
Barrier/ground point locations			
Coordinate points for the above			
1:500 metric scale			
Finalized lot and building grade plan			
Lot type identification	X		
1:500 metric scale		X	1:750
Traffic Information			
Forecasted traffic volumes	X		
Truck routes/Non truck routes	X		
Percentage Trucks and Medium to heavy truck ratio	X		
Speed limit	X		
Copy of facsimile (from Forecast Dept.)		N/A	
Calculation tables			
Calculations used for receiver base elevation	X		
Hourly volume conversion	X		
List of assumptions used	X		
Cross sections (minimum 3 cross-sections at critical receiver locations)			
Ground level elevation at receiver	X		
Main floor elevation at receiver (walkout)	X		
Property line elevation	X		
Elevation of proposed noise attenuation		X	Noise attenuation not required
Roadway centerline elevation (both directions)	X		
Distance from receiver to PL	X		
Distance from residence to PL	X		
Receiver locations			
End lots, Corner Lots, Walkout Lots, Critical Lots	X		
Sufficient number to represent development	X		
Input and Summary tables (hard copy of all tables)			
Input Tables	X		
Noise levels without attenuation	X		
Noise levels with attenuation (if required)		X	Noise attenuation not required
Barrier height (if required)		X	Barrier not reuqired
Data file(s)			
Hardcopy of data file(s)	X		
Compact Disc containing all data files*		X	Email copy to be sent

APPENDIX C

GEOTECHNICAL EVALUATION

A TETRA TECH COMPANY

October 13, 2011

ISSUED FOR USE
EBA FILE: L12102095

Stantec Consulting Ltd.
290, 220 – 4 Street S
Lethbridge AB T1J 4J7

Attention: Mr. Brad Schmidtke

Dear Sir:

Subject: Country Meadows Outline Plan
Geotechnical Evaluation
EBA File No. L12101650

Further to your request, EBA, A Tetra Tech Company (EBA), has reviewed the correspondence received from the City of Lethbridge (City), dated September 26, 2011 regarding, 'Country Meadows Outline Plan – Gate 4 Version 1 Review Comments'.

The City review of the document provided a number of comments regarding the geotechnical and environmental engineering services provided by EBA. EBA provides the following comments to the City's review questions. The section references noted are taken from the City's letter:

- Section 2 – Location and Area Context; Figure 2.1

  'The 'textural manner' in which the existing dugouts will be dealt with during development of the project site was contained in Section 5.1, Paragraph 6 of EBA's geotechnical evaluation report, reference number L12101650.001, December 2010'.

- Geotechnical Report – Section 4.3 Mining Activity

  'Further exploration in the northeast corner of the subject site is not required with regards to potential impact to the surface features of the site from historic underground mine workings'.

- Geotechnical Report – Section 4.3 (page 4)

  'In this context of the report nomenclature, residential buildings are considered as relatively small, lightly loaded structures'.

- Geotechnical Report – Water Well Information

  'The Alberta Environment database shows 3 water wells within Sections 33 and 34, one of which was applied for but not drilled. During development of the site, should the water wells be located (exact locations unknown) they will be dealt with in accordance with the applicable jurisdictional requirements to ensure no detrimental impact to the development structures or infrastructure elements'.

EBA, A Tetra Tech Company
442 - 10 Street North
Lethbridge, AB T1H 2C7 CANADA
p. 403.329.9009 f. 403.328.8817

We trust this letter satisfies the queries presented by the City with regards to the works previously completed on the subject site by EBA.

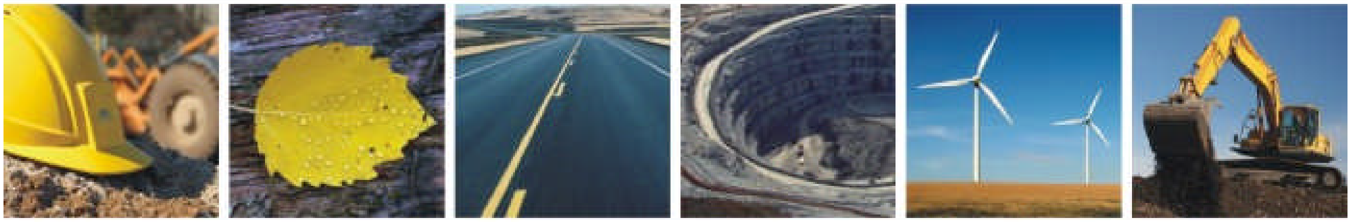
Sincerely,
EBA, A Tetra Tech Company

Marc J. Sabourin, P.Eng.
Senior Project Director
Engineering Practice, Prairie Region
Direct Line: 403.329.9009 x225
msabourin@eba.ca

/rcm

STANTEC CONSULTING LTD.

GEOTECHNICAL EVALUATION COUNTRY MEADOWS OUTLINE PLAN LETHBRIDGE, ALBERTA



REPORT

DECEMBER 2010
ISSUED FOR USE
EBA FILE: L12101650.001

creating & delivering | BETTER SOLUTIONS

A TETRA TECH COMPANY

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Gemini Property & Land Development, and their agents. EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than those noted above, or for any project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions provided in Appendix A of this report.

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation, conducted by EBA, A Tetra Tech Company (EBA), for the proposed Country Meadows Subdivision, to be located in West Lethbridge, Alberta.

The scope of work for the geotechnical evaluation was described in a proposal issued to Mr. Trent Purvis, P.Eng., of Stantec Consulting Ltd. (Stantec) on May 6, 2010. The objective of this evaluation was to determine the general subsurface conditions in the area of the proposed development and to provide general recommendations for the geotechnical aspects of design and construction for the residential subdivision development, in support of the Outline Plan to be submitted to the City of Lethbridge.

This work is supplemented by a preliminary geotechnical review completed by EBA in 2007, as well as a Phase I Environmental Site Assessment (ESA) completed for the development by EBA (reported under separate cover).

Authorization to proceed with the evaluation was provided by Stantec.

2.0 PROJECT DETAILS AND SCOPE OF WORK

The subject property is located within west Lethbridge, Alberta, as shown on Figure 1, including approximately 300 acres (121 hectares). It is understood that the development will include residential and commercial lots, a school site, utility and street infrastructure, as well as stormwater management facilities, including three dry ponds and one wet pond. The foundation system for the housing will likely be shallow spread footings and a grade supported lower level floor slab, typical of residential developments in the Lethbridge area. Foundation recommendations for larger structures, such as schools or commercial developments, are provided in subsequent sections of this report.

It is understood that the proposed street structures will be designed and constructed to City of Lethbridge Infrastructure Services Engineering Standards. The majority of the roadways may comprise designated ‘local’ pavement structures, with some arterial or collector pavement structures in heavier loaded traffic areas.

This geotechnical evaluation is a follow up to a geotechnical desktop study performed by EBA in 2009 (EBA File No. L12101592).

The scope of work also included the installation of twenty (20) geotechnical boreholes (for the general property development, street developments, and stormwater ponds). A laboratory program was completed to assist in classifying the subsurface soils and this report provides the following general design and construction recommendations:

- Recommended design parameters for footings and pile foundations.
- Recommendations for lot grading, backfill materials, and compaction.
- Recommendations for utility installation, including trench excavation, backfill, and compaction standards.

- Recommendations for general stormwater management facility design and construction considerations.
- Recommendations for subgrade preparation for street pavements.
- Recommendations for dewatering during construction.
- Recommended design and construction provisions for control of groundwater.
- Recommendations for concrete type.

3.0 GEOTECHNICAL FIELD AND LABORATORY WORK

The initial fieldwork for this evaluation was carried out on October 5 and 7, 2010. A truck-mounted drill rig was contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The rig was equipped with 150 mm diameter solid stem continuous flight augers. EBA's field representative was Mr. Jackson Meadows, C.E.T. The location of buried utilities was carried out through Alberta One Call.

Twenty (20) boreholes were drilled across the property area to depths of 6.6 m and 9.6 m below ground surface. The borehole locations are depicted on Figure 1. The boreholes were surveyed, as directed by Stantec.

In all boreholes, disturbed grab samples were obtained at depth intervals of 600 mm. The Standard Penetration Test (SPT) was completed at intervals of 1.5 m. All soil samples were visually classified in the field, and the individual soil strata and the interfaces between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

Slotted 25 mm diameter polyvinyl chloride (PVC) standpipes were installed in each of the boreholes in order to monitor the groundwater levels. Auger cuttings were used to backfill around the standpipes and they were sealed at the ground surface with bentonite chips.

Classification tests, including natural moisture content, Atterberg Limits, and soluble sulphate content were subsequently performed in the laboratory on samples collected from the boreholes to aid in the determination of engineering properties. The results of the laboratory tests are presented on the borehole logs in Appendix B. In addition, bulk samples were also tested for Standard Proctor moisture density, as well as remoulded hydraulic conductivity. These results are presented in Appendix D.

4.0 SITE CONDITIONS

4.1 Surface Features

The land to be developed is bounded on the east by the future Benton Drive West right-of-way, to the west by the future Chinook Trail West right-of-way, to the north by Walsh Drive West, and extends south to the future Garry Drive West extension.

The land was noted to be largely undeveloped at the time of this evaluation. The exception includes three farmsteads located in the central area of the land, accessed via 30 Street which runs north/south approximately through the middle of the site (Figure 1). The farmsteads include farmhouses, barns and other small outbuildings, as well as a dugout for each farmstead. A livestock pen is located at the northern farmstead. The farmsteads are assumed to include septic tanks and/or septic disposal fields, in addition to local gas supply lines. The land west of 30 Street comprises uncultivated pasture land covered with prairie grasses, with occasional trees near the farmsteads. The land east of 30 Street is surfaced with wheat and canola crops.

The ground surface was noted to be undulating. Site drainage is generally towards the low lying areas, with marginal off-site drainage noted, resulting in seasonal surface water ponding in some areas. Seasonal wet areas are suspected due to thicker vegetation growth near the center of the SE ¼ of Section 34, and near the center of the SE ¼ of Section 33, although ponded surface water was not noted at the time of this evaluation.

4.2 Historical Aerial Photographic Review

Based on EBA’s understanding of the property’s history, including an aerial photograph review from the 1950s to the present day, the land has been used for agricultural purposes.

As part of the aerial photograph review, seasonal wet areas were noted in Sections 33 and 34. The location and existence of the wet areas were noted to vary over time, with some wet areas being present in the 1950s but not present in later years. Most recently, wet areas noted on the 2007 air photo were located in the center of the SE ¼ of Section 34, and near the center of the SE ¼ of Section 33.

4.3 Mining Activity

Research was conducted on the possible existence of mine workings within the boundary of the development area (Section 33-8-22 W4M and west half of 34-8-22 W4M). The study was performed using publications by ERCB (Coal Mine Atlas, 1988) and various documents contained in EBA’s library regarding the coal mining industry in the Lethbridge area.

The literature indicates that Mine 1464 (commonly referred to as Galt No. 8), operated on the subject property between 1934 and 1957. The relatively extensive mine underlies the west side of the river valley, including the northeastern edge of the subject property and the surrounding areas (specifically the West Highlands subdivision to the east). This was an underground coal mine operated by Lethbridge Collieries Ltd., a division of Canadian Pacific Railway Company. The depth of mine workings in this area was approximately 110 m to 120 m below prairie level.

The mine used a room and pillar mining arrangement. Figure 1 presents an overlay of the mine map on the subject site. EBA understands that a large portion of the coal pillars were removed during mine working, prior to mine closure. It is uncertain what percentage of supporting coal pillars would have been left in place. Areas of the mine shown as shaded on Figure 1 are understood to have had the coal extracted.

The scope of work for this geotechnical evaluation also included a general assessment of the risk of ground surface subsidence due to the existence of coal mine workings located beneath the property. Specifically, this included a review of a mine subsidence evaluation carried out by Jacques Whitford AXYS Ltd. (JWAL) for the lands east of the project site (West Highlands), as well as a review of EBA’s local experience with similar developments over coal mine workings, including mine subsidence studies by EBA and others in other areas of Lethbridge.

Of note is that since this was one of the last mines to close in the Lethbridge area, it was studied closely in the 1950s and 1960s, including monitoring of ground surface subsidence with time after the coal had been extracted. The results of this study (referenced by JWAL) indicated that coal mine collapse and ground surface subsidence occurred within three years after the coal was extracted (in this case, regardless of whether the supporting pillars had been removed). Ground surface subsidence in the order of 300 mm on average was recorded at prairie level. Negligible additional surface subsidence was recorded thereafter.

In general terms, the findings of the JWAL report were consistent with local experience and other published reports, including those by EBA. The JWAL report indicated that the risk of land development due to coal mine workings is generally negligible, as the mine subsidence should have already occurred in the late 1950s and early 1960s.

However, for this specific development, two recommendations in the JWAL report and from EBA's mine subsidence studies, which are normally provided for similar local developments over coal mines, will be restated herein. All footing excavations overlying the mine workings should be observed by a geotechnical engineer. Due to coal mine subsidence, there may be localized tension cracks which may require special attention if encountered below the bearing surfaces. This should not adversely affect the foundation load capacity of the site soils. However, it is recommended that any cracks encountered should be over-excavated to remove any softened infill soil materials and backfilled with compacted general engineered fill.

In addition, the JWAL report included values for approximate ground surface strain that could theoretically be experienced in a worst case scenario, should an old mine roadway collapse in the future. The range of vertical strain approached 0.001 in the worst case areas along the perimeter of mined areas and overlying mine roadways. For buildings higher than four storeys, the proposed design and location must be reviewed by a geotechnical engineer. It is recommended that the issue of potential mine subsidence should be reviewed by the project structural engineer to verify that the type of structures proposed can accommodate these ranges of strain.

Based on EBA's review of these mining subsidence studies, given the depth of the coal mine workings, it is considered that relatively small, lightly loaded surface developments at prairie level would likely not be adversely affected by the presence of the mine workings. However, the weight of larger structures must be considered in order to limit the risk of additional residual subsidence of the mine workings, induced by structure loading. In addition, the possibility of additional mine subsidence, and any residual surface strains must be considered for all foundations within the areas overlying the mine (Figure 1).

4.4 Soil Stratigraphy

It should be noted that geological conditions are innately variable. At the time of preparation of this report, information on the subsurface stratigraphy was available only at discrete borehole locations. In order to develop recommendations from this information, it is necessary to make some assumptions concerning conditions other than at the borehole locations. Adequate field reviews should be provided during construction to check that these assumptions are reasonable.

The following subsections provide a summary of the stratigraphic units encountered at the project site at the specific borehole locations. A more detailed description is provided on the borehole logs provided in Appendix B.

4.4.1 Topsoil

A surficial layer of topsoil was encountered at the borehole locations with varying thicknesses ranging between 100 mm and 400 mm. The topsoil was generally described as clay, silty, sandy, moist, dark brown with roots and organics. The thickness of topsoil should be expected to vary across the lands, with thicker topsoil expected in low lying areas. Note that the underlying 'B Horizon' layer may extend an additional 300 mm.

4.4.2 Clay

A clay layer was encountered below the topsoil at some of the borehole locations, extending to depths ranging between 0.5 m and 4.9 m. The clay was described as silty, some sand, moist to very moist, high plastic, and firm to very stiff in consistency. Moisture contents of samples from this layer indicated values ranging between 11% and 30%. Atterberg Limits testing indicated a Liquid Limit of 65% and a Plastic Limit of 17%, indicative of high plasticity. One of the properties of this clay soil is its propensity to swell with increasing moisture content. The clay soils are considered to have a high swelling potential. Standard Penetration Test (SPT) "N" values within this layer ranged from 7 to 35 blows per 300 mm penetration, indicative of firm to very stiff consistency.

4.4.3 Clay Till

Clay till was encountered beneath the topsoil and clay (where encountered), and extended to borehole termination depths. The clay till was generally described as silty, some sand to sandy, trace gravel, damp to moist, medium plastic, very stiff, and light brown, with coal and oxide specks, and white precipitates. Occasional sand lenses and pockets, coal inclusions, oxide staining, gravel inclusions, and high plastic clay inclusions were also encountered at the borehole locations. Moisture contents of samples in this layer indicated values ranging between 10% and 37%. Atterberg Limits testing indicated Liquid Limits ranging from 39% to 57% and Plastic Limits ranging from 13% to 15%, indicative of medium plasticity, with high plastic inclusions.

Standard Penetration Test (SPT) "N" values within this layer ranged from 11 to 59 blows per 300 mm penetration, indicative of stiff to hard consistency.

The results of Standard Proctor moisture density testing of the clay till indicate a maximum dry density of 1760 kg/m^3 at an optimum moisture content (OMC) of 15.5%.

A more complete description of the subsurface conditions encountered at the borehole locations is provided on the borehole logs presented in Appendix B.

4.5 Groundwater Conditions

The groundwater level was measured on October 18, 2010. The following table summarizes the groundwater monitoring data.

Table 4.5: Groundwater Monitoring Data

Borehole Number	Depth of Standpipe (m)	Geodetic Elevation of Borehole (m)	Groundwater Monitoring Data October 18, 2010	
			Depth to Groundwater (m)	Elevation of Groundwater (m)
BH001	6.6	936.17	DRY	-
BH002	9.6	930.57	1.65	928.92
BH003	9.6	930.60	2.09	928.51
BH004	6.6	932.45	DRY	-
BH005	9.6	933.56	4.87	928.69
BH006	6.6	935.04	DRY	-
BH007	6.6	935.72	DRY	-
BH008	6.6	935.33	6.19	929.14
BH009	9.6	936.35	DRY	-
BH010	6.6	937.59	DRY	-
BH011	9.6	938.99	DRY	-
BH012	6.6	935.80	DRY	-
BH013	9.6	938.42	DRY	-
BH014	6.6	940.59	DRY	-
BH015	9.6	937.32	DRY	-
BH016	6.6	937.44	DRY	-
BH017	9.6	936.88	DRY	-
BH018	9.6	939.24	DRY	-
BH019	6.6	941.74	DRY	-
BH020	9.6	934.41	DRY	-

It is noted that groundwater levels will fluctuate seasonally in response to climatic conditions, and may be at a different depth when construction commences. Groundwater levels should be monitored prior to development. The intent is to provide an early indication of dewatering requirements during excavation for foundations or utility trenches.

Further comments regarding groundwater issues are provided in subsequent sections.

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 General

The recommendations that follow offer varying options intended to aid in the development of the project concepts and specifications. The recommendations are provided on the understanding and condition that EBA will be retained to review the relevant aspects of the final design (drawings and specifications), and will be retained to conduct such field reviews as are necessary to ensure compliance with geotechnical aspects of the Building Code, this report, and the final plans and specifications. EBA accepts no liability for any use of this report in the event that EBA is not retained to provide these review services.

Recommendations are provided for shallow footings, cast-in-place concrete piles, grade supported floor slabs, below grade construction, general site development and lot grading, trench excavation and backfill, stormwater retention ponds, groundwater issues, backfill materials and compaction, roadway subgrade preparation, pavements, and concrete type.

A groundwater study has not been requested as part of this evaluation. It is recommended that weeping tiles for the residences include tie-ins to the storm sewer utility, as per City of Lethbridge Design Standards.

The initial topsoil stripping depth is of particular importance. A topsoil survey is recommended on a phase by phase basis to confirm stripping requirements. Following removal of the surficial organic topsoil, the majority of any underlying B Horizon layer (organic stained, but essentially inorganic clay) can likely remain in place during site stripping and be incorporated into the fill mass during general site grading. Full-time monitoring by experienced personnel is recommended in order to avoid over-stripping and to ensure appropriate material mixing and placement.

Subgrade preparation is required in all lots as well as all paved areas, to City of Lethbridge Standards. This includes stripping of topsoil and deleterious fill materials, scarification, moisture conditioning, and compaction. The native clay soils should be acceptable for site grading purposes in most areas. The clay soils appear to be both below and above optimum moisture content and as such, moisture conditioning (wetting, mixing, and drying as necessary) will be required to reduce the swelling potential of this soil and to achieve the compaction standards recommended. Proof-rolling within roadways to detect soft areas is also recommended. The contractor should expect soil moisture variability across the site.

Particular attention should be given to areas of existing development (farmsteads, dugouts, existing underground utilities, septic fields, solid waste pits and/or burn pits etc). Existing dugouts should be drained, all saturated material removed and backfilled with general engineered fill. All existing utilities (whether operational or abandoned) must be located. Existing utility trenches pose a particular risk due to settlement of backfill material. Care should be taken to ensure that all existing utility trenches are excavated to remove the utility and backfilled with general engineered fill. All other existing or historical ground disturbances should be removed and backfilled with general engineered fill.

Shallow footings are generally feasible for residential developments in all areas of the subdivision, most likely in conjunction with full or partial basements. Further recommendations are provided in Section 5.10. However, because footings may be placed within areas of general engineered fill, full-time quality assurance monitoring by geotechnical personnel is required during fill placement. It is noted that placement of foundations on engineered cohesive fill thicknesses greater than 1.5 m require special consideration regarding long-term consolidation of the fill and subsequent performance issues with the foundations/floor slabs-on-grade. Following finalization of the surface grades for the subdivision, this aspect will need to be addressed, as per City of Lethbridge Design Standards.

Cast-in-place concrete piles are a feasible alternative for other developments, such as schools or commercial buildings. However, for drilled pile foundations, the thin wet sand lenses and inclusions within the clay till may necessitate the use of casing to prevent sloughing of the pile bores. This may make this foundation alternative less economic in consideration of a shallow foundation system. Recommendations for both of these foundation systems are provided in the following subsections.

Slabs-on-grade for this project must consider the precautions recommended for slabs-on-grade, including the subgrade preparation measures intended to improve slab performance.

All foundation recommendations presented in this report are based on the assumption that an adequate level of monitoring will be provided during construction and that all construction will be carried out by suitably qualified contractors, experienced in foundation and earthworks construction. An adequate level of monitoring is considered to be:

- for shallow foundations and slabs; inspection of bearing surfaces prior to placement of concrete or mudslab, and design review during construction;
- for pile foundations; full time monitoring and design review during construction; and
- for earthworks; full-time monitoring and compaction testing.

All such monitoring should be carried out by suitably qualified persons, independent of the contractor. One of the purposes of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the site.

5.2 Lot Grading

The lot grading should be designed and carried out to the current City of Lethbridge Infrastructure Services Engineering Standards, with particulars discussed as follows.

All lots should be graded for drainage at a minimum gradient of 2.0%. The existing surficial site soils, comprising medium plastic clay and clay till, are suitable for use as landscape fill materials or for use as general engineered fill materials for lot grading, as defined in Appendix C. The moisture content of the site soil materials at surface generally appears to be both above and below the anticipated optimum moisture content for these soils in most areas. It is anticipated therefore, that moisture conditioning consisting of both wetting and drying will be required at the site for proper compaction. Although soil moisture variability should be expected, the earthwork contractor should assess the requirements and should consider such factors as weather and construction procedures.

General engineered fill materials for lot grading should be moisture conditioned to within a range of -1% to +2% of the OMC prior to compaction, and compacted to a minimum of 98% of SPD.

Further recommendations regarding backfill materials and compaction are in Appendix C.

5.3 Construction Excavations

Excavations should be carried out in accordance with the Alberta OH&S Regulations. For this project, the depth for the majority of the excavations is assumed to be less than 3.0 m below existing ground surface. Excavations to deeper depths require special considerations. The following recommendations notwithstanding, the responsibility of trench and all excavation cut slopes resides with the Prime Contractor and should take into consideration site-specific conditions concerning soil stratigraphy and groundwater. All excavations should be reviewed by a geotechnical engineer prior to personnel working within the base of the excavation.

Temporary excavations within stiff clay soils which are to be deeper than 1.5 m should have the sides shored and braced or the slopes should be cut back no steeper than 1.0 horizontal to 1.0 vertical.

Flatter sideslopes may be required in some areas where groundwater is encountered within sand/silt layers interbedded within the clay layers, which may cause local sloughing and instability of the excavation sidewalls. In these instances, the excavation configuration design should be reviewed by experienced personnel, prior to allowing personnel to enter the base of the excavation. Vertical trench cuts utilizing trench box wall support are not recommended for this project due to the inherent difficulty in compacting the backfill materials to an engineered standard, as well as the potential of cave-ins of the excavation sidewalls against the utility box.

Any encountered groundwater seepage should be directed towards sumps for removal. Conventional construction sump pumps should be capable of groundwater control.

The composition and consistencies of the soils encountered along the utility alignments are such that conventional hydraulic excavators should be able to remove these materials.

Temporary surcharge loads, such as spill piles, should not be allowed within a distance equal to the depth of the excavation from an unsupported excavation face or 3.0 m, whichever is greater, while mobile equipment should be kept back at least 3.0 m. All excavation sidewall slopes should be checked regularly for signs of sloughing, especially after rainfall periods. Small earth falls from the sideslopes are a potential source of danger to workmen and must be guarded against.

General recommendations regarding construction excavations are included in Appendix C.

5.4 Trench Backfill

The moisture content of the clay soils encountered across the site generally varies between below and above the estimated OMC for the materials. It is expected that such soils would be satisfactory as trench backfill material, however, may require moisture conditioning prior to reworking. It is anticipated therefore, that moisture conditioning consisting of both wetting and drying or mixing will be required for proper compaction. The earthwork contractor should, however, make his own estimate of the requirements and should consider such factors as weather and construction procedures.

Trenches must be backfilled in such a way as to minimize the potential differential settlement and/or frost heave movements. A minimum density of 98% of SPD is recommended for all trench backfill, at a moisture content of between −1% and +2% of optimum. The compacted thickness of each lift of backfill shall not exceed 150 mm. The upper 1.5 m of service trenches should be cut back at a maximum slope of 1.0 horizontal to 1.0 vertical to avoid an abrupt transition between backfill and in situ soil.

It should be noted that the ultimate performance of the trench backfill is directly related to the uniformity of the backfill compaction. In order to achieve this uniformity, the lift thickness and compaction criteria must be strictly enforced.

For frost protection, pipes buried with less than 2.0 m of soil cover (above top of pipe) should be protected with insulation to avoid frost damage or breakage of the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

General recommendations regarding construction excavation, backfill materials and compaction are contained in Appendix C.

5.5 Backfill Materials and Compaction

The existing site soils comprising the predominantly medium plastic clay and clay till are adequate for use as both landscape fill and general engineered fill materials, as defined in Appendix C. Any soil containing deleterious materials should be removed from site. The final decision on approved backfill materials should be made during site construction.

The moisture content of the site soil materials is expected to be variable with respect to the optimum moisture contents. It is anticipated, therefore, that moisture conditioning will be required at the site for proper backfill placement. The earthwork contractor should make their own estimate of the requirements for moisture conditioning to the recommended standards, and should consider such factors as weather and construction procedures. A contingency for importation of general engineered clay fill is recommended, in the event that the site soils can not be moisture conditioned.

General engineered fill materials in all building areas and for trenches should be moisture conditioned to within a range of -1% to +2% of the optimum moisture content prior to compaction, and compacted to a minimum of 98% SPD.

Further recommendations for backfill materials and compaction are in Appendix C.

5.6 Street Subgrade Preparation

Within all paved areas, the upper 300 mm of native clay soils or prepared general engineered fill subgrade should be scarified and uniformly moisture conditioned to between -1% of optimum and 2% over optimum moisture content. The subgrade should then be uniformly compacted to a minimum of 98% of SPD.

Based on EBA's local experience, the contractor should be made aware that subgrade difficulties often arise at moisture contents of 3% over optimum, as noted in the current City of Lethbridge Standards, where siltier soils are encountered. Therefore, in practice, the moisture content within proposed paved areas should be limited to no more than 2% over optimum for acceptable subgrade support conditions.

Backfill to raise these areas to subgrade level should be general engineered cohesive fill materials, as defined in the report text or Appendix C, moisture conditioned and compacted as noted previously. The subgrade should be prepared and graded to allow drainage into catchbasins. Proof-rolling of the prepared surface is recommended to identify localized soft areas and for an indication of overall subgrade support characteristics.

It is imperative that positive surface drainage be provided to prevent ponding of water within the roadway structure and subsequent softening and loss of strength of the subgrade materials. Surrounding landscaping should be such that runoff water is prevented from ponding beside paved areas in order to avoid softening and premature failure of the pavement surface.

The soil moisture regime should be considered in achieving the above recommended standards for construction of the subgrades. If localized areas of soft subgrade soils are encountered, provisions may be required to subcut each area and replace with cohesive engineered fill, or alternatively, with granular (pit-run) fill with the use of a geotextile grid or geotextile fabric to strengthen the subgrade support characteristics. Further design information can be provided following initial proof-rolling of the subgrade soils.

5.7 Pavement Design and Construction

For the purposes of this report, two design sections are provided. One, if the roadway design classification is as a 'local' roadway and one where the classification is as a 'collector' roadway.

Table 5.7: Pavement Structures

DESIGN PAVEMENT SECTION		
MATERIAL TYPE	**LOCAL URBAN (mm)**	**COLLECTOR (mm)**
Surface Course Asphalt Concrete (Type III)*	75	50
Base Course Asphalt Concrete (Type II)*	-	60
Granular Base Course*	200	300

* Current City of Lethbridge Transportation Detailed Engineering Standards

A detailed review of the general paving plan has not been completed. The above recommended pavement layer thicknesses generally refer to average values and recognize typical construction variability. As constructed layer thicknesses should satisfy the thickness tolerances identified in the City of Lethbridge Engineering Standards for granular materials and asphalt concrete (or equivalent).

All asphalt paving lifts should be compacted to a minimum of Marshall Design density, as per current City of Lethbridge Transportation Detailed Engineering Standards. Additional recommended guidelines for design and construction of pavement structure are presented in Appendix C of this report.

The pavement design should include provisions for subsurface drainage of the pavement granular layers. For urban sections, one option is to provide subsurface drainage in the form of longitudinal subdrains along the edge of the pavement structure, where viable. Subdrains will provide a means of removing water that infiltrates the pavement structure, either through cracks and vertical details (e.g., face of gutter), or from peripheral surface runoff. The subdrain should consist of a perforated flexible plastic drainpipe

(100 mm diameter), complete with filter sock. The drain should be placed along the edge of the pavement section in a recessed area of the prepared subgrade. Positive outfall of the drains should be provided at catchbasin locations or other stormwater outfalls.

5.8 Concrete Issues

5.8.1 Concrete Type

The water soluble sulphate content of four representative soil samples recovered from the site (determined in a laboratory) varied between 0.01% and 0.1%. The properties of concrete for foundations in contact with soil or groundwater shall meet the requirements of Canadian Standards Association (CSA) A23.1-09, Table 3 Class S-2 exposure, i.e., water/cementing materials (w/cm) ratio of 0.45, air-entrainment of 4% to 7% (for 14 mm to 20 mm nominal maximum aggregate size), and a minimum specified 56-day compressive strength of 32 MPa.

For this exposure classification, alternatives include the usage of Type HS (sulphate-resistant) Portland cement or blends of cement and supplementary cementing materials conforming to Type MSb and/or Type HSb cements.

Stricter recommendations may be required due to structural or other exposure considerations (A23.1-09, Table 1). Air entrainment should be increased to 5% to 7% for exterior flatwork.

5.8.2 Concrete Surface Works

With respect to surface works concrete (i.e., specifically concrete curbs and sidewalks), the recommendations provided in this report for subgrade preparation, including moisture conditioning and compaction, are intended to provide relative uniformity in the subgrade. The intention of uniformity, with respect to material type and moisture content, is to reduce the risk of differential concrete movements due to soil volume changes as a result of fluctuating moisture content. A gradual increase in soil moisture content over time is likely to occur (due to precipitation, reduced evaporation, and irrigation), and some differential movement and subsequent cracking of concrete surface works should be anticipated, typical for the Lethbridge area.

With respect to providing a layer of granular material beneath surface works concrete, there are both positive and negative consequences. In the positive sense, it must be assumed that the subgrade will be uniformly graded properly such that any moisture gaining access beneath the concrete within the granular layer would be drained away quickly to an area designed to accommodate excess moisture (i.e., roadway weeping tile tied into the storm system). If well drained, the provision of granular material also serves to reduce some differential distortions, when washed materials are used, and has been documented as helping to reduce longitudinal cracking.

On the negative side, if free drainage of the granular layer is not designed, constructed, and maintained, granular materials provide easy access for excess moisture to pond below the concrete, causing swelling of the medium to high plastic subgrade soils and/or consolidation of fill soils. There is also a risk of softening of the adjacent roadway pavement edges.

The risk of differential movement of the subgrade soils and the economic consequence for either option should be given due consideration by the municipal engineer.

5.9 Limit States Design

The design parameters provided in the following sections may be utilized to calculate the ultimate foundation capacity in each case. For the Limit States Design (LSD) methodology, in order to calculate the factored load capacity, the appropriate soil resistance factors must be applied to each loading condition, as follows.

Factored Capacity = Ultimate Capacity x (Soil Resistance Factors)

The following soil resistance factors must be incorporated into the foundation design. These factors are considered to be in accordance with the 2006 Canadian Foundation Engineering Manual (CFEM), as well as the 2005 National Building Code of Canada.

Table 5.9: Soil Resistance Factors

Item	Soil Resistance Factor
Shallow Foundations	
Bearing resistance	0.5
Passive resistance	0.5
Horizontal resistance (sliding)	0.8
Deep Foundations	
Axial load - From semi-empirical analysis	0.4
Axial load - From static loading test results	0.6
Axial load - From dynamic monitoring results (i.e., pile driving analyzer [PDA] testing)	0.5
Uplift - From semi-empirical analysis	0.3
Uplift - From loading test results	0.4
Horizontal passive resistance	0.5

Under LSD methodology, foundations should be designed on the basis of factored Ultimate Limit State (ULS) parameters. In order to determine the applicable working capacity, Serviceability Limit States (SLS) must also be considered. The lower of the factored ULS resistance or the unfactored SLS resistance should be used as the working capacity for foundation design purposes

Further comments are provided in the following sections. Deep foundations refer to drilled cast-in-place concrete piles.

5.10 Shallow Foundations

Shallow foundations, if considered, should be constructed a minimum of 1.4 m below the final design exterior ground surface (frost protection requirement).

At the time of preparation of this report, information about the presence of fill soils on site was only available at the specific borehole locations. For this reason, the final subgrade elevation for footings should be determined in the field by qualified geotechnical personnel. All fill and debris materials (where encountered) must be removed from the building footprint areas to expose native clay subgrade.

The ultimate static bearing pressure for the design of strip and spread footings at these depths may be taken as 225 kPa for native clay and clay till soils, subject to other recommendations in this report. The ultimate static bearing pressure is based on correlation between SPT "N" values. Factoring should be considered as noted in Section 5.2. Footing dimensions should be in accordance with the minimum requirements of the Building Code.

Bearing certification by a geotechnical engineer is recommended to ensure that the shallow foundations are placed on competent native soils. If softer native soils or residual fill soils are encountered at footing level, recommendations may be provided to lower the footing elevations to materials satisfying the design bearing capacity or to widen the footings within softer clay areas. This should be a field determination at the time of bearing observation.

It is recommended that a smooth-edge trimming bucket or grade-all be used for final excavation to the foundation subgrade elevation to minimize disturbance of the founding soils. A 50 mm concrete mudslab should be placed immediately following excavation to protect the bearing surface from weathering.

The anticipated foundation soils are of medium plasticity, and as such, are prone to volume changes (both heave and settlement) with varying moisture content. Therefore, a permanent weeping tile system is also recommended around the outside perimeter of any structures at the foundation elevation to maintain a consistent moisture profile of the founding soils. This will reduce the potential of differential movement (heave or settlement) of the foundations.

Settlement of footings designed and constructed in accordance with the above recommendations should be well within the normally tolerated values of 25 mm total and 15 mm differential at factored loading. If this range of settlement is not tolerable, then a pile foundation system may be considered for the building.

Recommendations for minimum depth of cover for footings are presented in Section 5.16. Further recommendations regarding shallow foundations are given in Appendix C.

5.11 Bored Cast-In-Place Concrete Piles

Bored cast-in-place concrete piles, if considered, should be founded in native clay till and may be designed to resist axial compressive loads on the basis of the ultimate skin friction and end-bearing parameters given below. End-bearing should not be used for small diameter (less than 760 mm base diameter) piles because of the difficulties associated with ensuring a clean base. End-bearing may only be considered in the design of under-reamed or belled piles if facilities are available for adequate cleaning of the pile base.

Straight shaft bored piles should have a minimum diameter of 400 mm plus a minimum length of 6.0 m. The piling designer and/or contractor should take the soil conditions into account during pile design consideration. Under-reaming to form belled piles may be considered for piles with shaft diameters of 400 mm or greater, and where formation of the bell is within competent clay till soils to prevent sloughing of the under-ream.

Static ultimate design parameters for skin friction and end-bearing are as follows:

Table 5.11: Static Ultimate Design Parameters for Skin Friction and End-Bearing

Depth below Final Grade (m)	Ultimate Skin Friction (kPa)	Ultimate End-Bearing (kPa)
0 – 1.5	0	N/A
1.5 – 6.0	40	N/A
Below 6.0	50	950

A minimum ratio of depth of cover versus the base or bell diameter (D/B) of 2.5 has been assumed to determine the above end-bearing pressure. Should less cover be provided, the bearing pressure would have to be reduced. Minimum bell diameters should be twice the shaft diameter.

The pile design for belled piles may consider end-bearing in addition to shaft friction, as noted above, in order to determine the total ultimate pile capacity. However, the shaft friction should be neglected for a distance of one shaft diameter above the top of the bell, and within the portion of the pile shafts within fill soils.

Casing should be on hand before drilling starts and used, if necessary, to seal off water and/or prevent sloughing of the hole. In the present site conditions, it is anticipated that casing use may be required due to the presence of groundwater. The piling contractor should make his own estimate of casing requirements considering such factors as soil types, construction procedures, and bore diameter.

5.12 Floor Slabs-On-Grade

Construction of floor slabs-on-grade for this project (outside of basements) must consider the surficial clay soils noted within the development area as well as the general engineered fill layers placed during site grading. Construction may be considered feasible, provided the following precautions and construction recommendations are followed.

In native soils areas, following removal of topsoil, the subgrade should be scarified to a minimum depth of 300 mm, and moisture conditioned to a range of optimum to 2% over OMC. Within areas of fill, the exposed subgrade should be scarified for a minimum depth of 600 mm, considering the clay fill soils (not containing deleterious materials) and moisture conditioned as noted above. The minimum compaction in each case should be 98% of SPD. The prepared subgrade should be proof-rolled and any soft or loose pockets detected should be reconditioned as recommended above or over-excavated and replaced with general engineered fill.

A levelling course of clean well graded crushed gravel, at least 150 mm in compacted thickness, is recommended directly beneath the slabs-on-grade, unless a thicker course is required for structural purposes. The subgrade beneath slabs-on-grade should be protected at all times from moisture or exposure which may cause softening or disturbance of the subgrade soils. This applies during and after the construction period (and before and after replacement of the required general engineered fill). Should the exposed surface become saturated or disturbed, it should be reworked to achieve the above standards.

If the subgrade is properly prepared as noted above, floor slab movements should be limited to less than, approximately, 25 mm. Slabs-on-grade should be separated from bearing members to allow some differential movement. If this range of differential movement is unacceptable, the owner should consider a structurally supported floor.

Recommended procedures for proof-rolling and backfill materials and further recommendations for slabs-on-grade construction are included in Appendix C.

5.13 Structural Slabs

A structurally supported floor slab with a crawl space beneath may be used if differential movements from a slab-on-grade system are not tolerable. The crawl space floor should be graded toward a sump to collect water that may enter. The crawl space floor should also be covered with a vapour barrier and concrete. If a concrete floor is selected for the crawl space, bond breaks should be provided at the foundation walls and columns to allow it to move independently of the structure.

It is important that the crawl space be properly insulated and vented according to applicable building codes, as it has been EBA's experience that in some cases, crawl spaces may develop a moisture/humidity problem. The use of a crawl space with any other floor covering is not recommended for this development.

Alternatively, the slab may be totally structurally supported with no crawl space. However, with this type of structurally supported floor slab system, there is a risk of ground movement relative to the slab. This relative movement can lead to problems if piping and other utilities that are connected to the slab are embedded within the ground beneath the slab. Utilities beneath the structurally supported ground floor slabs should be protected from differential movement by placing utilities within boxes suspended from the structural slab. In addition, a void form is recommended below the floor slab in order to prevent transfer of uplift pressures due to swelling clay soil.

5.14 Basement Construction

5.14.1 Basement Floor Slabs

Slab-on-grade construction for basements is considered feasible providing certain precautions are undertaken. All excavations should be carried out remotely using a smooth-mouth bucket or Grade-All at final grade in order to minimize disturbance of the base. Basement floor slabs should be supported by a minimum of 150 mm compacted, clean, free-draining granular material.

In areas where floor slabs bear on a clay subgrade, the clay at this site may swell following completion of the floor slabs. Therefore, some movement should be anticipated. Any light columns in the basement designed to support the main floor should be of the adjustable "telepost" type. If partitions are constructed in the basement, provision must be made so that, if the basement floor slab heaves, the partitions do not raise the main floor. A minimum allowance of 25 mm should be left between the top plates of basement partitions and the floor above them to accommodate heaving of the floor slab. This heaving allowance is less applicable for interior columns founded on spread footings.

The slab subgrade should be sloped to provide positive drainage to the edge of the slab (where the native soils are cohesive). A minimum drainage gradient of 0.5% is recommended.

Slabs-on-grade should be separated from bearing members to allow some differential movement. If differential movement is unacceptable, a structurally supported floor system or crawlspace may be considered.

General recommendations regarding floor slab construction are presented in Appendix C.

5.14.2 Below-Grade Walls

All below-grade walls should be designed to resist lateral earth pressures in an "at-rest" condition. This condition assumes a triangular pressure distribution and may be calculated using the following expression:

$$P_o = K_o\ (\gamma H+Q)$$

Where: Po = Lateral earth pressure "at-rest" condition (no wall movement occurs at a given depth).

K_o = Coefficient of earth pressure "at-rest" condition (use 0.5 for cohesive backfill and 0.45 for sand and gravel backfill).

γ = Bulk unit weight of backfill soil (use 19 or 21 kN/m^3 for cohesive or granular backfill, respectively).

H = Depth below final grade (m).

Q = Surcharge pressure at ground level (kPa).

It is assumed that drainage is provided for all below-grade walls through the installation of the weeping tile, and hydrostatic pressures will not be a factor in design. An acceptable weeping tile system should consist of a perforated weeping tile wrapped in a geosock or geotextile fabric, in turn surrounded with a minimum of 150 mm thick blanket of washed rock (maximum size 20 mm). The weeping tile should have a minimum 0.5% slope leading to a sump. The preferred method would be to have provision to tie the sump into the storm sewer utility or the property's on site drainage system.

Backfill around concrete walls should not commence before the concrete has reached a minimum two-thirds of its design strength and first floor framing is in place or the walls are laterally braced. Only hand-operated compaction equipment should be employed within 600 mm of the concrete walls. Caution should be used when compacting backfill to avoid high lateral loads caused by excessive compactive effort. A compaction standard of 95% of SPD is recommended. To avoid differential wall pressures, the backfill should be brought up evenly around the walls. A minimum 600 mm thick clay cap should be placed at the ground surface to reduce the infiltration of surface water.

5.15 Foundation Perimeter Drainage Requirements

It is recommended that a weeping tile and sump system be constructed around the outside perimeter of the buildings (at the base of the footings, if selected) to maintain a relatively consistent moisture profile of the subgrade soils. The weeping tile system should comprise a perforated weeping tile, in turn surrounded with a minimum of 150 mm thick blanket of washed rock (maximum size 20 mm) with the granular layer wrapped in non-woven geotextile. The weeping tile should have a minimum 0.5% slope leading to a sump.

5.16 Frost Protection

For protection against frost-action, perimeter footings in heated structures should be extended to such depths as to provide a minimum soil cover of 1.4 m. Isolated or exterior footings in unheated structures should have a minimum soil cover of 2.1 m unless provided with equivalent insulation.

For a deep foundation system, all piles in unheated areas should have full depth steel reinforcement and should be drilled to a minimum depth of 6.0 m. Grade beams spanning concrete piles should have a minimum 100 mm void space on the underside of the grade beam and around the pile caps to reduce the risk of interaction with the underlying soil associated with frost heaving and/or swelling soils.

Pipes buried with less than 2.0 m of soil cover should be protected with insulation to avoid frost effects that might cause damage to or breakage of the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

5.17 Seismic Design

The Site Classification recommended for Seismic Site Response is Classification D, as noted in Table 4.1.8.4.a of NBCC.

6.0 STORMWATER POND DEVELOPMENT

6.1 General

The locations of the stormwater management facilities proposed have not been finalized at the time of preparation of this report.

Based on EBA's understanding of a typical stormwater management facility design, a dry pond typically has a base elevation of approximately 2 m to 3 m below final ground surface. A typical wet pond might have a base elevation ranging between 3 m and 5 m below final ground surface. Such facilities are normally constructed as an excavation below ground surface, while above ground berms are generally not common. The facility will provide overland stormwater storage for the area in accordance with municipal regulations.

Once the operational water level elevation of the wet pond is designed, it is recommended that the proposed sideslopes for the pond below normal operating level be no steeper than 3 horizontal to 1 vertical. Above the normal water level, the sideslopes are recommended to be no steeper than 5 horizontal to 1 vertical.

In the preparation of the recommendations provided in this report for the geotechnical aspects of design and construction of the facility, EBA reviewed pertinent sections of the "Stormwater Management Guidelines for the Province of Alberta", dated January 1999 and prepared by the Municipal Program Development Branch of Alberta Environmental Protection (known now as Alberta Environment (AENV)). Detailed recommendations for the design and construction of this facility are provided in subsequent sections.

6.2 Facility Design

As discussed in the previous sections, the subsurface stratigraphy of the site comprises lacustrine clay overlying glacial clay till. Within the stormwater facility footprint, all organic soils must be removed to ensure the pond subgrades bear on the site's clay soils.

It is considered that the clay till soils will most likely comprise the majority of the clay liner and are found naturally below the proposed pond invert. Literature references (geology) for the clay till (Buffalo Lake Till Sheet) confirm that the till is vertically fractured (due to over consolidation during periods of glaciation). The till is also referenced (as confirmed by the site specific drilling program) to contain sand and/or silt lenses or pockets throughout its matrix. These preferential paths for groundwater seepage may or may not be horizontally continuous and it is not possible to quantify potential seepage losses. However, the literature does present a range of permeability (k) for this till sheet between 10E-05 cm/sec and 10E-06 cm/sec. When compared to the field permeability of a reworked clay liner (recommended k=10E-07 cm/sec), the difference in potential water loss may be in the order of one to two magnitudes (10 to 100 times less for a remoulded clay liner).

It should be recognized that, following construction of the wet pond component (within 3 to 5 years), siltation of the pond floor, swelling of the medium plastic clays, and the development of a groundwater mound will greatly affect the estimated annual water losses. Quantifying this loss to a greater extent than that predicted here would require groundwater modeling which was not included in the current project scope.

In consideration of the above-noted factors, the utilization of the clay till soils in their native state is not recommended because of the potential loss of containment through the fissured till structure and possible silty or sandy pockets within the clay till, which may provide preferential seepage paths. For this development, it is recommended that the native, cohesive clay till soils be reworked into a low permeable, compacted clay liner to provide the required containment (for wet ponds). With this option, some loss of containment is still possible (as with any earth retention structure). However, the recommendations presented herein are intended to limit seepage losses to an acceptable level, consistent with current industry standards.

Alternate liner types, such as synthetics, are not addressed in this evaluation. They may provide additional protection against leakage but are substantially more expensive.

The use of the native clay till materials encountered on this site for construction of a remoulded clay liner for the pond is considered feasible, provided certain precautions are undertaken, as recommended in the following sections. The results from the field program indicate that perched groundwater levels may be within the proposed wet pond invert, within relatively thin or small saturated sand/silt seams. The use of native lacustrine clay soils for construction of remoulded clay liners should be limited to areas above the high water level (HWL).

It is assumed that above the normal water level, the sideslopes are to be 5 horizontal to 1 vertical (5H:1V). Below the normal water level, the sideslopes are assumed to be at approximately 3H:1V. Assuming the embankment between the normal water level and HWL is constructed with an engineered clay liner (as recommended in this report), the potential for erosion from wave action should be considered. Slope protection comprising rip-rap designed for potential wave erosion or other means should be given consideration. The use of a filter fabric median between the native soils and rip-rap is also recommended. Design recommendations for this type of protection are beyond the scope of this report.

For the assessment of clay liner suitability, one laboratory constant head permeability test was conducted on a remoulded sample of the native clay soils. The laboratory test was conducted on composite clay till samples retrieved from between 1.5 m to 3.0 m below ground level (to model that excavated from within the pond footprint and proposed for use as a clay liner). The sample was compacted to approximately 98% of SPD at approximately the OMC for the soil sample (Appendix D). The measured steady state permeability (k) was 6.4E-08 cm/sec. Therefore, the design field liner permeability assumed for the remoulded clay till soil is 6.4E-07 cm/sec. (one order of magnitude larger than the laboratory k). Prior to final design and construction of the proposed facility, additional permeability testing on site soil samples taken from the proposed excavation of the facility or borrow source should be conducted to verify the site specific permeability coefficient.

Based upon the site soil conditions and the above-noted permeability value, it is recommended that a preliminary thickness for the remoulded clay liner be 0.6 m along the base of the wet pond and 1.0 m along the sidewalls up to design operation water elevation (minimum recommended).

A liner thickness of 0.3 m may be given consideration for base liners in other areas of the proposed developed (dry pond), which will only occasionally be below water. This thickness accounts for the potential of desiccation of the upper 0.2 m during the initial periods when the dry pond is empty. It also accounts for potential disturbance during storm events and to facilitate access during periods of maintenance. Thirdly, it is intended as an additional level of protection, to reduce the long term infiltration of groundwater and soil saturation below the dry pond, as a means of maintaining long-term stability of the adjacent slopes.

The following discussions and recommendations pertain to the pond construction, including the construction of a low permeability compacted clay liner.

6.3 Pond Construction

6.3.1 General Base Preparation

Following stripping of any organic materials within the development area, the containment basin area should be over-excavated beneath the proposed invert elevation in order to allow sufficient thickness of compacted clay base liner. The clay till soil within the base of the excavation should then be scarified to a minimum depth of 300 mm, moisture conditioned to between –1% and +2% of OMC, and recompacted to a minimum of 98% of SPD. The prepared subgrade thickness may be taken into account in the design liner thickness.

The basin sidewalls in the cut areas (up to HWL) should also be over-excavated a sufficient amount to allow the construction of a compacted clay liner with the exposed subgrade scarified, moisture conditioned, and compacted as noted above.

Monitoring of excavated soils within the pond footprint is recommended so that unsuitable materials, such as low plastic silts or cohesionless sands, are incorporated only in general landscape areas (above HWL) where low permeability is not a requirement.

The composition and consistencies of the soils encountered on the property are such that conventional hydraulic excavators should be able to remove these materials. Cobbles and boulders may be present within the clay till matrix, albeit infrequently. General recommendations regarding backfill materials and compaction as well as construction excavations are given in Appendix C.

Full-time monitoring is recommended by suitably qualified persons, independent of the Contractor. One of the purposes of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the site.

6.3.2 Remoulded Clay Liner

The following recommendations for the construction of remoulded clay liners are based on compliance with Alberta Environment's publication, “Stormwater Management Guidelines for the Province of Alberta”, dated January 1999. This publication does not specifically provide permeability recommendations for wet ponds, however, it does provide a guideline in Figure 6.10, Wet Detention Pond Plan Sections, for suitable subgrade to prevent infiltration below permanent depth (Max = 1.2 m/Min = 0.6 m).

Recommendations for the pond base and sidewall preparation have been provided in the previous section. The plan dimensions of the excavation should exceed the final "toe to toe" interior basin dimensions to provide an overlap between the pond floor liner, and berm or sideslope liner. The subgrade should be relatively level and proof-rolled to provide a good base for compacting the first liner lift to the specified density. Soft pockets that would prevent sufficient compaction of the liner must be over-excavated and replaced with compacted cohesive clay fill materials. In lieu of satisfying the compaction requirements, a geotextile fabric (such as Armtec 200) may be required on or about the elevation of any encountered soft subgrade, although this is not anticipated for the current site conditions.

Careful site observation and testing will be required to avoid incorporating low or non-plastic materials into the liner. It is recommended that materials with a Liquid Limit of less than 30 not be incorporated into the liner. However, low plastic clays, silt or sands not meeting liner requirements, may be used in the top areas of the embankments above HWL or outside the liner zones.

Based on the results of the field program, moisture conditioning of the clay liner materials will be required during liner construction. Appropriate methods of moisture conditioning should be reviewed with qualified construction personnel prior to final design of the liner.

Subsequent to the preparation of the pond floor, the excavated clay soils (liner borrow material) should be moisture conditioned to between –1% and +2% of OMC. Each lift should then be compacted to a minimum of 98% of SPD in lifts of maximum 150 mm compacted thickness to a total placed liner thickness of 0.6 m for the base, as recommended above.

A maximum "clod" size of 100 mm during moisture conditioning (prior to compaction) will produce relatively uniform moisture content throughout the soil matrix and a relatively homogenous compacted soil structure. The size of the "clods" can be controlled with agricultural equipment such as a disk. As far as practical, the liner should be built up in a uniform fashion over the containment basin area, in order to avoid sections of “butted fill” where seepage paths may develop. Compaction should be carried out utilizing "kneading" type compaction equipment such as vibratory padfoot or sheepsfoot type compactors. Completed liner areas should have the surface smoothed by a vibratory smooth drum roller.

Sideslope liners in "cut" areas should have a minimum thickness (perpendicular to the slope face) of 1.0 m, as noted. The cohesive materials for the sideslope liners should be moisture conditioned and compacted as indicated above for the pond bottom.

If a lift of liner soil is allowed to become dry and desiccated prior to the placement of the next lift, the exposed surface should be scarified, re-moisture conditioned, and recompacted. Prior to pond filling and during maintenance periods when the pond is empty, the pond bottom should be prevented from drying out beyond 0.2 m as accounted for in the design liner thickness.

7.0 DESIGN AND CONSTRUCTION GUIDELINES

Recommended general design and construction guidelines are provided in Appendix C, under the following headings:

- Shallow Foundations
- Floor Slabs-on-Grade
- Construction Excavations
- Backfill Materials and Compaction
- Bored Cast-In-Place Concrete Piles
- Proof-Rolling

These guidelines are intended to present standards of good practice. Although supplemental to the main text of this report, they should be interpreted as part of the report. Design recommendations presented herein are based on the premise that these guidelines will be followed. The design and construction guidelines are not intended to represent detailed specifications for the works although they may prove useful in the preparation of such specifications. In the event of any discrepancy between the main text of this report and Appendix C, the main text should govern.

8.0 REVIEW OF DESIGN AND CONSTRUCTION

EBA should be given the opportunity to review details of the design and specifications, related to geotechnical aspects of this project, prior to construction.

Bearing surfaces, foundation installation, and deep excavations should be monitored by qualified geotechnical personnel during construction. EBA should be retained to provide these services. A detailed, site specific geotechnical evaluation is recommended for large structures (i.e. multi-family residences, institutional and commercial developments).

9.0 LIMITATIONS

Recommendations presented herein are based on a geotechnical evaluation of the findings in twenty geotechnical boreholes and a review of historical air photos, mine records, and other existing information. The conditions encountered during the fieldwork are considered to be reasonably representative of the site. If, however, conditions other than those reported are noted during subsequent phases of the project, EBA, A Tetra Tech Company, should be notified and given the opportunity to review our current recommendations in light of new findings. Recommendations presented herein may not be valid if an adequate level of monitoring is not provided during construction.

10.0 CLOSURE

We trust this report satisfies your present requirements. We would be pleased to provide further information that may be needed during the design and to advise on the geotechnical aspects of specifications for inclusion in contract documents. Should you require additional information or monitoring services, please contact the undersigned at your convenience.

EBA, A Tetra Tech Company

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December 7, 2010

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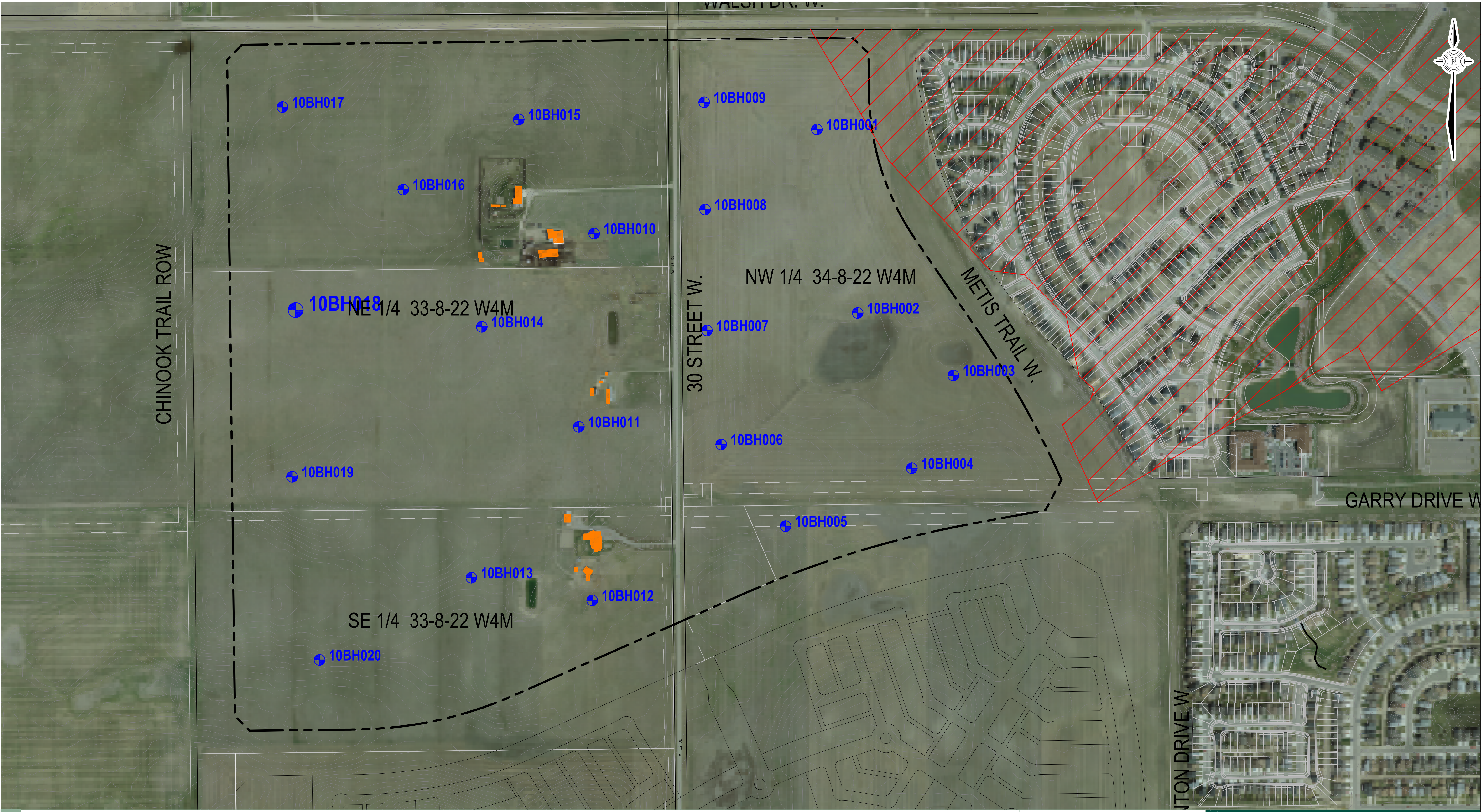
PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
Signature
Date Dec 07, 2010
PERMIT NUMBER: P245
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FIGURES



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LEGEND

- – - – SITE BOUNDARY

⊕ BOREHOLE LOCATION

▨ APPROXIMATE LOCATION OF UNDERGROUND MINE

🟧 EXISTING BUILDINGS

0 100 250 500m

SCALE 1:10 000

CLIENT

Gemini Property and
Land Development

COUNTRY MEADOWS OUTLINE PLAN

SITE PLAN

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
L12101650	LCH	TC	0
OFFICE	DATE		
EBA-Lethbridge	December 8, 2010		

Figure 1

APPENDIX A

APPENDIX A GEOTECHNICAL REPORT – GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client’s expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

APPENDIX B BOREHOLE LOGS

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 to 20%	0 to 4
Loose	20 to 40%	4 to 10
Compact	40 to 75%	10 to 30
Dense	75 to 90%	30 to 50
Very Dense	90 to 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (kPa)
Very Soft	Less Than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater Than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

GENERAL DESCRIPTIVE TERMS

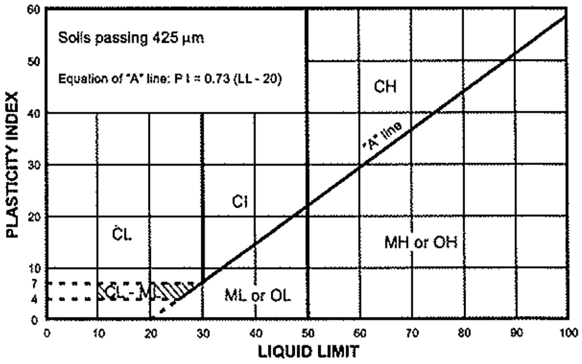
Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated	- composed of thin layers of varying colour and texture.
Interbedded	- composed of alternate layers of different soil types.
Calcareous	- containing appreciable quantities of calcium carbonate.
Well Graded	- having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded	- predominantly of one grain size, or having a range of sizes with some intermediate size missing.

eba

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION				GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS More than 50% retained on 75 μm sieve*	**GRAVELS** 50% or more of coarse fraction retained on 4.75 mm sieve	**CLEAN GRAVELS**		GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% Pass 75 μm sieve More than 12% Pass 75 μm sieve 5% to 12% Pass 75 μm sieve GW, GP, SW, SP GM, GC, SM, SC Borderline Classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		GRAVELS WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
				GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
	SANDS More than 50% of coarse fraction passes 4.75 mm sieve	**CLEAN SANDS**		SW	Well-graded sands and gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
				SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		SANDS WITH FINES		SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
				SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 μm sieve*	**SILTS**	Liquid limit	<50	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity	For classification of fine-grained soils and fine fraction of coarse-grained soils.		
			>50	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CLAYS Above "A" line on plasticity chart negligible organic content	Liquid limit	<30	CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			30-50	CI	Inorganic clays of medium plasticity, silty clays			
			>50	CH	Inorganic clays of high plasticity, fat clays			
	ORGANIC SILTS AND CLAYS	Liquid limit	<50	OL	Organic silts and organic silty clays of low plasticity			
			>50	OH	Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils			

PLASTICITY CHART



*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

SOIL COMPONENTS

FRACTION	SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS	
	PASSING	RETAINED	PERCENTAGE	DESCRIPTOR
GRAVEL				
coarse	75 mm	19 mm	>35 %	"and"
fine	19 mm	4.75 mm	21 to 35 %	"y-adjective"
SAND				
coarse	4.75 mm	2.00 mm	10 to 20 %	"some"
medium	2.00 mm	425 μm		
fine	425 μm	75 μm	>0 to 10 %	"trace"
SILT (non plastic) or CLAY (plastic)	75 μm		as above but by behavior	

OVERSIZE MATERIAL

Rounded or subrounded

COBBLES	75 mm to 300 mm
BOULDERS	> 300 mm

Not rounded

ROCK FRAGMENTS	>75 mm
ROCKS	> 0.76 cubic metre in volume

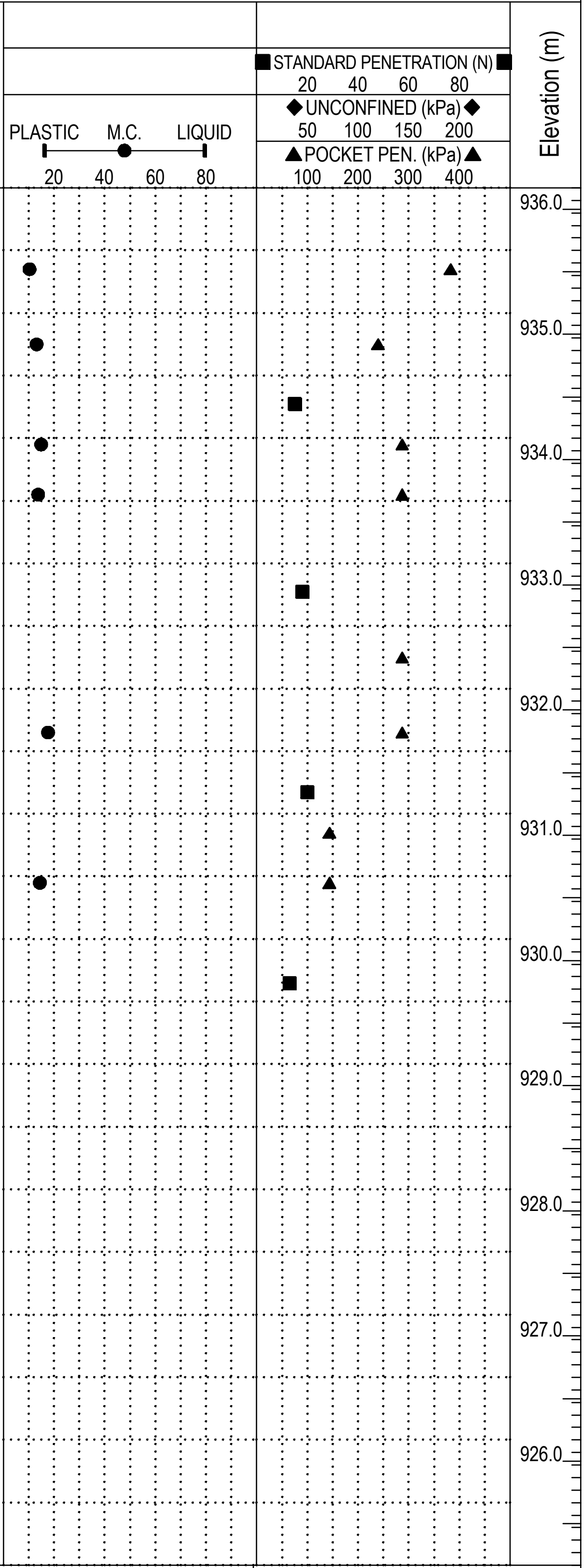
EBA Engineering Consultants Ltd.

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH001
CITY: LETHBRIDGE, AB	5507132N; 378547E; Zone 12	ELEVATION: 936.17m

SAMPLE TYPE ▆ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▆ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, light brown, coal and oxide specks, white precipitates				
		▆	B1		10.3
1					
	... moist, brown with dark brown mottling, occasional high plastic clay inclusions	▆	B2		13.1
	... some sand to sandy, light brown to brown, occasional sand pockets to 50mm	☒	D1	15	
2	... some sand, brown	▆	B3		14.9
		▆	B4		13.7
3	... slight oxide staining				
		☒	D2	18	
	... light brown with dark brown mottling				
		▆	B5		
4					
		▆	B6		17.6
		☒	D3	20	
5	... stiff				
		▆	B7		
		▆	B8		14.4
6					
		☒	D4	13	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					

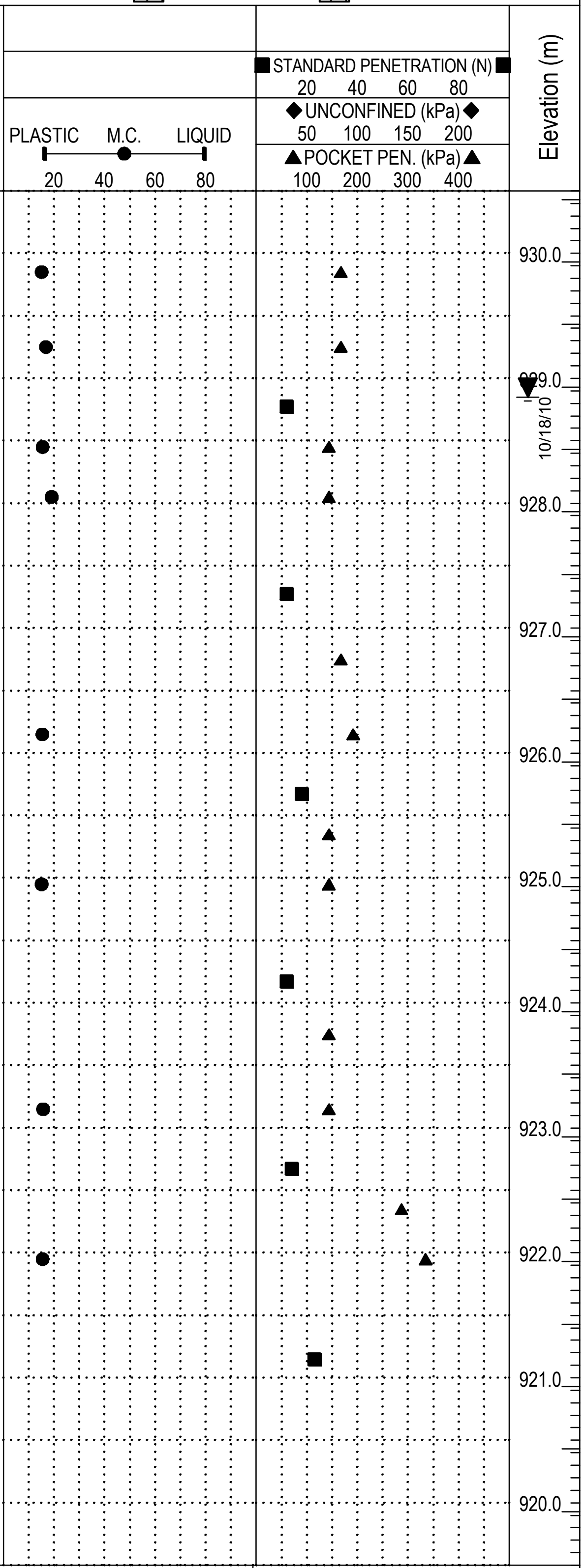


LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B1	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH002
CITY: LETHBRIDGE, AB	5506827N; 378615E; Zone 12	ELEVATION: 930.57m

SAMPLE TYPE	▨ DISTURBED	▱ NO RECOVERY	☒ SPT	☰ A-CASING	▥ SHELBY TUBE	▮ CORE
BACKFILL TYPE	▨ BENTONITE	⁘ PEA GRAVEL	▥ SLOUGH	⁘ GROUT	▧ DRILL CUTTINGS	⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, thin sand lenses, high plastic clay inclusions				
		▨	B1		15.1
1					
		▨	B2		16.8
▼ 10/18/10	... white precipitates	☒	D1	12	
2	... brown	▨	B3		15.5
		▨	B4		19.1
3					
		☒	D2	12	
		▨	B5		
4	... oxide staining, weathered				
		▨	B6		15.4
	... very stiff, light brown with dark brown mottling				
		☒	D3	18	
5					
		▨	B7		
	... stiff	▨	B8		15.1
6					
		☒	D4	12	
		▨	B9		
7					
		▨	B10		15.7
		☒	D5	14	
8	... very stiff	▨	B11		
		▨	B12		15.5
9					
		☒	D6	23	
	End of Borehole @ 9.6m				
10	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Indicated Water Level Measured Oct. 18, 2010				
11					



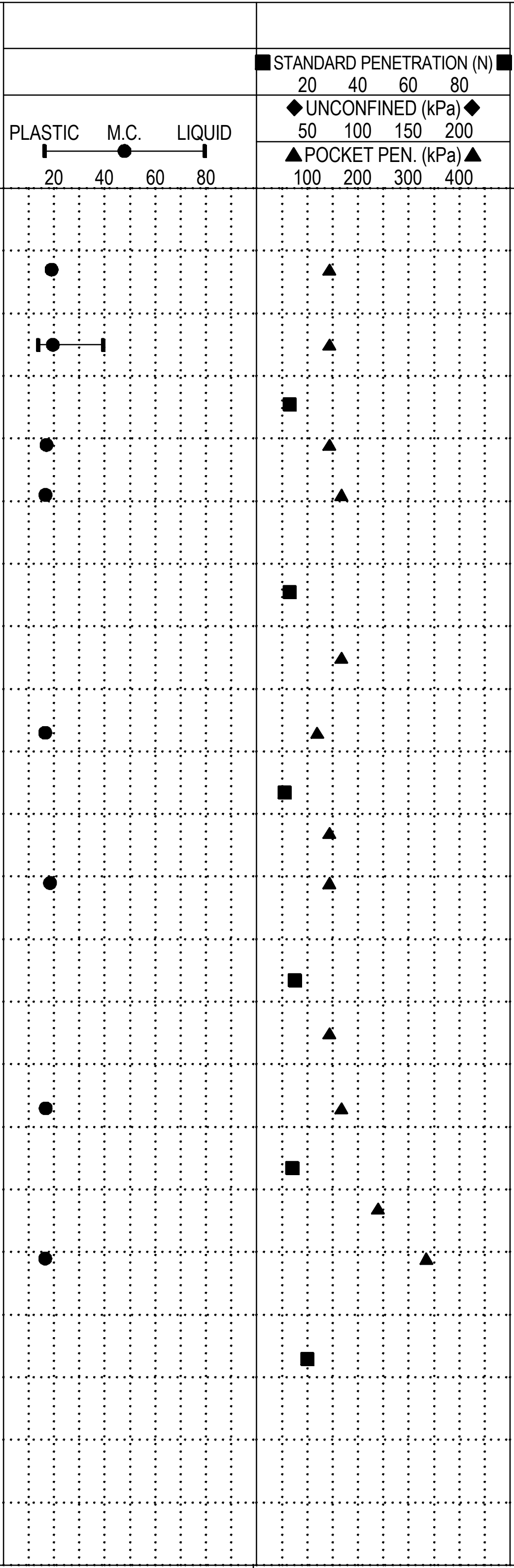
eba	LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
	REVIEWED BY: JAR	COMPLETE: 10/5/2010
	DRAWING NO: B2	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH003
CITY: LETHBRIDGE, AB	5506723N; 378774E; Zone 12	ELEVATION: 930.6m

SAMPLE TYPE ▨ DISTURBED ◸ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics					
	CLAY - silty, some sand to sandy, moist, stiff, medium plastic, light brown, sand lenses, white precipitates, slightly laminated					930.0
	CLAY (TILL) - silty, some sand to sandy, trace gravel, moist, very stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, thin sand lenses, white precipitates	▨	B1		19	
1						
		▨	B2		19.5	
	... slight oxdie staining, high concentration white precipitates					929.0
		☒	D1	13		
2	... some sand, brown to grey brown, heavy oxide staining, weathered	▨	B3		17	
10/18/10		▨	B4		16.6	928.0
3	... light brown with drak brown mottling					
		☒	D2	13		
						927.0
		▨	B5			
4						
		▨	B6		16.5	
	... brown					926.0
		☒	D3	11		
5		▨	B7			
		▨	B8		18.4	925.0
6	... very stiff					
		☒	D4	15		
	... stiff					924.0
		▨	B9			
7						
		▨	B10		16.7	
						923.0
		☒	D5	14		
8	... very stiff	▨	B11			
		▨	B12		16.5	922.0
9						
		☒	D6	20		
	End of Borehole @ 9.6m No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Indicated Water Level Measured Oct. 18, 2010					921.0
10						
						920.0
11						



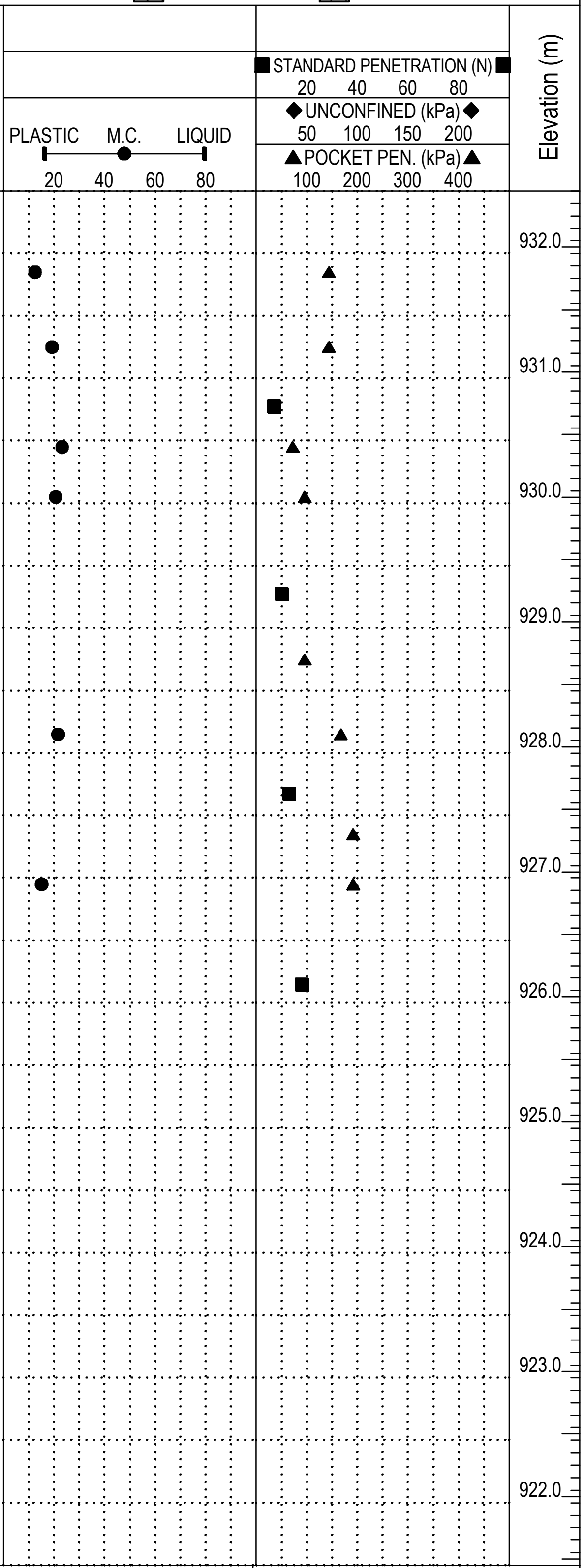
eba	LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
	REVIEWED BY: JAR	COMPLETE: 10/5/2010
	DRAWING NO: B3	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH004
CITY: LETHBRIDGE, AB	5506569N; 378705E; Zone 12	ELEVATION: 932.45m

SAMPLE TYPE ▩ DISTURBED ▨ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▩ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁙ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, some sand, damp to moist, stiff, medium plastic, brown, white precipitates				
	... soluble sulphate content = 0.01% @ 0.6m	▩	B1		12.5
1	... occasional sand lenses				
	... oxide staining, slightly weathered	▩	B2		19.2
	... moist to very moist, firm, high plastic clay inclusions				
	... trace to some sand, medium to high plastic	☒	D1	7	
2	... some sand to sandy, medium plastic, occasional sand pockets to 75mm	▩	B3		23.2
	... stiff	▩	B4		20.7
3	... trace to some sand, medium to high plastic	☒	D2	10	
		▩	B5		
4		▩	B6		21.6
		☒	D3	13	
5	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, thin sand lenses, occasional high plastic clay inclusions	▩	B7		
		▩	B8		15.1
6	... oxide stianing, weathered	☒	D4	18	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B4	Page 1 of 1

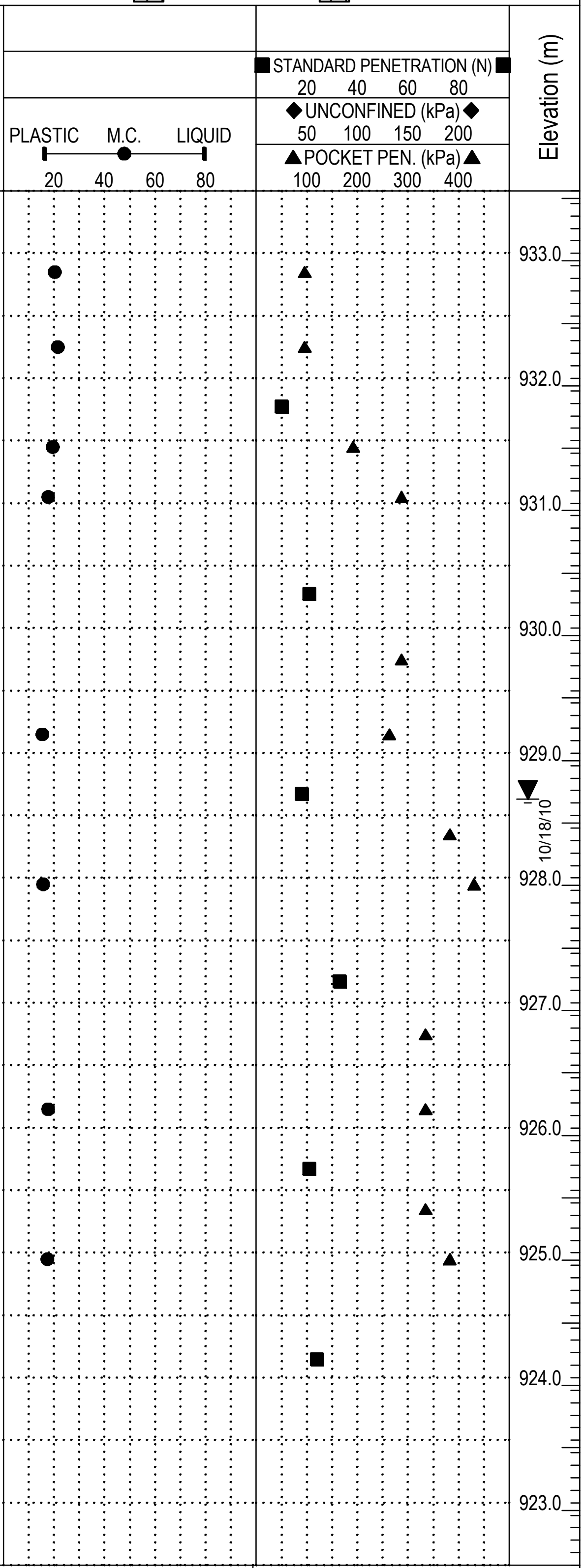
PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH005
CITY: LETHBRIDGE, AB	5506472N; 378495E; Zone 12	ELEVATION: 933.56m

SAMPLE TYPE ■ DISTURBED ◪ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ■ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, trace to some sand, miost, stiff, medium to high plastic, light brown, white precipitates	■	B1		20.3
1	... occasional sand lenses	■	B2		21.5
		☒	D1	10	
2	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, light brown with dark brown mottling, sand lenses, occasional high plastic clay incluisons	■	B3		19.5
	... very stiff, brown with dark brown mottling	■	B4		17.7
3		☒	D2	21	
		■	B5		
4		■	B6		15.4
	... trace to some sand, medium to high plastic				
5		☒	D3	18	
		■	B7		
	... hard	■	B8		15.7
6		☒	D4	33	
	... very stiff	■	B9		
7	... light brown with grey brown mottling	■	B10		17.7
8		☒	D5	21	
		■	B11		
		■	B12		17.4
9		☒	D6	24	
	End of Borehole @ 9.6m				
10	No Seepage or Sloughing on Completion Slotted PVC Standpipe Installed to 9.6m Indicated Water Level Measured Oct. 18, 2010				
11					

▼ 10/18/10

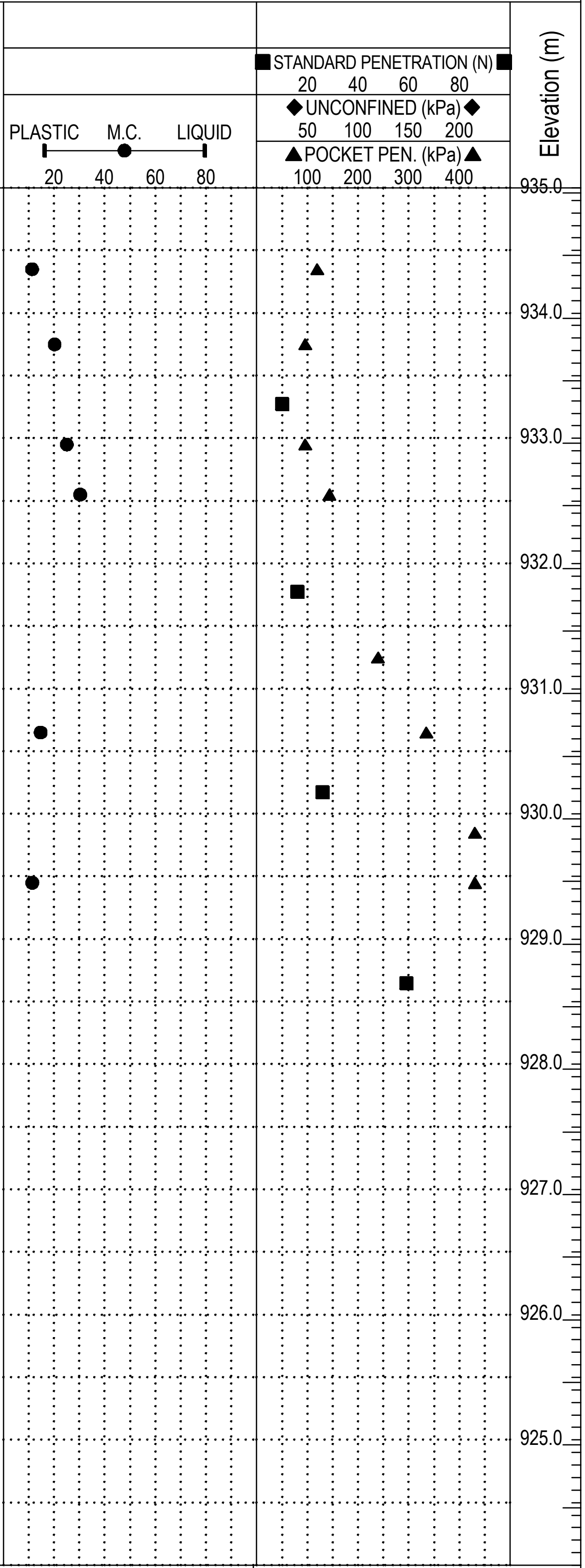


LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B5	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH006
CITY: LETHBRIDGE, AB	5506608N; 378388E; Zone 12	ELEVATION: 935.04m

SAMPLE TYPE	▆ DISTURBED	◸ NO RECOVERY	☒ SPT	☰ A-CASING	▥ SHELBY TUBE	▮ CORE
BACKFILL TYPE	▆ BENTONITE	⁘ PEA GRAVEL	▥ SLOUGH	⁘ GROUT	▧ DRILL CUTTINGS	⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, trace to some sand, damp to moist, medium to high plastic, light brown with dark brown mottling, high plastic clay inclusions	▆	B1		11.3
1	... moist, white precipitates				
	... oxide staining, weathered	▆	B2		20.2
		☒	D1	10	
2	... some sand				
	... very moist, sand pockets to 100mm	▆	B3		25
	... trace to some sand, moist to very moist, medium to high plastic	▆	B4		30.3
3	... very stiff				
		☒	D2	16	
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, light brown to brown, coal and oxide specks, thin sand lenses	▆	B5		
4		▆	B6		14.7
		☒	D3	26	
5	... damp to moist, hard	▆	B7		
		▆	B8		11.4
6		☒	D4	59	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



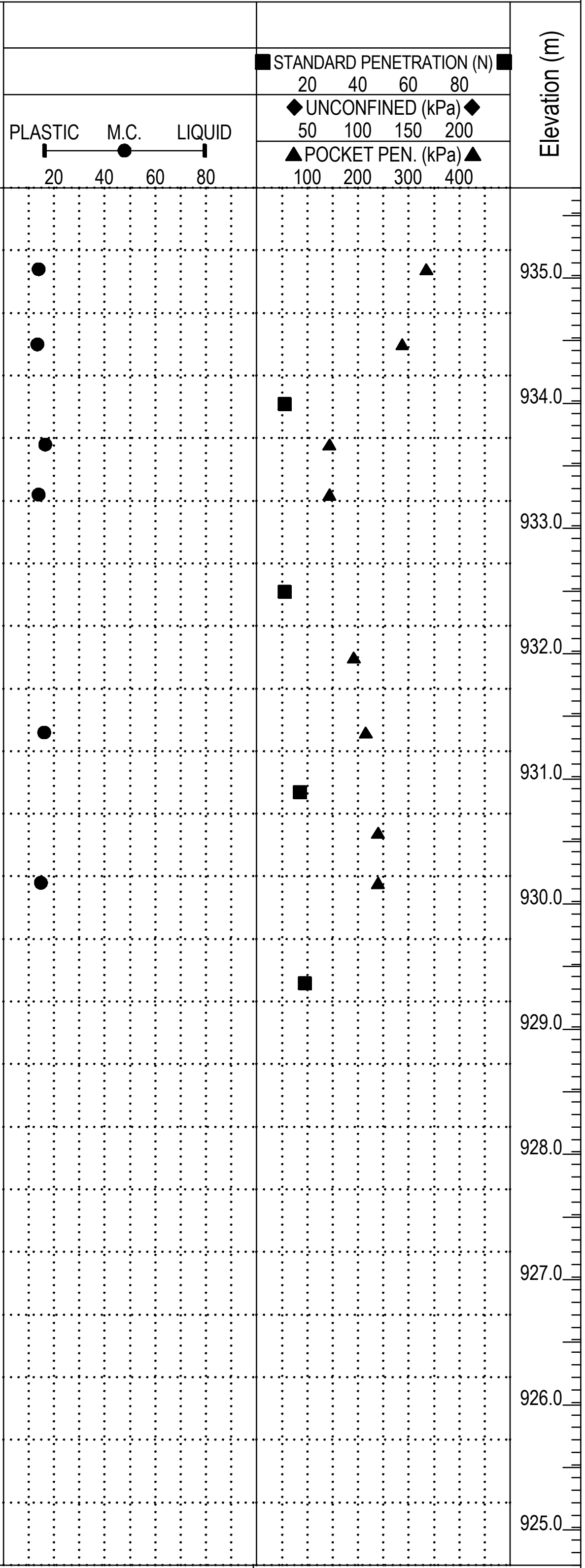
LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B6	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH007
CITY: LETHBRIDGE, AB	5506798N; 378364E; Zone 12	ELEVATION: 935.72m

SAMPLE TYPE ■ DISTURBED ⧄ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ◧ CORE

BACKFILL TYPE ■ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, some sand, moist, stiff, medium plastic, light brown, white precipitates	■	B1		13.9
1					
	... soluble sulphate content = 0.1% @ 1.2m	■	B2		13.4
		☒	D1	11	
2	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, thin sand lenses, white precipitates	■	B3		16.5
		■	B4		13.9
3					
		☒	D2	11	
	... very stiff	■	B5		
4					
		■	B6		16.1
5	... oxide staining, weathered	☒	D3	17	
		■	B7		
		■	B8		14.8
6					
		☒	D4	19	
	End of Borehole @ 6.6m				
7	No seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B7	Page 1 of 1

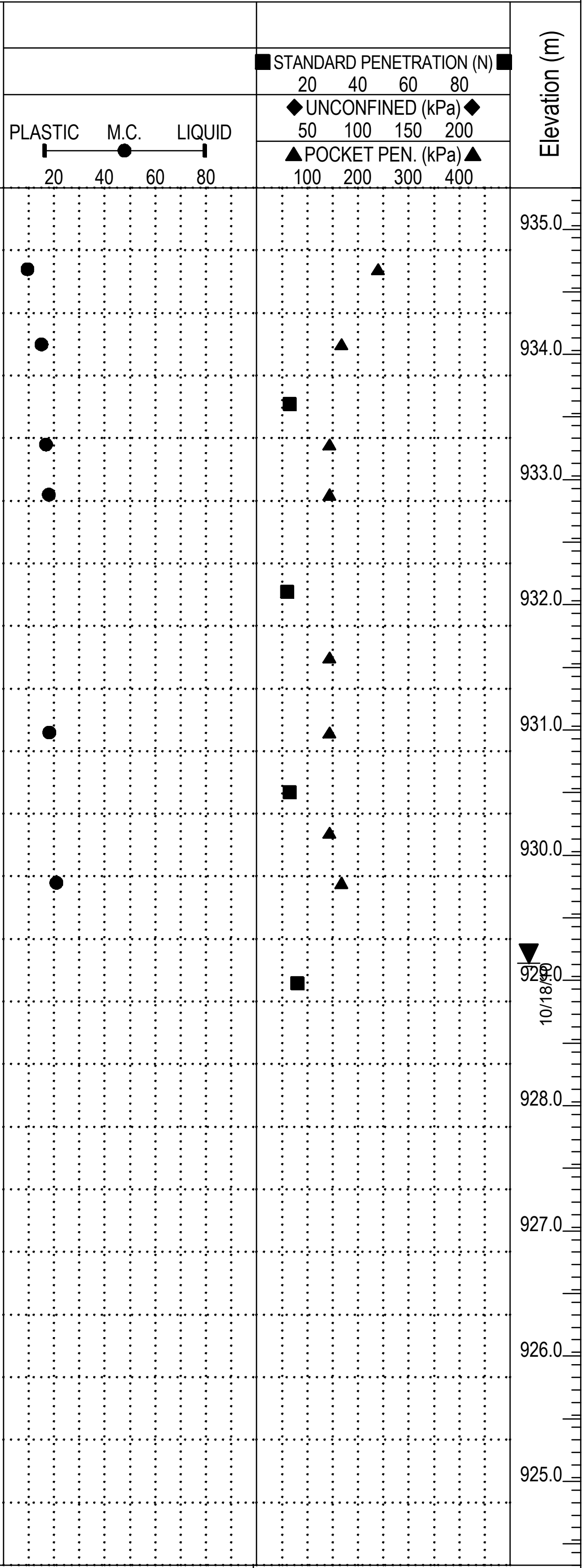
PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH008
CITY: LETHBRIDGE, AB	5506999N; 378361E; Zone 12	ELEVATION: 935.33m

SAMPLE TYPE ▨ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, light brown with dark brown mottling, coal and oxide specks, sand lenses, high plastic clay inclusions	▨	B1		9.5
1	... moist, stiff, white precipitates	▨	B2		15
		☒	D1	13	
2	... oxide staining, weathered	▨	B3		16.8
	... brown	▨	B4		17.9
3		☒	D2	12	
		▨	B5		
4		▨	B6		18.1
5	... occasional coal inclusions	☒	D3	13	
		▨	B7		
		▨	B8		20.9
6	... very stiff	☒	D4	16	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Indicated Water Level Measured Oct. 18, 2010				
8					
9					
10					
11					

▼ 10/18/10



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B8	Page 1 of 1

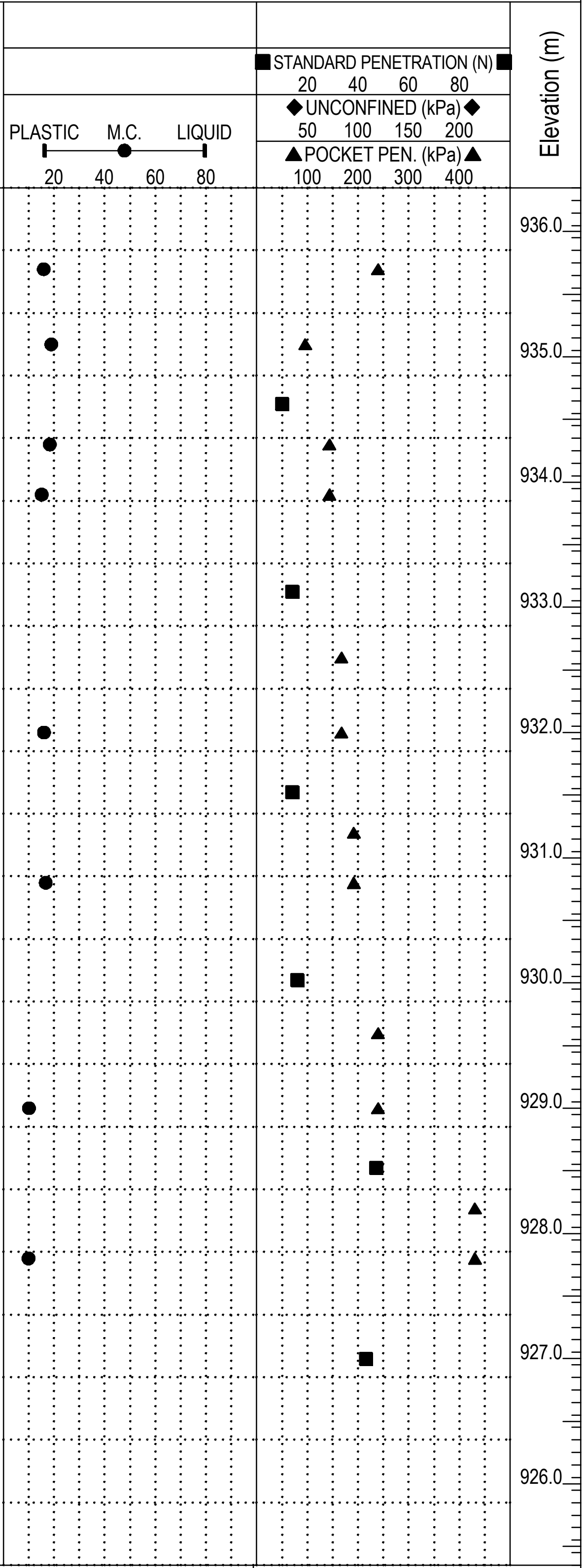
PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH009
CITY: LETHBRIDGE, AB	5507178N; 378360E; Zone 12	ELEVATION: 936.35m

SAMPLE TYPE ▨ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics
	CLAY - silty, trace sand, damp to moist, very stiff, high plastic, light brown with dark brown mottling, white precipitates, high plastic clay inclusions, laminated
1	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, light brown with dark brown mottling, coal and oxide specks, occasional sand lenses
	... stiff
	... oxide staining, weathered, white precipitates
2	... some sand, medium plastic, brown
4	... gypsum crystals, high plastic clay inclusions
5	... very stiff
6	... occasional silt lenses
	... damp to moist
7	... some sand to sandy, hard, olive brown
9.6	End of Borehole @ 9.6m
	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Borhole Measured Dry Oct. 18, 2010

SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
▨	B1		15.9
▨	B2		18.9
☒	D1	10	
▨	B3		18.3
▨	B4		15.1
☒	D2	14	
▨	B5		
▨	B6		16
☒	D3	14	
▨	B7		
▨	B8		16.7
☒	D4	16	
▨	B9		
▨	B10		10.1
☒	D5	47	
▨	B11		
▨	B12		9.9
☒	D6	43	



LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/5/2010
DRAWING NO: B9	Page 1 of 1

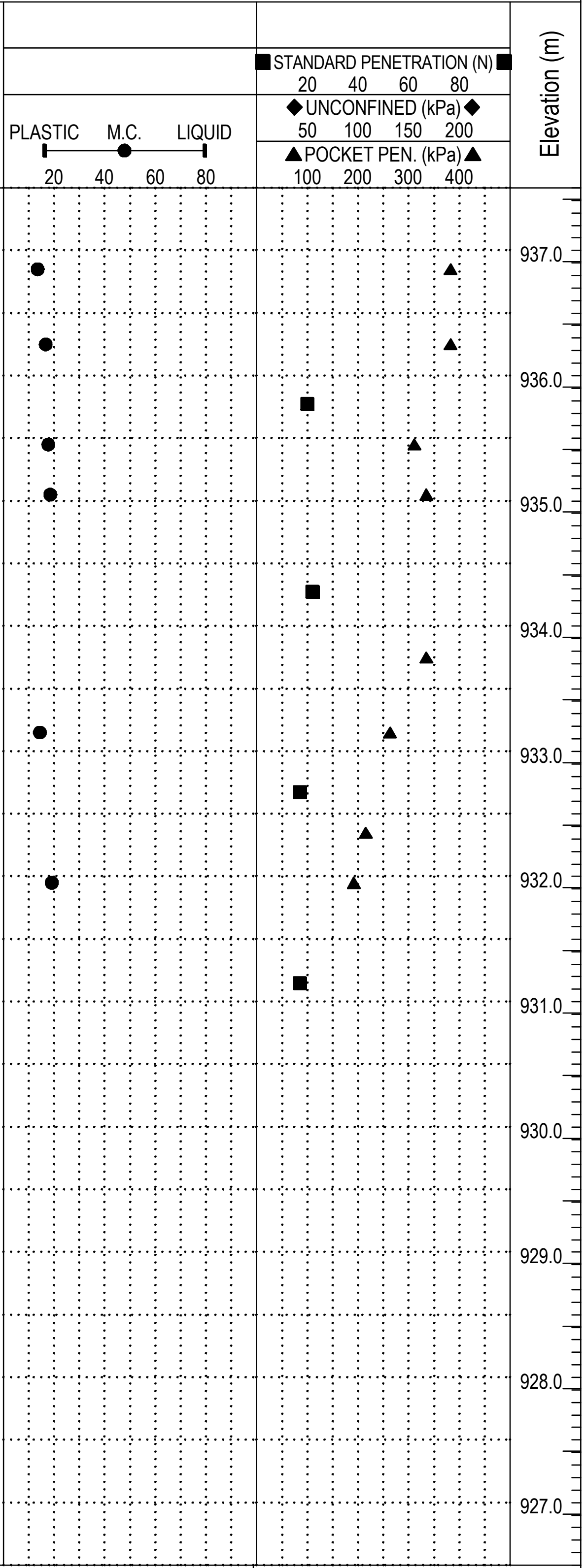
PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH010
CITY: LETHBRIDGE, AB	5506959N; 378177E; Zone 12	ELEVATION: 937.59m

SAMPLE TYPE ▆ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▌ CORE

BACKFILL TYPE ▆ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics
	CLAY - silty, some sand, damp to moist, very stiff, medium plastic, brown, white precipitates
1	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, light brown with drak brown mottling, coal and oxide specks, high plastic clay inclusions, white precipitates
2	... heavy white precipitates
3	... some sand, medium plastic
	... oxide staining, weathered
4	
	... trace to some sand, brown with grey brown mottling
5	... occasional silt lenses
6	
	End of Borehole @ 6.6m
7	No Seepage or Sloughing on Completion Slotted PVC Standpipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010
8	
9	
10	
11	

SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
▆	B1		13.5
▆	B2		16.7
☒	D1	20	
▆	B3		17.7
▆	B4		18.5
☒	D2	22	
▆	B5		
▆	B6		14.4
☒	D3	17	
▆	B7		
▆	B8		19.1
☒	D4	17	



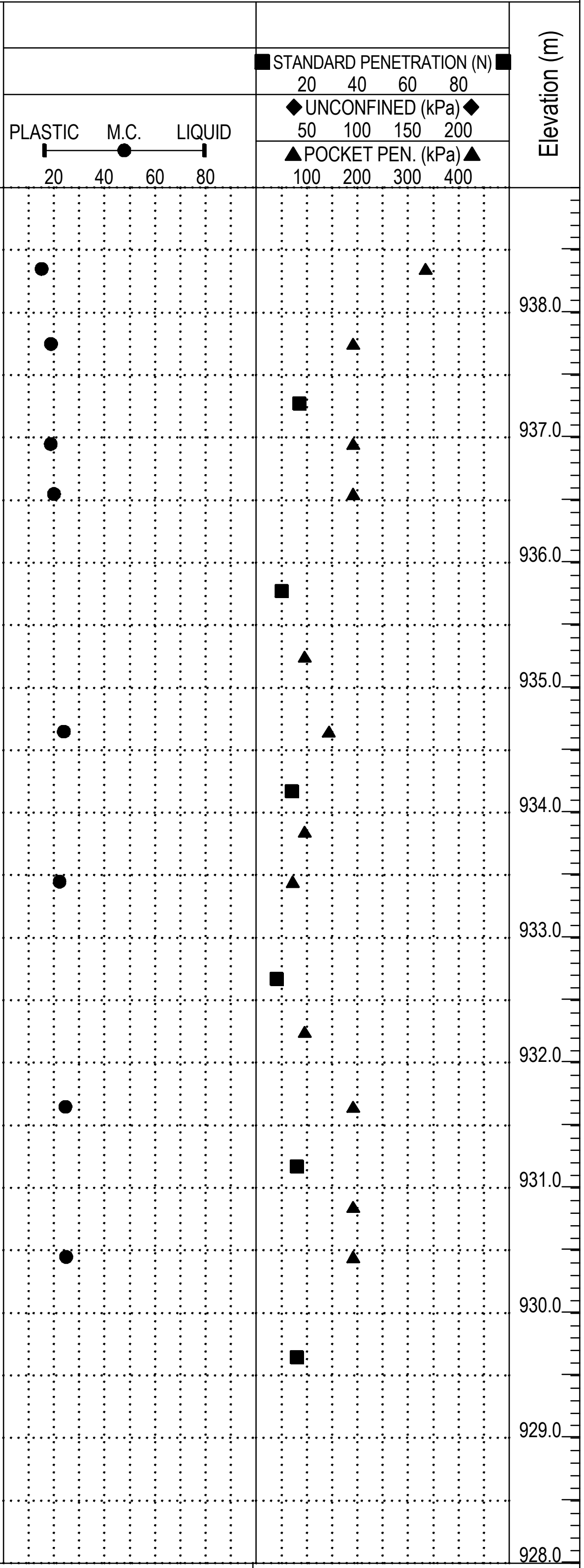
LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B10	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH011
CITY: LETHBRIDGE, AB	5506638N; 378151E; Zone 12	ELEVATION: 938.99m

SAMPLE TYPE ▬ DISTURBED ▱ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▬ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, trace sand, moist, very stiff, high plastic, brown, white precipitates	▬	B1		15.1
1	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, brown with dark brown mottling, coal and oxide specks, whtie precipitates, high plastic clay inclusions, white precipitates	▬	B2		18.8
	... thinly laminated	☒	D1	17	
2	... dark brown, gypsum crystals	▬	B3		18.7
		▬	B4		20
3	... stiff, slight oxide staining	☒	D2	10	
		▬	B5		
4		▬	B6		23.9
		☒	D3	14	
5		▬	B7		
	... moist to very moist, stiff	▬	B8		22.2
6	... light brown with grey brown mottling, blocked				
		☒	D4	8	
	... moist	▬	B9		
7	... very stiff, light brown with dark brown mottling	▬	B10		24.5
		☒	D5	16	
8		▬	B11		
		▬	B12		24.8
9		☒	D6	16	
	End of Borehole @ 9.6m				
10	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Borhole Measured Dry Oct. 18, 2010				
11					



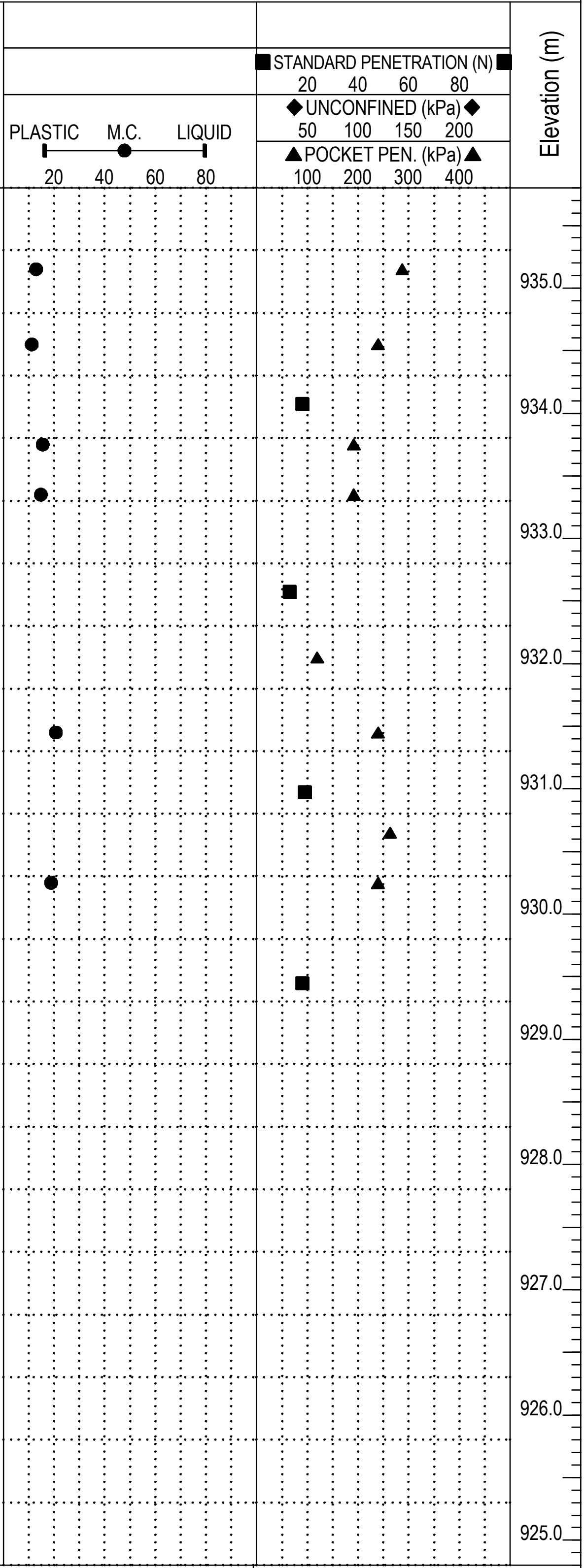
LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B11	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH012
CITY: LETHBRIDGE, AB	5506349N; 378173E; Zone 12	ELEVATION: 935.8m

SAMPLE TYPE ■ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ■ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, white precipitaes				
		■	B1		12.9
1	CLAY (TILL) - silty, some sand, damp to moist, very stiff, medium plastic light brown with dark brown mottling, coal and oxide specks, sand lenses, white precipitates				
		■	B2		11.2
	... moist, brown	☒	D1	18	
2		■	B3		15.5
	... light brown with dark brown mottling, high plastic clay inclusions				
		■	B4		14.8
3	... stiff				
		☒	D2	13	
		■	B5		
4	... trace to some sand, very stiff, medium to high plastic				
	... gypsum crystals	■	B6		20.7
		☒	D3	19	
5		■	B7		
		■	B8		18.8
6					
		☒	D4	18	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B12	Page 1 of 1

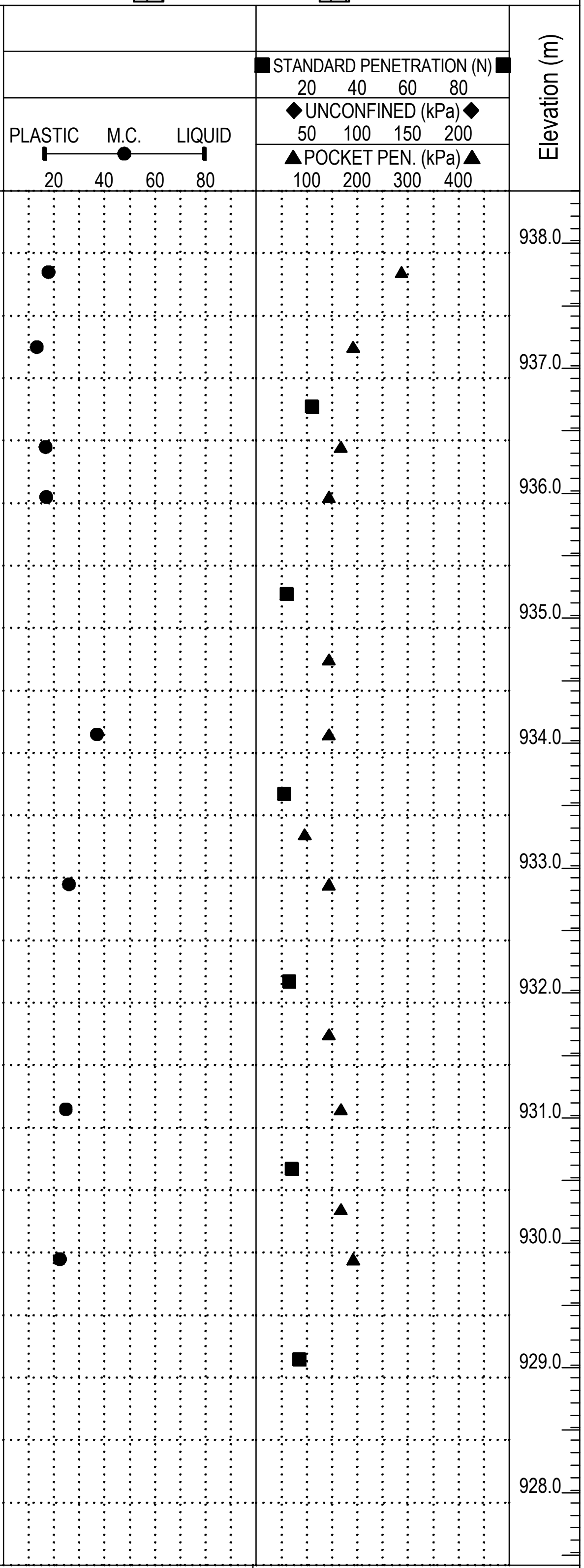
eba

PROJECT: COUNTRY MEADOWS GEOTECH.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH013
CITY: LETHBRIDGE, AB	5506387N; 377972E; Zone 12	ELEVATION: 938.42m

SAMPLE TYPE ▨ DISTURBED ◸ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, trace sand, moist, very stiff, high plastic light brown with dark brown mottling, white precipitates	▨	B1		17.8
1	CLAY (TILL) - silty, some sand to sandy, trace gravel, moist, very stiff, medium plastic, brown, coal and oxide specks, sand lenses	▨	B2		13.2
		☒	D1	22	
2	... trace to some sand, medium to high plastic, light brown with dark bown mottling	▨	B3		16.7
	... stiff	▨	B4		16.9
3	... light brown with grey brown mottling, high plastic clay inclusions, blocked	☒	D2	12	
	... trace sand, very moist, high plastic	▨	B5		
4	... gypsum crystals	▨	B6		37
		☒	D3	11	
5		▨	B7		
		▨	B8		25.9
6		◸	D4	13	
		▨	B9		
7		▨	B10		24.7
		☒	D5	14	
8		▨	B11		
	... trace to some sand, medium to high plastic, very stiff	▨	B12		22.3
9		☒	D6	17	
	End of Borehole @ 9.6				
10	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Borhole Measured Dry Oct. 18, 2010				
11					



LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B13	Page 1 of 1

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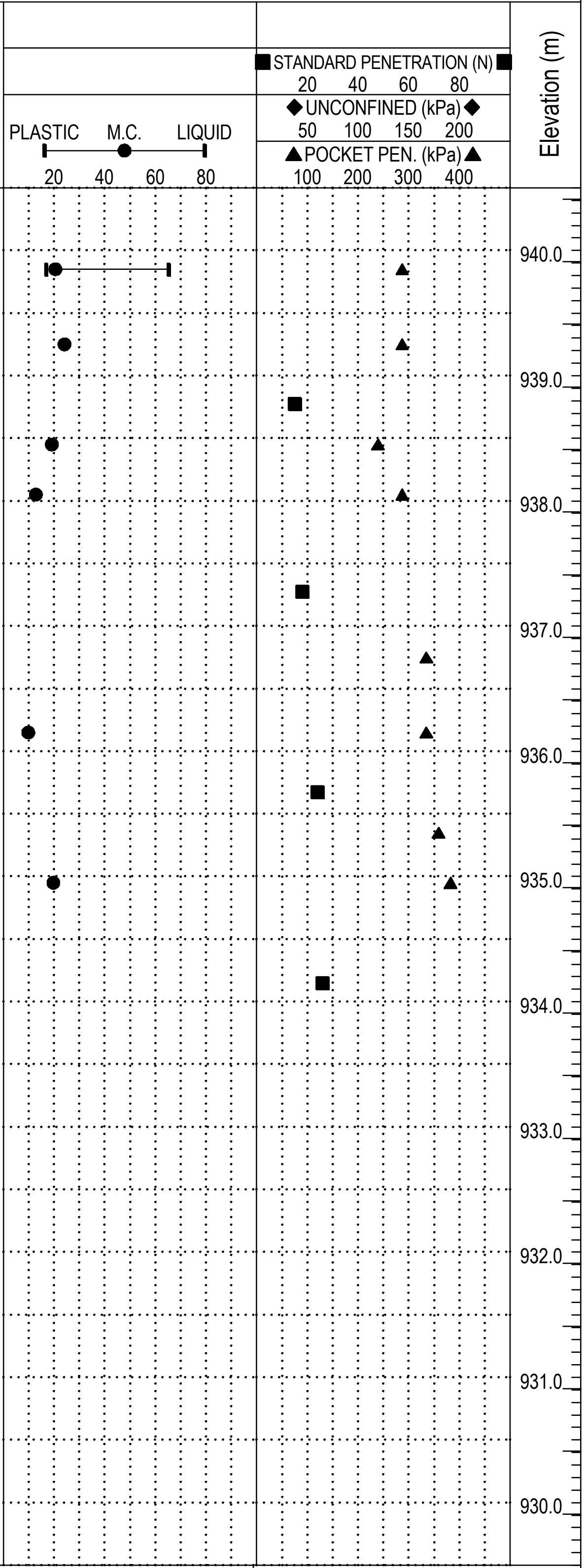
PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH014
CITY: LETHBRIDGE, AB	5506804N; 377990E; Zone 12	ELEVATION: 940.59m

SAMPLE TYPE ▩ DISTURBED ◪ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▩ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, tracesand, moist, very stiff, high plastic, brown with dark brown mottling, white precipitates	▩	B1		20.5
	... heavy white precipitates				
1	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, brown, coal and oxide specks, thin sand lenses, high plastic clay inclusions, slightly laminated	▩	B2		24.1
		☒	D1	15	
2		▩	B3		19.1
	... damp to moist	▩	B4		12.8
3	... gypsum crystals	☒	D2	18	
		▩	B5		
4	... silt pockets to 30mm	▩	B6		9.8
	... occasional sand pockets to 50mm	☒	D3	24	
5	... moist, oxide staining, weathered	▩	B7		
		▩	B8		19.7
6		☒	D4	26	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B14	Page 1 of 1

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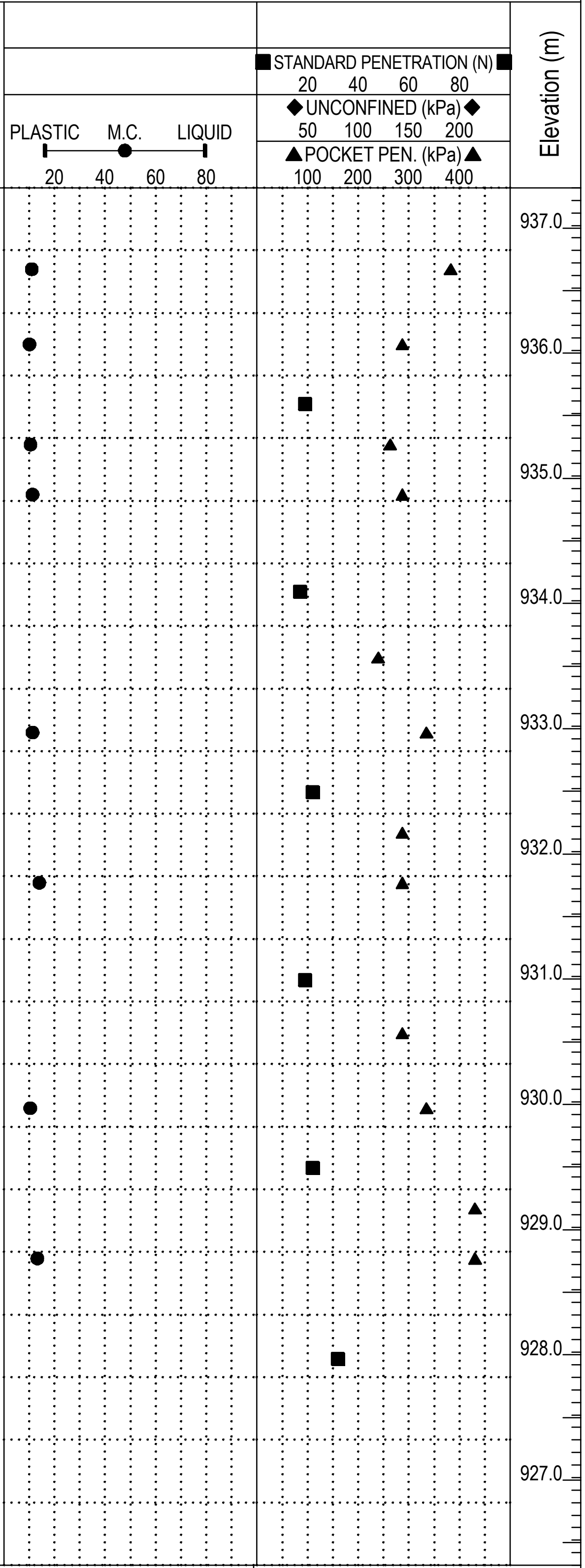
PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH015
CITY: LETHBRIDGE, AB	5507149N; 378051E; Zone 12	ELEVATION: 937.32m

SAMPLE TYPE ▇ DISTURBED ⧄ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▇ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, some sand to moist, damp, very stiff, medium plastic, light brown, white precipitates				
	... brown	▇	B1		11
1					
		▇	B2		10.1
	CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, white precipitates	☒	D1	19	
2	... oxide staining, weathered	▇	B3		10.5
		▇	B4		11.3
	... brown with grey brown mottling				
3	... some sand to sandy				
		☒	D2	17	
	... thin sand lenses				
		▇	B5		
4					
		▇	B6		11.3
		☒	D3	22	
5	... trace to some sand, moist, medium to high plastic, light brown with dark brown mottling, occasional silt lenses	▇	B7		
		▇	B8		14
6					
	... gypsum crystals	☒	D4	19	
	... brown with light brown silt inclusions	▇	B9		
7					
		▇	B10		10.4
		☒	D5	22	
8	... light brown with dark brown mottling, heavy oxide staining, severly weathered	▇	B11		
	... damp to moist, hard	▇	B12		13.2
9					
		☒	D6	32	
	End of Borehole @ 9.6m				
10	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 9.6m Borhole Measured Dry Oct. 18, 2010				
11					



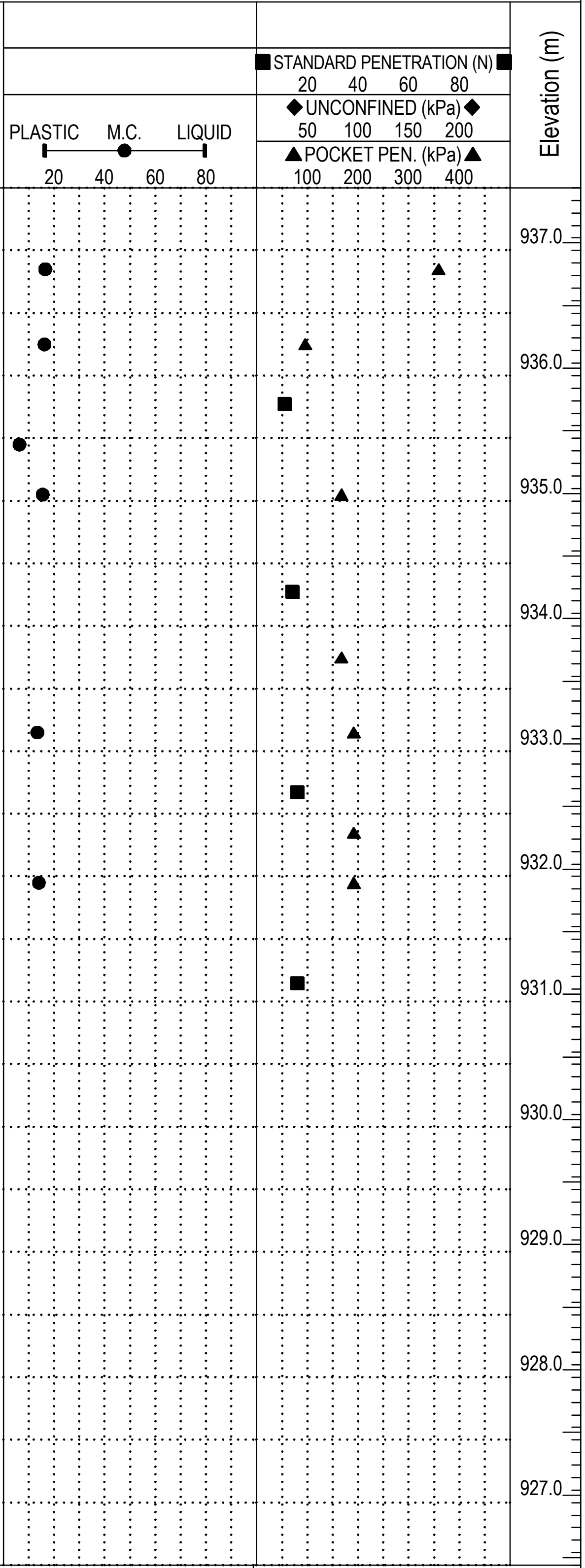
LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B15	Page 1 of 1

eba

PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH016
CITY: LETHBRIDGE, AB	5507032N; 377859E; Zone 12	ELEVATION: 937.44m

SAMPLE TYPE	▨ DISTURBED	◸ NO RECOVERY	☒ SPT	☰ A-CASING	▥ SHELBY TUBE	▮ CORE
BACKFILL TYPE	▨ BENTONITE	⁘ PEA GRAVEL	▥ SLOUGH	⁘ GROUT	▧ DRILL CUTTINGS	⁘ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY - silty, some sand, trace gravel, moist, stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, high plastic clay inclusions, white precipitates	▨	B1		16.5
1	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, high plastic clay inclusions, white precipitates	▨	B2		16.2
	... some sand to sandy, damp to moist, medium plastic	☒	D1	11	
2	... 300mm gravel inclusion sizes to 30mm	▨	B3		6.3
	... trace to some sand, moist, medium to high plastic, occasional silt lenses	▨	B4		15.5
3		☒	D2	14	
		▨	B5		
4	... very stiff				
	... pebbles to 40mm	▨	B6		13.4
5	... brown	☒	D3	16	
	... oxide staining, weathered	▨	B7		
		▨	B8		14
6	... brown with grey brown mottling	☒	D4	16	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B16	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH017
CITY: LETHBRIDGE, AB	5507170N; 377658E; Zone 12	ELEVATION: 936.88m

SAMPLE TYPE ▨ DISTURBED ◺ NO RECOVERY ☒ SPT ☰ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

SOIL DESCRIPTION

TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics

CLAY - silty, some sand, damp, medium plastic, light brown, white precipitates

CLAY (TILL) - silty, trace to some sand, trace gravel, damp, very stiff, medium to high plastic, light brown with dark brown mottling, coal and oxide specks, sand lenses

... damp to moist, slightly laminated

... moist, stiff

... high plastic clay inclusions, occasional silt lenses

... oxide staining, weatherd

... very stiff

... some sand, medium plastic, brown

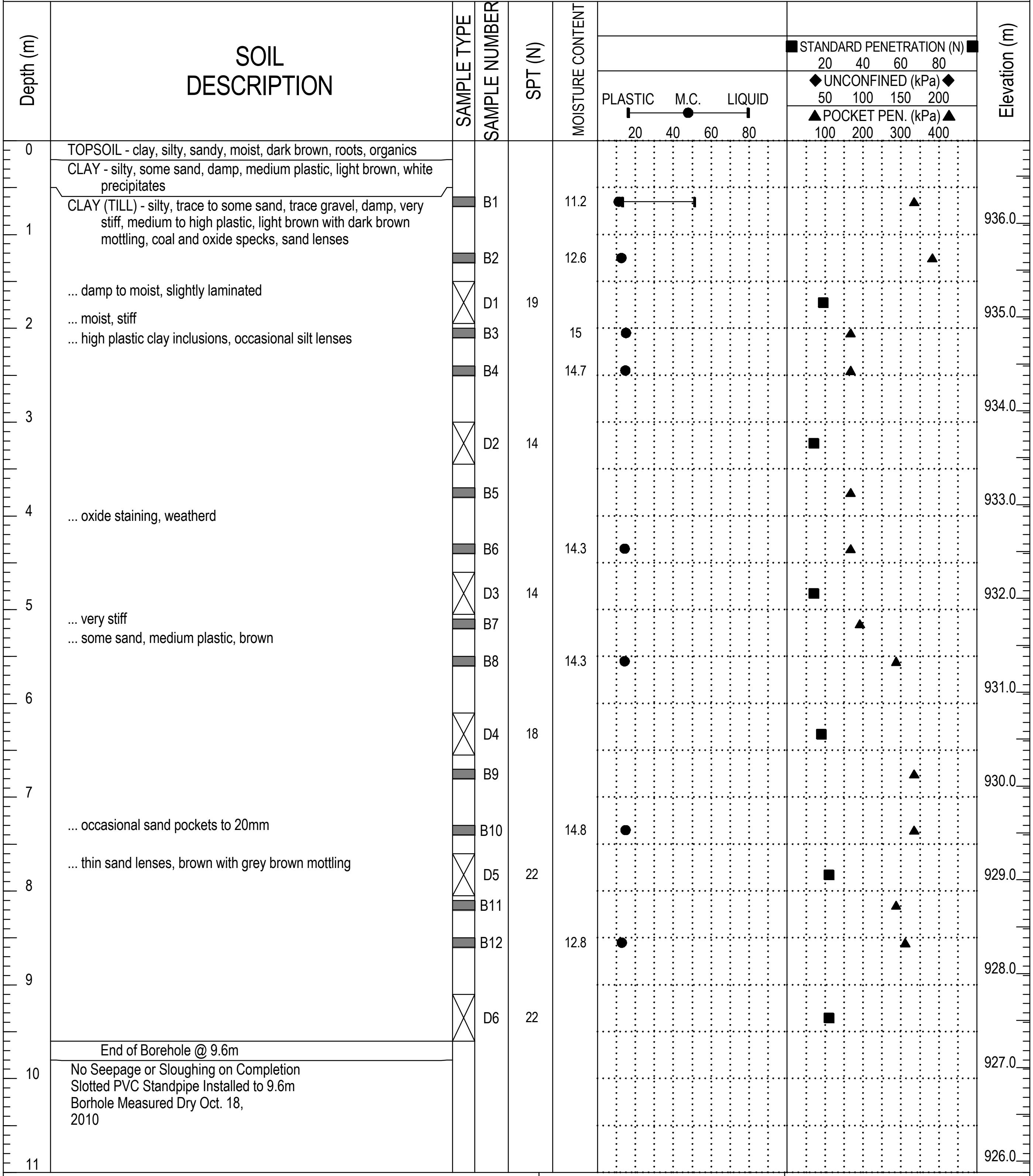
... occasional sand pockets to 20mm

... thin sand lenses, brown with grey brown mottling

End of Borehole @ 9.6m

No Seepage or Sloughing on Completion
Slotted PVC Standpipe Installed to 9.6m
Borhole Measured Dry Oct. 18, 2010

SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
▨	B1		11.2
▨	B2		12.6
☒	D1	19	
▨	B3		15
▨	B4		14.7
☒	D2	14	
▨	B5		
▨	B6		14.3
☒	D3	14	
▨	B7		
▨	B8		14.3
☒	D4	18	
▨	B9		
▨	B10		14.8
☒	D5	22	
▨	B11		
▨	B12		12.8
☒	D6	22	



LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B17	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH018
CITY: LETHBRIDGE, AB	5506832N; 377680E; Zone 12	ELEVATION: 939.24m

SAMPLE TYPE ▨ DISTURBED ◺ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

SOIL DESCRIPTION

TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics

CLAY - silty, some sand, moist, very stiff, meidum plastic, brown, white precipitates

... trace to some sand, moist, medium to high plastic, brown with dark brown mottling, high plastic clay inclusions

... hard

... blocked

CLAY (TILL) - silty, some sand, trace gravel, damp to moist, hard, medium plastic, light brown with dark brown mottling, coal and oxide specks, white precipitates

... slight oxide staining

... some sand to sandy, pebbles to 20mm

... occasional gravel and sand pockets to 100mm

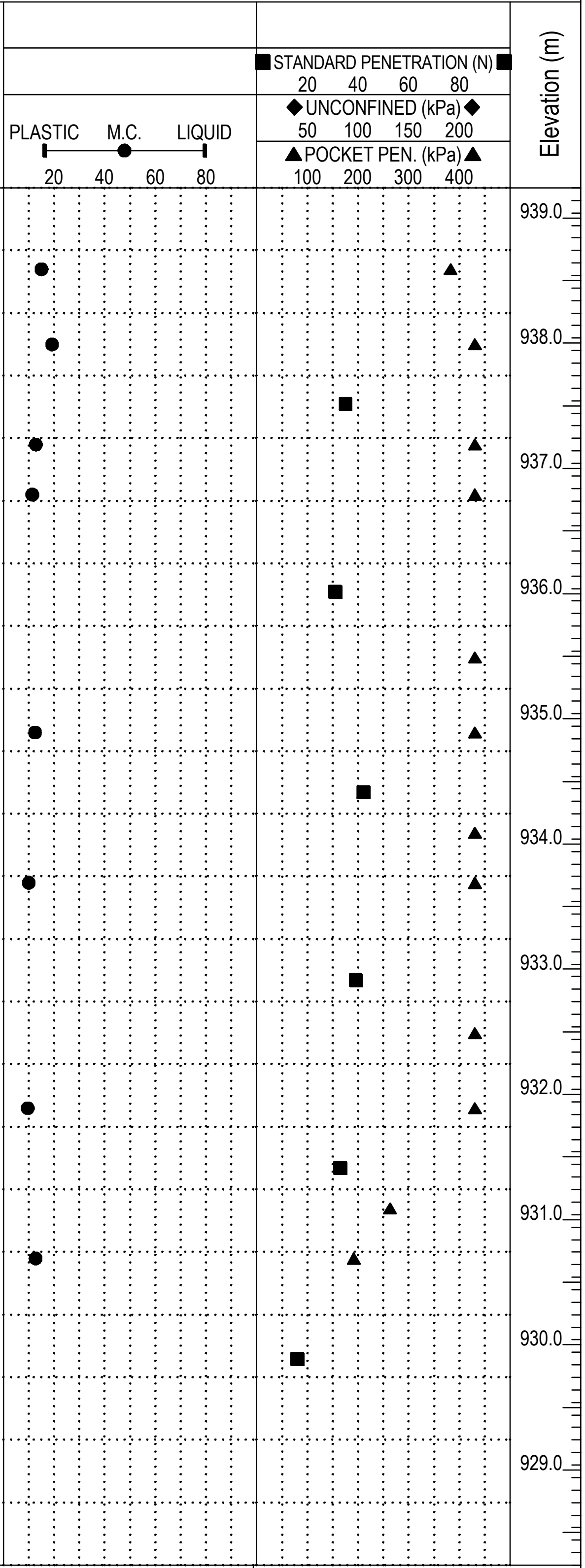
... some sand, oxide staining, weathered

... very stiff, dark brown with grey brown mottling

End of Borehole @ 9.6m

No Seepage or Sloughing on Completion
Slotted PVC Pipe Installed to 9.6m
Borhole Measured Dry Oct. 18, 2010

SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
▨	B1		15
▨	B2		19.2
☒	D1	35	
▨	B3		12.8
▨	B4		11.4
☒	D2	31	
▨	B5		
▨	B6		12.5
☒	D3	42	
▨	B7		
▨	B8		10
☒	D4	39	
▨	B9		
▨	B10		9.6
☒	D5	33	
▨	B11		
▨	B12		12.7
☒	D6	16	



Depth (m): 0 1 2 3 4 5 6 7 8 9 10 11

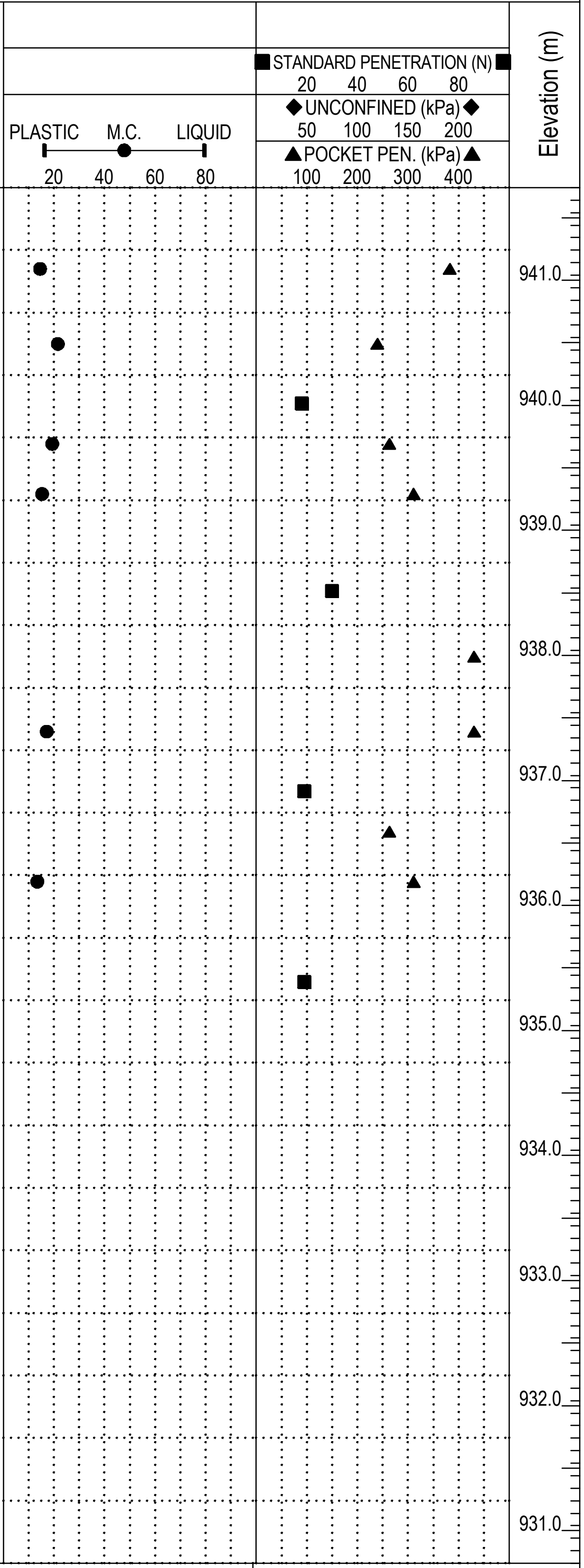
LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B18	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH019
CITY: LETHBRIDGE, AB	5506554N; 377674E; Zone 12	ELEVATION: 941.74m

SAMPLE TYPE ▨ DISTURBED ◿ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ▨ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ⁘ GROUT ▧ DRILL CUTTINGS ⁘ SAND

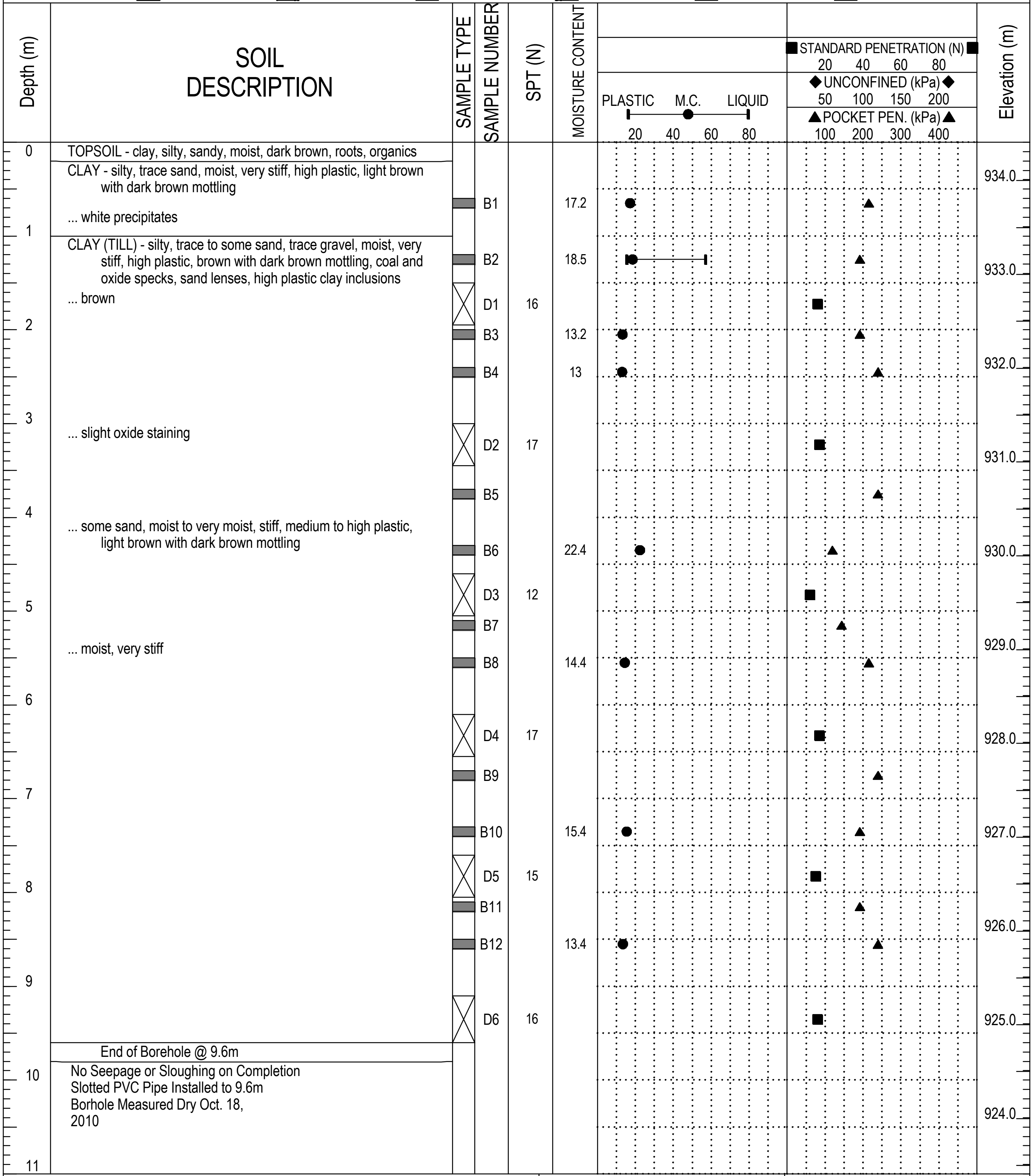
Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics				
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, light brown with dark brown mottling, coal and oxide specks, sand lenses	▨	B1		14.5
1	... moist, brown with dark brown mottling, high plastic clay inclusions	▨	B2		21.5
	... oxide stianing, weathered, white precipitates	☒	D1	18	
2	... trace to some sand, medium to high plastic, light brown with dark brown mottling	▨	B3		19.3
		▨	B4		15.3
3	... hard	☒	D2	30	
4	... brown with grey brown mottling, slightly laminated	▨	B5		
		▨	B6		17.1
	... very stiff	☒	D3	19	
5		▨	B7		
		▨	B8		13.4
6		☒	D4	19	
	End of Borehole @ 6.6m				
7	No Seepage or Sloughing on Completion Slotted PVC Pipe Installed to 6.6m Borhole Measured Dry Oct. 18, 2010				
8					
9					
10					
11					



LOGGED BY: JKM	COMPLETION DEPTH: 6.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B19	Page 1 of 1

PROJECT: COUNTRY MEADOWS GEOTECH. EVAL.	CLIENT: STANTEC CONSULTING LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: WEST LETHBRIDGE	DRILL METHOD: 150mm SOLID STEM AUGER	L12101650.001 - 10BH020
CITY: LETHBRIDGE, AB	5506250N; 377720E; Zone 12	ELEVATION: 934.41m

SAMPLE TYPE	▨ DISTURBED	▨ NO RECOVERY	☒ SPT	▤ A-CASING	▥ SHELBY TUBE	▮ CORE
BACKFILL TYPE	▨ BENTONITE	▨ PEA GRAVEL	▥ SLOUGH	▨ GROUT	▧ DRILL CUTTINGS	▨ SAND



TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics

CLAY - silty, trace sand, moist, very stiff, high plastic, light brown with dark brown mottling

... white precipitates

CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, high plastic, brown with dark brown mottling, coal and oxide specks, sand lenses, high plastic clay inclusions

... brown

... slight oxide staining

... some sand, moist to very moist, stiff, medium to high plastic, light brown with dark brown mottling

... moist, very stiff

End of Borehole @ 9.6m

No Seepage or Sloughing on Completion
Slotted PVC Pipe Installed to 9.6m
Borhole Measured Dry Oct. 18, 2010

SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
B1		17.2
B2		18.5
D1	16	
B3		13.2
B4		13
D2	17	
B5		
B6		22.4
D3	12	
B7		
B8		14.4
D4	17	
B9		
B10		15.4
D5	15	
B11		
B12		13.4
D6	16	

LOGGED BY: JKM	COMPLETION DEPTH: 9.6m
REVIEWED BY: JAR	COMPLETE: 10/7/2010
DRAWING NO: B20	Page 1 of 1

APPENDIX C

APPENDIX C   RECOMMENDED GENERAL DESIGN AND CONSTRUCTION GUIDELINES

CONSTRUCTION GUIDELINE

SHALLOW FOUNDATIONS

Design and construction of shallow foundations should comply with relevant Building Code requirements.

The term 'shallow foundations' includes strip and spread footings, mat slab and raft foundations.

Minimum footing dimensions in plan should be 0.45 m and 0.9 m for strip and square footings respectively.

No loose, disturbed or sloughed material should be allowed to remain in open foundation excavations. Hand cleaning should be undertaken to prepare an acceptable bearing surface. Recompaction of disturbed or loosened bearing surface may be required.

Foundation excavations and bearing surfaces should be protected from rain, snow, freezing temperatures, excessive drying and the ingress of free water before, during and after footing construction.

Footing excavations should be carried down into the designated bearing stratum.

After the bearing surface is approved, a mud slab should be poured to protect the soil and provide a working surface for construction, should immediate foundation construction not be intended.

All constructed foundations should be placed on unfrozen soils, which should be at all times protected from frost penetration.

All foundation excavations and bearing surfaces should be inspected by a qualified geotechnical engineer to check that the recommendations contained in this report have been followed.

Where over-excavation has been carried out through a weak or unsuitable stratum to reach into a suitable bearing stratum or where a foundation pad is to be placed above stripped natural ground surface such over-excavation may be backfilled to subgrade elevation utilizing either structural fill or lean-mix concrete. These materials are defined under the separate heading 'Backfill Materials and Compaction'.

FLOOR SLABS-ON-GRADE

All soft, loose or organic material should be removed from beneath slab areas. If any local 'hard spots' such as old basement walls are revealed beneath the slab area, these should be over-excavated and removed to not less than 0.9 m below underside of slab level. The exposed soil should be proof-rolled and the final grade restored by general engineered fill placement. If proof-rolling reveals any soft or loose spots, these should be excavated and the desired grade restored by general engineered fill placement. Proof-rolling should be carried out in accordance with the recommendations given elsewhere in this Appendix. The subgrade should be compacted to a depth of not less than 0.3 m to a density of not less than 98 percent Standard Proctor Maximum Dry Density (ASTM Test Method D698).

If, for economic reasons, it is considered desirable to leave low quality material in-place beneath a slab-on-grade, special ground treatment procedures may be considered, EBA could provide additional advice on this aspect if required.

A levelling course of 20 mm crushed gravel at least 150 mm in compacted thickness, is recommended directly beneath all slabs-on-grade. Alternatively a minimum thickness of 150 mm of pit-run gravel overlain by a minimum thickness of 50 mm of 20 mm crushed gravel may be used. Very coarse material (larger than 25 mm diameter) should be avoided directly beneath the slab-on-grade to limit potential stress concentrations within the slab. All levelling courses directly under floor slabs should be compacted to 100 percent of Standard Proctor maximum dry density.

General engineered fill, pit-run gravel and crushed gravel are defined under the heading 'Backfill Materials and Compaction' elsewhere in this Appendix.

The slab should be structurally independent from walls and columns supported on foundations. This is to reduce any structural distress that may occur as a result of differential soil movements. If it is intended to place any internal non-load bearing partition walls directly on a slab-on-grade, such walls should also be structurally independent from other elements of the building founded on a conventional foundation system so that some relative vertical movement of the walls can occur freely.

The excavated subgrade beneath slabs-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water. This applies during and after the construction period.

A minimum slab concrete thickness of 100 mm is recommended. Control joints should be provided in all slabs. Typically for a 125 mm slab thickness; control joints should be placed on a 3 m square grid, should be sawn to a depth of one-quarter the slab thickness and have a width of approximately 3 mm.

Wire mesh reinforcement, 150 mm square grid, should be provided to reduce the possibility of uncontrolled slab cracking. The mesh should be adequately supported and should be located at mid-height of the slab with adequate cover.

CONSTRUCTION GUIDELINE

CONSTRUCTION EXCAVATIONS

Construction should be in accordance with good practice and comply with the requirements of the responsible regulatory agencies.

All excavations greater than 1.5 m deep should be sloped or shored for worker protection.

Shallow excavations up to about 3 m depth may use temporary sideslopes of 1H:1V. A flatter slope of 2H:1V should be used if groundwater is encountered. Localized sloughing can be expected from these slopes.

Deep excavations or trenches may require temporary support if space limitations or economic considerations preclude the use of sloped excavations.

For excavations greater than 3 m depth, temporary support should be designed by a qualified geotechnical engineer. The design and proposed installation and construction procedures should be submitted to EBA for review.

The construction of a temporary support system should be monitored. Detailed records should be taken of installation methods, materials, in situ conditions and the movement of the system. If anchors are used, they should be load tested. EBA can provide further information on monitoring and testing procedures if required.

Attention should be paid to structures or buried service lines close to the excavation. For structures, a general guideline is that if a line projected down, at 45 degrees from the horizontal from the base of foundations of adjacent structures intersects the extent of the proposed excavation, these structures may require underpinning or special shoring techniques to avoid damaging earth movements. The need for any underpinning or special shoring techniques and the scope of monitoring required can be determined when details of the service ducts and vaults, foundation configuration of existing buildings and final design excavation levels are known.

No surface surcharges should be placed closer to the edge of the excavation than a distance equal to the depth of the excavation, unless the excavation support system has been designed to accommodate such surcharge.

CONSTRUCTION GUIDELINE

BACKFILL MATERIALS AND COMPACTION

Maximum density as used in this section means Standard Proctor Maximum Dry Density (ASTM Test Method D698) unless specifically noted otherwise. Optimum moisture content is as defined in this test.

"Landscape fill" material may comprise soils without regard to engineering quality. Such soils should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90 percent of maximum density.

"General engineered fill" materials should comprise clean, inorganic granular or clay soils. "Select engineered fill" materials should comprise clean, well-graded granular soils or inorganic low plastic clay soils. Engineered fill materials should be placed in layers of 150 mm compacted thickness and should be compacted to 98 percent of maximum density.

Granular soils used for select engineered fills should consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).

Low to medium plastic clay with the following range of Atterberg limits is generally considered suitable for use as select engineered fill.

Liquid Limit = 20 to 40%

Plastic Limit = 10 to 20%

Plasticity Index = 10 to 30%

Clay fill materials should be compacted at or slightly above the optimum moisture content.

"Structural fill" materials should comprise clean, well-graded inorganic granular soils. Such fill should be placed in compacted lifts not exceeding 150 mm and compacted to not less than 100 percent of maximum density.

Backfill adjacent to and above footings, abutment walls, basement walls, grade beams and pile caps or below highway, street or parking lot pavement sections and base courses should comprise "general engineered fill" materials as defined above.

Backfill below slabs-on-grade or where increased volumetric stability is desired should comprise "select engineered fill" materials as defined above.

Backfill supporting structural loads should comprise "structural fill" materials as defined above.

Exterior backfill adjacent to footings, foundation walls, grade beams and pile caps and within 300 mm of final grade should comprise inorganic clay "general engineered" fill as defined above. Such backfill should provide a relatively impervious surface layer to reduce seepage into the subsoil.

Backfill should not be placed against a foundation structure until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction. During compaction, careful observation of the foundation wall for deflection should be carried out continuously. Where deflections are apparent, the compactive effort should be reduced accordingly.

In order to reduce potential compaction induced stresses, only hand held compaction equipment should be used in the compaction of fill within 500 mm of retaining walls or basement walls.

Backfill materials should not be placed in a frozen state, or placed on a frozen subgrade. All lumps of materials should be broken down during placement.

Where the maximum-sized particles in any backfill material exceed 50 percent of the minimum dimension of the cross-section to be backfilled, such particles should be removed and placed at other more suitable locations on-site or screened off prior to delivery to site.

Bonding should be provided between backfill lifts, if the previous lift has become desiccated. For fine-grained materials the previous lift should be scarified to the base of the desiccated layer, properly moisture-conditioned and recompacted and bonded thoroughly to the succeeding lift. For granular materials, the surface of the previous lift should be scarified to about a 75 mm depth followed by proper moisture-conditioning and recompaction.

Suggested specifications for various backfill types are presented below.

"Pit-Run gravel" and fill sand shall be reasonably well graded and should conform to the following gradings:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	**PIT RUN GRAVEL (A.T. D6-C80)**	**FILL SAND**
80.0 mm	100	--
50 mm	55-100	--
25 mm	38 – 100	100
16 mm	32 – 85	--
5.0 mm	20 – 65	75 – 100
630 µm	--	45 – 80
315 µm	6 – 30	--
80 µm	2 – 10	2 - 10

The Pit-Run gravel should be free of any form of coating and any gravel or sand containing clay, loam or other deleterious materials should be rejected. No oversize material should be tolerated. The percent of material passing the 80 µm sieve should not exceed 2/3 of the material passing the 315 µm sieve.

20 mm and 40 mm crushed gravel should be hard, clean, well graded, crushed aggregate, free of organics, coal, clay lumps, coatings of clay, silt and other deleterious materials. The aggregates should conform to the following Alberta Transportation gradation requirements when tested in accordance with ASTM C136:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	**20 mm CRUSH (A.T. D2-C20)**	**40 mm CRUSH (A.T. D2-C40)**
40 mm	--	100
25 mm	--	70 – 94
20 mm	100	--
16 mm	84 – 94	55 – 85
10 mm	63 – 86	44 – 74
5.0 mm	40 – 67	32 – 62
1.25 mm	20 – 43	17 – 43
630 µm	14 – 34	12 – 34
315 µm	9 – 26	8 – 26
160 µm	5 – 18	5 – 18
80 µm	2 – 10	2 – 10

A minimum of 60 percent of the material retained on the 5 mm sieve for the 20 mm crushed gravel should have at least two freshly crushed faces. Not less than 50 percent of the material retained on the 5 mm sieve for the 40 mm crushed gravel should have at least two freshly crushed faces.

The 20 mm granular course should be compacted in lifts not exceeding 150 mm to 100 percent of Standard Proctor maximum dry density.

"Coarse gravel" for bedding and drainage should conform to the following grading:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	**28 mm GRAVEL**	**20 mm GRAVEL**
40 mm	100	--
28 mm	95 - 100	100
20 mm	--	85 – 100
14 mm	25 - 60	60 – 90
10 mm	--	25 – 60
5 mm	0 - 10	0 – 10
2.5 mm	0 - 5	0 - 5

"Coarse sand" for bedding and drainage should conform to the following grading:

SIEVE SIZE (Square Openings)	**PERCENT PASSING (By Weight)**
10 mm	100
5 mm	95 - 100
2.5 mm	80 - 100
1.25 mm	50 - 90
630 μm	25 - 65
315 μm	10 - 35
160 μm	2 - 10
80 μm	0 - 4

"Lean-mix concrete" should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

CONSTRUCTION GUIDELINE

BORED CAST-IN-PLACE CONCRETE PILES

Design and construction of piles should comply with relevant Building Code requirements.

Piles should be installed under full-time inspection of geotechnical personnel. Pile design parameters should be reviewed in light of the findings of the initial bored shafts drilled on a site. Further design review may be necessary if conditions observed during site construction do not conform to design assumptions.

Where fill material or lenses or strata of sand, silt or gravel are present within the designed pile depth, these may be incompetent and/or water bearing and may cause sloughing. Casing should be on hand before drilling starts and be used, if necessary, to seal off water and/or prevent sloughing of the hole.

If piles are to be underreamed (belled), the underreams should be formed entirely in self supporting soil and entirely within the competent bearing stratum. Where caving occurs at design elevation it may be necessary to extend the base of the pile bell to a greater depth. Piles may be constructed with bells having outside diameters up to approximately three times the diameters of their shafts. Piles with shaft diameters of less than 400 mm should not be underreamed due to difficulties associated with ensuring a clean base.

Prior to pouring concrete, bottoms of pile bells or of straight-shaft end-bearing piles should be cleaned of all disturbed material.

Pile excavations should be visually inspected after completion to ensure that disturbed materials and/or water are not present on the base so that recommended allowable bearing and skin friction parameters may apply.

Visual inspection may be accomplished by the inspector descending into the pile shaft (shaft diameter of 760 mm (30 inch) or greater). A protective cage and other safety equipment required by government regulations should be provided by the contractor to facilitate downhole inspection.

Other procedures to inspect the pile shafts may be used where shaft diameters of less than 760 mm (30 inch) are constructed, such as, inspection with a light.

For safety reasons, where hand cleaning and/or 'down shaft' inspection by personnel are required, the pile shaft must be cased full-length prior to personnel entering the shaft.

Reinforcing steel should be on hand and should be placed as soon as the bore has been completed and approved.

Longitudinal reinforcing steel is recommended to counteract the possible tensile stresses induced by frost action and should extend to a minimum depth of 3.5 m. A minimum steel of 0.5 percent of the gross shaft area is recommended.

Where a limited quantity of water is present on the pile base, when permitted or directed by a geotechnical engineer, it should be either removed or absorbed by the addition of dry cement, which should then be thoroughly mixed as an in situ slurry by means of the belling tool, using reverse rotation of the tool. Where significant quantities of water are present and it is impracticable to exclude water from the pile bore, concrete should be placed by tremie techniques or concrete pump.

A "dry" pile should be poured by "free fall" of concrete only where impact of the concrete against the reinforcing cage, which can cause segregation of the concrete, will not occur. A hopper should be used to direct concrete down the centre of the pile base and to prevent impact of concrete against reinforcing steel.

Concrete used for "dry" uncased piles should be self compacting and should have a target slump of 125 mm. Where casing is required to prevent sloughing or seepage, the slump should be increased to 150 mm. In order to comply with maximum water:cement ratios for the concrete, the use of chemicals (or superplasticizers) to temporarily increase the slump may be required. Concrete for each pile should be poured in one continuous operation and should be placed immediately after excavation and inspection of piles, to reduce the opportunity for the ingress of free water or deterioration of the exposed soil or rock.

If piles cannot be formed in dry conditions then the concrete should be placed by tremie tube or concrete pump. Concrete placed by tremie should have a slump of not less than 150 mm. A ball or float should be used in the tremie tube to separate the initial charge of concrete from the water in the pile hole. The outlet of the tremie tube should be maintained at all times 1.0 m to 2.0 m below the surface of the concrete. The diameter of the tremie tube should be at least 200 mm. The tube should be water tight and not be made of aluminum. Smaller diameter pipes may be used with a concrete pump. The surface of the concrete should be allowed to rise above the cut off level of the pile, so that when the temporary casing is withdrawn and the surface level of the concrete adjusts to the new volume, the top of the uncontaminated concrete is at or above the cut off level. The concrete should be placed in one continuous smooth operation without any halts or delays. Placing the lower portion of the pile by tremie tube and placing the upper portion of the pile by "free fall" should not be permitted, to ensure that defects in the pile shaft at the top of the tremie concrete do not occur. As the surface of the concrete rises in the pile bore the water in the pile bore will be displaced upwards and out of the top of the pile casing. It may be necessary to pump off this water to a container or temporary ditch drain to prevent the formation of ice or flooding conditions, and possibly damage to existing structures.

When concreting piles by tremie techniques allowance should be made for the removal of contaminated or otherwise defective concrete at the tops of the piles.

The casing should be filled with concrete and then the casing should be withdrawn smoothly and continuously. Sufficient concrete should be placed to allow for the additional volume of the casing and reduction in level of the concrete as the casing is withdrawn. Concrete should not be poured on top of previously poured concrete, after the casing is withdrawn.

An accurate record of the volume of concrete placed should be maintained as a check that a continuous pile had been formed.

Concrete should not be placed if its temperature is less than 5°C or exceeds 30°C, or if it is more than 2.0 hours old.

Where tension, horizontal or bending moment loading on the pile is foreseen, steel reinforcing should be extended and tied into the grade beam or pile cap. The steel should be designed to transfer loads to the required depth in the pile and to resist resultant bending moments and shear forces.

Void formers should be placed beneath all grade beams to reduce the risk of damage due to frost effects or soil moisture changes.

Where the drilling operation might affect the concrete in an adjacent pile (i.e.; where pile spacing is less than about three diameters) drilling should not be carried out before the previously poured pile concrete has set for at least 24 hours.

Where a group of four or more piles are used the allowable working load on the piles may need to be modified to allow for group effects.

Piles should be spaced no closer than 2.5 times the pile shaft diameter, measured centre-to-centre. Strict control of pile location and verticality should be exercised to provide accurate locations and spacings of piles. In general, piles should be constructed within a tolerance of 75 mm plan distance in any direction and within a verticality of 1 in 75.

A detailed record should be kept of pile construction; the following information should be included, pile number, shaft/base diameter, date and time bored, date and time concreted, elevation of piling platform, depths (from piling platform level) to pile base and to concrete cut-off level, length of casing used, details of reinforcement, details of any obstructions, details of any groundwater inflows, brief description of soils encountered in the bore and details of any unusual occurrences during construction.

If a large number of piles are to be installed, it may be possible to optimize the design on the basis of pile load tests.

CONSTRUCTION GUIDELINE

PROOF-ROLLING

Proof-rolling is a method of detecting soft areas in an 'as-excavated' subgrade for fill, pavement, floor or foundations or detecting non-uniformity of compacted embankment. The intent is to detect soft areas or areas of low shear strength not otherwise revealed by means of testholes, density testing, or visual examination of the site surface and to check that any fill placed or subgrade meets the necessary design strength requirements.

Proof-rolling should be observed by qualified geotechnical personnel.

Proof-rolling is generally accomplished by the use of a heavy (15 to 60 tonne) rubber-tired roller having 4 wheels abreast on independent axles with high contact wheel pressures (inflation pressures ranging from 550 kPa (80 psi) up to 1030 kPa (150 psi).

A heavily loaded tandem axle gravel truck may be used in lieu of the equipment described in the paragraph above. The truck should be loaded to approximately 10 tonnes per axle and a minimum tire pressure of 550 kPa (80 psi).

Ground speed - maximum 8 km/hr recommended 4 km/hr.

The recommended procedure is two complete coverages with the proof-rolling equipment in one direction and a second series of two coverages made at right angles to the first series; one 'coverage' means that every point of the proof-rolled surface has been subjected to the tire pressure of a loaded wheel. Less rigorous procedures may be acceptable under certain conditions subject to the approval of an engineer.

Any areas of soft, rutted, or displaced materials detected should be either recompacted with additional fill or the existing material removed and replaced with general engineered fill, or properly moisture conditioned as necessary.

The surface of the grade under the action of the proof-roller should be observed, noting; visible deflection and rebound of the surface, formation of a crack pattern in the compacted surface or shear failure in the surface of granular soils as ridging between wheel tracks.

If any part of an area indicates significantly more distress than other parts, the cause should be investigated, by, for example, shallow auger holes.

In the case of granular subgrades, distress will generally consist of either compression due to insufficient compaction or shearing under the tires. In the first case, rolling should be continued until no further compression occurs. In the second case, the tire pressure should be reduced to a point where the subgrade can carry the load without significant deflection and subsequently gradually increased to its specified pressure as the subgrade increases in shear strength under this compaction.

APPENDIX D

APPENDIX D LABORATORY TEST RESULTS

CONSTANT HEAD PERMEABILITY TEST REPORT

ASTM D5084

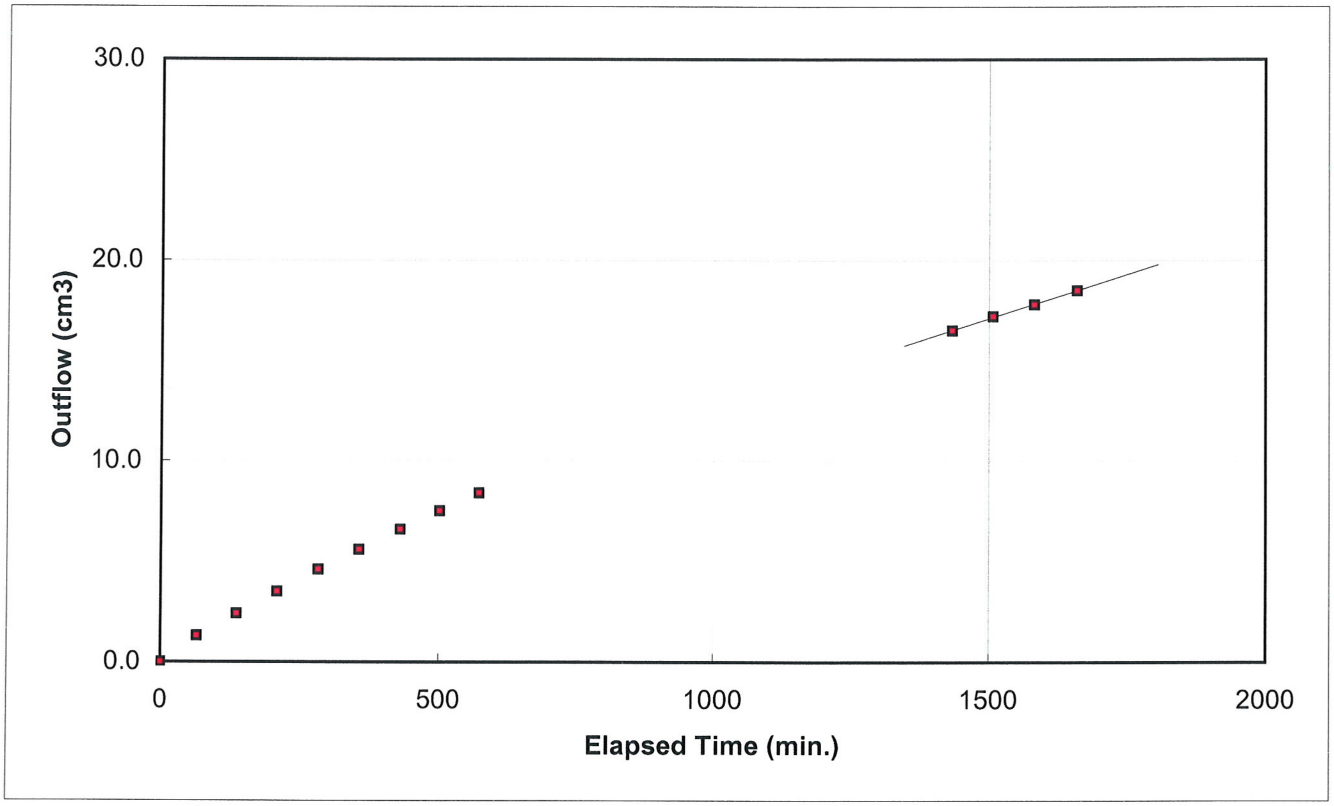
Project:	County Meadows - Geotechnical Evaluation	Test No.:	P-1
Project No.:	L12101650.001	Sample No.:	N/A
Client:	Stantec Consulting Ltd.	Sample Location:	Stockpile on site
Attention:		Date Tested:	10-11-17
		Tested By:	SK

Soil Description: Clay, silty, some sand

	Initial	Final
Moisture Content (%)	15.9	21.3
Dry Density (kg/m^3)	1723	1720

k_{20} = 6.4E-08 cm/sec

Height =	2.546	cm
Diameter =	7.116	cm
Head Diff. =	14	kPa
Q =	0.00015	cm^3/sec
i =	56.10	
A =	39.77	cm^2



Remarks: Tested at 97.7% SPD and 15.9% M.C.

Reviewed By: ______________________ P.Eng.

EBA Engineering
Consultants Ltd.

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D698, D1557, or D2049

Project: Country Meadows - Geotechnical Evaluation

Sample No.:

Project No.: L12101650.001

Test Date: November 1, 2010

Client: Stantec Consulting Ltd.

Moisture Content (as recieved): N\A%

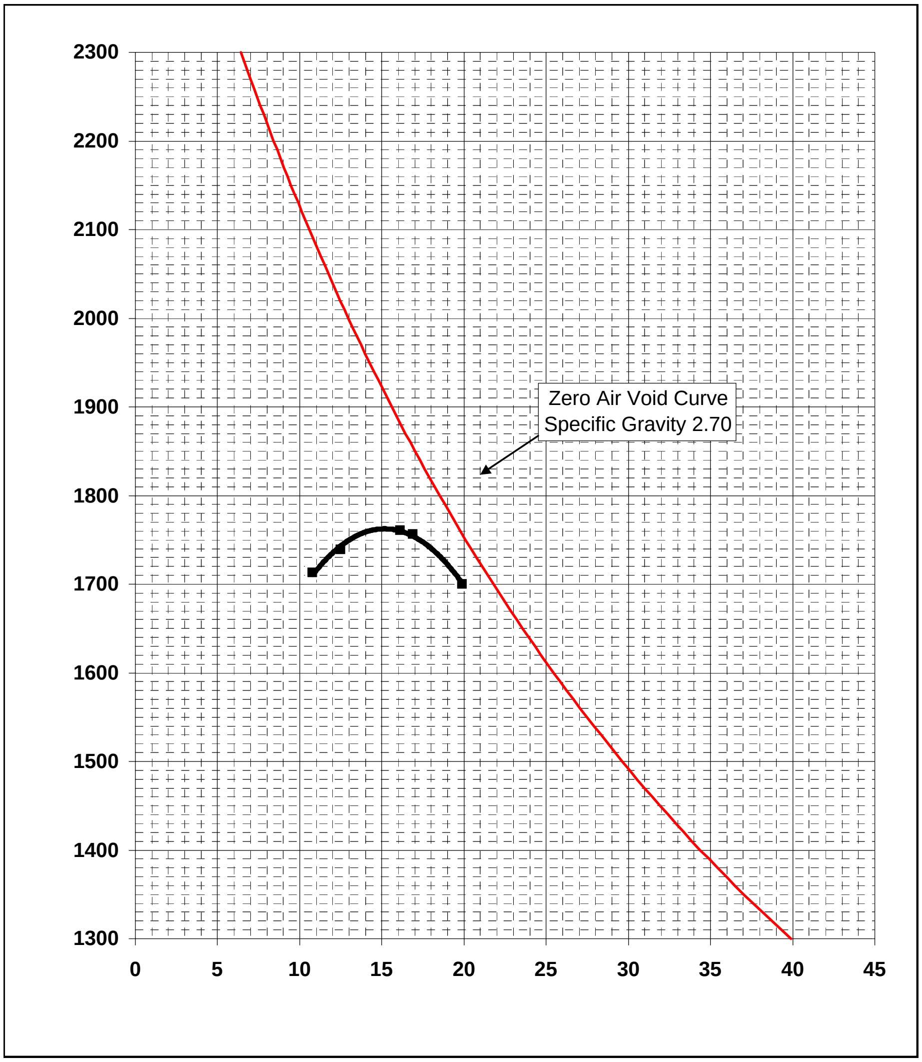
Description: Clay, silty, some sand

Maximum Dry Density: 1760kg/m³

Location: Stockpile on site

Optimum Moisture Content: 15.5%

Compaction: Manual **Preparation:** Moist



Standard Proctor

ASTM D698, Method

Hammer Mass: 2.494 kg

Hammer Drop: 304.8 mm

Number of Layers: 3

Number of Blows/Layer: 25

Diameter of Mould: 101.4 mm

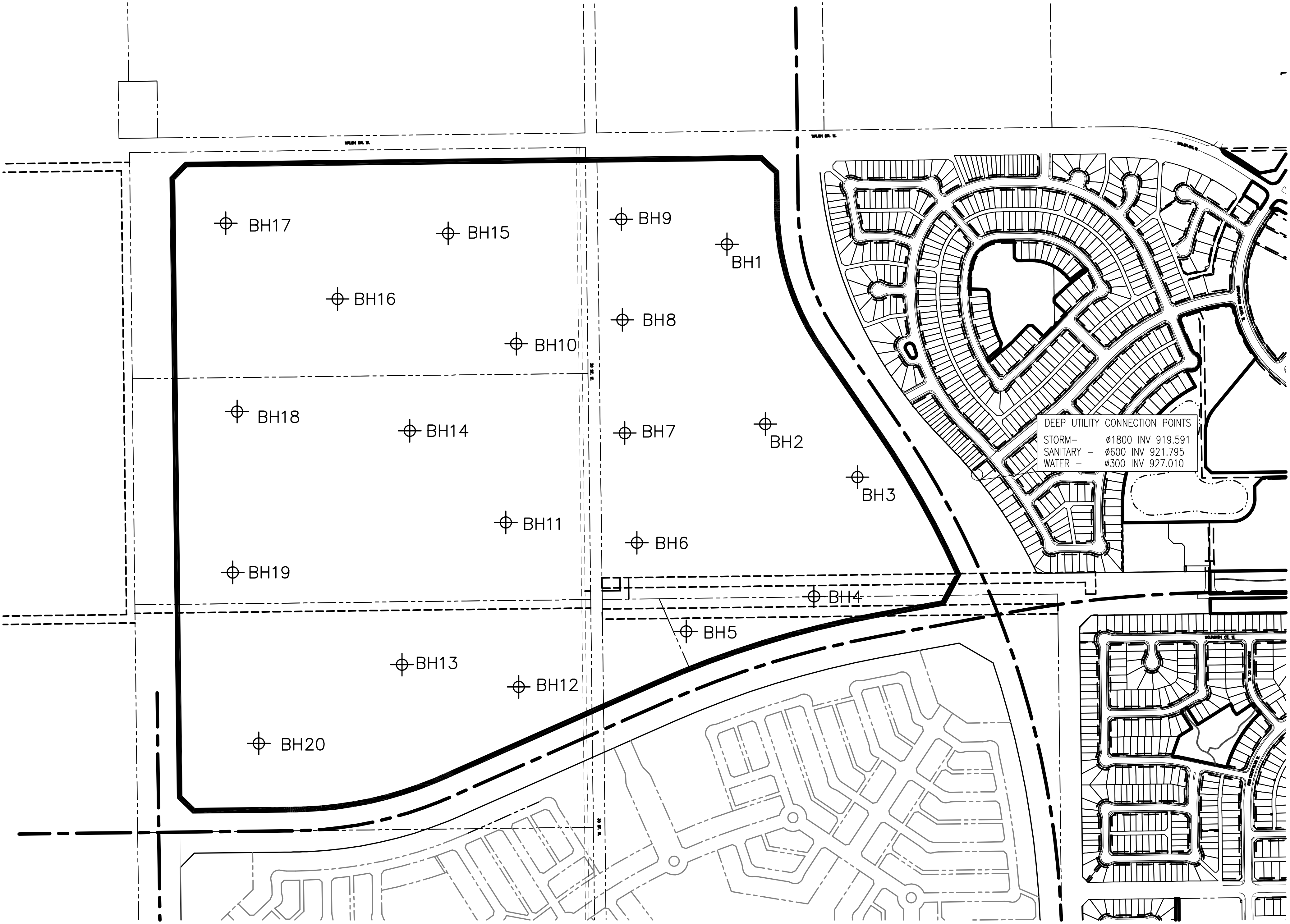
Height of Mould: 116.6 mm

Mould Volume: 0.000942 m³

Compactive Effort: 593.5 kJ/m³

Remarks: Atterberg Limits: PL = 14, LL = 36, PI = 22

Reviewed By: ______________________ C.E.T.



DEEP UTILITY CONNECTION POINTS
STORM– ø1800 INV 919.591
SANITARY – ø600 INV 921.795
WATER – ø300 INV 927.010

Point Listing made Tue Sep 14 08:31:53 2010 **Page 1 of 1**

Drawing Name: borehole layout_20100913
Project Name: Bore holes
Project Path: V:\1129\active\112945195\ld\Bore holes
Username: bschmidtke

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1	5506664.509	362175.900	.	bh1	bh1
2	5506344.616	362230.962	.	bh2	bh2
3	5506244.431	362389.790	.	bh3	bh3
4	5506036.823	362304.688	.	bh4	bh4
5	5505984.094	362076.826	.	bh5	bh5
6	5506144.139	361995.992	.	bh6	bh6
7	5506338.490	361982.427	.	bh7	bh7
8	5506538.559	361986.168	.	bh8	bh8
9	5506716.357	361991.365	.	bh9	bh9
10	5506503.932	361797.211	.	bh10	bh10
11	5506189.117	361766.143	.	bh11	bh11
12	5505897.979	361777.335	.	bh12	bh12
13	5505945.425	361572.807	.	bh13	bh13
14	5506357.722	361603.059	.	bh14	bh14
15	5506703.395	361684.679	.	bh15	bh15
16	5506595.561	361484.933	.	bh16	bh16
17	5506736.987	361293.150	.	bh17	bh17
18	5506403.739	361299.775	.	bh18	bh18
19	5506120.168	361280.730	.	bh19	bh19
20	5505816.491	361314.614	.	bh 20	bh 20

APPENDIX D

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

Gemini Property & Land Development

ISSUED FOR USE

PHASE I ENVIRONMENTAL SITE ASSESSMENT
310 – 30 STREET WEST
515 – 30 STREET WEST
520 – 30 STREET WEST
711 – 30 STREET WEST
720 – 30 STREET WEST
1025 – 30 STREET WEST

NE 33-008-22 W4M, A PORTION OF SE 33-008-22 W4M,
A PORTION OF NW-34-008-22 W4M, A PORTION OF SW 34-008-22 W4M,
AND LOT 1, BLOCK 1, PLAN 0814008
LETHBRIDGE, ALBERTA

L12101650.002

June 2010

EBA Engineering Consultants Ltd.
p. 403.329.9009 • f. 403.328.8817
442 – 10 Street North • Lethbridge, Alberta T1H 2C7 • CANADA

EXECUTIVE SUMMARY

FOREWORD

Gemini Property & Land Development (Gemini) retained EBA Engineering Consultants Ltd. (EBA) to conduct a Phase I environmental site assessment (ESA) of agricultural land located to the west of West Highlands Residential Subdivision in Lethbridge, Alberta. The land is located at 310, 515, 520, 711, 720, 1025 – 30 Street West, legally described as NE 33-008-22 W4M, a portion of SE 33-008-22 W4M, a portion of NW 34-008-22 W4M, a portion of SW 34-008-22 W4M, and Lot 1, Block 1, Plan 0814008. Collectively, these properties will hereinafter be referred to as the site. EBA understands that Gemini requires this environmental investigation as part of the proposed outline for the Country Meadows subdivision application process.

The objective of the Phase I ESA was to comment on whether any past or present land use, either off site or on site, may have a potential to cause environmental impairment to the site.

The Phase I ESA was conducted in general accordance with the Canadian Standards Association (CSA) Phase I ESA standard Z768-01 (2006).

FINDINGS AND CONCLUSIONS

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential impairment from on-site land use. This would include potential accidental spills or site practices that may impact the site directly. The second type of risk is from impairment caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater or in overland runoff onto the site.

There were five sources of potential environmental impairment from current or historical on-site land uses identified during this study. The following table outlines these sources.

POTENTIAL SOURCES OF ENVIRONMENTAL IMPAIRMENT

Potential Source of Environmental Impairment	Source of Information	EBA Evaluation
Potential Building materials [Asbestos, polychlorinated biphenols (PCBs), lead and lead based paint, ozone-depleting substances (ODS), urea formaldehyde foam insulation (UFFI)].	Aerial photo review, site visit.	During site re-development, if the on-site buildings are demolished or removed, a building materials survey should be conducted and the materials managed and disposed of appropriately.
Septic tank and septic fields.	Site interview.	During site re-development, these should be decommissioned in accordance with current regulations.
Ephemeral Wetlands.	Aerial photo review, site visit.	There is a potential for methane generation from buried organics, which could present a potential concern to nearby structures. Buried organic soils within a building's footprint should be addressed for geotechnical considerations and potential methane generation.

POTENTIAL SOURCES OF ENVIRONMENTAL IMPAIRMENT (CONTINUED)		
Potential Source of Environmental Impairment	Source of Information	EBA Evaluation
Unknown historical waste disposal practices.	Site interview/visit.	Historical practices of waste disposal, including burning barrel ashes and burn pits, animal, and chemical disposal was unknown on the site. Should site development encounter a disposal area, a qualified environmental professional should be contacted for further assessment.
Above-ground storage tanks (ASTs).	Site visit.	It is unknown if the AST contents have impacted the area in the vicinity of the ASTs. While they are currently active, when the ASTs are decommissioned or removed from their current location, it should be determined if there is a hydrocarbon impact.

There was no potential source of environmental impairment from current or historical off-site land uses identified during this study.

FURTHER ACTION/RENDERING AN OPINION

Based on the current study, no further work (i.e., Phase II ESA) is recommended at this time. However, EBA suggests taking the following into consideration:

- Ephemeral wetlands containing water were observed at the site during the site reconnaissance and noted in the aerial photograph review. Future development in these areas may require an approval under the Alberta Water Act. According to the aerial photograph review, several of these ephemeral wetlands have been cultivated since the 1950s. There is potential for methane generation from buried organic material commonly found in wetland areas. Buried organic soils should be removed in the areas of future building development.
- Based on the age of the building, there is potential for hazardous materials such as asbestos and lead in the construction materials. Should the site building be redeveloped or demolished, a hazardous building materials survey should be conducted and potentially hazardous building material should be disposed of in a manner consistent with current regulations.
- During site development, if fill, organic material, or debris is encountered, an environmental professional should be notified to determine if further assessment is required at the site.
- During site development, septic tanks/fields should be decommissioned in accordance with current regulations.
- Should site development encounter a disposal area, a qualified environmental professional should be contacted for further assessment.
- When the ASTs are decommissioned or removed from their current location, the area in the vicinity of the current active ASTs should be assessed by an environmental professional to determine if the area has been impacted by petroleum hydrocarbons.

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APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

Gemini Property & Land Development (Gemini) retained EBA Engineering Consultants Ltd. (EBA) to conduct a Phase I environmental site assessment (ESA) of agricultural land located to the west of West Highlands Residential Subdivision in Lethbridge, Alberta. The land is located at 310, 515, 520, 711, 720, 1025 – 30 Street West, legally described as NE 33-008-22 W4M, a portion of SE 33-008-22 W4M, a portion of NW 34-008-22 W4M, a portion of SW 34-008-22 W4M, and Lot 1, Block 1, Plan 0814008. Collectively, these properties will hereinafter be referred to as the site. EBA understands that Gemini requires this environmental investigation as part of the proposed outline for the Country Meadows subdivision application process.

The objective of the Phase I ESA was to comment on whether any past or present land use, either off site or on site, may have a potential to cause environmental impairment to the site.

The Phase I ESA was conducted in general accordance with the Canadian Standards Association (CSA) Phase I ESA standard Z768-01 (2006).

1.2 AUTHORIZATION

Mr. Joe Mezaros of Gemini provided authorization to proceed with the present study via a signed Services Agreement to EBA on May 17, 2010.

1.3 SCOPE OF WORK

EBA conducted the following scope of work for the Phase I ESA:

- Conducted a records review for the site and surrounding properties:
  - Reviewed current and historical information searches of provincial regulatory information including:
    - the Petroleum Tank Management Association of Alberta (PTMAA);
    - the Energy Resources Conservation Board (ERCB) information provided by the Abacus Datagraphics (AbaData) database and the Coal Mine Atlas; and
    - Alberta Environment's (AENV's) database: ESA Repository (ESAR), Online Water Well Database, Approval Viewer and Spatial Information System (SPIN II).
  - Reviewed previous reports for the site (if available).

- Reviewed available regional and municipal information, including:
  - aerial photographs;
  - The City of Lethbridge (the City);
  - The County of Lethbridge (the County);
  - The Galt Museum and Archives; and
  - geologic and hydrogeologic information, including published topographic, geologic, soils, and groundwater maps.
- Conducted a site visit to evaluate the extent and manner that past, present, and surrounding activities may have upon the site and the environment. Intrusive sampling was not conducted as part of the Phase I ESA.
- Prepared this report discussing the site history and identified the potential for environmental concerns resulting from past or present land use on site and in the surrounding area.

1.4 QUALIFICATIONS OF ASSESSORS

Mr. Jaymes Going, B.Sc., conducted the historical records review, site visit, and prepared this report. Mr. Going is an environmental scientist for EBA's Lethbridge environment practice and has over two years of experience in the environmental industry.

Ms. Mandi Parker, P.Ag., assisted with the interpretation of the findings and conducted a preliminary review of the report. Ms. Parker is the team leader for the Lethbridge environment practice and has over nine years of experience in the environment industry.

Mr. Brian Tsang, M.Sc., P.Chem., P.Geol., assisted with the interpretation of the findings and conducted the senior review of the report. Mr. Tsang is the project director of EBA's environment practice in Calgary and has over 13 years of experience conducting ESAs.

1.5 GENERAL SITE DETAILS

The irregularly-shaped site is located in West Lethbridge, west of West Highlands residential subdivision, and northwest of Indian Battle Heights residential subdivision. The site is located within the NE quarter of 33-008-22 W4M, a portion of the SE quarter of 33-008-22 W4M, a portion of the NW quarter of 34-008-22 W4M, and a portion of the SW quarter of 34-008-22 W4M corresponding with six municipal addresses, detailed in Table A. The site primarily consists of undulating, cultivated agricultural and pasture land containing several ephemeral wetlands.

The site is bounded by Walsh Drive West to the north, West Highlands residential subdivision to the east, and agricultural land to the south and west. The western boundary of the site is also the City of Lethbridge municipal boundary, and 30 Street West bisects

Section 33 and Section 34. There are three separate private residences on the west side of 30 Street West.

Figure 1 shows the site location plan and Figure 2 shows the site plan and surrounding land use. Photographs of the site are provided in Appendix A.

2.0 RECORDS REVIEW

The results of the record review are provided in Appendix B.

2.1 LEGAL DESCRIPTION, MUNICIPAL ADDRESSES, SIZE, AND OWNERSHIP

The site is located in Lethbridge, Alberta. The legal description, municipal address, zoning and ownership are summarized in Table A.

TABLE A: LEGAL DESCRIPTION, MUNICIPAL ADDRESS, ZONING, AND OWNERSHIP

Legal Description	Municipal Addresses	Zoning	Owner(s)
North 1/2 of the NE quarter 33-008-22 W4M	310 – 30 Street West	Urban Reserve (UR)	Marlene and Clifford Brown
South 1/2 of the NE quarter 33-008-22 W4M	520 – 30 Street West	Urban Reserve (UR)	Mervyn Hiebert Professional Corporation and Duncan Mackey Professional Corporation
North 1/2 of the SE quarter 33-008-22 W4M	720 – 30 Street West	Direct Control (DC)	Debra Dudley-Olafson
NW 34-008-22 W4M	515 – 30 Street West	Urban Reserve (UR)	Southgate Commercial Lands Corp.
SW 34-008-22 W4M	711 – 30 Street West	Urban Reserve (UR)	The City of Lethbridge
SW 34-008-22 W4M	1025 – 30 Street West	Urban Reserve (UR)	Mavis McKay, Marion Moore, Sharon Marshall, Kenneth McKay

Copies of the current land titles are provided in Appendix B.

2.2 HISTORIC RECORDS REVIEW

A historic records review was undertaken for the site and surrounding properties. Section 2.2.1 through Section 2.2.10 discuss the findings of this review.

2.2.1 Historic Land Title Records

The results of the land title search are summarized in the following tables (Table B to Table G).

TABLE B: LAND TITLES SUMMARY NORTH 1/2 OF THE NE QUARTER 33-008-22 W4M		
Year(s) of Ownership	Owner(s)	EBA Evaluation
1974 to present	Marlene and Clifford Brown	No obvious potential for environmental concerns.
1948 to 1974	John Rogers Davis	
1912 to 1948	Alice Maria Stockdale	

TABLE C: LAND TITLES SUMMARY SOUTH 1/2 OF THE NE QUARTER 33-008-22 W4M		
Year(s) of Ownership	Owner(s)	EBA Evaluation
2005 to present	Mervyn Hiebert Professional Corporation and Duncan Mackey Professional Corporation	No obvious potential for environmental concerns.
1998 to 2005	William Rogers and Joni Lee Davis	
1974 to 1998	William Rogers Davis	
1948 to 1974	John Rogers Davis	
1912 to 1948	Alice Maria Stockdale	

TABLE D: LAND TITLES SUMMARY NORTH 1/2 OF THE SE QUARTER 33-008-22 W4M		
Year(s) of Ownership	Owner(s)	EBA Evaluation
2006 to present	Debra Dudley-Olafson	No obvious potential for environmental concerns.
1994 to 2006	Debbie and Randall Olafson	
1993 to 1994	838 Land Developments Ltd.	
1993	Soroka Ventures Ltd.	
1989 to 1993	Soroka Ventures Ltd. and Gemini Property & Land Developments Ltd.	
1988	Soroka Developments Ltd.	
1982 to 1988	Krahn Homes Ltd.	
1915 to 1982	Private landowners	

TABLE E: LAND TITLES SUMMARY NW 34-008-22 W4M

Year(s) of Ownership	Owner(s)	EBA Evaluation
2009 to present	Southgate Commercial Lands Corp.	No obvious potential for environmental concerns.
1954 to 2009	College Farms Ltd.	
1954	Aubern P Hubbard	
1949 to 1954	Ada P Culham	
1943 to 1949	Harry Hubbard	
1920 to 1943	Mary Knibbs	
1908 to 1920	Mike Blasco	

TABLE F: LAND TITLES SUMMARY SW 34-008-22 W4M (711 – 30 STREET WEST)

Year(s) of Ownership	Owner(s)	EBA Evaluation
2008 to present	The City of Lethbridge	No obvious potential for environmental concerns.
1993 to 2008	Mavis McKay, Marion Moore, Sharon Marshall, Kenneth McKay	
1987 to 1993	Donald McKay	
1975 to 1987	Thomas John Crawford	
1963 to 1987	Mary Crawford	
1908 to 1963	Robert Crawford	

TABLE G: LAND TITLES SUMMARY SW 34-008-22 W4M (1025 – 30 STREET WEST)

Year(s) of Ownership	Owner(s)	EBA Evaluation
1993 to present	Mavis McKay, Marion Moore, Sharon Marshall, Kenneth McKay	No obvious potential for environmental concerns.
1987 to 1993	Donald McKay	
1975 to 1987	Thomas John Crawford	
1963 to 1987	Mary Crawford	
1908 to 1963	Robert Crawford	

Notes:

Land titles were obtained from Alberta Registries Land Title Office in Calgary, Alberta.

2.2.2 Aerial Photographs

Aerial photographs provide visual evidence of site occupancy, operational activities, and general site details. Aerial photographs capture a view of the site and the surrounding areas at a given time. Table H provides a detailed historical review of the aerial photographs.

TABLE H: HISTORIC AIR PHOTO SUMMARY

Year	Scale	Observations
1950	1:40,000	On Site: Cultivated agricultural land containing several ephemeral wetlands that appear dry. A road is partially visible (30 Street West) through the middle of the site.
		Off Site: Cultivated agricultural land with a few scattered acreages and several ephemeral wetlands, some appear to have water in them. A road (Walsh Drive West) is adjacent to the site to the north. South of the site is a small piece of land uncultivated containing unknown objects (possibly an abandoned farmstead or outbuildings). To the east of the site appears to be a canal running crookedly in a northerly/southerly direction.
1961	1:31,680	On Site: Similar to the 1950 photograph.
		Off Site: Similar to the 1950 photograph. A road (30 Street West) is clearly visible.
1970	1:31,680	On Site: Similar to the 1961 photograph. The ephemeral wetlands appear to have water in them.
		Off Site: Similar to the 1961 photograph. The ephemeral wetlands appear to have water in them.
1979	1:25,000	On Site: An acreage has been constructed in the north central region of the site, and appears to have a dugout. The ephemeral wetlands scattered across the site appear to have water in them.
		Off Site: Similar to the 1970 photograph. The ephemeral wetlands appear to have water in them. The feature described as a canal in the 1950 aerial photograph has been modified and is now running straight in a northwest to southeast direction.
1988	1:30,000	On Site: Similar to the 1979 photograph. The ephemeral wetlands appear dry.
		Off Site: Similar to the 1979 aerial photograph. The ephemeral wetlands appear dry. To the southeast of the site, Indian Battle Heights residential subdivision has been constructed.
1994	1: 20,000	On Site: The ephemeral wetlands across the site appear to be dry or were cultivated. A dugout, a corral, and unknown objects (possibly granaries) are visible south of the acreage mentioned in 1979. Further south, an acreage and what appears to be a dugout has been constructed on site.
		Off Site: Similar to the 1988 photograph.

TABLE H: HISTORIC AIR PHOTO SUMMARY (CONTINUED)

Year	Scale	Observations
2001	1: 20,000	On Site: Similar to the 1994 photograph. Between the two acreages mentioned earlier, a road and what appears to be a mobile home is now visible.
		Off Site: Similar to the 1988 photograph.
2009	1: 10,000	On Site: Similar to the 2001 photograph.
		Off Site: West Highlands residential subdivision has being constructed adjacent to the site to the east, on the land where the canal was. South of the site a large building and sports fields and a residential subdivision have been partially constructed.

Notes:
To be read in conjunction with the accompanying report.
The aerial photographs are enlarged (where possible) for the review.
Aerial photographs were obtained from Alberta Sustainable Resource Development (ASRD).

2.2.3 Museum Archives

EBA contacted the Galt Museum and Archives for indications of historical land use at the site and the surrounding area; however, no records were available.

2.2.4 Business Directories

EBA contacted the Galt Museum and Archives for Henderson Business Directories (HBDs); however, no HBDs were available for the site or surrounding area.

2.2.5 Fire Insurance Plans (FIP)

EBA reviewed the 1955 (Revised 1965) fire insurance plan (FIP) coverage maps for the City (Western Canada Insurance Underwriters Association 1955). The FIP maps did not provide coverage for the site.

2.2.6 Other Archival Records

No additional archival records were reviewed for the site.

2.3 PROVINCIAL REGULATORY INFORMATION

This section describes the results of provincial regulatory searches. Copies of the search results and correspondence are provided in Appendix B.

2.3.1 Petroleum Tank Management Association of Alberta (PTMAA)

EBA contacted the PTMAA regarding the potential for registered petroleum storage tanks (PSTs) at the site. The PTMAA response indicated that no records are available for the site (NW and SW-34-008-22 W4M or NE and SE-33-008-22 W4M Lethbridge, Alberta). Please note that municipal addresses have been assigned to the site for approximately eight years but these were not searched as no development or subdivision has occurred on the site in that time.

The PTMAA requires that all underground storage tanks (USTs) be registered; however, only above-ground storage tanks (ASTs) with a capacity greater than 2,500 L are required to be registered. The database is based on a limited survey conducted in 1992 and voluntary information submitted thereafter; therefore, it is not considered to be a comprehensive inventory of tanks in Alberta.

2.3.2 Energy Resources Conservation Board (ERCB)

EBA acquires ERCB database information through AbaData. AbaData indicated there are pipeline right-of-ways (ROWs) on the site or in the surrounding area. A pipeline ROW is adjacent to the site to the west and south of the NE Section 33-008-22 W4M, and two gas pipeline ROWs intersect the site between the NW and SW quarters of Section 34. AbaData indicated that two pipelines are present to the southwest of the site at a distance greater than 300 m. Tables I outline the details of the pipelines.

TABLE I: PIPELINE INFORMATION

	21918-4	21918-6	21918-8
Location	Located along the west and south boundaries of NW Section 34-008-22 W4M.	Located along the southeast boundary of NW Section 34-008-22 W4M.	Located along the south boundary of NE Section 33-008-22 W4M.
Permit Date	August 25, 2009	August 25, 2009	August 25, 2009
Company	ATCO Gas and Pipelines Ltd. (South)	ATCO Gas and Pipelines Ltd. (South)	ATCO Gas and Pipelines Ltd. (South)
From	15-09-009-22 W4M (pipeline)	11-34-008-22 W4M (pipeline)	05-33-008-22 W4M (metre station)
To	11-34-008-22 W4M (pipeline)	10-34-008-22 W4M (pipeline)	12-34-008-22 W4M (pipeline)
Length	4.86 km	0.09 km	1.53 km
Substance	Natural gas	Natural gas	Natural gas
H_2S	10 parts per million (ppm)	10 ppm	10 ppm

AbaData had no records or spills or facilities located on the site or the immediate surrounding area. No oil pipelines exist on the site nor have any reported spills occurred on the site or surrounding area.

High pressure pipeline and well information provided by AbaData is current to May 31, 2010 and information on low pressure pipelines is current to November 1, 2005.

The ERCB Coal Mine Atlas was reviewed and it was determined that a portion of the Galt No. 008 Mine was previously located below the northeast corner of the site. The mine operated between 1934 and 1957 and removed a total of 3187 kT of coal. The mine entrance and shafts are located greater than 1,000 m to the east of the site, in 02-009-22 W4M. The coal was located approximately 100 m below surface, minimizing environmental concerns to the site. This mine is not suspected to be an environmental concern to the site.

2.3.3 Alberta Environment (AENV)

The AENV ESAR is a searchable database that provides scientific and technical information about assessed sites throughout Alberta. The ESAR was searched for ESAs on the site or in the immediate surrounding area within 100 m. The ESAR search indicated that no information was available for the properties that were searched.

The AENV Online Approval Viewer allows the public to view approvals, licenses, registrations, and permits issued under the Water Act and Environmental Protection and Enhancement Act (EPEA). The Approval Viewer has no documents related to NW and SW-34-008-22 W4M or NE and SE-33-008-22 W4M.

The AENV Water Well Database has records of five water wells located within or near the site (Section 27, 33, 34-8-22 W4M and Section 3-9-22 W4M); however, the exact locations of the wells are unknown. If the wells are encountered during potential future site development and are no longer required, they should be decommissioned in accordance with current regulations. The following Table J summarizes the water well information.

TABLE J: WATER WELL INFORMATION

Section Location	Water Well ID	Owner	Year Drilled	Depth (m)
27-008-22 W4M	118440	Unknown	Unknown	7.62
33-008-22 W4M	118456	W.L. Hamilton	1937	193
33-008-22 W4M	118454	Steve Soroka	1988	0
34-008-22 W4M	118458	Unknown	1937	114
03-009-22 W4M	109450	# Hole 5	1947	112.78

The Alberta Government SPIN Website map for the site and surrounding area identified the same ROWs as the ERCB's AbaData website. No further records of the pipeline ROWs are available on the SPIN website.

2.4 REGIONAL AND MUNICIPAL REGULATORY INFORMATION

This section describes the results of regional and municipal regulatory searches. Copies of the search results and correspondence are provided in Appendix B.

2.4.1 The City of Lethbridge

EBA requested a site inquiry with the City for available information regarding environmental information at or near the site. The site inquiry indicated that no environmental information exists for the site.

The City of Lethbridge Interactive WebMap was also searched to determine the land use and zoning for the site and surrounding area, detailed in Section 2.1 and Section 3.4, respectively.

2.4.2 The County of Lethbridge

EBA requested a site inquiry with the County for available information regarding environmental information at or near the site. The site inquiry indicated that the site was annexed by the City in 1984. At that time, all records and files pertaining to the site were turned over to the City.

2.5 LAND FORMS AND GEOLOGY

2.5.1 Topography

Surface topography can influence the direction of migration of contaminants at the soil surface. The local topography is the topography at the site whereas regional topography is the overall expression of the soil surface in a given region. The surface topography of the site and surrounding area is undulating.

2.5.2 Geology

The surficial geology in the area is characterized by moraine till deposits with sporadic lenses of gravel, sand, and silt (Shetson 1981).

The stratigraphy of the Lethbridge area is generally comprised of 65 m to 70 m of surficial deposits overlying bedrock. Bedrock in the Lethbridge area consists of strata from the upper Oldman Formation and the lower Bearpaw Formation, both of the late Cretaceous Age (Tokarsky 1973). The bedrock has a relatively flat surface dipping slightly to the northwest and is locally encountered at about geodetic elevation 840 m. The bedrock strata consist of thin beds of predominantly weak mudstones, siltstones, and sandstones with occasional bentonite and coal seams.

2.5.3 Hydrology and Hydrogeology

Groundwater is of significance as a potential means of contaminant transport. Regional groundwater flow is the overall direction of groundwater flow in a given region. There may be local groundwater flow within a region that is in a different direction from the regional flow and that is controlled by topography and/or subsurface soil conditions.

There are ephemeral wetlands scattered across the site. According to the aerial photograph review, some of these wetlands contain water in wet years. Additional surface waterbodies in the area include a stormwater management pond in the West Highlands residential subdivision approximately 300 m to the east and two stormwater management ponds approximately 1,500 m and 2,500 m to the southeast, located in The Crossings and Copperwood residential subdivision.

The Oldman River loops around the surrounding area to the west, south, and east approximately 3 km to 4 km from the site (Tokarsky 1973). It is anticipated that shallow and local groundwater flow would be east towards the Oldman River. Perched groundwater tables have also been encountered in many areas of Lethbridge. The depth to these perched tables can vary from approximately 2 m below ground level to considerable depths within gravel, sand, and/or silt seams. The flow of these perched tables can also vary in any direction or be still, dependent on the horizontal and vertical dip and the extent of the sand and/or silt seams.

It should be noted that topography, geologic materials, land development, and soil disturbances influence localized variances in groundwater movement and pattern. In addition, groundwater levels will fluctuate seasonally and in response to climatic conditions.

2.6 PREVIOUS REPORTS

No known previous reports were available for the site.

2.7 OTHER INFORMATION SOURCES

There were no other information sources reviewed for the site.

3.0 SITE VISIT

Mr. Going of EBA visited the site on June 2, 2010. Full access to the site was available at the time of the site reconnaissance, with the exception of the acreages, including the associated private residences and other small buildings.

The reconnaissance included a visual inspection of the accessible site boundaries and observations of adjacent properties to identify evidence of impairment or potential sources of impairment, which may adversely affect the site.

3.1 BUILDING DETAILS

Three acreages are present on site. Review of aerial photos show that the oldest building (northern acreage) was constructed in the 1970s. The southern acreage was constructed in the mid 1990s, and the age of the middle acreage (a mobile home) is unknown (arrived on site between the years 1994 and 2001). Other small buildings are also located on the acreages. These include storage sheds, horse shelters, and hay storage. The interior of the buildings were not inspected at time of site reconnaissance.

Table K summarizes site servicing for all three acreages.

TABLE K: SITE SERVICING			
Item	Present	Type	Comments
Water Supply	Yes	Dugouts	None.
Storm Sewer	No	n/a	Surface runoff only.
Sanitary Sewer	Yes	Septic Tanks/Fields	It is understood that each acreage has its own septic tanks and fields.
Heating	Yes	Unknown	Furnaces are typically forced air that run on natural gas. If air conditioning units are present at the residential dwellings, they may contain Freon. These should be maintained by a qualified contractor and disposed of appropriately at the end of their useful life.
Cooling			
Fire Extinguishing Systems	Unknown	n/a	Likely water from the dugout or fire extinguishers.

3.2 SPECIAL ATTENTION ITEMS

Some construction materials, which may be present in buildings, may be hazardous to building occupants or users of the site. There were multiple buildings located on the site at the time of the site reconnaissance and special attention items may be present at the site. The following table (Table L) summarizes these special attention items. Further background information on these materials is provided in Appendix C.

TABLE L: SPECIAL ATTENTION ITEMS		
Item	Presence/ Potential	Comments
Asbestos	High	Based on the age of construction (northern acreage), there may be asbestos containing materials in the building. Lead or PCBs may also be present in the construction materials based on the age of construction. Sampling of the construction materials was not included as part of the Phase I ESA.
Lead		
Polychlorinated Biphenyls (PCBs)		
Ozone-depleting Substances (ODS)	High	It is suspected that the private residences have ODS containing appliances. If found, these units should be disposed of according to the appropriate standards.
Urea Formaldehyde Foam Insulation (UFFI)	Low	Based on the age of construction. If this type of insulation was used, the fugitive emissions were likely the most harmful within two years of installation.
Mould	n/a	Access to the inside of the buildings was not available.
Radon	Low	There was no radon gas testing reported for the site; however, natural radon concentrations are low in Alberta and radon gas concentrations are usually well below target limits set for Canada. There were no anthropogenic sources of radon gas identified.

TABLE L: SPECIAL ATTENTION ITEMS

Item	Presence/ Potential	Comments
Methane	Low	There was no methane gas testing reported for the site. Based upon information collected during this investigation (i.e., aerial photograph review, site reconnaissance), there is evidence of possible buried organics at the site that could produce methane. Suspected areas of potential methane generation include ephemeral wetlands that are on site, some of which have been cultivated over. Refer to Section 3.3.5 regarding potential fill areas.
Electromagnetic (EM)	Low	Overhead power lines are present along Walsh Drive West and 30 Street West that could produce EM fields. No EM assessment was completed for the site.
Noise and Vibration	Low	Walsh Drive West and 30 Street West, adjacent to and through the site, are potential sources of noise and vibration.

3.3 SITE OBSERVATIONS

This section describes observations made of the site during the site reconnaissance.

3.3.1 Surficial Stains

There were no areas of surficial staining noted at the site during the site reconnaissance.

3.3.2 Vegetation

The site was largely vegetated at the time of the site reconnaissance; to the west of 30 Street West was pasture containing pasture grasses. East of 30 Street West was stubble and a small area of an agricultural crop. There were no signs of distressed vegetation at the time of the site reconnaissance.

3.3.3 Ponding of Water

Ephemeral wetlands were located on the site and contained water at the time of the site reconnaissance. Future development in these areas may require an approval under the Alberta Water Act.

Under the Alberta Water Act, a "waterbody" refers to "any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood, and includes but is not limited to wetlands…" (Water Act, revised Statutes of Alberta 2000, Chapter W-3, Section 1). A wetland identified on the property would be considered a "waterbody" under the Alberta Water Act and should therefore be included in the wetland compensation plan.

AENV's Provincial Restoration and Compensation Guide (February 2007) defines a wetland as "land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity which are adapted to a wet environment".

3.3.4 Washouts and Erosion

There were no washouts or indications of erosion observed at the site during the site reconnaissance.

3.3.5 Fill Areas and Soil Conditions

No fill areas were observed at the site during the site reconnaissance.

It should be noted that volumes and exact locations of potential fill material have not been determined as this is not within the scope of this Phase I ESA. The potential for methane generation is described in Section 3.2.

3.3.6 Oil/Gas Wells and Pipelines

ATCO gas pipelines run adjacent to and intersect the site, as well, there is an ATCO gas pipeline receipt tie-in situated along the pipeline ROW between the NW and SW quarters of section 34-008-22 W4M. An ATCO gas regulating station for West Lethbridge is located adjacent to the site to the east, within the Indian Battle Heights residential subdivision.

3.3.7 Waste Storage

This area of Lethbridge does not have a municipal waste collection service, and is not serviced by the municipal sewer system. Waste is burned in burning barrels and the residences have septic tanks and fields. It is unknown where the ashes from the burning barrels are currently disposed. Historical waste disposal is also unknown. Though not observed during the site visit, there is the possibility of disposal areas including municipal waste pits, ash pits, burnpits, animal, and chemical pits.

3.3.8 Chemical Storage

No chemical storage was observed at the site during the site reconnaissance; however, it is assumed that there would be storage of small amounts of both household and/or agricultural chemicals. This was not confirmed during the site visit. Refer to Section 3.3.10 and Section 3.3.11 for details regarding storage tanks.

3.3.9 Transformers

There were two pole-mounted transformers observed on site during the site reconnaissance. These were located at the intersection of Walsh Drive West and 30 Street West, and in the yard of the southern acreage. These transformers appeared relatively new; however, it is unknown whether the transformers contain PCBs. No staining or leakage was observed beneath the transformers during the site reconnaissance.

There are two distribution transformers adjacent to the site along West Highlands residential subdivision. They both were relatively new (2006) and were situated on concrete bases. No staining or leakage was observed beneath the transformers during the site reconnaissance.

3.3.10 Hydraulic Elevators and Hoists

There were no hydraulic elevators or hoists observed on the site during the site reconnaissance.

3.3.11 Vent Pipes and Underground Storage Tanks (USTs)

No USTs were observed at the site during the site reconnaissance. Underground tanks for the septic systems are present. Please see Section 2.3.1 (PTMAA) for information about USTs in the surrounding area.

3.3.12 Above-ground Storage Tanks (ASTs) and Drum Storage

Three ASTs were observed at the site during the site reconnaissance; these are located on the northern acreage and are still in use. These ASTs are approximately 500 L and are typical on farms. They would contain gas or diesel and are used to fuel farm vehicles and equipment. Please see Section 2.3.1 (PTMAA) for information about ASTs in the surrounding area.

3.3.13 General Housekeeping

The general housekeeping of the site was good and no obvious evidence of negligent acts or illegal dumping was observed during the site reconnaissance.

3.4 OFF-SITE OBSERVATIONS

The following table (Table M) summarizes the surrounding land use.

TABLE M: SURROUNDING LAND USE

Direction	Land Use	Business Name	Zoning	Observations EBA Evaluation
North and south	Agricultural	n/a	Urban Reserve (UR), Direct Control (DC)	No obvious potential for environmental concern.
West	Agricultural	County of Lethbridge.	Lethbridge Urban Fringe (LUF)	
East	Residential	West Highlands residential subdivision.	Low Density Residential (R-L)	

The surrounding land to the north and south is zoned urban reserve and direct control. The surrounding land to the east is low density residential. The surrounding land to the west is outside the City municipal boundary, is agricultural, and is zoned Lethbridge Urban Fringe by the County of Lethbridge. Key surrounding land use is indicated on Figure 2.

4.0 PERSONNEL INTERVIEWS

EBA interviewed the following personnel during the Phase I ESA. The findings of the personnel interview, which have been incorporated into this report, are in general agreement with the records review conducted for the site. Table N summarizes the interviews.

TABLE N: INTERVIEW SUMMARY

Item	Description
Interviewee	Cliff Brown, current landowner.
Information Provided	Provided information about current and historical land use.
Interviewee	Employee with ATCO gas.
Information Provided	Provided information about the receipt tie-in (located on site) and the West Lethbridge regulating station (adjacent to the site).

5.0 DISCUSSION AND CONCLUSIONS

5.1 GENERAL

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential impairment from on-site land use. This would include potential accidental spills or site practices that may impact the site directly. The second type of risk is from impairment caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater, or in overland runoff onto the site.

5.2 POTENTIAL FOR IMPAIRMENT FROM ON-SITE SOURCE(S)

There were five sources of potential environmental impairment from current or historical on-site land uses identified during this study. Table O outlines these sources.

TABLE O: POTENTIAL ON-SITE SOURCES OF ENVIRONMENTAL IMPAIRMENT

Potential Source of Environmental Impairment	Source of Information	EBA Evaluation
Potential Building materials (Asbestos, PCBs, Lead and lead based paint, ODS, UFFI).	Aerial photo review, site visit.	During site re-development, if the on-site buildings are demolished or removed, a building materials survey should be conducted and the materials managed and disposed of appropriately.
Septic tank and septic fields.	Site interview.	During site re-development, these should be decommissioned in accordance with current regulations.
Ephemeral Wetlands.	Aerial photo review, site visit.	There is a potential for methane generation from buried organics, which could present a potential concern to nearby structures. Buried organic soils within a building's footprint should be addressed for geotechnical considerations and potential methane generation.
Unknown historical waste disposal practices.	Site interview/visit.	Historical practices of waste disposal, including burning barrel ashes and burn pits, animal, and chemical disposal was unknown on the site. Should site development encounter a disposal area, a qualified environmental professional should be contacted for further assessment.
ASTs.	Site visit.	It is unknown if the AST contents have impacted the area in the vicinity of the ASTs. While they are currently active, when the ASTs are decommissioned or removed from their current location, it should be determined if there is a hydrocarbon impact.

5.3 POTENTIAL FOR IMPAIRMENT FROM OFF-SITE SOURCE(S)

There was no potential source of environmental impairment from current or historical off-site land uses identified during this study.

6.0 FURTHER ACTION/RENDERING AN OPINION

Based on the current study, no further work (i.e., Phase II ESA) is recommended at this time. However, EBA suggests taking the following into consideration:

- Ephemeral wetlands containing water were observed at the site during the site reconnaissance and noted in the aerial photograph review. Future development in these areas may require an approval under the Alberta Water Act. According to the aerial photograph review, several of these ephemeral wetlands have been cultivated since the 1950s. There is potential for methane generation from buried organic material commonly found in wetland areas. Buried organic soils should be removed in the areas of future building development.

- Based on the age of the building, there is potential for hazardous materials such as asbestos and lead in the construction materials. Should the site building be redeveloped or demolished, a hazardous building materials survey should be conducted and potentially hazardous building material should be disposed of in a manner consistent with current regulations.
- During site development, if fill, organic material, or debris is encountered, an environmental professional should be notified to determine if further assessment is required at the site.
- During site development, septic tanks/fields should be decommissioned in accordance with current regulations.
- Should site development encounter a disposal area, a qualified environmental professional should be contacted for further assessment.
- When the ASTs are decommissioned or removed from their current location, the area in the vicinity of the current active ASTs should be assessed by an environmental professional to determine if the area has been impacted by petroleum hydrocarbons.

7.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Gemini Property & Land Development and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Gemini Property & Land Development or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement. EBA's General Conditions are provided in Appendix D of this report.

8.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact Mr. Jaymes Going at our Lethbridge office.

Respectfully submitted,
EBA Engineering Consultants Ltd.

ALBERTA INSTITUTE OF AGROLOGISTS
MANDI PARKER, P.Ag.
2885
MEMBER

June 17/10

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PROFESSIONAL GEOLOGIST ALBERTA
BRIAN TSANG

June 17, 2010

Reviewed by:
Brian Tsang, M.Sc., P.Chem., P.Geol.
Project Director
CAELUM Group, Environment Practice
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/hms

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
Signature
Date June 17, 2010
PERMIT NUMBER: P245
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REFERENCES

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Tokarsky, O. 1973. Hydrogeological Map – Lethbridge-Fernie, Alberta (NTS 82G-H). Alberta Research Council, Edmonton, Alberta.

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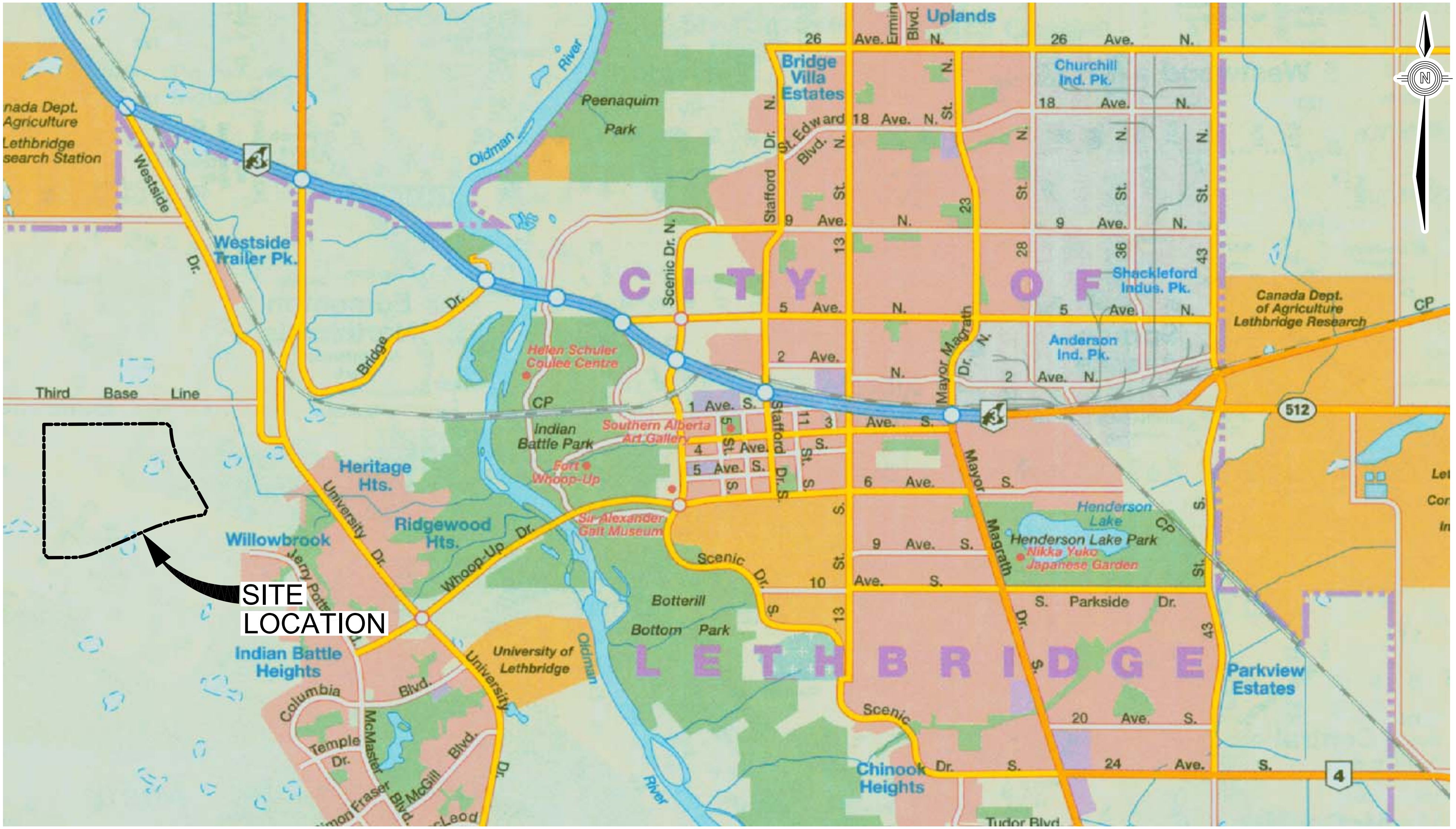
FIGURES

\\lethbridge\drafting\L121 Projects\L12101650\L12101650-002_FIG1,2_R0.dwg



0 1 1.5 2.0 2.5km

APPROXIMATE SCALE 1:50000

CLIENT

Gemini Property
and Land Development

EBA Engineering Consultants Ltd.

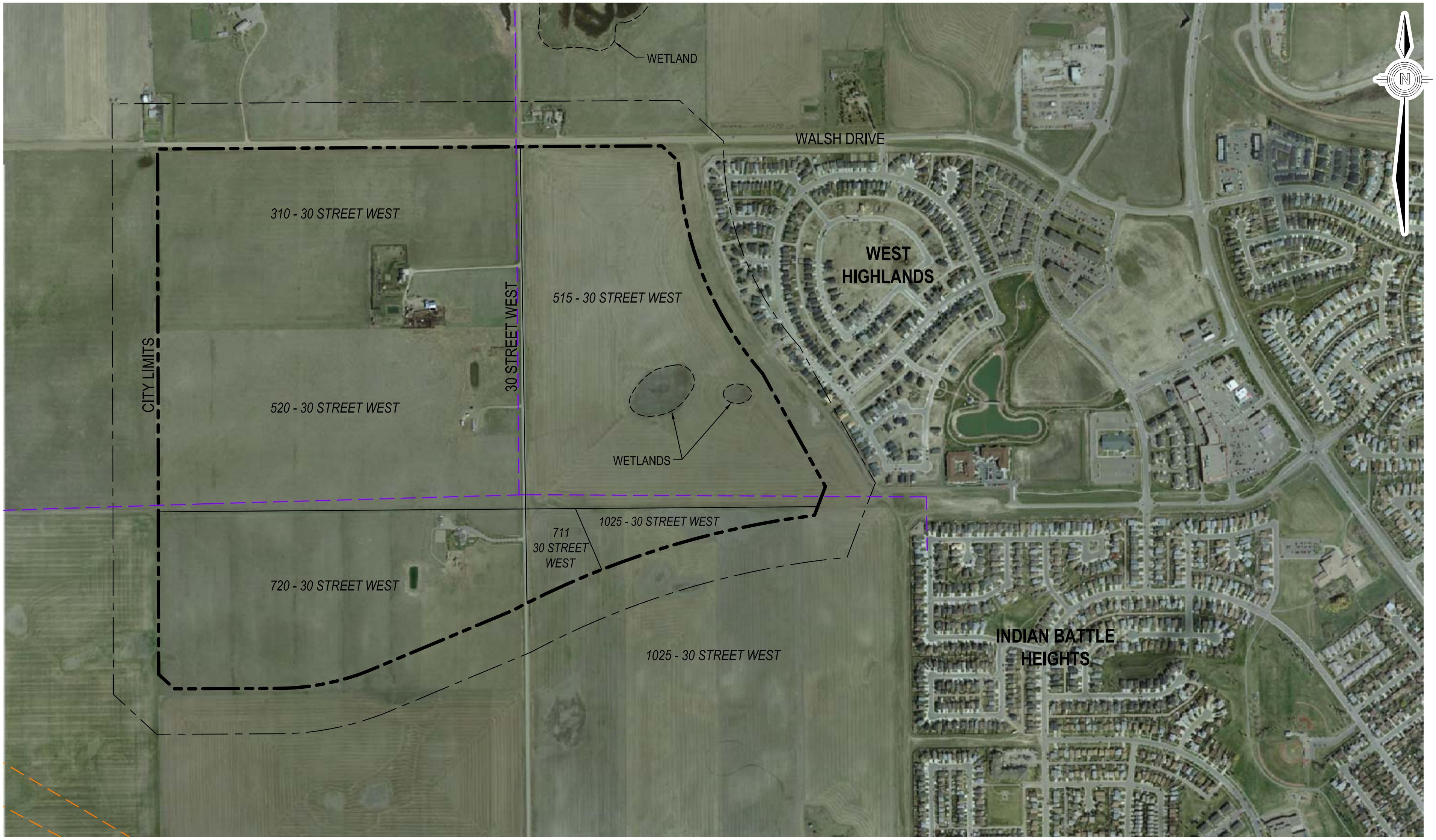
PHASE I ENVIRONMENTAL SITE ASSESSMENT
COUNTRY MEADOWS OUTLINE PLAN, LETHBRIDGE, AB

SITE LOCATION PLAN

PROJECT NO. L12101650.002	DWN LCH	CKD JG	REV 0
OFFICE Lethbridge	DATE June 3, 2010		

Figure 1

\\lethbridge\drafting\L121 Projects\L12101650\L12101650-002_FIG1,2_R0.dwg



0 200 500m

SCALE 1:12,500

LEGEND

- SITE BOUNDARY
- NATURAL GAS UNDERGROUND PIPELINE OWNED BY ATCO GAS AND PIPELINES LTD. (SOUTH)
- NATURAL GAS UNDERGROUND PIPELINE OWNED BY BONAVISTA OIL & GAS LTD.
- 100 m BUFFER

CLIENT

Gemini Property
and Land Development

EBA Engineering
Consultants Ltd.

PHASE I ENVIRONMENTAL SITE ASSESSMENT COUNTRY MEADOWS OUTLINE PLAN, LETHBRIDGE, AB

DETAILED SITE PLAN

PROJECT NO.	DWN	CKD	REV
L12101650.002	LCH	JG	0
OFFICE	DATE		
Lethbridge	June 11, 2010		

Figure 2

APPENDIX

APPENDIX A SITE PHOTOGRAPHS

Photo 1
View looking southeast from northwest corner of site. (Note West Lethbridge City limits)

Photo 2
View looking south from northwest corner of site.

Photo 3
View looking south at the corner of 30 Street and Walsh Drive West.

Photo 4
View looking north from middle of the south side of the site showing West Highlands residential subdivision.

Photo 5
View looking north from the southeast corner of the site. West Highlands residential subdivision is visible.

Photo 6
View looking west from the southeast corner of the site.

Photo 7

View looking east from the southern boundary of the site. Photo was taken from 30 Street West.

Photo 8

View looking west from 30 Street West at the southern acreage.

Photo 9
View looking west from 30 Street West at the middle acreage.

Photo 10
View looking west from 30 Street West at the northern acreage.

Photo 11

View looking west from the southern boundary of the site. Photo taken from 30 Street West.

Photo 12

View of the ATCO Pipeline West Lethbridge Receipt Tie In.

Photo 13
View of ATCO's regulating station for West Lethbridge, adjacent to the site to the east. Located at the northwest corner of Indian Battle Heights residential subdivision.

Photo 14
View looking east at adjacent properties. To the right is Indian Battle Heights residential subdivision. To the left is West Highlands residential subdivision.

APPENDIX

APPENDIX B REGULATORY INQUIRIES

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 087 977	4;22;8;33;NE	741 052 929

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 33
THE NORTH HALF OF THE NORTH EAST QUARTER
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING 1.03 ACRES FOR ROADWAY AS SHOWN ON PLAN 1618LK
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: COUNTY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
741 052 929	03/06/1974		$28,000	

OWNERS

MARLENE M BROWN (HOUSEWIFE)

AND
CLIFFORD R BROWN (FIREFIGHTER)
BOTH OF:
1308-13 AVE SOUTH
LETHBRIDGE
ALBERTA
AS JOINT TENANTS

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 052 928	03/06/1974	CAVEAT CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
751 003 057	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED AS TO 20' STRIPS IN NE 1/4 BY INST 761072085"
861 031 205	24/02/1986	EASEMENT "SUBJECT TO: IN FAVOUR OF N 1/2 OF SE 1/4 4-9-22-W4TH"
901 021 471	23/01/1990	REQUEST FOR RELEASE OF D.C.T.

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 27 DAY OF MAY, 2010 AT 03:16 P.M.

ORDER NUMBER:16628674

CUSTOMER FILE NUMBER: 6594745

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0019 856 798	4;22;8;33;NE	051 183 050

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 33
THE SOUTH HALF OF THE NORTH EAST QUARTER
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 981 099 589

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 183 050	27/05/2005	TRANSFER OF LAND	$800,000	$800,000

OWNERS

MERVYN P. HIEBERT PROFESSIONAL CORPORATION.
OF 23 SANDSTONE WAY
LETHBRIDGE
ALBERTA T1K 7X8
AS TO AN UNDIVIDED 1/2 INTEREST

DUNCAN S. MACKEY PROFESSIONAL CORPORATION.
OF 1518-11 AVE S
LETHBRIDGE
ALBERTA T1K 0J7
AS TO AN UNDIVIDED 1/2 INTEREST

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
751 003 319	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT AS TO PORTION DESCRIBED BY 761072087"
011 207 162	24/07/2001	MORTGAGE MORTGAGEE - ST. PATRICK'S CREDIT UNION LTD.. 1320 3 AVE S P.O. BOX 1237 LETHBRIDGE ALBERTA T1J4A4 ORIGINAL PRINCIPAL AMOUNT: $70,000
041 243 302	29/06/2004	NOTICE OF SECURITY INTEREST RE : FIXTURES IN FAVOUR OF - LETHBRIDGE LEGION SAVINGS AND CREDIT UNION LIMITED. 324 MAYOR MAGRATH DR S LETHBRIDGE ALBERTA T1J3L7 DEBTOR - BOBBI LEE DAVIS 520-30 ST W LETHBRIDGE ALBERTA T0L0V0 AMOUNT: $52,466 EXPIRES: 2010/03/01
051 183 051	27/05/2005	MORTGAGE MORTGAGEE - ROYAL BANK OF CANADA. 614-4 AVE S LETHBRIDGE ALBERTA T1J3C8 ORIGINAL PRINCIPAL AMOUNT: $540,000
051 227 189	27/06/2005	DISCHARGE OF NOTICE OF SECURITY INTEREST 041243302
051 233 355	04/07/2005	DISCHARGE OF MORTGAGE 011207162

(CONTINUED)

TOTAL INSTRUMENTS: 007

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 27 DAY OF MAY, 2010 AT 03:16 P.M.

ORDER NUMBER:16628674

CUSTOMER FILE NUMBER: 6594745

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0025 602 905	4;22;8;33;SE	061 218 951

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
THE NORTH HALF OF THE SOUTH EAST
QUARTER OF SECTION 33
CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 061 138 871

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
061 218 951	02/06/2006	TRANSFER OF LAND	$480,000	SEE INSTRUMENT

OWNERS

DEBRA L DUDLEY-OLAFSON
OF BOX 511
LETHBRIDGE
ALBERTA T1J 3Z4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
751 006 966	27/01/1975	UTILITY RIGHT OF WAY

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "20 FOOT STRIP. BY 761072088"
981 066 289	04/03/1998	CAVEAT RE : RIGHT OF WAY AGREEMENT CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. 909 - 11 AVENUE, S.W. CALGARY ALBERTA T2R1L8 (DATA UPDATED BY: TRANSFER OF CAVEAT 981078661)
981 078 661	17/03/1998	TRANSFER OF CAVEAT 981066289 TRANSFEREE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. 909 - 11 AVENUE, S.W. CALGARY ALBERTA T2R1L8
031 338 405	01/10/2003	MORTGAGE MORTGAGEE - CANADIAN IMPERIAL BANK OF COMMERCE. 701 - 4 AVENUE SOUTH, LETHBRIDGE ALBERTA T1J4A5 ORIGINAL PRINCIPAL AMOUNT: $600,000
081 149 857	24/04/2008	DISCHARGE OF MORTGAGE 031338405

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 27 DAY OF MAY, 2010 AT 03:16 P.M.

ORDER NUMBER:16628674

CUSTOMER FILE NUMBER: 6594745

END OF CERTIFICATE

(CONTINUED)

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 175 871	4;22;8;34;NW	091 270 439

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 34
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

			HECTARES	(ACRES) MORE OR LESS
A)	PLAN 0211389	SUBDIVISION	2.588	6.39
B)	PLAN 0414578	SUBDIVISION	6.155	15.21
C)	PLAN 0510515	ROAD	8.933	22.07
D)	PLAN 0512653	SUBDIVISION	11.051	27.31

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 051 267 372 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
091 270 439	10/09/2009	TRANSFER OF LAND	$2,500,000	$2,500,000

OWNERS

SOUTHGATE COMMERCIAL LANDS CORP..
OF 238 22 ST NORTH
LETHBRIDGE
ALBERTA T1H 3R7

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
891 210 688	16/10/1989	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PARTIAL DISCHARGE EXCEPT PTN 8911794 BY 901058685, 05 03 1990 (RE-ENTERED 22/12/04 BY 041482893)"
911 068 943	08/04/1991	UTILITY RIGHT OF WAY GRANTEE - ALBERTA GOVERNMENT TELEPHONES. AS TO PORTION OR PLAN:9110217 "TAKES PRIORITY OF CAVEAT 891193049, REG'D 25 09 1989 (RE-ENTERED 22/12/04 BY 041482893)"
971 107 756	21/04/1997	CAVEAT RE : SURFACE LEASE CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. 909-11 AVE SW CALGARY ALBERTA T2R1L7
981 066 287	04/03/1998	CAVEAT RE : RIGHT OF WAY AGREEMENT CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. 909 - 11 AVENUE,S.W. CALGARY ALBERTA T2R1L8 (DATA UPDATED BY: TRANSFER OF CAVEAT 981078399)
981 078 399	17/03/1998	TRANSFER OF CAVEAT 981066287 TRANSFEREE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. 909 - 11 AVENUE,S.W. CALGARY ALBERTA T2R1L8
021 135 987	23/04/2002	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH

(CONTINUED)

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

LETHBRIDGE
ALBERTA
AGENT - P GEORGE KUHL

TOTAL INSTRUMENTS: 007

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 1 DAY OF JUNE, 2010 AT 03:43 P.M.

ORDER NUMBER:16663971

CUSTOMER FILE NUMBER: in training

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 454 852	0814008;1;1	081 329 015

LEGAL DESCRIPTION
PLAN 0814008
BLOCK 1
LOT 1
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 2.06 HECTARES (5.09 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;34;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 329 014

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 329 015	03/09/2008	TRANSFER OF LAND	$167,805	$167,805

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
071 107 911	05/03/2007	CAVEAT RE : AGREEMENT FOR SALE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CAVEATOR - MELCOR DEVELOPMENTS LTD.. 3200, 10180 101 ST EDMONTON ALBERTA T5J3W8 AGENT - VICTOR L LIRETTE
071 551 524	08/11/2007	CAVEAT RE : AMENDING AGREEMENT CAVEATOR - CANADIAN IMPERIAL BANK OF COMMERCE. 595 BAY ST,SUITE 500 TORONTO ONTARIO M5G2C2 AGENT - WAYNE R WHITLOCK
081 329 013	03/09/2008	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA AGENT - GARY WEIKUM.
081 363 302	26/09/2008	DISCHARGE OF CAVEAT 071107911
081 392 230	20/10/2008	DISCHARGE OF CAVEAT 071551524

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 27 DAY OF MAY, 2010 AT 03:21 P.M.

ORDER NUMBER:16628795

CUSTOMER FILE NUMBER: 6594745

END OF CERTIFICATE

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS

(CONTINUED)

GOVERNMENT OF THE PROVINCE OF ALBERTA

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 454 844	4;22;8;34;SW	081 329 014 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 34
QUARTER SOUTH WEST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

	HECTARES	(ACRES) MORE OR LESS
A) PLAN 0814008 SUBDIVISION	2.06	5.09

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 041 410 431

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 329 014	03/09/2008	SUBDIVISION PLAN		

OWNERS

MAVIS MCKAY
OF 26 DOUGLAS WOODS PARK SE
CALGARY
ALBERTA T2Z 2K6
AS TO AN UNDIVIDED 25% INTEREST

MARION MOORE
OF 1068 MCKENZIE DR SE
CALGARY
ALBERTA T2Z 1S2
AS TO AN UNDIVIDED 25% INTEREST

SHARON MARSHALL

(CONTINUED)

OF 35 BROOKPARK CRESC SW
CALGARY
ALBERTA T2W 2W6
AS TO AN UNDIVIDED 25% INTEREST

KENNETH D MCKAY
OF 219 LAKE BONAVISTA DR SE
CALGARY
ALBERTA T2J 3M3
AS TO AN UNDIVIDED 25% INTEREST

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 091 031	27/09/1974	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE NORTHERN IRRIGATION DISTRICT
071 107 911	05/03/2007	CAVEAT RE : AGREEMENT FOR SALE CAVEATOR - MELCOR DEVELOPMENTS LTD.. 3200, 10180 101 ST EDMONTON ALBERTA T5J3W8 AGENT - VICTOR L LIRETTE
071 551 524	08/11/2007	CAVEAT RE : AMENDING AGREEMENT CAVEATOR - CANADIAN IMPERIAL BANK OF COMMERCE. 595 BAY ST,SUITE 500 TORONTO ONTARIO M5G2C2 AGENT - WAYNE R WHITLOCK
081 329 013	03/09/2008	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

PAGE 3
081 329 014 +1

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

AGENT - GARY WEIKUM.

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 3 DAY OF JUNE, 2010 AT 01:17 P.M.

ORDER NUMBER:16683132

CUSTOMER FILE NUMBER: 6594745

END OF CERTIFICATE

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

THE ABOVE PROVISIONS DO NOT PROHIBIT THE ORIGINAL PURCHASER FROM INCLUDING THIS UNMODIFIED PRODUCT IN ANY REPORT, OPINION, APPRAISAL OR OTHER ADVICE PREPARED BY THE ORIGINAL PURCHASER AS PART OF THE ORIGINAL PURCHASER APPLYING PROFESSIONAL, CONSULTING OR TECHNICAL EXPERTISE FOR THE BENEFIT OF CLIENT(S).

PETROLEUM TANK
MANAGEMENT
ASSOCIATION
OF ALBERTA

Petroleum Tank Management
Association of Alberta
Suite 980, 10303 Jasper Avenue
Edmonton, Alberta T5J 3N6
PH: (780)425-8265 or 1-866-222-8265
FAX: (780)425-4722

May 26, 2010

Jaymes Going
EBA Engineering Consultants Ltd.
442 10 Street N
Lethbridge, AB
T1H 2C7

Dear Jaymes Going:

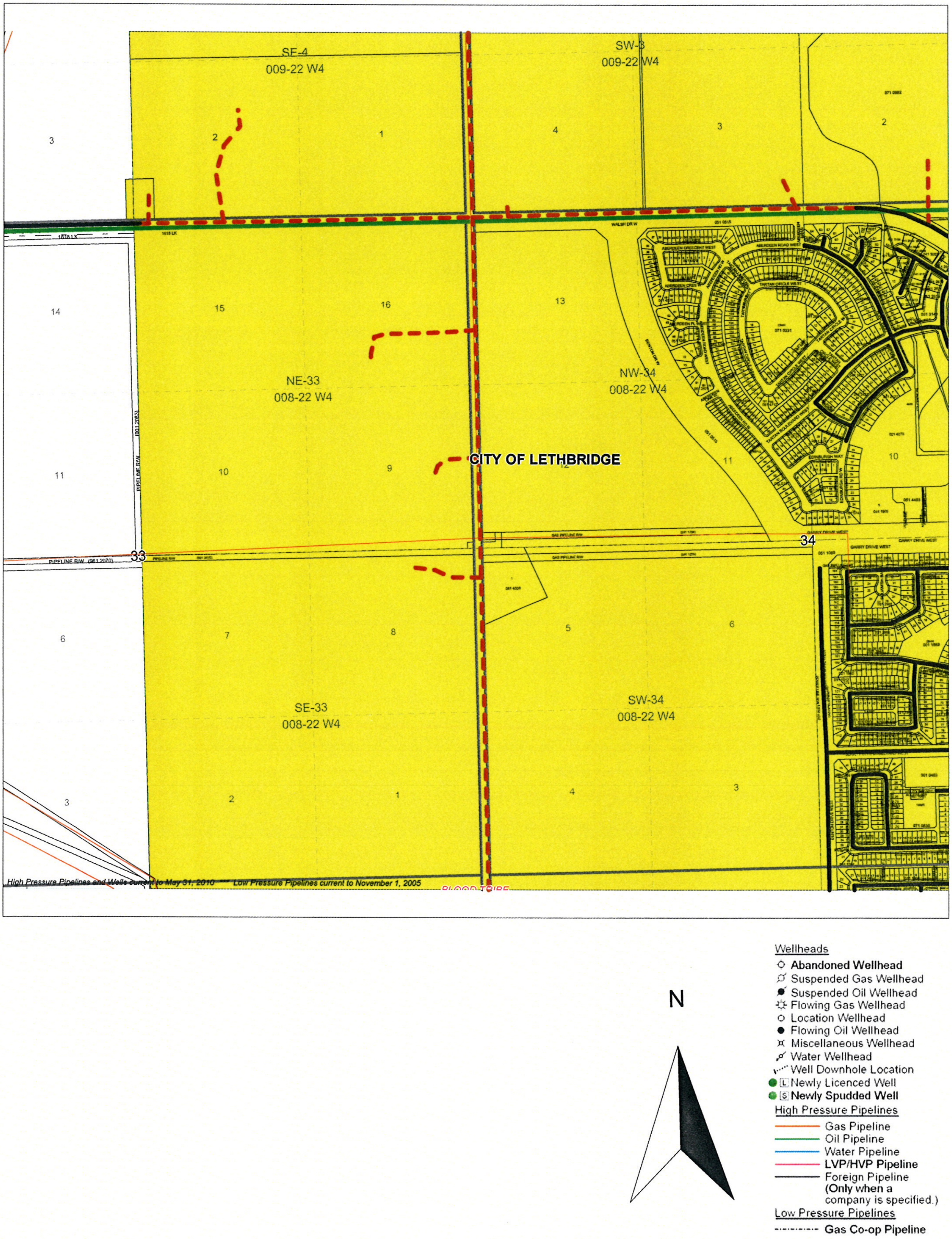
As per your request, the PTMAA has checked the registration of active tank sites and inventory of abandoned tank sites and there are no records for the properties with the legal land description:

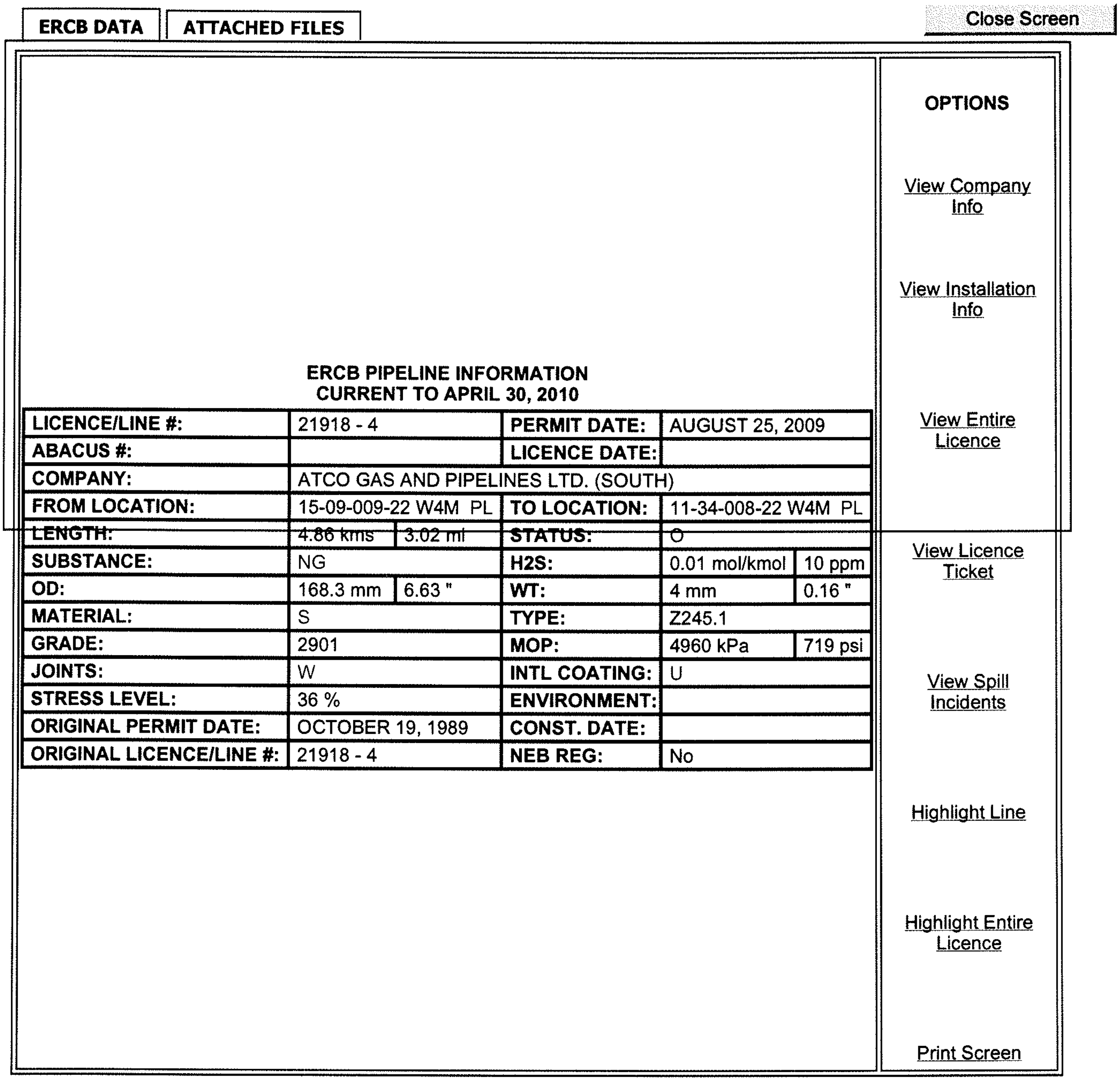
NW & SW 34-008-22-W4. Lethbridge
NE & SE 33-008-22-W4, Lethbridge

Please note that both databases are not complete. The main limitation of these databases is that they only include information reported through registration or a survey of abandoned sites completed in 1992 and should not be considered as a comprehensive inventory of all past or present storage tank sites. The PTMAA **cannot** guarantee that tanks do not or have not existed at this location. Information in the databases is based on information supplied by the owner and the PTMAA cannot guarantee its accuracy. Information on storage tanks or on past or present contaminant investigations may be filed with the local Fire Department or Alberta Environment.

Yours truly,

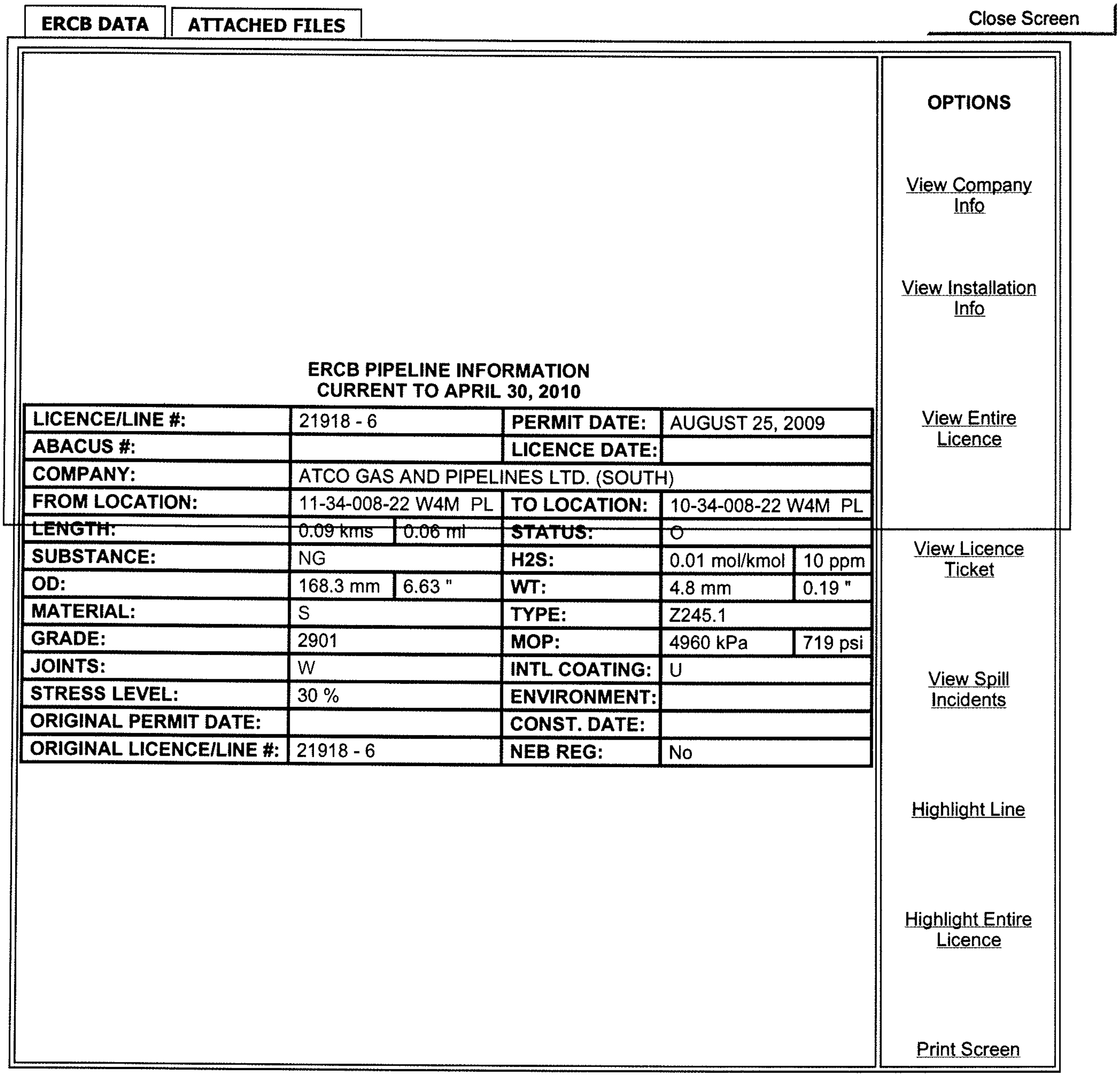
Connie Jacobsen
PTMAA


SE-4
009-22 W4
SW-3
009-22 W4
3
2
1
4
3
2
14
15
16
13
NE-33
008-22 W4
NW-34
008-22 W4
CITY OF LETHBRIDGE
11
10
9
12
11
10
WALSH DR W
GARRY DRIVE WEST
PIPELINE R/W (961 2070)
33
34
6
7
8
5
6
SE-33
008-22 W4
SW-34
008-22 W4
3
2
1
4
3
High Pressure Pipelines and Wells current to May 31, 2010 *** Low Pressure Pipelines current to November 1, 2005
BLOOD TRIBE
N
Wellheads
Abandoned Wellhead
Suspended Gas Wellhead
Suspended Oil Wellhead
Flowing Gas Wellhead
Location Wellhead
Flowing Oil Wellhead
Miscellaneous Wellhead
Water Wellhead
Well Downhole Location
L Newly Licenced Well
S Newly Spudded Well
High Pressure Pipelines
Gas Pipeline
Oil Pipeline
Water Pipeline
LVP/HVP Pipeline
Foreign Pipeline (Only when a company is specified.)
Low Pressure Pipelines
Gas Co-op Pipeline



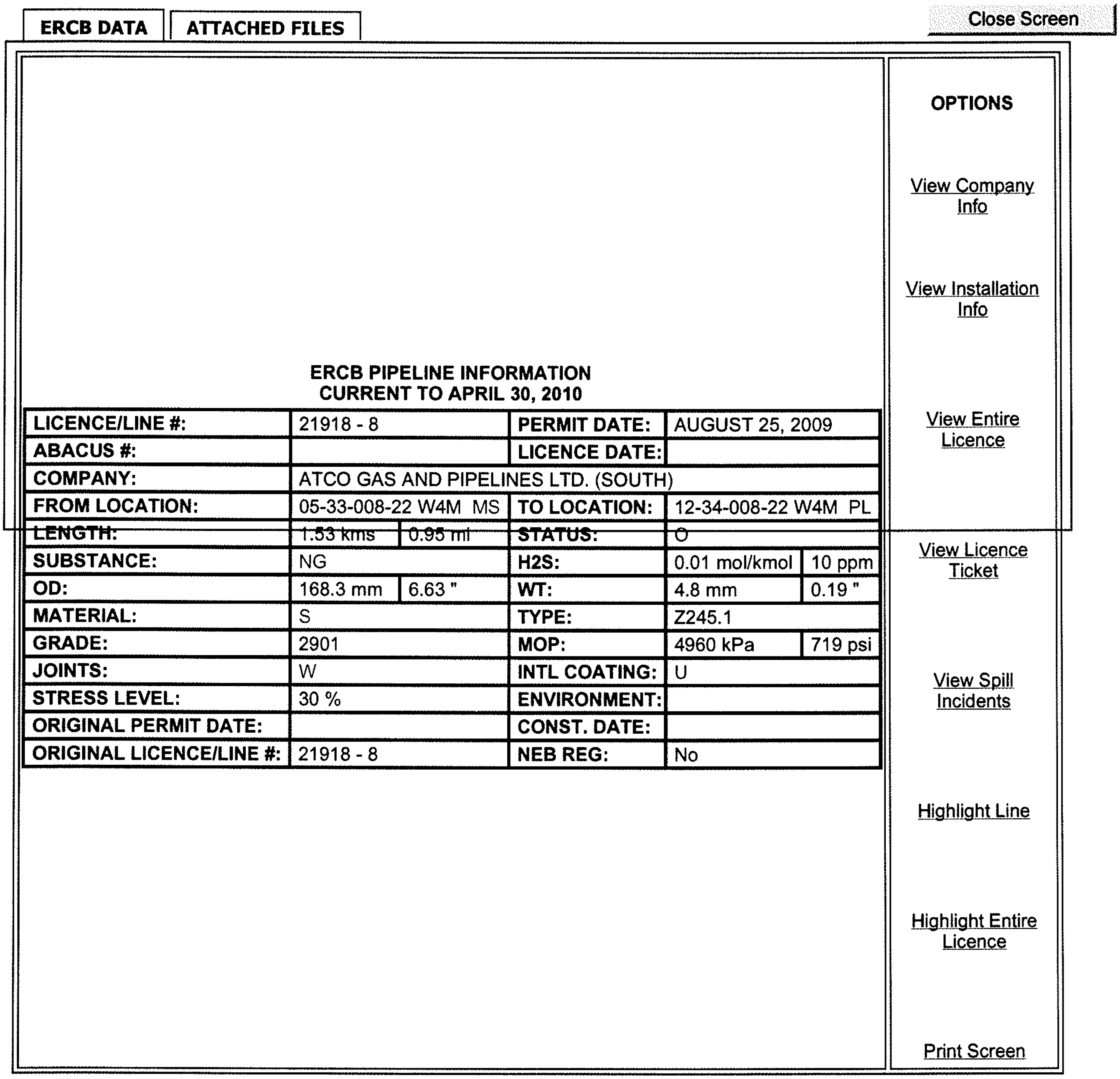
ERCB PIPELINE INFORMATION
CURRENT TO APRIL 30, 2010

LICENCE/LINE #:	21918 - 4		**PERMIT DATE:**	AUGUST 25, 2009	
ABACUS #:			**LICENCE DATE:**		
COMPANY:	ATCO GAS AND PIPELINES LTD. (SOUTH)				
FROM LOCATION:	15-09-009-22 W4M PL		**TO LOCATION:**	11-34-008-22 W4M PL	
LENGTH:	4.86 kms	3.02 mi	**STATUS:**	O	
SUBSTANCE:	NG		**H2S:**	0.01 mol/kmol	10 ppm
OD:	168.3 mm	6.63 "	**WT:**	4 mm	0.16 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2901		**MOP:**	4960 kPa	719 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	36 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	OCTOBER 19, 1989		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	21918 - 4		**NEB REG:**	No	



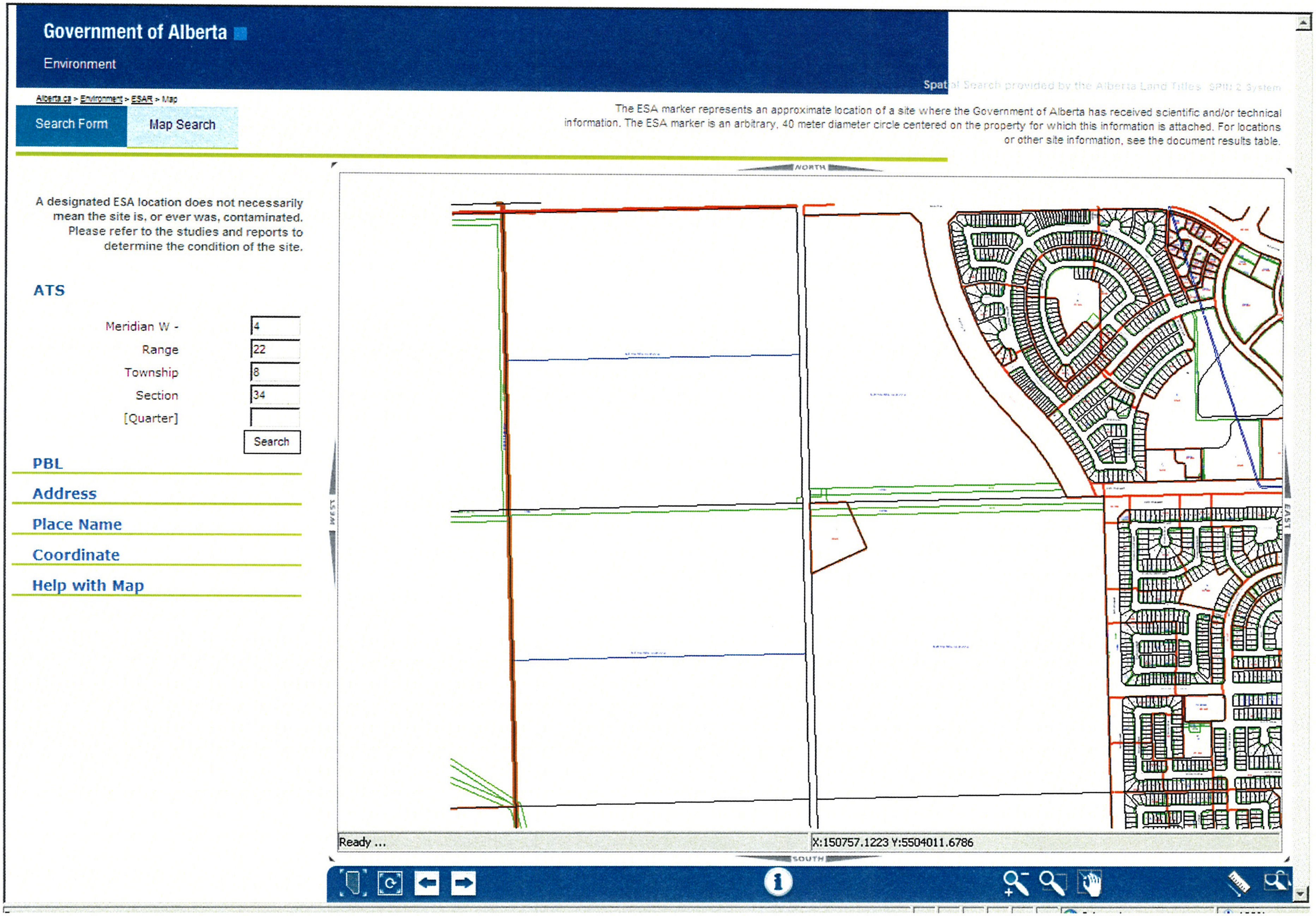
ERCB PIPELINE INFORMATION
CURRENT TO APRIL 30, 2010

LICENCE/LINE #:	21918 - 6		**PERMIT DATE:**	AUGUST 25, 2009	
ABACUS #:			**LICENCE DATE:**		
COMPANY:	ATCO GAS AND PIPELINES LTD. (SOUTH)				
FROM LOCATION:	11-34-008-22 W4M PL		**TO LOCATION:**	10-34-008-22 W4M PL	
LENGTH:	0.09 kms	0.06 mi	**STATUS:**	O	
SUBSTANCE:	NG		**H2S:**	0.01 mol/kmol	10 ppm
OD:	168.3 mm	6.63 "	**WT:**	4.8 mm	0.19 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2901		**MOP:**	4960 kPa	719 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	30 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	21918 - 6		**NEB REG:**	No	



ERCB PIPELINE INFORMATION
CURRENT TO APRIL 30, 2010

LICENCE/LINE #:	21918 - 8		**PERMIT DATE:**	AUGUST 25, 2009	
ABACUS #:			**LICENCE DATE:**		
COMPANY:	ATCO GAS AND PIPELINES LTD. (SOUTH)				
FROM LOCATION:	05-33-008-22 W4M MS		**TO LOCATION:**	12-34-008-22 W4M PL	
LENGTH:	1.53 kms	0.95 mi	**STATUS:**	O	
SUBSTANCE:	NG		**H2S:**	0.01 mol/kmol	10 ppm
OD:	168.3 mm	6.63 "	**WT:**	4.8 mm	0.19 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2901		**MOP:**	4960 kPa	719 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	30 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	21918 - 8		**NEB REG:**	No	



The ESA marker represents an approximate location of a site where the Government of Alberta has received scientific and/or technical information. The ESA marker is an arbitrary, 40 meter diameter circle centered on the property for which this information is attached. For locations or other site information, see the document results table.

A designated ESA location does not necessarily mean the site is, or ever was, contaminated. Please refer to the studies and reports to determine the condition of the site.

ATS

Meridian W - 4

Range 22

Township 8

Section 34

[Quarter]

X:150757.1223 Y:5504011.6786

protection
&
enforcement

Alberta
ENVIRONMENT

Last Update/Review: **April 1, 2000**

Authorization /Approval Viewer

For advanced search help see: Authorization / Approval Viewer Help

The search used the following values:

Legal Land Location: M: 4 Rge: 22 Twp: 8 Sec: 34 QS: NW

Show Inactive Authorizations / Approvals: Yes

The resulting Authorizations / Approvals based on the search criteria will be displayed below. A 📄 will appear next to the Authorization / Approval when documentation is available for viewing or downloading. **Please click Authorization / Approval Viewer Help if you encounter problems viewing the approval document.**

The documents referenced from this page are in Adobe Acrobat Writer (.pdf) format. Click on Get Acrobat Reader to download Adobe Acrobat Reader.

No records match the search criteria.

Back to Search Page | Protection and Enforcement | Water | Top of Page

Comments regarding the Alberta Environment Authorization / Approval Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca

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Last Update/Review: **April 1, 2000**

Authorization /Approval Viewer **For advanced search help see: Authorization / Approval Viewer Help**

The search used the following values:

Legal Land Location: M: 4 Rge: 22 Twp: 8 Sec: 34 QS: SW

Show Inactive Authorizations / Approvals: Yes

The resulting Authorizations / Approvals based on the search criteria will be displayed below. A 📄 will appear next to the Authorization / Approval when documentation is available for viewing or downloading. **Please click Authorization / Approval Viewer Help if you encounter problems viewing the approval document.**

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Last Update/Review: **April 1, 2000**

Authorization /Approval Viewer

For advanced search help see: Authorization / Approval Viewer Help

The search used the following values:

Legal Land Location: M: 4 Rge: 22 Twp: 8 Sec: 33 QS: NE
Show Inactive Authorizations / Approvals: Yes

The resulting Authorizations / Approvals based on the search criteria will be displayed below. A 🗎 will appear next to the Authorization / Approval when documentation is available for viewing or downloading. **Please click Authorization / Approval Viewer Help if you encounter problems viewing the approval document.**

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No records match the search criteria.

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Last Update/Review: **April 1, 2000**

Authorization /Approval Viewer

For advanced search help see: Authorization / Approval Viewer Help

The search used the following values:

Legal Land Location: M: 4 Rge: 22 Twp: 8 Sec: 33 QS: SE

Show Inactive Authorizations / Approvals: Yes

The resulting Authorizations / Approvals based on the search criteria will be displayed below. A 📄 will appear next to the Authorization / Approval when documentation is available for viewing or downloading. **Please click Authorization / Approval Viewer Help if you encounter problems viewing the approval document.**

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No records match the search criteria.

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Comments regarding the Alberta Environment Authorization / Approval Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca

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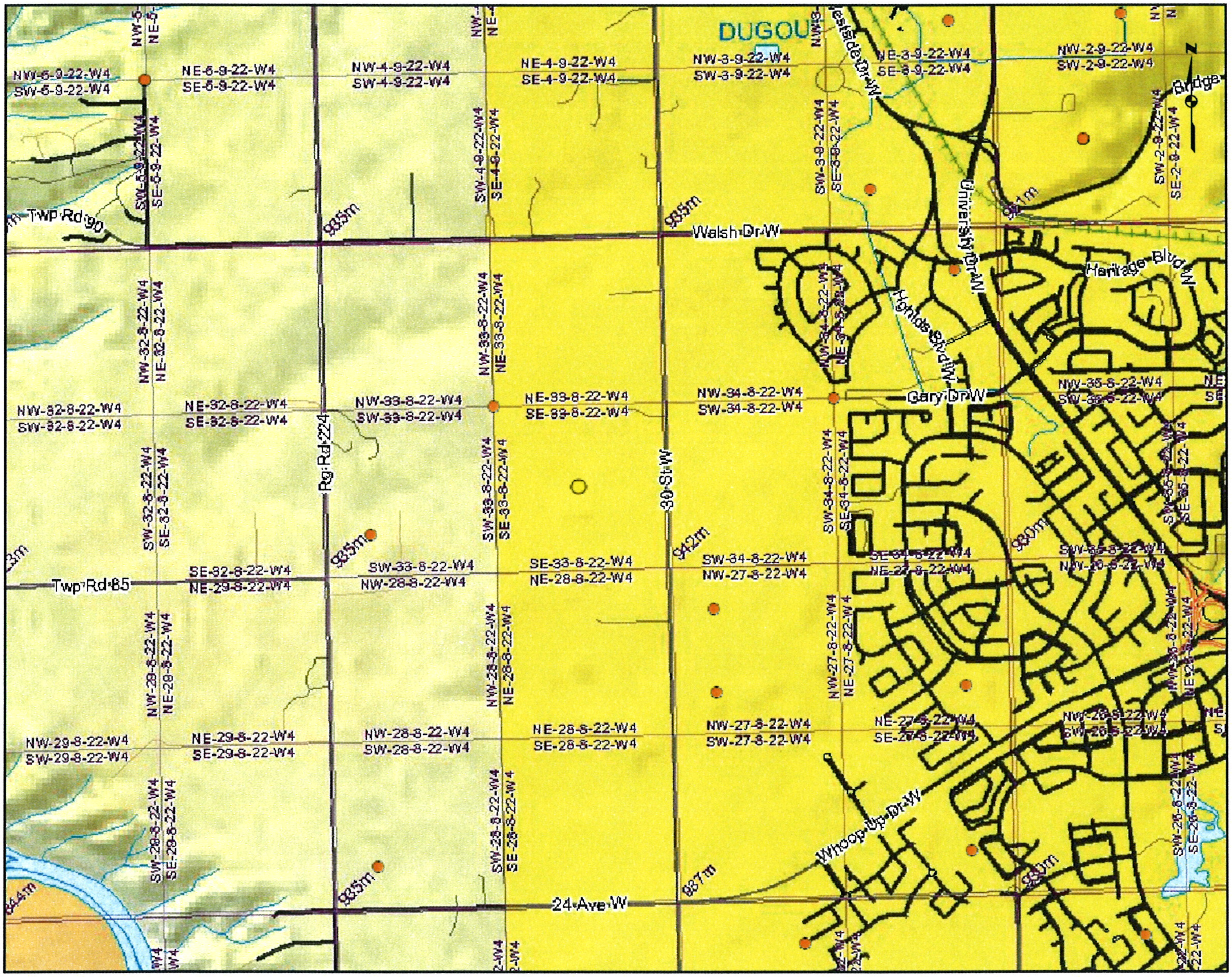


Legend

Groundwater Well ●

Selected Groundwater Well ●

Selection or Drawing area 🟦

Information as depicted is subject to change, therefore the Government of Alberta assumes no responsibility for discrepancies at time of use.

Base Data provided by Spatial Data Warehouse Ltd.

Alberta Environment

Groundwater Information Centre Map

Projection	Datum	Date
ALBERTA 10TM	NAD 83	2010-May-26

http://www.envinfo.gov.ab.ca/GroundWater/#

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118440
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	27	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.682020 *Longitude* -112.911601
How Location Obtained
Field

Elevation 3075.00 ft
How Elevation Obtained
Estimated

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Unknown	Well Inventory	Unknown

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
25.00 ft			

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	25.00

Surface Casing (if applicable)
Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal
Placed from 0.00 ft *to* 0.00 ft
Amount
Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings *Bottom Fittings*

Pack
Type *Grain Size*
Amount

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
UNKNOWN DRILLER

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118440
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name *Address* *Town* *Province* *Postal Code*

Location	*1/4 or LSD*	*SEC*	*TWP*	*RGE*	*W of MER*	*Lot*	*Block*	*Plan*	*Additional Description*
	13	27	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.682020 *Longitude* -112.911601
How Location Obtained
Field

Elevation 3075.00 ft
How Elevation Obtained
Estimated

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 0.00 igpm
Recommended Pump Intake Depth (From TOC) 0.00 ft
Pump Installed
Depth ft
Type
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS) *Depth* ft
Gas *Depth* ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC
Sample Collected for Potability *Result Attached*

Additional Comments on Well

5. Yield Test

Measurement in Imperial Taken From Ground Level

Test Date 1964/08/01
Start Time 12:00 AM
Static Water Level 24.00 ft

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)

Method of Water Removal
Type
Removal Rate igpm
Depth Withdrawn From 0.00 ft

If water removal period was < 2 hours, explain why

6. Water Diverted for Drilling

Water Source
Amount Taken ig
Diversion Date & Time

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
UNKNOWN DRILLER

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118456
GoA Well Tag No.
Date Report Received 1937/01/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
HAMILTON, W.L.	BIENFAIT			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	00	33	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.691102 *Longitude* -112.925760
How Location Obtained
Field

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Drilled	Federal Well Survey	Unknown

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
633.00 ft			

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	633.00

Surface Casing (if applicable)
Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal
Placed from 0.00 ft *to* 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings *Bottom Fittings*

Pack
Type *Grain Size*
Amount

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
UNKNOWN DRILLER

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118456
GoA Well Tag No.
Date Report Received 1937/01/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
HAMILTON, W.L.	BIENFAIT			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	00	33	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.691102 Longitude -112.925760
How Location Obtained
Field

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate igpm
Recommended Pump Intake Depth (From TOC) ft
Pump Installed
Depth ft
Type
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS) Depth ft
Gas Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC
Sample Collected for Potability Result Attached

Additional Comments on Well

5. Yield Test

Measurement in Imperial Taken From Ground Level

Test Date	Start Time	Static Water Level
		ft

Method of Water Removal
Type
Removal Rate igpm
Depth Withdrawn From ft

If water removal period was < 2 hours, explain why

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID	118454
GoA Well Tag No.	
Date Report Received	1988/12/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	*Address*	*Town*	*Province*	*Postal Code*
SOROKA, STEVE	11 MIC MAC PL, LETHBRIDGE			T1K 5H6

Location	*1/4 or LSD*	*SEC*	*TWP*	*RGE*	*W of MER*	*Lot*	*Block*	*Plan*	*Additional Description*
	SE	33	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.687486 *Longitude* -112.920182
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	*Type of Work*	*Proposed Well Use*
Unknown	Chemistry	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description

4. Well Completion

Measurement in Imperial

Total Depth Drilled	*Finished Well Depth*	*Start Date*	*End Date*
0.00 ft			

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	0.00

Surface Casing (if applicable)
Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal
Placed from 0.00 ft *to* 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings *Bottom Fittings*

Pack
Type *Grain Size*
Amount

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
UNKNOWN DRILLER

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118454
GoA Well Tag No.
Date Report Received 1988/12/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
SOROKA, STEVE	11 MIC MAC PL, LETHBRIDGE			T1K 5H6

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	33	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.687486 Longitude -112.920182
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Is Flow Control Installed
Rate igpm
Describe

Recommended Pump Rate igpm
Pump Installed
Depth ft
Recommended Pump Intake Depth (From TOC) ft
Type
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Well Disinfected Upon Completion
Gas
Depth ft
Geophysical Log Taken
Submitted to GIC
Additional Comments on Well
Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
		ft

Method of Water Removal
Type
Removal Rate igpm
Depth Withdrawn From ft

If water removal period was < 2 hours, explain why

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118458
GoA Well Tag No.
Date Report Received 1937/01/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	*Address*	*Town*	*Province*	*Postal Code*

Location	*1/4 or LSD*	*SEC*	*TWP*	*RGE*	*W of MER*	*Lot*	*Block*	*Plan*	*Additional Description*
	00	34	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.691059 *Longitude* -112.903183
How Location Obtained
Field

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	*Type of Work*	*Proposed Well Use*
Drilled	Federal Well Survey	Unknown

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description

4. Well Completion

Measurement in Imperial

Total Depth Drilled	*Finished Well Depth*	*Start Date*	*End Date*
374.00 ft			

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	374.00

Surface Casing (if applicable)
Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal
Placed from 0.00 ft *to* 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings *Bottom Fittings*

Pack
Type *Grain Size*
Amount

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
UNKNOWN DRILLER

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Printed on 5/26/2010 11:15:49 AM

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 118458
GoA Well Tag No.
Date Report Received 1937/01/01

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	00	34	008	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.691059 Longitude -112.903183
How Location Obtained
Field

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Is Flow Control Installed
Rate igpm
Describe

Recommended Pump Rate igpm
Pump Installed
Depth ft
Recommended Pump Intake Depth (From TOC) ft
Type
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Well Disinfected Upon Completion
Gas
Depth ft
Geophysical Log Taken
Submitted to GIC
Additional Comments on Well
Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial Taken From Ground Level

Test Date	Start Time	Static Water Level
		ft

Method of Water Removal
Type
Removal Rate igpm
Depth Withdrawn From ft

If water removal period was < 2 hours, explain why

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 109540
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
# HOLE 5				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	02	03	009	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.700136 *Longitude* -112.900314
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	*Type of Work*	*Proposed Well Use*
Unknown	New Well	Unknown

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
70.00		Yellow Clay & Rocks
265.00		Blue Gray Clay & Sand
285.00		Gravel
295.00	Yes	Water Bearing Shale
370.00		Dark Brown Shale

4. Well Completion

Measurement in Imperial

Total Depth Drilled	*Finished Well Depth*	*Start Date*	*End Date*
370.00 ft			1947/01/01

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	370.00

Surface Casing (if applicable)
Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal
Placed from 0.00 ft *to* 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings *Bottom Fittings*

Pack
Type *Grain Size*
Amount

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
MAUGHAN WM

Certification No
1

Copy of Well report provided to owner *Date approval holder signed*

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 109540
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
# HOLE 5				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	02	03	009	22	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.700136 Longitude -112.900314
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 0.00 igpm
Recommended Pump Intake Depth (From TOC) 0.00 ft
Pump Installed
Depth ft
Type
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS) Depth ft
Gas Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC
Sample Collected for Potability
Result Attached

Additional Comments on Well
WATER REPORTED @ 285'-295'. REPORT STATES: CANNOT BE BAILED DRY

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
1947/01/01	12:00 AM	0.00 ft

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)

Method of Water Removal
Type Bailer
Removal Rate igpm
Depth Withdrawn From 0.00 ft

If water removal period was < 2 hours, explain why

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

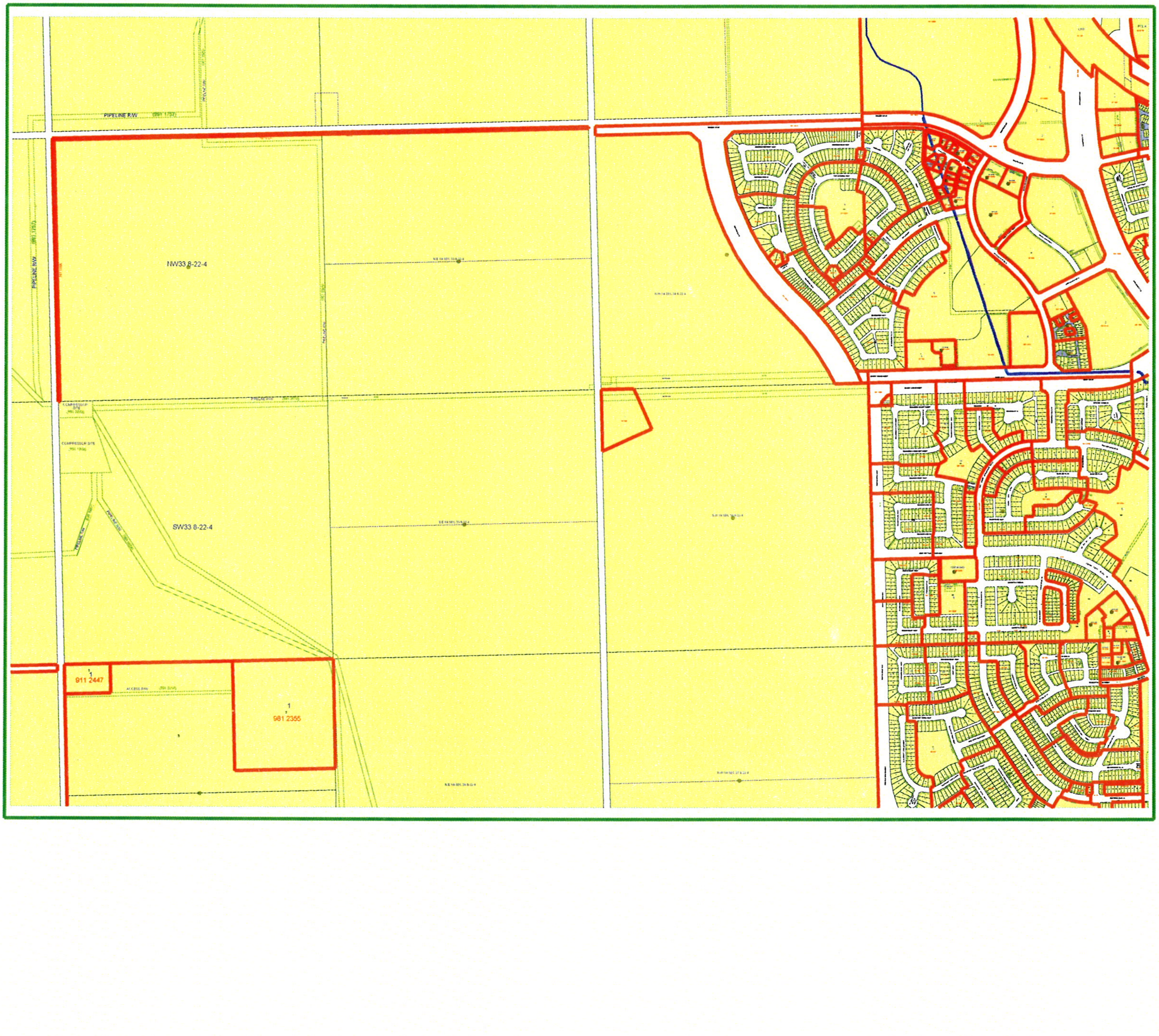
Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

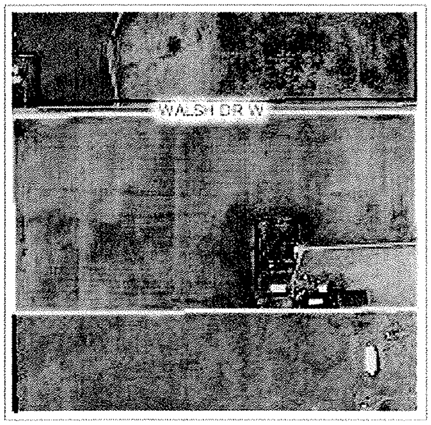
Company Name
MAUGHAN WM

Copy of Well report provided to owner
Date approval holder signed

Alberta Spatial Information System



12:26PM Wednesday May 26, 2010



** Imagery: 2009 Ortho*

310 30 ST W

General Info

Roll Number:	2130003100001
Address:	310 30 ST W
Plan:	NOPLAN
Block:	
Lot:	
Legal:	PLAN NOPLAN MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 33 QUARTER NE
Zoning:	UR

Census Info

- 310 30 ST W falls within **Census Tract 2009**

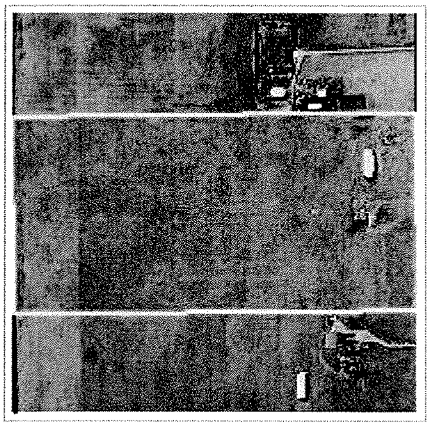
⊟ ***Summary***

Male:	43
Female:	36
Total:	**79**

⊞ ***Demographics by Age & Sex***

** Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close



** Imagery: 2009 Ortho*

520 30 ST W

General Info

Roll Number:	2130005200001
Address:	520 30 ST W
Plan:	NOPLAN
Block:	
Lot:	
Legal:	MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 33 THE SOUTH HALF OF THE NORTH EAST QUARTER CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
Zoning:	UR

Census Info

- 520 30 ST W falls within **Census Tract 2009**

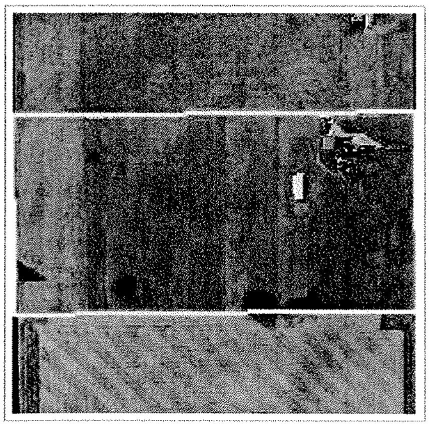
⊟ *Summary*

Male:	43
Female:	36
Total:	**79**

⊞ *Demographics by Age & Sex*

** Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close


* *Imagery: 2009 Ortho*

720 30 ST W

General Info

Roll Number:	2130007200001
Address:	720 30 ST W
Plan:	NOPLAN
Block:	
Lot:	
Legal:	MERIDIAN 4 RANGE 22 TOWNSHIP 8 THE NORTH HALF OF THE SOUTH EAST QUARTER OF SECTION 33 CONTAINING 32.4 HECTARES (80 ACRES) MORE OR LESS
Zoning:	DC

Census Info

- 720 30 ST W falls within **Census Tract 2009**

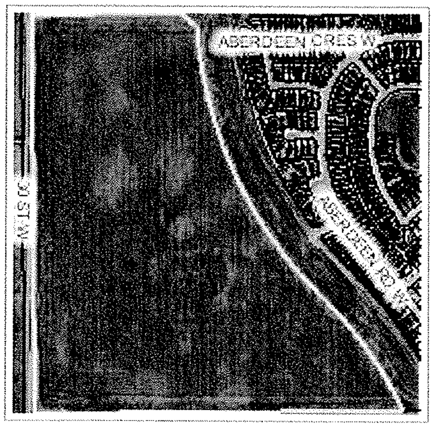
⊟ ***Summary***

Male:	43
Female:	36
Total:	**79**

⊞ ***Demographics by Age & Sex***

* *Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close



** Imagery: 2009 Ortho*

515 30 ST W

General Info

Roll Number:	2130005150001
Address:	515 30 ST W
Plan:	NOPLAN
Block:	
Lot:	
Legal:	MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 34 QUARTER NORTH WEST CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS EXCEPTING THEREOUT: HECTARES (ACRES) MORE OR LESS A) PLAN 0211389 SUBDIVISION 2.588 6.39 B) PLAN 0414578 SUBDIVISION 6.155 15.21 C) PLAN 0510515 ROAD 8.933 22.07 D) PLAN 0512653 SUBDIVISION 11.051 27.31
Zoning:	UR

Census Info

- 515 30 ST W falls within **Census Tract 813**

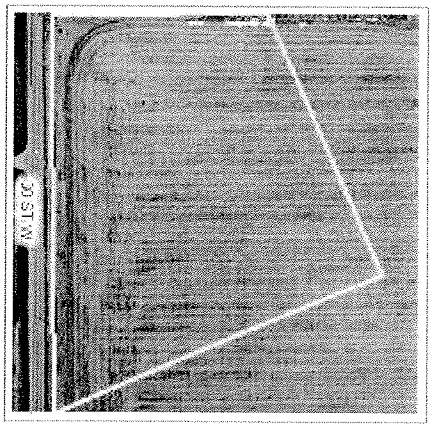
⊟ ***Summary***

Male:	528
Female:	494
Total:	**1022**

⊞ ***Demographics by Age & Sex***

** Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close



* *Imagery: 2009 Ortho*

711 30 ST W

General Info

Roll Number:	2130007110001
Address:	711 30 ST W
Plan:	0814008
Block:	1
Lot:	1
Legal:	PLAN 0814008 BLOCK 1 LOT 1
Zoning:	UR

Census Info

- 711 30 ST W falls within **Census Tract 2009**

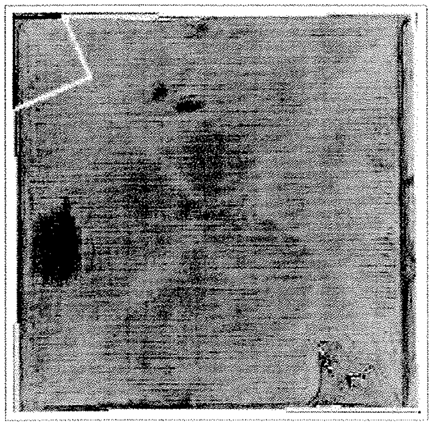
⊟ *Summary*

Male:	43
Female:	36
Total:	**79**

⊞ *Demographics by Age & Sex*

* *Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close



* *Imagery: 2009 Ortho*

1025 30 ST W

General Info

Roll Number:	2130010250001
Address:	1025 30 ST W
Plan:	NOPLAN
Block:	
Lot:	
Legal:	MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 34 QUARTER SOUTH WEST CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS EXCEPTING THEREOUT: HECTARES (ACRES) MORE OR LESS A) PLAN 0814008 SUBDIVISION 2.06 5.09
Zoning:	UR

Census Info

- 1025 30 ST W falls within **Census Tract 2009**

- ***Summary***

Male:	43
Female:	36
Total:	**79**

+ ***Demographics by Age & Sex***

* *Statistics compiled from City of Lethbridge 2009 Census.*

⊗ Close

APPENDIX

APPENDIX C SPECIAL ATTENTION ITEMS – BACKGROUND INFORMATION

BACKGROUND INFORMATION

C1 ASBESTOS

Construction materials used prior to the late 1970s were known to possibly contain asbestos (i.e., ceiling or floor tiles, drywall, and insulation for the walls, boiler, piping, and/or ducts). Asbestos is considered a health hazard if it is friable, airborne, and exposed to humans.

C2 POLYCHLORINATED BIPHENYLS (PCBs)

The federal Environmental Contaminants Act (1976) has restricted the use and controlled the phase out of polychlorinated biphenyls (PCBs) in Canada. Additionally, the storage and disposal of PCBs is regulated. The Act prohibited the use of PCBs in electrical equipment installed after July 1, 1980. PCBs are commonly found in light ballasts, electrical transformers (pole- or ground-mounted) and various other types of electrical equipment (i.e., rectifiers) dating back to the early 1980s or earlier.

PCB containing light ballasts or electrical equipment should be disposed of appropriately at the end of their useful life.

C3 OZONE-DEPLETING SUBSTANCES (ODS)

In December of 1998, The Government of Canada enacted the Ozone-depleting Substances (ODS) Regulations, which governs the use, handling and release of ODS. ODS may include, but are not limited to, chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl bromide. ODS are usually associated with operations such as: fire extinguishing systems; foam manufacturing; fumigant and pesticide application; prescription metered dose inhalers; refrigeration and air conditioning units; and solvent cleaning and degreasing facilities. ODS are not a health issue for people in the building, but are more a maintenance issue to limit or prevent their release. This is accomplished by regular maintenance by trained personnel.

C4 LEAD

Lead can be associated with paints, plumbing solder, pipes, and other products such as wall shielding in x-ray rooms. Lead-based paint was withdrawn from the market in the late 1970s. If present, lead-based paint is typically concealed beneath multiple layers of paint applied over the years during renovations. Lead-based paint and plumbing equipment are not a direct health risk when concealed (sealed behind layers of non-lead paint) and/or in good condition. It should, however, be considered when planning future renovations, when particles from lead-based paint could be released and/or ingested in the course of the work.

C5 UREA FORMALDEHYDE FOAM INSULATION (UFFI)

Insulation materials used during the 1970s and 1980s were known to possibly contain urea formaldehyde foam insulation (UFFI). UFFI was banned in 1980 under the federal Hazardous Products Act.

C6 RADON

Radon gas is a product of the decay series that begins with uranium. Radon is produced directly from radium that is often found in bedrock that contains black shale and/or granite. The gas and its by-products occur naturally everywhere, in soil, water, and air, but usually in concentrations too low to pose a threat. Radon gas can migrate through the ground and enter buildings through porous concrete or fractures. Certain building materials including concrete and gyprock can also release radon. Natural radon concentrations are low in Alberta and radon gas concentrations are usually well below target limits set for Canada. Potential anthropogenic sources of radon gas should be considered.

C7 METHANE

Methane gas is a product of anaerobic decomposition of organic material (e.g., buried fill high in organic material). Methane is also associated with natural gas deposits. Methane gas can migrate through the ground and enter buildings through porous concrete, joints, or fractures. Methane presents a potential explosive hazard when it accumulates to concentrations greater than the lower explosive limit (LEL) in the presence of an ignition source.

C8 MOULD

Mould can be found anywhere in a building; however, it is usually associated with enclosed, damp areas. If the personnel interviewed indicated that they were not aware of complaints related to potential mould in the building, and/or there were no obvious signs of mould (i.e., visible mould growth larger than 1 m^2) observed during the site visit, a mould assessment is not typically conducted within the scope of a Phase I ESA.

APPENDIX

APPENDIX D GEO-ENVIRONMENTAL REPORT – GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX E

HISTORICAL RESOURCES IMPACT ASSESSMENT

Country Meadows

AREA STRUCTURE PLAN

September 2009

MARTIN
GEOMATIC CONSULTANTS LTD

LONGVIEW
Planning + Design

The Alberta Energy and Utilities Board recommends permanent structures, such as residential dwellings, be set back a minimum of fifteen (15) metres from an existing natural gas transmission pipeline right-of-way. Wherever possible, the high-pressure gas lines will be contained in proposed road rights-of-way or within parks and open space areas.

3.5 HISTORICAL AND ARCHAEOLOGICAL ANALYSIS

It was determined by the Cultural Facilities and Historical Resources Division (CFHRD) of Alberta Community Development that a Historical Resources Impact Assessment was not required. A letter from Arrow Archaeology Ltd. attesting to this is appended.

Government of Alberta ■
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca/hrm

June 11, 2010

Project File: 4835-10-041

Mr. Mike Kitchen
Martin Geomatic Consultants Ltd.
255 – 31 Street N
Lethbridge, Alberta
T1H 3Z4

Dear Mr. Kitchen:

SUBJECT: CITY OF LETHBRIDGE
MARTIN GEOMATIC CONSULTANTS LTD.
COUNTRY MEADOWS AREA STRUCTURE PLAN
PROPOSED SUBDIVISION DEVELOPMENT
NW & PARTS OF NE, SE & SW SECTION 34, TOWNSHIP 8, RANGE 22, W4M
***HISTORICAL RESOURCES ACT* REQUIREMENTS**

Arrow Archaeology Ltd. has provided the Historic Resources Management Branch (HRMB) of Alberta Culture and Community Spirit with information regarding the **COUNTRY MEADOWS AREA STRUCTURE PLAN** located in the NW & parts of the NE, SE & SW of Section 34-8-22-W4M. After review by the HRMB, it has been determined that a **Historic Resources Impact Assessment is not required.** Therefore, the City of Lethbridge has *Historical Resources Act* clearance for the **COUNTRY MEADOWS AREA STRUCTURE PLAN**. Should you require additional information regarding the HRMB's review of this project to impact historic resources, please contact myself.

HISTORICAL RESOURCES ACT REQUIREMENTS

Reporting the discovery of historic resources

Please be aware, pursuant to Section 31 of the *Historical Resources Act*, should any archaeological, palaeontological, Aboriginal traditional use sites and/or historic sites be encountered during development activities, please contact George Chalut at 780-431-2329 (Southeast Region, Land Use Planner, Land Use Planning Section, Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8), fax 780-422-3106 or e-mail george.chalut@gov.ab.ca . It may then be necessary for the HRMB to issue further instructions regarding the documentation of these resources. On behalf of the HRM B, I would like to thank the City of Lethbridge, Martin Geomatic Consultants Ltd. and Arrow Archaeology Ltd. for your cooperation in our endeavour to conserve Alberta's past.

Sincerely,

George Chalut

George Chalut
Southeast Region, Land Use Planner
Land Use Planning Section

cc: City of Lethbridge
Neil Mirau, Arrow Archaeology Ltd.

Arrow
Archaeology
Limited

2315 - 20 Street, Coaldale, Alberta, T1M 1G5
Phone: 403 345 2812 Fax: 403 345 2817
Cell: 403 330 8376 arrowarchaeology.com
Email: neil@arrowarchaeology.com

July 7, 2009

Mike Kitchen
Martin Geomatic Consultants Ltd.
255 – 31 Street N
Lethbridge, Alberta
T1H 3Z4

Dear Mr. Kitchen:

Re: Portions of 33 and 34-8-22 W4M as indicated in Country Meadows Area Structure Plan Map, dated April, 2009

We have searched the March, 2009 edition of Alberta Culture and Community Spirit's *Listing of Significant Historical Sites and Areas* (Public and Restricted versions) and examined Alberta Historical Resources Management's site inventory data files and we can confirm that above-noted parcel does not have an assigned Historical Resource Value and that there are no recorded historical resources in the parcel or its immediately surrounding area. The general area has been under cultivation for many decades and it is unlikely that there is any shallowly buried fossiliferous bedrock within the proposed subdivision.

A pre-development Historical Resources Impact Assessment is therefore not required.

Historical resources can, however, occur in unexpected locations and according to Section 31 of the *Historical Resources Act*, if a development inadvertently or accidentally impacts a historical resource during development or land modification activity, it must be reported. If any historical resources or suspected historical resources, such as artifacts or fossils, are observed during development activities in the area, please contact us or Alberta Historical Resources Management in Edmonton.

Thank you for your enquiry regarding historical resources in this area and on behalf of Arrow Archaeology Limited and Alberta Culture and Community Spirit's Historical Resources Management Branch, thank you for your continued cooperation in the endeavour to conserve Alberta's past.

Please let me know if you need any further information or have any questions.

Yours truly,

Neil Mirau
Senior Archaeologist, Arrow Archaeology Limited

APPENDIX F

LETHBRIDGE NORTHERN IRRIGATION DISTRICT

WATER CONVEYANCE LETTER

LETHBRIDGE NORTHERN
IRRIGATION DISTRICT

334 - 13TH STREET NORTH, LETHBRIDGE, AB T1H 2R8

PHONE: (403) 327-3302 FAX: (403) 320-2457

August 7, 2009

RECEIVED
AUG 1 1 2009

Michael Kitchen, P.Eng.
Project Manager
Martin Geomatic Consultants Ltd.
255 – 31 Street North
LETHBRIDGE, AB T1H 3Z4

Dear Sir:

RE: WATER CONVEYANCE AGREEMENT – TYPE 3
CITY OF LETHBRIDGE – SECTION 33-08-22-4

The Lethbridge Northern Irrigation District (LNID) is willing to supply water to the City of Lethbridge for use in "Country Meadows Area Structure Plan" a subdivision in West Lethbridge.

Based on calculations by Martin Geomatic Consultants Ltd., "Country Meadows" will require approximately 17 acre-feet of water annually. A one time lump sump payment of an access fee to the LNID water licence at a rate of $1,100/acre-foot of water, will be due and payable at the time of signing of the agreement.

The City of Lethbridge will be invoiced for the agreement annually. The current rate is $350.00, plus GST, for the first three (3) acre-feet and then $22.00/acre-foot over three (3) acre-feet.

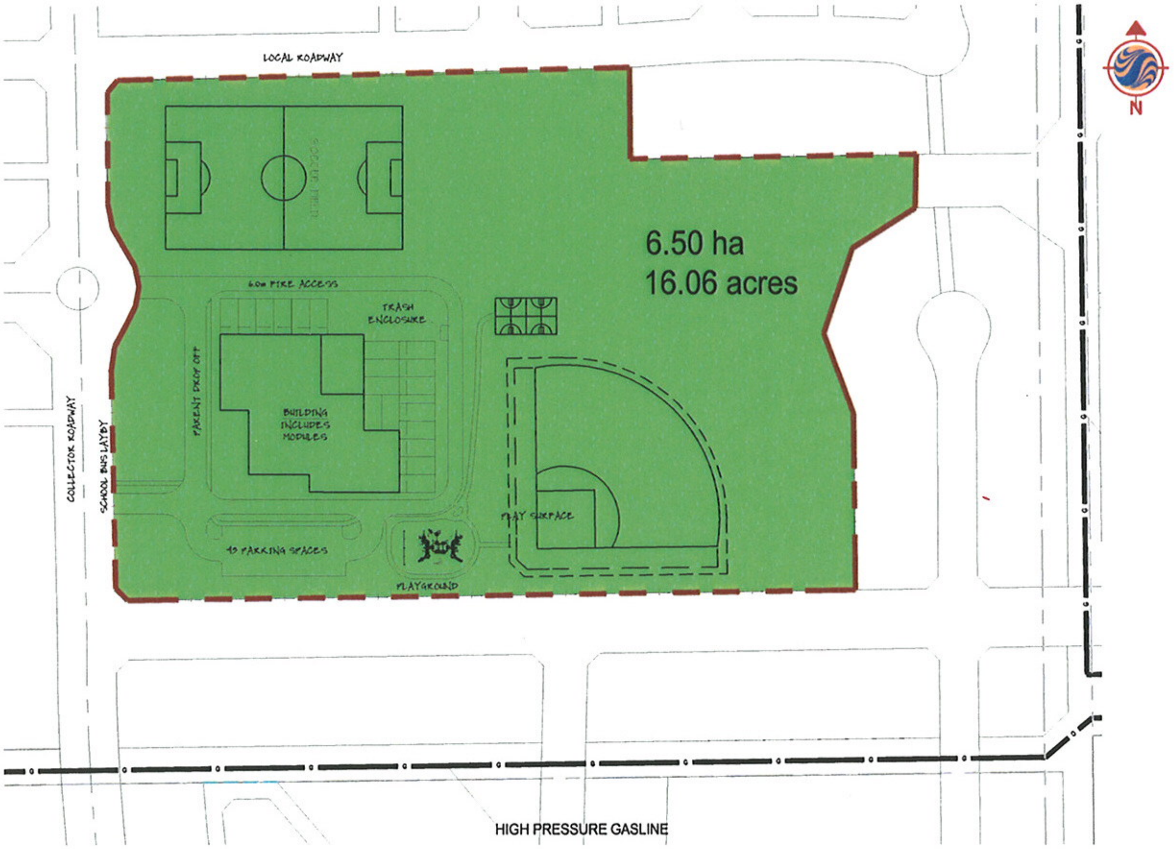
Yours truly

Gary Burke

Gary Burke
Classification/Network Technician
GB/jcp

APPENDIX G

LETHBRIDGE SCHOOL DISTRICT SITE LAYOUT



Notes

Site Area 6.50ha

Building Footprint.......4620m²

Facilities

Design Basis: "Design Development Report" A.I.T.

Capacity ......700+ students

Core Classrooms....10
Modular Classrooms....19

Library

Gymnasium

Administration

Site Features

Soccer Pitch

Play surface

Playground

Fire Lane

Parking Lot - based on City of Lethbridge, Land Use By-law requirements

Garbage pick-up area

SCHOOL SITE KEY PLAN
NTS

NOTE: LAYOUT IS CONCEPTUAL AND IS SUBJECT TO CHANGE PENDING DETAILED DESIGN. THE CONCEPT HAS BEEN PREPARED TO HIGHLIGHT THE SITE'S SUITABILITY FOR A TYPICAL ELEMENTARY SCHOOL LAYOUT.

MARCH 2011
112945195

CONCEPTUAL SITE LAYOUT APPROVED BY:

PRINT NAME: DON LUSSIER

SIGN NAME: Don Lussier

SCHOOL DISTRICT: Lethbridge School District No 51

Stantec

V:\1129\active\112945195\drawings\civil\planning drawings\cm-fig_school site preliminary.dwg
2011-04-01 11:05AM By: cmartino

Client/Project

Southgate Commercial Lands Corp.

Country Meadows
Outline Plan

Figure No.

1.0

Title

Country Meadows Elementary School Site Concept

APPENDIX H

HIGH INTENSITY FIRE RESPONSE ANALYSIS

CITY OF LETHBRIDGE

CITY OF
Lethbridge

OFFICE OF
PLANNING & DEVELOPMENT SERVICES DEPARTMENT
PLANNING SECTION
Telephone No. 320-3920

September 13, 2011

RE: Fire Response Times – Country Meadows Outline Plan

The above referenced Outline Plan was evaluated to determine the extent to which it is located within the fire department's ten minute response area. This evaluation only considers what areas will or will not be within the fire department's ten minute response area at its ultimate "build-out".

Fire response times can increase or decrease depending on the phasing of new subdivisions and the actual construction of new road segments into an area. As such, subdivision applications submitted to the Subdivision Authority will also be assessed to verify whether the proposed lots are within the fire department's ten minute response area.

Areas that do not fall within the fire department's ten minute response area must address the level of fire protection that is required on exterior walls and the distance between adjacent structures, as outlined by the Alberta Building Code Sub-Sections 9.10.14 & 9.10.15.

Yours Truly,

Senior Subdivision Planner,
City of Lethbridge

cc. Chief, Fire and EMS
Chief, Fire Marshall
Building Safety & Inspection Services Manager

APPENDIX I

GATE 1 SIGN-OFF AND DOCUMENT

City of Lethbridge
Outline Plan - Gated Review Process
Sign-Off Templates

Stantec Consulting Ltd.
Project: Country Meadows
File: 112945195
Submittal Date: June 4, 2010

Gate 1 - Information Gate

1 Project Team

- Developer: Southgate Commercial Lands Corp., Joe Meszaros, 403-382-7977
- Landowners: Southgate Commercial Lands Corp., Gary Ivey, Mervyn Hiebert, Duncan Mackey, Marleen Brown, Clifford Brown, Debra Dudley-Olafson, Melcor Developments Ltd., City of Lethbridge
- Consultants: Stantec Consulting Ltd. (Lead), Trent Purvis, Project Manager, 403-329-3344
  Brad Schmidtke, Project Coordinator, 403-393-3196
  EBA Engineering Consultants Ltd. (Geotechnical), Trevor Loomer, 403-329-9009
  Hogeweide Management & Consulting Inc., Bud Hogeweide, 403-360-4139
- City of Lethbridge: Development Review Committee (DRC), Barry Peat, 403-320-3927

2 Confirmation of Gated Process Template

- Gated Plan / Master Servicing Plans Gated Process Template, May 14, 2010 (attached)
- **Proposed Additional Gate: Gate 3A - Boundary Conditions and Connection Points:** The intent of this proposed gate is to provide a framework for Gate 3 from an infrastructure perspective, and will run concurrently with Gate 2. We anticipate that Gate 3A will be able to provide preliminary engineering input that will benefit the development of Gate 2 planning deliverables. Gate 3A will culminate in the consultant's preparation and submission of the Infrastructure Design Basis Memorandum which will address the following:
  - Sewer and Water connection locations, sizes and available capacity
  - Water Pressure Zones
  - Raw Water Supply source and details (make-up and irrigation water)
  - Allowable Storm Water Release Rates and discharge location/invert
  - "Upstream" Sanitary Sewage generation, connection point and invert
  - Boundary Grading Constraints and Boundary Drainage
  - Transportation access points and adjacent arterial road planning
  - Open Space requirements
  - Applicable Design Standards

  The Infrastructure Design Basis Memorandum will be used as the basis for preparing Gate 3 preliminary engineering requirements. It is hoped that the evolution of Gate 3A will foster a collaborative effort between the Developer, City Departments and Consultant with regard to the determination of key constraints that will influence the detailed preparation of Gate 3.

3 Authority / Permission to Proceed with Planning

- April 2010 preliminary meeting Barry Peat, Gary Weikum, Trent Purvis, Bud Hogeweide, Devin Huber
- April 27th, 2010 meeting with the landowners, consultants and members of DRC

4 Area to be Planned

- Project Limits provided on *Figure 1.0 Country Meadows Project Limits*
- Project Legal Description: NE 33-8-22-4, Portions of: SE 33-8-22-4; NW 34-8-22-4; SW 34-8-22-4
- Stormwater drainage in arterials is to be considered to far property line and accommodated from the centerline of the adjacent arterial roadway.
- Chinook Trail ROW will be included in the Country Meadows Planning Boundary (75m East of City Boundary)

5 Potential Connection Points

- Transportation - Shown on *Figure 1.0*. City has not approved an alignment for Chinook Trail, City stated that Chinook Trail alignment should not encroach into the West Lethbridge Phase 2 ASP boundary. There is one connection to Chinook Trail, one connection to Walsh Drive, one connection to Metis Trail, and two connections to Garry Drive.
- Water - Shown on *Figure 1.0*
- Sewer - Shown of *Figure 1.0*
- Storm - Shown of *Figure 1.0*

Gate 1 - Information Gate

6 Existing Reference Plans
- *Country Meadows Area Structure Plan*
- *West Lethbridge Employment Centre Area Structure Plan (ongoing)*
- Adjacent Area Structure Plan: *West Lethbridge Stage II Area Structure Plan*
- Adjacent Outline Plan: *The Piers*
- Adjacent Outline Plan: *Garry Station*

7 Servicing Constraints / Opportunities
- Sanitary Sewer - the development of Country Meadows requires the completion of the proposed sanitary sewer trunk and river crossing in the Bridge Drive Utility Corridor.
- Stormwater - the Country Meadows ASP indicates that development of Country Meadows requires the implementation of a zero release storm water management facility. (To be Confirmed by the City of Lethbridge).
- Existing development and grading on the East Boundary
- Existing / future grading of Walsh Drive to the North
- Future boundary grading on West and South Boundary (Chinook Trail and Garry Drive)

8 Supporting Studies Required
- Traffic Impact Assessment (TIA-Stantec) - Will be primarily focused on trip generation within the lands and trip assignment to the ASP collector network.
- Geotechnical Investigation (EBA) - Drilling required.
- Environmental Site Assessment (EBA)
- Historical Resources Impact Assessment (HRIA) - ASP indicates that HRIA is not required. Clearance letter from provincial Sustainable Resource Department (SRD) is required.
- Traffic Noise Mitigation Study is required for the Country Meadows Access Roadways in 2 Locations off Garry Drive and 1 location off Metis Trail. However, this requirement is waived if the access road is adjacent to non-residential zoning . A Traffic Noise Mitigation Study is not required for Arterial Roadways bounding Country Meadows.
- Confirmation from SRD that no other studies are required.

9 Agreed Change Process
- Change to a previous gate decision must be requested
- Request must document all impacts of the change
- City to review request and determine if it is deemed either inconsequential or requires more supporting analysis and the impact to subsequent gate approvals

10 Schedule / Timelines
- Development review Committee meetings will occur on every Thursday at 1:00 pm. Articles to be taken up in meetings are to be submitted preferrably 2 weeks prior to the meeting date, but depending on length of meeting agenda, may be submitted 1 week prior to meeting date.

Gate 1 Sign Off: ____________ City of Lethbridge — Barry Peat Print Name — June 7/10 Date

Gate 1 Sign Off: ____________ Southgate Commercial Lands Corp. — JOE MESZAROS Print Name — ____ Date

GATE OUTLINE

The following outline describes the work completed in advance of each gate.

GATE #1

Information Gate

- Definition of project team – Developer(s), landowner(s), consultants, City of Lethbridge DRC (Provide names and contact information)
- Confirm/modify Gated Process Template
- Authority/Permission to proceed with planning
- Area to be planned (primary area and shadow plan area)
- Potential connection points
- Existing plans (MDP, ASP)
- Servicing constraints/opportunities
- Establish supporting studies that will be required for the site (historical resources, geotechnical, environmental impact assessment, etc.)
- Agreed change process
- Establish time lines

GATE #2

Land Use Layout Gate

- Confirm previous gate
- Establish need for, and type of, public consultation
- Developer's vision and principles for the area
- Conceptual Land Use – bubble plan level of detail
- Conceptual layout for parks, pathways and open space
- Conceptual road network connections and internal circulation
- Conceptual zoning districts - multiple options, if appropriate
- Confirm conformance to governing documents (ASP, MDP, adjacent outline plans)
- Confirm design criteria (trip generation rates, water demand rates, sewage generation rates, storm release rates)

GATE #3A

Boundary Conditions and Connection Points

- Sewer and Water connection locations, sizes and available capacity
- Water Pressure Zones
- Raw Water Supply source and details (make-up and irrigation water)
- Allowable Storm Water Release Rates and discharge location/invert
- "Upstream" Sanitary Sewage generation, connection point and invert
- Boundary Grading Constraints and Boundary Drainage
- Transportation access points and adjacent arterial road planning
- Open Space requirements
- Applicable Design Standards

GATE #3

Draft Design Gate

- Confirm previous gate
- Refine Land Use Plan to gross parcel sizes (with dwelling unit / population estimates in table format)
- Figure showing transportation network layout and showing preliminary road classification
- Figure showing park and pathway/bikeway network classification and playground locations
- Figures showing storm drainage catchments (minor & major), wastewater sewersheds and water supply zones
- Figure showing transit routes and stops
- Figure showing Infrastructure and transportation connection point details (locations, flow rates, capacities)
- Table showing wastewater flows
- Figures & tables showing major storm system flow routes, major and minor storm system flows, storm pond sizing
- Figure showing future adjacent service area – services to be provided
- Documentation of all variances from design standards and standard practice
- Agreement on final document outline/format

Check List:

- Daily traffic volumes relative to roadway classification
- Design assumptions for minor and major drainage systems
- Design assumptions for sanitary system
- Do the proposed systems and facilities conform with accepted practice, standards, regulations and guideline
- Has the same population and land use been used for all analysis
- Conformance with standard practice, previous documents, studies, master plans and reports
- Have you highlighted anything that does not conform with standard practice, previous documents, studies, master plans and reports

GATE #4

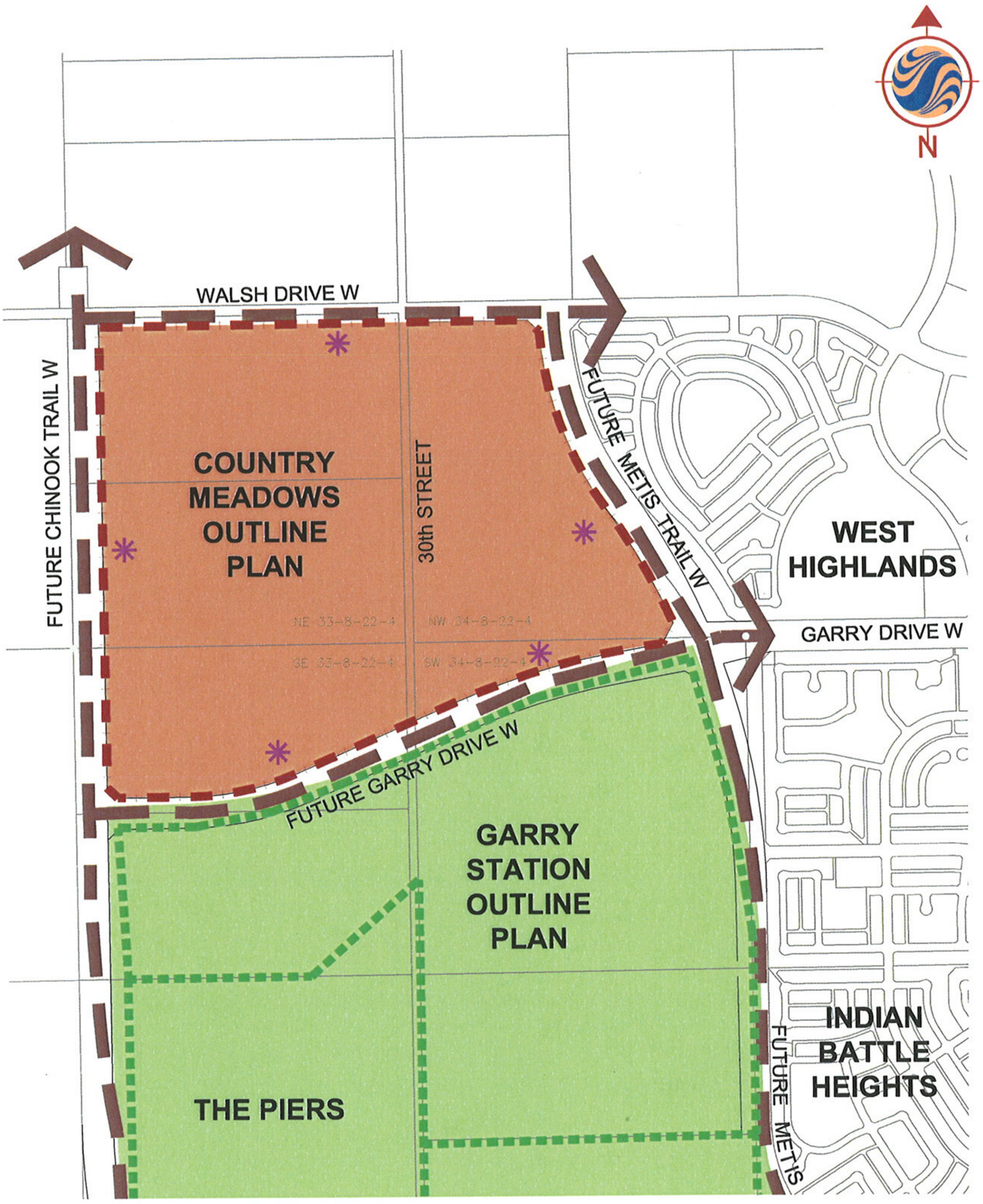
Draft Plan Gate – First Draft of Outline Plan

- Confirm previous gate
- Provide draft TIA
- Provide draft Stormwater Management Plan
- Location & size/capacity of major facilities (roads, storm, sanitary, water, parks)
- Connection points and their characteristics for existing and future areas (roads, storm, sanitary, water, pathways)
- Offsite servicing requirements (indicate facilities to be funded by offsite levy)
- All supporting documentation (geotechnical, environmental, historical resources, etc.) and information from all previous gates.
- Proposed staging - order of development/construction
- Public consultation

GATE #5

Final Submission

- Confirm previous gate
- Presentation & review of final document
- Set MPC date



APRIL 2010
112945195

ORIGINAL SHEET - ANSI A

Legend

- — — — Country Meadows ASP / Outline Plan Boundaries
- ✳ Potential Servicing Connection Points (Country Meadows ASP)

Stantec

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2010-06-03 02:22PM By: bschmidtke

Client/Project

SOUTHGATE COMMERCIAL LANDS CORP.
COUNTRY MEADOWS
OUTLINE PLAN

Figure No.

1.0

Title

PROJECT LIMITS

APPENDIX J

GATE 2 SIGN-OFF AND DOCUMENT

City of Lethbridge
Outline Plan - Gated Review Process
Sign-Off Templates

Stantec Consulting Ltd.
Project: Country Meadows OLP
Submittal Date: February 2011

Gate 2 - Preliminary Land Use

File: 112945195

1 **Confirmation of Previous Gate**
- Gate 1 completed and signed off on June 7, 2010.

2 **Public Consultation**
- The public consultation component will be a one night Open House held after formal approval of Gate 3

3 **Developer's Vision**
- Country Meadows Visioning Brief (attached)

4 **Conceptual Land Use**
- Figure 1.0 Conceptual Land Use & Zoning
- Figure 2.0 Site Constraints

5 **Conceptual Open Space Layout**
- Figure 1.0 Conceptual Land Use & Zoning

6 **Conceptual Road Network**
- Figure 1.0 Conceptual Land Use & Zoning

7 **Conceptual Zoning**
- Figure 1.0 Conceptual Land Use & Zoning

8 **Conformance to Governing Documents**
- Area Structure Plan: *Country Meadows*
- Adjacent Outline Plan: *Garry Station*

9 **Infrastructure Design Basis Memorandum**
- As proposed in Gate 1, the Infrastructure Design Basis Memorandum will set the framework for future analysis
- Correction to Gate 1, Item 2 "Water Pressure Zones" should be "Water Demands".

10 **Gate Meeting Notes**
- Preliminary City Comment Letter Gate 2 Submission and Stantec Response Letter
- Gate 2 Visioning Meeting and Workshop June 24, 2010 (attached).
- ATCO Pipelines Meeting Minutes October 29, 2010
- ATCO Pipelines Planning Meeting Notes December 13, 2010
- Transportation Meeting Notes January 13, 2011

Gate 2 Sign Off: City of Lethbridge
Barry Pent Feb 15, 2011
Print Name Date

Gate 2 Sign Off: Southgate Commercial Lands Corp.
Joe Meszaros Feb 24 2011
Print Name Date

COUNTRY MEADOWS

(Affording Beauty, Integrity & Quality)

A COMMUNITY VISION

September, 2010

Stantec

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PART I – COMMUNITY VISION & LAND USE PLANNING

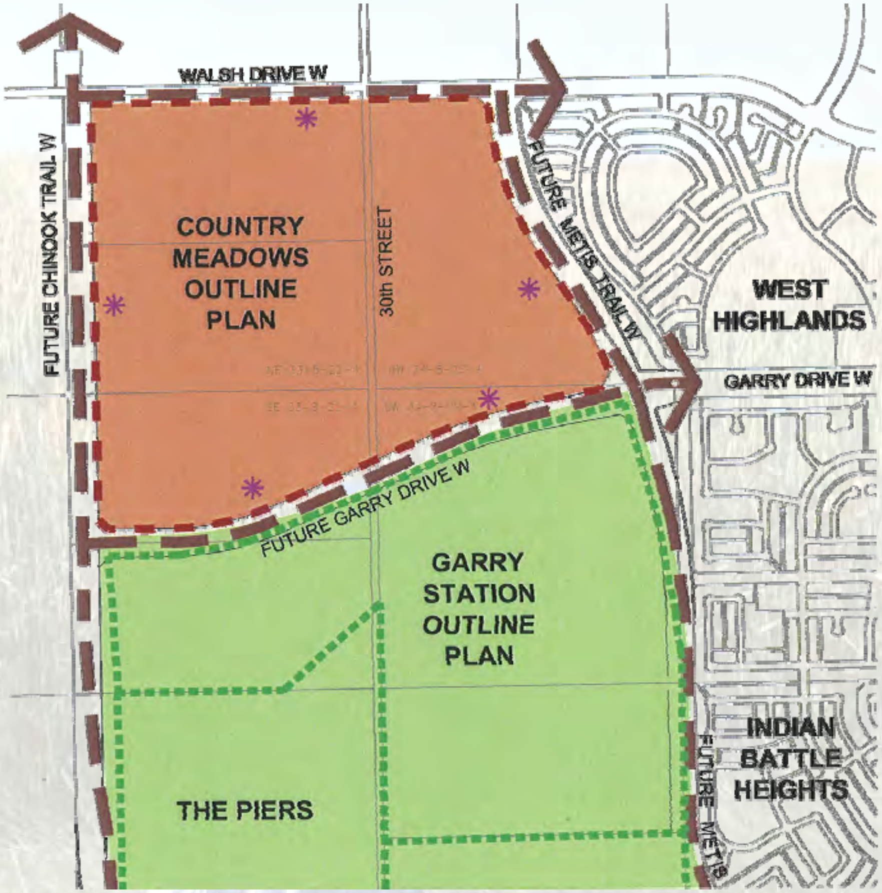
PART II – INFRASTRUCTURE DESIGN BASIS MEMORANDUM

FIGURES

PART I

Community Vision and Land Use Planning

Introduction



The Country Meadows Area Structure Plan was adopted in Bylaw 5629, February 8, 2010 and contains just over 300 acres (122 ha). The Outline Plan area in the northwest portion of this fast developing sector of West Lethbridge is bounded on the east by the future Metis Trail West, on the south by the future Garry Drive West, on the north by Walsh Drive West and on the west by the future Chinook Trail. The Country Meadows Outline Plan is situated west of the existing West Highland's community and north of the future community of Garry Station. Directly to the north of Country Meadows, plans are being developed for a commercial area "The West Lethbridge Employment Centre".

The plan for Country Meadows incorporates lands owned by six landowners and is currently designated Urban Reserve or Direct Control.

Community Vision, Values & Amenities

VISION

The community of Country Meadows hearkens back to a time when the pioneering spirit brought families west in search of a new beginning. For these settlers who paused amid the rolling Prairies, the Rocky Mountains must have been a wonder, hovering above the Oldman River Valley. With expansive views in all directions, and a sky that seemingly went on forever, this new land would become home.

VALUES

Community and family values have always been strong in Lethbridge. Here, there is a respect for one’s neighbor and the environment; we take pride in our property and neighbourhood. The community is healthy and secure, and Country Meadows will become an extension of these Values.

AMENITIES

For the pioneers a sense of wonder would have been strong—the joy of exploration. In Country Meadows, we see a community built into the rolling prairies, where exploration along a network of pathways and inter-connecting green spaces lead to the focal points of a community: Open Park Space; Linear Parks and Pathways; Water Features and Ponds; Sports Fields; Neighbourhood Stores.

At the heart of the community an elementary school is easily accessible to both vehicular and pedestrian traffic.

Planning Considerations

In preparing the Country Meadows concept plan, the following planning considerations have been or will be taken into account:

- The interface with the existing residential community of West Highlands
- The interface with the adjacent community of Garry Station
- Outcomes from Workshop and Visioning Session including: a pedestrian and cyclist friendly community; affordable housing types; a variety of housing styles; incorporation of sustainable elements; a safe community; an environmentally friendly community.
- On Site Storm Water Management and Water Quality
- Land Ownership Boundaries
- Existing Infrastructure and Site Constraints
- Historical Resources Impact Assessment
- Phase 1 Environmental Site Assessment
- Lethbridge School District Requirements
- Topography

- Sustainable Practices may include:
  - Consideration of materials for pedestrian/ pathway development,
  - Consideration to different lighting forms and power sources,
  - Provision of recycling sites,
  - Enhanced opportunity for neighbourhood socializing and interaction,
  - Provide bicycle racks,
  - Require building designs that provide orientation for maximum feasible use of solar design and equipment,
  - Provide a range of housing types and styles,
  - Provide housing types that allow more opportunity to work at home,

Land Use Concept

The land use concept will be based upon a cellular grid system with a central elementary school at its core. Mixed Use Areas including neighbourhood stores will be located north of Garry Drive n the SE Quadrant of the development.

The principal land uses in Country Meadows are residential. The arrangement of land uses recognizes the continued strong local demand for suburban style single detached homes, but will also include more affordable multi-family sites. The plan will also incorporate Urban Innovation Zones that will be integrated into residential communities around small parks.

Country Meadows residential lots will cater to:

- a "starter home" market on the periphery of the development
- a "move-up home" market
- a "large-home" market around parks and water features

The allocation of Multi-Family has been distributed throughout the development and in most cases is in close proximity to the school site.

The Mixed Use area located at the south east corner of the site will include neighbourhood stores, zones of multi-family and low density residential.

PART II

Infrastructure Design Basis Memorandum

Introduction

The Country Meadows Outline Plan Development Boundary is located in West Lethbridge just south of Walsh Drive and west of West Highlands. Refer to **Figure 1.0**. The site is comprised of approximately 122ha (300 acres) excluding arterial road right of ways.

The purpose of our Design Basis Memorandum is to:

- Identify key site constraints and opportunities
- Identify Stantec's design assumptions that will be used as a basis for more detailed analysis

It is anticipated that this will allow us to make any necessary corrections in a more efficient manner prior to the development of more detailed documents in Gates 3 and 4.

Site Topography & Grading

The Country Meadows Site drains, from a centrally located plateau in all directions, with a maximum elevation difference of approximately 12-13m. Existing drainage from the site flows towards multiple low areas that occur along the perimeter of the development. Refer to **Figure 2.0**. Special consideration with regard to existing drainage will need to be considered along the existing Walsh Drive and West Highlands Development Boundary.

Site grading designs will attempt to match existing terrain as much as possible in order to reduce excessive earthwork quantities and maintain grades/drainage around existing properties, roadways and infrastructure. One of the key design challenges will be maintaining acceptable grades along the ATCO Pipelines High Pressure Gasline Alignment.

Transportation

BACKGROUND INFORMATION

Country Meadows access points have been defined by the Country Meadows ASP conceptually, and further refined as indicated on **Figures 1.0 and 2.0**. Access points will meet City of Lethbridge requirements with regard to intersection spacing for arterial roads. Development adjacent to West Highlands and Walsh Drive must consider, and not adversely impact, the existing drainage and grading condition.

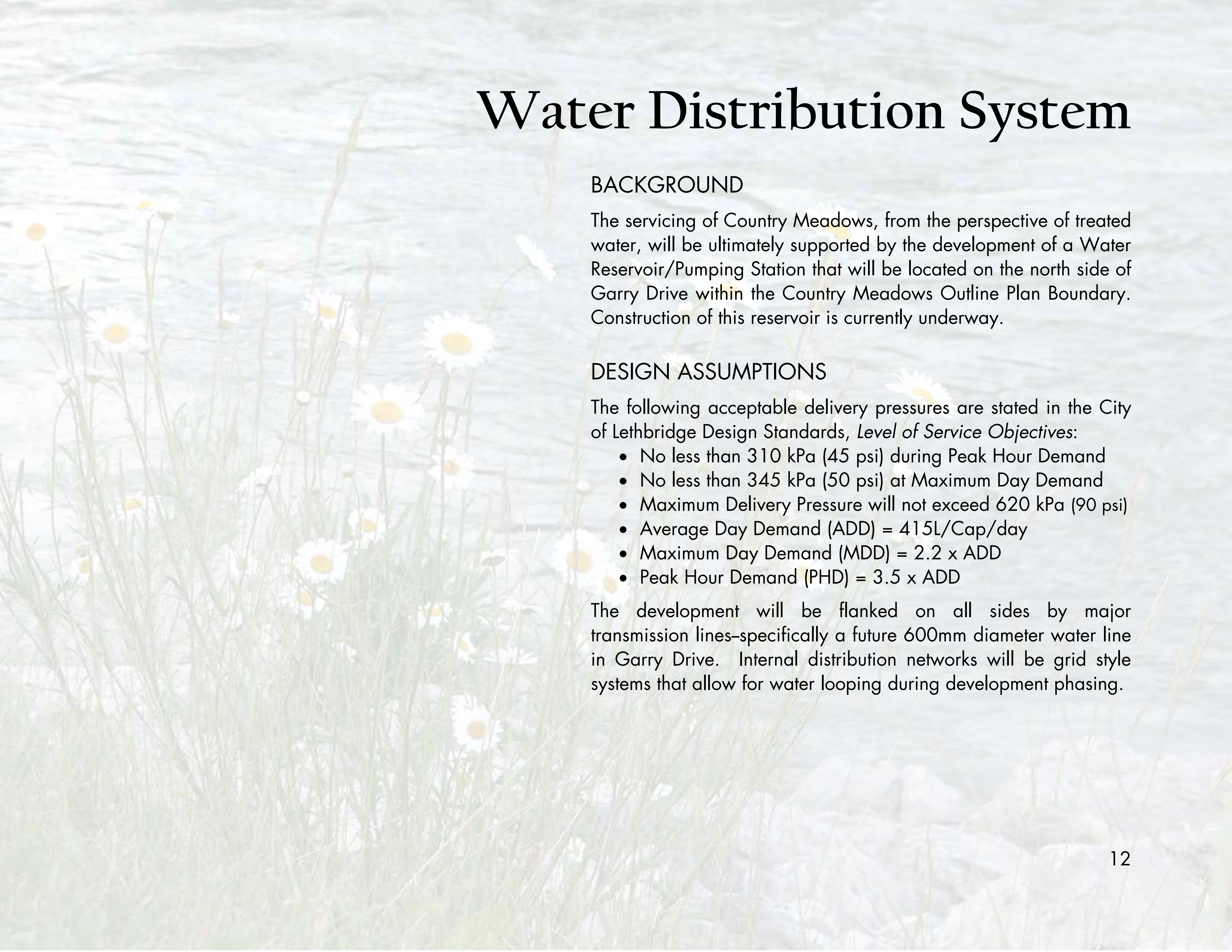
DESIGN ASSUMPTIONS

Drainage will be accommodated by internal storm water management facilities up to the centerline of the adjacent arterial road; drainage will be considered from beyond the centerline. A preliminary design meeting has occurred with City of Lethbridge Transporation to discuss boundary grading of future arterial roads; we anticipate working out these vertical control details during Gate 3.

Preliminary roadway classifications will be confirmed through a Traffic Impact Assessment (TIA) during Gate 4. The TIA will reflect the requirements of the City of Lethbridge Traffic Impact Assessment Guidelines.

Land Use	Peak Period	Total Trip Ends (trips/du)	Inbound (trips/du)	Outbound (trips/du)
Low Density Residential (xxx units)	AM (PM)	0.77 (1.02)	0.20 (0.65)	0.57 (0.37)
Medium Density Residential (xxx units)	AM (PM)	0.75 (0.92)	0.22 (0.56)	0.53 (0.36)
Elementary school site (ITE code 522, per student)	AM (PM)	0.42 (0.28)	0.23 (0.13)	0.19 (0.15)

Noise levels will be investigated and mitigation strategies will be reviewed along Country Meadows Entrance roadways (one location off Metis Trail, two locations off Garry Drive). The Design Noise Level set in the City of Lethbridge Arterial Road Noise Policy is 60 dBA Leq (24Hr) for traffic noise. The guideline is intended to achieve acceptable noise levels in the rear yard outdoor living spaces and is not intended to deal with indoor space. It is understood that noise levels would not need to be evaluated or mitigated if the adjacent land use were non residential.



Water Distribution System

BACKGROUND

The servicing of Country Meadows, from the perspective of treated water, will be ultimately supported by the development of a Water Reservoir/Pumping Station that will be located on the north side of Garry Drive within the Country Meadows Outline Plan Boundary. Construction of this reservoir is currently underway.

DESIGN ASSUMPTIONS

The following acceptable delivery pressures are stated in the City of Lethbridge Design Standards, *Level of Service Objectives*:

- No less than 310 kPa (45 psi) during Peak Hour Demand
- No less than 345 kPa (50 psi) at Maximum Day Demand
- Maximum Delivery Pressure will not exceed 620 kPa (90 psi)
- Average Day Demand (ADD) = 415L/Cap/day
- Maximum Day Demand (MDD) = 2.2 x ADD
- Peak Hour Demand (PHD) = 3.5 x ADD

The development will be flanked on all sides by major transmission lines–specifically a future 600mm diameter water line in Garry Drive. Internal distribution networks will be grid style systems that allow for water looping during development phasing.

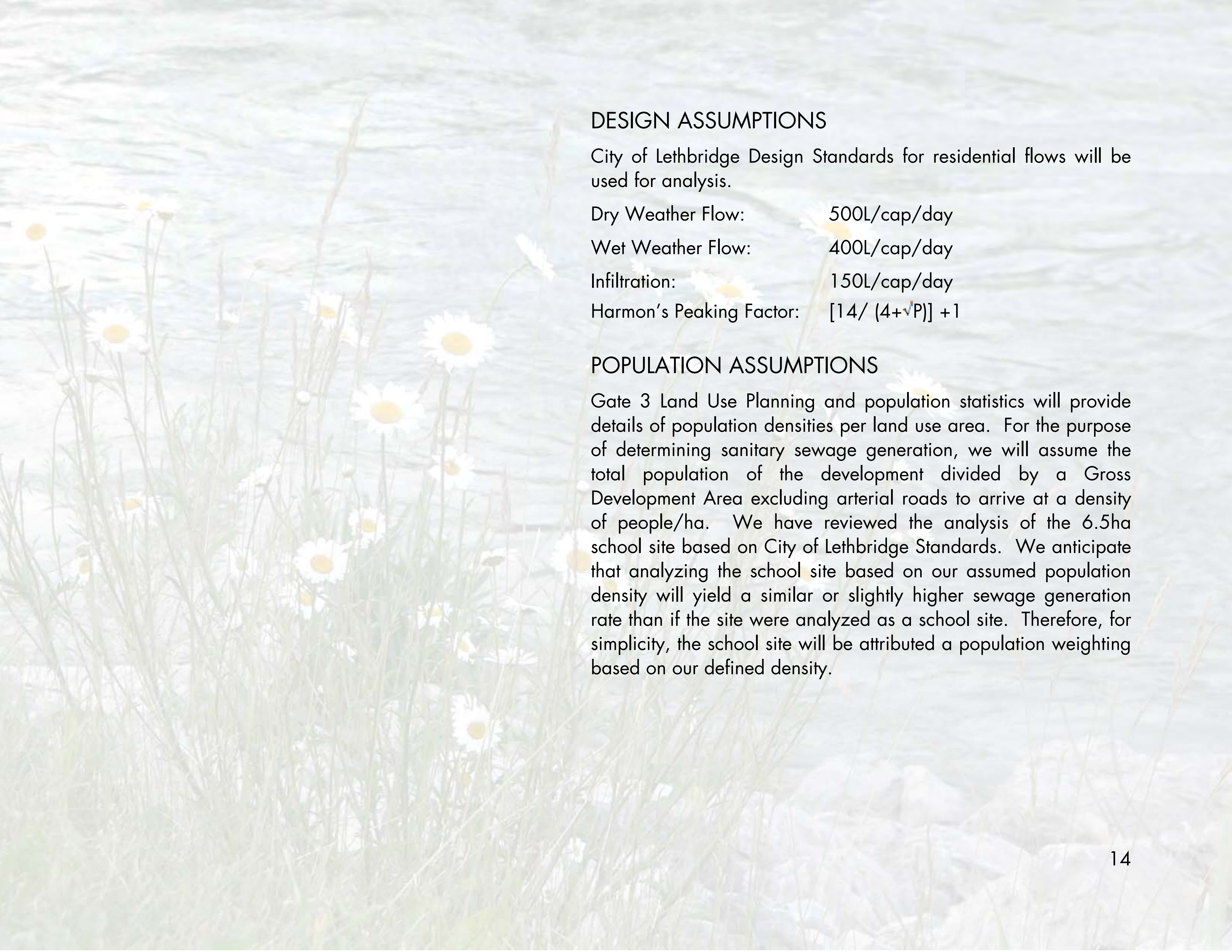
Sanitary Sewage Collection System

BACKGROUND

Previous planning documents have indicated that substantial upgrades or new installations will be required to the sanitary sewer collection system on the City of Lethbridge's West side in order to provide adequate service to future developments. It is understood that the City will construct a new sanitary sewer trunk line through the Bridge Drive Utility Corridor that will be installed along Walsh Drive, Metis Trail and Garry Drive. The proposed sewer trunk in Metis Trail will match the existing 600mm diameter sewer that extends west of West Highlands along the projection of Tartan Boulevard.

The residual capacity of this existing sewer in Tartan Boulevard is unidentified at this time. However, it is understood that, as an interim measure, and subject to the Bridge Drive Utility corridor being completed and connected to the existing sanitary sewer on Walsh Drive, limited development can proceed with a connection to this sewer from lands west of Metis Trail. Future plan development (Gate 3) will minimize the installation of redundant sewer lines in the Metis Trail R/W. We anticipate that permanent sewer trunk lines will enter the Country Meadows Development at a location near the existing West Highlands sewer extension. In this way, the sewer can be used in both the interim and ultimate servicing strategy.

The Country Meadows ASP indicates that a 1200mm diameter sewer trunk will be extended from Walsh Drive South along Metis Trail and that a 450mm diameter sewer trunk will be installed along Garry Drive as part of the new Bridge Drive Utility Corridor. A 900mm diameter sewer will be installed along Walsh Drive on the North Boundary of Country Meadows. Unlike the Country Meadows ASP, upstream sewage contributions from north of the development boundary will not be considered to flow through Country Meadows.



DESIGN ASSUMPTIONS

City of Lethbridge Design Standards for residential flows will be used for analysis.

Dry Weather Flow: 500L/cap/day

Wet Weather Flow: 400L/cap/day

Infiltration: 150L/cap/day

Harmon's Peaking Factor: $[14/ (4+\sqrt{P})] +1$

POPULATION ASSUMPTIONS

Gate 3 Land Use Planning and population statistics will provide details of population densities per land use area. For the purpose of determining sanitary sewage generation, we will assume the total population of the development divided by a Gross Development Area excluding arterial roads to arrive at a density of people/ha. We have reviewed the analysis of the 6.5ha school site based on City of Lethbridge Standards. We anticipate that analyzing the school site based on our assumed population density will yield a similar or slightly higher sewage generation rate than if the site were analyzed as a school site. Therefore, for simplicity, the school site will be attributed a population weighting based on our defined density.

Storm Sewer and Storm Water Management

BACKGROUND

Where practical, catchment areas have been defined by natural topography in an effort to minimize excessive earthwork; these boundaries extend to the centerline of the adjacent arterial roadways thereby allowing for the combined control of runoff from the development and arterial roads.

Due to offsite constraints, Country Meadows storm water ponds will need to operate at a near "zero" release rate. The City has indicated that Country Meadows storm water detention facilities will need to connect to the 1800mm diameter storm line that extends from the west boundary of West Highlands along the projection of Tartan Boulevard.

DESIGN ASSUMPTIONS

As specified in the City of Lethbridge 2009 Design Standards, storm water ponds must be designed to fully accommodate runoff from the 1:100 year, 24 hour rain event.

With regard to pond discharge, it is anticipated that all pond outlets will connect to a future sewer trunk that will extend from the existing 1800mm diameter pipe located at the west end of Tartan Boulevard in the West Highlands Area. All ponds will be serviced by a minor storm sewer system sized for the 1:5 year rainfall event.

Overland flow routes are to be designed to convey the 1:100 year storm event and not exceed AENV guidelines for safe velocities and depths. Overland flow routes will incorporate trapped lows at strategic locations. Trapped low areas will:

- Increase surface run-off capture
- Provide for energy dissipation during extreme rain fall events ("stilling" basins)
- Allow for the practical creation of overland flow routes given localized topographical constraints
- Meet City of Lethbridge design guidelines for maximum depth of 300mm.

In addition to the above, overland flow within a drainage boundary will be proportioned in a way that evenly distributes the flow routes throughout the drainage boundary. Special attention at the detailed design stage may be required where two intersecting overland flow routes meet. Where possible, this point of intersection will occur in close proximity to a storm water management facility.

Emergency Overland Flow Routes beyond the 1:100 year event could be implemented along the western boundary of the development. However, an existing low in the site topography (El. 929.50 in SE Quadrant) is trapped. If an emergency overland flow route cannot be established, the worst case route for overland flow is through the established neighbourhood of West Highlands.

At the planning stage, ponds will be designed to accommodate 1000m^3/ha, and will be allowed to discharge a flow of 4L/s/ha at the 1:100 year storage level. This is a volume equivalent to the 90% of the 1:100 year, 24 hour rainfall volume (~110mm rainfall). This is based on no allowance for initial abstraction, depression storage or infiltration.

Wet ponds and low impact design techniques including bio-swales and rain gardens will be utilized for storm water treatment with regard to the removal of Total Suspended Solid (TSS).

Open Space Planning

Park function must be the first priority in park location and design. Efforts will be made to divide the open space equitably between landowners. Open spaces will be linked by pathway/ bikeway networks to promote walkability. It is anticipated that storm water management facilities will be incorporated into Open Spaces.

With regard to Raw Water Supply, a preliminary discussion has been held with the Lethbridge Northern Irrigation District (LNID) about the possibility of make-up water for ponds and irrigation of parks. The LNID has indicated that Raw Water is available for the development, and that a final connection location to their existing distribution system will need to be co-ordinated between the LNID, City of Lethbridge and possibly other developers working the the West Lethbridge Area. The LNID indicated that the creation of a large central distribution hub within the future West Lethbridge Employment Center Area may be one possible location.

Discussions are ongoing with the Letbridge School District with regard to a final location and size for their elementary school and open space area. The elementary school site will incorporate a playground and sports fields with its development. Location and size of the site will be finalized in Gate 3.

Existing Shallow Utilities

ATCO PIPELINES

ATCO Pipelines has been contacted with regard to the integration and/or relocation of their existing high pressure lines in the Country Meadows Area. Discussions between the Developer, ATCO Pipelines and the City of Lethbridge will be continue during the development of Country Meadows. At this time, it is proposed that Public Utility Corridors be established along the existing pipe alignments combined with pathways. We wish to note that this proposal does not prevent future developer's from relocating the line through a planning adjustment. ATCO has provided Stantec with their "ATCO Pipelines Guidelines Controlling Development and/or Landscaping of High Pressure Natural Gas Rights of Way" (enclosed). It is anticipated that the Developer/City of Lethbridge will submit plans to ATCO Pipelines during the Gate 3 design stage. ATCO's current easement widths must be maintained along with cover above the existing line. However, the addition of fill material above the line will be permitted to a height of 2m above the crown of the gas line. Minimum cover is 1.2m.

Correspondence with ATCO Pipelines indicates that an easement currently registered to Canadian Western Natural Gas on SW 34-8-22-4 has no corresponding infrastructure installed within it and has been discharged.

It is understood that City of Lethbridge Land Use Bylaws will govern the development of land beyond the gas line right of way (permanent structures shall be a minimum of 15m from the gas line).

ATCO GAS

It is anticipated that the existing ATCO gas facilities will be relocated and integrated into the community at the subdivision detailed design stage.

TELUS

It is anticipated that the existing Telus facilities will be relocated and integrated into the community at the subdivision detailed design stage.

FORTIS

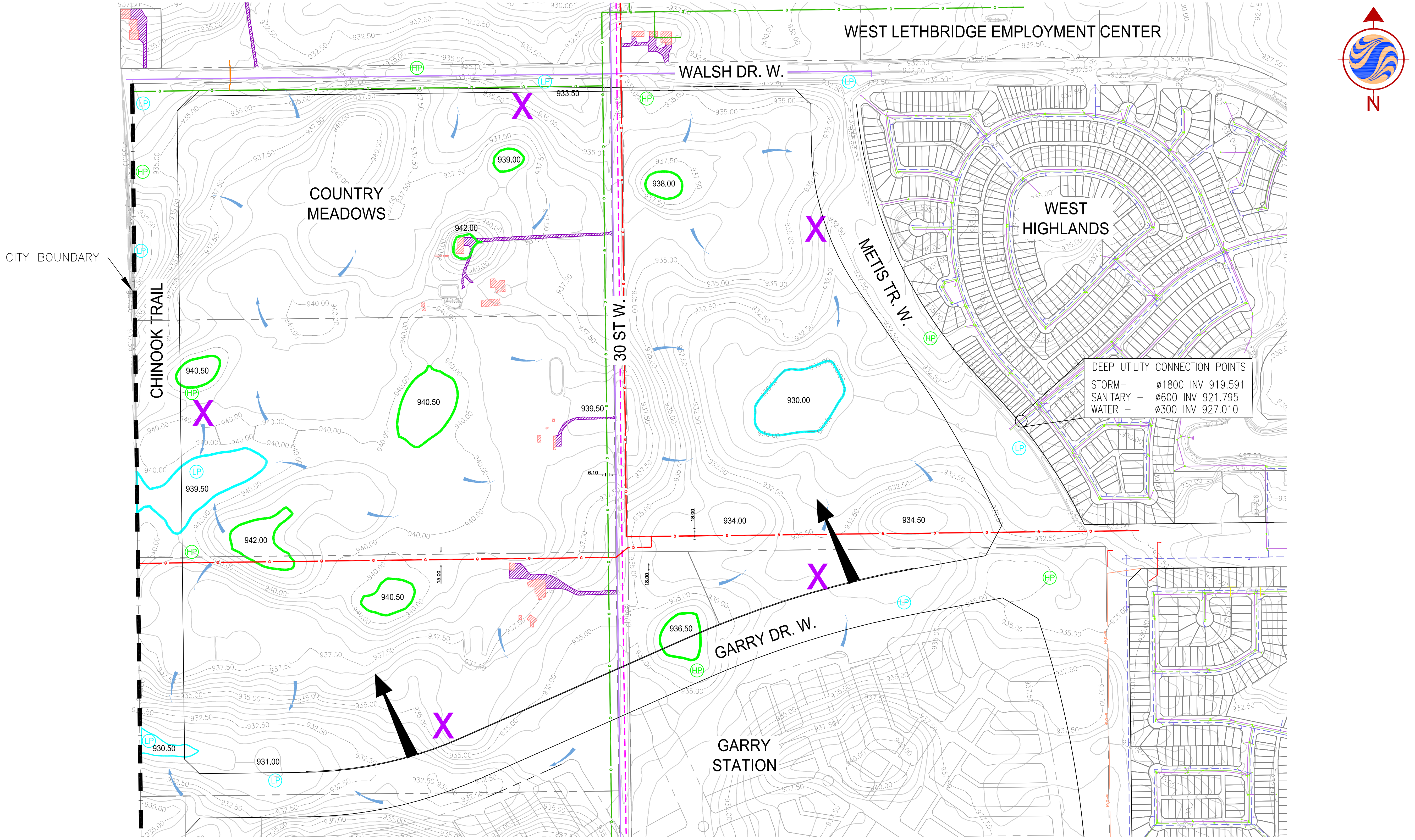
It is anticipated that the existing Fortis facilities will be relocated and integrated into the community at the subdivision detailed design stage by the City of Lethbridge and their Electrical Department.

BONAVISTA GAS

We have confirmed that Bonavista Gas has no infrastructure currently installed in the area.

COUNTRY MEADOWS - CONCEPTUAL LAND USE & ZONING

FEBRUARY 2011 FIGURE 1.0



NTS

112945195

ORIGINAL SHEET – ANSI B

Legend

Land Low Point
Land High Point
Overland Flow & Spill Direction
Existing Ground Contours
Existing Buildings
Existing Driveways
ATCO Gas
ATCO Pipelines (High Pressure)
Fortis- Over head
Telus
Existing Watermain
Existing Sanitary
Existing Storm
X Transportation Access Point

Stantec

Client/Project
Southgate Commercial Lands Corp.
Country Meadows
Outline Plan

Figure No.
2.0

Title
Site Constraints

V:\1129\active\112945195\drawings\civil\planning drawings\cm-fig_Constraints.dwg

SUPPLEMENTARY INFORMATION

CITY OF
Lethbridge

Office of:
Planning & Development Services Department
Planning Section
Phone No. 320-3920

September 9, 2010

Stantec Consulting Ltd.
Lethbridge, AB

Attention: Brad Schmidtke

Dear Sir:

RE: Country Meadows Outline Plan - Gate 2 Review Comments

The DRC reviewed your Gate 2 submission and has the following comments in addition to those expressed at the September 2, 2010 Development Review Committee meeting:

Transportation

- Figure 1.0; please extend the collector roadway running along the north limit of the Community Core parcel, westerly along the south boundary of the school site to intersect with the north / south collector.
- Please show pathway connections to Garry Station.

Underground Utilities

- Page 13; please revise the second paragraph to read: *The residual capacity of this existing sewer in Tartan Boulevard is unidentified at this time. However, it is understood that as an interim measure, and subject to the Bridge Drive Utility Corridor being completed and connected to the existing sanitary sewer on Walsh Drive, limited development can proceed with a connection to this sewer from lands west to Métis Trail.*
- Further to you email comment on using LNID water for park irrigation and make-up water in the storm ponds, the City of Lethbridge supports the concept of an integrated irrigation supply system. The developer is encouraged to investigate this proposal.

- On page 16, please replace: " … is trapped, and an emergency overland flow route cannot be established" with " … is trapped. If an emergency overland flow route cannot be established, the worst-case route for overland flow is through the established neighborhood of West Highlands."

Planning

- Figure 1 – Land Use Concept, please relocate one of the multifamily sites from the Walsh Drive entrance so that it would be adjacent to the North side of the school site (on the same side of the collector, as this would prevent children from crossing the collector to attend school). By relocating a multifamily site to the specified location, many of the policies encouraged within Section 6.4.5 of the newly adopted Municipal Development Plan would be achieved.
- Figure 1 – Land Use Concept, at this point in the process would it be possible to examine the potential of having the multifamily units located near the Easterly entrance on Garry Drive front the street? This area has so much potential being located across from the Community core (mixed use commercial) site. If the Multifamily area was zoned Urban Innovation and the units were street town houses they would have a great street presence and offer a unique product. The parking (garages) could be accessed from the rear yard and only street parking would be allowed on the front street, as to minimize the traffic concerns into the neighbourhood. A great example of this product can be found in Chestermere, Ab. The Neighbourhood is called Rainbow Falls and the entrance road with this street town house product is Rainbow Falls Dr. A key component to this concept is the divided collector. This provides an area to have street trees in the boulevard, as well as slow down vehicles entering the neighbourhood.

Urban Construction

- In light of the number of development restrictions ATCO Pipeline would like to impose within the high pressure gas line rights of way, ATCOs' interests might be better served if they, rather that the City of Lethbridge, owned the rights of way.

Parks

- Page 17; reference is made to "low impact design techniques such as bioswales and rain gardens may be used along linear park spaces." These features are presently being evaluated in another area of the City and may be included in the Parks standards at a future date. Future gate information shall include specific locations and x-section design details to assist in their evaluation.

- Gate 3 information should include amenities within the park areas with their locations shown.
- As discussed previously, the Parks Planning Manager will participate in discussions with the public school district regarding school parcel layout.
- In future gates, to qualify for MR credit, please adhere to the MR credit standard for lands surrounding the storm ponds.
- Please meet with the Parks Planning Manager for design details for aquatic benches.

Please amend the Gate 2 submission as noted and resubmit to DRC for review.

Yours truly,

Barry Peat
Development Review Committee
City of Lethbridge

Meeting Notes

Visioning Meeting

Country Meadows Outline Plan / FILE 112945195

Date/Time:	Thursday, June 24, 2010 / 1:00 PM
Place:	Lethbridge Centre Boardroom #3
Attendees:	Joe Meszaros, Developer's Project Manager Deb Olafson, Landowner Gary Weikum, City of Lethbridge Byron Buzunis, City of Lethbridge Barry Peat, City of Lethbridge Janet Gutsell, City of Lethbridge Maureen Gaehring, City of Lethbridge Jason Freund, City of Lethhbridge Bud Hogeweide, Approvals Facilitator, Stantec Consulting Ltd. Sue Paton, Stantec Consulting Ltd. Brenden Montgomery, Stantec Consulting Ltd. Trent Purvis, Stantec Consutling Ltd. Brad Schmidtke, Stantec Consulting Ltd. Karen Iwaasa, Stantec Consulting Ltd.
Distribution:	Attendees (Landowners via J. Meszaros), Devin Huber

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Item:

1.0 Introductions

2.0 Recap

- B. Schmidtke gave a recap of discussion and key elements that resulted from the April 27 Kick-off Meeting which included:
    - What makes a community special?
    - Must haves of a community.
    - Identity and character
    - Key components
    - Theming
    - Product
    - Features
- G. Weikum suggested new innovations that the Country Meadows community might consider incorporating. Statistics indicate that almost 30% of city land is dedicated to the automobile if considering elements such as roadways, parking, garages, etc. An alternative development scheme could reduce that amount by moving homes to the front of lots, implementing shared parking, eliminating driveway parking, utilizing one-way streets, etc.

- J. Meszaros indicated a desire to develop an innovative and creative community, but his past experience demonstrates acceptance of "something new" is often difficult.

3.0 Road Layout

- S. Paton walked the group through a variety of road layout display boards that demonstrated orientations of central hubs and orientation points to enhance creative options prior to the designing workshop. She reminded participants that "you can't plan in isolation".

4.0 Land Use Elements

- S. Paton discussed land use elements that should be considered in the development design:
  - green spaces
  - road networks
  - connections
  - transitions
  - balance

5.0 Opportunities and Constraints

- B. Schmidtke provided an overview of the opportunities and constraints that would require management and cost consideration during the project development.
  - topography
  - land ownership
  - possible school site of 6.5 ha. minimum
  - existing infrastructure:
    - >water reservoir
    - >utility tie-ins
    - >new sanitary sewer trunk line
  - shallow utilities
    - >Bonavista Gas
    - >ATCO Gas
    - >Telus
    - >Fortis
    - >ATCO Pipelines

- One of the greatest constraints is the ATCO high pressure pipeline contained within the development area. A meeting will be set up with ATCO to discuss options for integration or relocation of the pipeline.
- An HRIA clearance letter has been received.
- An EBA environmental report indicates no major concerns.

6.0 Design Workshop

- Participants were divided into three groups to engage in a development design activity for Country Meadows. Each group was provided with a base map of the area, trace, markers, and amenity templates created to scale to enhance perception of parcel size. Working together, each group designed a vision of the development guided by the key components that were identified in the kick-off meeting.

7.0 Discussion of Concepts

- The following three design concepts were created and then presented to the group as a whole for discussion and comment.
- Green Group Concept (Bud, Brad, Joe, Jason)
  - pathway connection focus
  - stormwater segments distributed throughout the development
  - grid concept roadway layout
  - school as the central community hub with stormwater facility
  - utility greenstrips created “opportunity” for ATCO pipeline
- Blue Group Concept (Byron, Maureen, Trent, Barry)
  - gasline became a pedestrian corridor connecting to Garry Station
  - school site at the centre of the development
  - school site connected to the stormwater facility
  - main roadways on all sides of the school site
  - roundabouts at strategic locations to change direction
  - green space connections
  - stormwater connected to reservoir to create a gathering space – community garden, etc.
- Yellow Group Concept (Gary, Janet, Brenden, Deb)
  - strict grid pattern to allow for “cell sell off”
  - school central with road around – possible 1 way roadway
  - another road loop located further out from the school roundabout
  - entry creates a sense of arrival
  - gasline separates commercial area and parking area
  - lots fronting onto the park with back access and parking nodes
- Common elements of the three designs include:
  - school as central hub
  - strong connectivity among people – not cars
  - amenities well spread out throughout the development
  - created opportunities out of the constraints

8.0 Next Steps

- Utilizing the common elements of the three designs and in consideration of infrastructure, constraints, emergency and essential services, a draft concept will be designed for consideration by the City and landowners.

The meeting adjourned at 3:45 PM.
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING LTD.

Brad Schmidtke
Project Coordinator
Brad.schmidtke@stantec.com

Meeting Notes

Country Meadows Outline Plan

Preliminary Design Meeting: ATCO PIpelines
FILE 112945195

Date:	October 29, 2010
Place/Time:	Stantec Boardroom / 11:00AM
Next Meeting:	As Required
Attendees:	Joe Meszaros, Southgate Commercial Land Corp. Frank Anderson, ATCO Pipelines Brodie Chalmers, ATCO Pipelines Maureen Gaehring, City of Lethbridge Byron Buzunis, City of Lethbridge Richard Brummund, City of Lethbridge Bud Hogeweide, Hogeweide Management Trent Purvis, Stantec Consulting Ltd. Brad Schmidtke, Stantec Consulting Ltd.
Distribution:	Barry Peat, Marcene Jacobi, Brad Cann, Sue Paton, Ryan Carriere

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Item:		Action:
1.	**Introductions and Meeting Purpose** • To discuss development plans in NW Lethbridge • To discuss the issues surrounding integration of ATCO Pipelines (AP) high pressure gas line and potential for relocation of the gas line.	**Info**
2.	**Planning and Development in NW Lethbridge** Stantec: • discussed growth and Development Plans in NW Lethbridge. Figure 1.0 enclosed. • outlined its understanding of the AP Alignment in the area highlighting key infrastructure locations including Willow Ridge Gate Station. • outlined a potential growth within the next couple of years and Phase 1 Projects in the Vicinity of Garry	**Info**

	Drive • current status of planning is at a Bubble Level of Detail, but street and block layouts will be commencing shortly.	
3.	**Key Development Areas**	
	Country Meadows	
	• Country Meadows overview: development is predominantly a residential development with a small mixed use area and an elementary school.	**Info**
	• A new potable water reservoir is being constructed just south of AP existing infrastructure and will be used to deliver water to new developments.	**Info**
	• Refer to Country Meadows Land Use Concept (Enclosed)	**Info**
	• Country Meadows contains about 2.3km of high pressure line	**Info**
	Garry Drive and Metis Trail	
	• Extension of arterial road Garry Drive will be commencing next year. Roughly 1km of arterial road.	**Info**
4.	**Integration of ATCO Pipelines**	**Info**
	AP Landscaping Guidelines were discussed.	**Info**
	Figure 2: represents interpretation of the Guidelines. **Figure 3:** represents additional infrastructure that the City of Lethbridge would require to make this a useable space that has some benefit to the community.	**Info**
	AP representatives indicated that AP Land Administration and AP Engineering would need to be involved in the design to determine if additional infrastructure as shown in Figure 3.0 was acceptable.	**Info**
	AP indicated that the integration of these lines into new communities on such a large scale did not seem to be the best long term solution.	**Info**

	Brodie indicated that it would be preferable to get the high pressure gas line out of the community.	**Info**
	Other key points about integration were: • Safety of neighbourhoods in the vicinity of the pipe line • Numerous traffic crossings over the pipeline • Maintenance and Ownership Issues	**Info**
5.	**ATCO Pipeline Relocations**	
	Based on the discussion of integration and the problems associated with it for all parties, the following two options for relocation were discussed: • relocation of pipeline to a new alignment • relocation of gate station located in the NW corner of Willow Ridge	**Info**
	Pipeline Relocation	
	• the possibility of a pipeline relocation was discussed to the future arterial road R/W's. Lines could be installed in the 15m Arterial Buffer Zone on the edge of R/W's. Figure 4.0	**Info**
	• costs would be high for relocation, and the lines would need to be maintained and dealt with in the future urban environment of the arterial roads. Refer to Mark-ups on Land Use Concept.	**Info**
	Gate Station Relocation	
	• the possibility of moving the gate station from Willow Ridge to the area just north of the new water reservoir was discussed. Refer to Mark-ups on Land Use Concept. • ATCO Gas (AG) could then install low pressure service lines back to the Willow Ridge Area and throughout the new developments. • Growth of the City to this new location would occur in 5-10 years depending on market conditions and	**Info**

	demand.	
	• AP indicated that this process of moving the facility would take 6-12 months to complete and would be $400,000 at a minimum.	**Info**
	• AP indicated that relocation costs are paid 100% by the party that requests the move due to the fact that the Utilities Board won't cover this cost in their rates.	**Info**
	• In some municipalities where agreements are in place, municipalities requesting a move have entered into a 50-50 cost share.	**Info**
	• In the future, another move of the gate station would be required, and the gas production line coming from the west of the City would need to be relocated if still in operation.	**Info**
	• It was understood that AG designs the Gate Station and AP brings line to the meter. AP owns meter at the Gate Station. AG owns the gate station	**Info**
	AP Recommendations for next steps: • Develop a planning strategy with both AP and AG Planners to develop a long term plan that can be implemented in stages for NW Lethbridge.	**Info**
	Key Contacts: Thomas Linder (AP) 403-245-7832 Andriana Klotz (AG) 403-245-7105 Byron Buzunis (City of Lethbridge) 403-320-3975 Maureen Gaehring (City of Lethbridge) 403-320-3191 Brad Schmidtke (Stantec) 403-329-3344	**Info**
	It was recommended that the City take a strong leadership role for the long term solution that will benefit all development regardless of developer.	**Info**

6.	**Next Steps**	
	Stantec to set up meeting with Barry, Maureen and Byron to discuss how to continue planning on Country Meadows Gate 2	**Stantec**
	Stantec to schedule a meeting with Byron, Maureen, Thomas Linder and Andrianna Klotz to initiate short and long term planning.	**Stantec**

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING LTD.

Brad Schmidtke, C.E.T.
Senior Civil Technologist
brad.schmidtke@stantec.com

Meeting Notes

Country Meadows Outline Plan

Gate 2 Meeting Discussion: ATCO Pipelines
FILE 112945195

Date:	December 13, 2010
Place/Time:	City of Lethbridge / 9:00AM
Next Meeting:	As Required
Attendees:	Joe Meszaros, Southgate Commercial Land Corp. Byron Buzunis, City of Lethbridge Barry Peat, City of Lethbridge Mitchell Comb, City of Lethbridge Jeff Greene, City of Lethbridge Bud Hogeweide, Hogeweide Management Brad Schmidtke, Stantec Consulting Ltd.
Distribution:	Trent Purvis, Sue Paton

Item:		Action:
1.	**Meeting Purpose** Meeting called to discuss latest Country Meadows Gate 2 Submission and to clarify City of Lethbridge requirements as outlined in the attached e-mail.	**Info**
2.	**City Comments** B. Peat reviewed attached e-mail and summarized the City position that DRC needed to have a final layout determined prior to presenting a Final Outline plan to MPC.	**Info**
	J. Greene and B. Buzunis indicated that the City would provide assistance and support to the developer with ongoing discussions with ATCO Pipelines	**Info**
	J. Greene indicated that it was the City's preference that the gas line be relocated and would like the developer to continue to evaluate the option.	**Info**
	B. Schmidtke indicated that linking the relocation of the gas line to Outline Plan Gate Approvals would stall the planning process. The relocation solution would take considerable time and effort to resolve. ATCO Pipelines has stated that the ultimate decision to move a line is typically not addressed until the subdivision stage of development.	**Info**

3.	**Developer Comments**	
	J. Meszaros indicated that he is currently working with both ATCO Pipelines and ATCO Gas to arrive at a solution to the ATCO Pipeline constraint and will continue to do so.	**Info**
	Bud Hogeweide stated that currently, there is no motivation on either the Developer's or ATCO's side to move the gas line. The gas line has a Utility R/W, and it will stay in place until such time as one party has an interest in relocation. The City has indicated its preference to have the line relocated	**Info**
	B. Schmidtke acknowledged the City's interest in assisting the developer with integration of the line within a linear green space as has been completed in other communities. Given this, it has been understood that the only area of concern at this time is the potential to create functional parcels of land in the SE corner of the development.	**Info**
4.	**Stantec Concepts**	**Info**
	Given the location and fixed nature of the constraint, Stantec prepared the attached figures for DRC Review. Option 1 was presented with the gas line remaining and Option 2 presented a possible evolution of the layout should the gas line be removed.	**Info**
	Concept Discussion	
	The City indicated that the development of the Option 1 layout (enclosed) by the developer in Gate 3 would be acceptable provided that: • Multi- family and neighbourhood commercial access points on Melcor lands will meet City Transportation requirements with regard to spacing • Storm Water Management, Drainage and Grading around the gas line could be managed and integrated into Country Meadows Plan (i.e. Private Sites to store storm water). Melcor's lands must be serviceable and integradted	**Info**
	B. Schmidtke indicated that these issues would be identified in Gate 2.	**Stantec**
	The creation of a shadow plan (Option 2) was not required at this time and should not be included in the Outline Plan.	**Info**
	It was indicated that Option 2 could be the layout for an Outline Plan Adjustment should gas line relocation become a	**Info**

	reality at some time in the future.	
	J. Greene proposed some different road layouts that could be investigated during Gate 3.	**Info**
5.	**ATCO Pipeline Relocations (General Discussion)**	
	The City indicated its preference that the line be relocated (preferably into a Public R/W)	**Info**
	B. Hogeweide indicated that ATCO's preference is to have a private R/W regardless of the ability to relocate the gas line into a public R/W like an arterial road.	**Info**
	B. Hogeweide mentioned that ultimately relocation would require an incentive for any party to undertake the relocation which would require significant cost	**Info**
	B. Buzunis indicated that he is still willing to discuss short term and long term relocations with ATCO, and would provide support to the developer in his future discussions.	**Info**
6.	**Next Steps**	
	Stantec to: • Revise and re-submit Gate 2 "Bubble Plan" stating ATCO Alignment as a Public Utility Corridor/Pathway. • Identify City concerns with regard to site access points off of community entrance Road, Drainage and Storm Water Management.	**Stantec**

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING LTD.

Brad Schmidtke, C.E.T.
Senior Civil Technologist
brad.schmidtke@stantec.com

Meeting Notes

Country Meadows Outline Plan

Gate 2 Meeting: Preliminary Transportation Investigation
FILE 112945195

Stantec

Date:	January 13, 2010
Place/Time:	City of Lethbridge / 9:30AM
Next Meeting:	As Required
Attendees:	Byron Buzunis, City of Lethbridge Ahmed Ali, City of Lethbridge Bud Hogeweide, Hogeweide Management Brad Schmidtke, Stantec Consulting Ltd.
Distribution:	Joe Meszaros, Trent Purvis, Cole Piechotta, Sue Paton, Maureen Gaehring, Darwin Juell and Barry Peat

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Item:		Action:
1.	**Meeting Purpose** Meeting called to investigate Transportation Access and Servicing Issues with regard to existing onsite constraints	**Info**
2.	**Background** B.Hogeweide (BH) and B. Schmidtke (BS) introduced the discussion of site constraints and their effect on future the overall design of the community	**Info**
	ATCO Pipelines: • It was determined at an offline meeting with DRC on December 13th that planning for Country Meadows should be completed with the High Pressure Line in its current location. The developer continues to research the possibility of relocation, but resolution will not be achieved on this item until detailed design; therefore, to continue planning the line will be planned into the community. Refer to Sketch #1. • DRC indicated that site accesses and servicing in the area be reviewed prior to finalization of the Gate 2 "Bubble Plan"	**Info**
	Metis Trail Access • The proposed 4-way intersection as proposed in the Country Meadows ASP appears to be problematic as there is potential for it to become similar to a Squamish	**Info**

	Intersection. • The ASP's proposed community access will run through a low area of Country Meadows that is more suitable to a Storm Water Management Facility than road embankment. • Our recently completed Geotechnical report indicates that Groundwater is present in the area of the ASP's proposed community access at a depth of 1.5m-2.0m.	
	BH indicated that the developer would like to • Relocate the Country Meadows Metis Trail Access • Evaluate the restructuring of the parcel layout in the SE corner of the development to meet site access requirements.	**Info**
3.	**Meeting Discussion**	
	Metis Trail Community Access	
	BH indicated that the subject had been opened up to City Transportation and DRC prior to Christmas that there may be some benefit to relocate the Country Meadows Access North in order to avoid existing site constraints. This will allow the developer to expand and develop with more freedom in the early stages of development. Initial Phase 1 Access would be from Walsh Drive	**Info**
	B. Buzunis (BB) wondered if marketing and site access from Garry Drive would be of more benefit due to Garry Station Development Plans.	**Info**
	BH mentioned that Country Meadows would be pursuing a different market and that this was not a concern	**Info**
	A. Ali (AA) indicated that as per previous correspondence an Open House would be required, and that the possibility of an ASP amendment may be required.	**Info**
	BS presented the attached sketch (#2) outlining the proposed Metis Trail Design and indicated that current spacing from the center of Walsh Drive to the center of the West Highland Access was approximately 520m.	**Info**
	AA indicated that the relocated tee intersection should be about 200 to 220m from the West Highland's Access. AA did not foresee any technical concerns with the relocation that could not be dealt with at the Gate 4 TIA Stage. The relocation was not a technical concern.	**Info**
	BS questioned if future analysis should consider the existing West Highland's Access as all turns. AA indicated that it would be best if this was planned as a right-in, right-out with the new Country Meadows Access as all turns.	**Info**
	BS questioned the implications of the City's Emergency Response Time Modeling on a Phase 1 development. The	**BS, BH**

	consultants will investigate the implications of the City's existing evaluations and HIRF Requirements.	
	BB indicated that the City was more concerned about the modeling of ultimate road networks and not interim conditions with regard to site access.	**Info**
	BB indicated that the Bridge Drive Utility Corridor may not be extended to the proposed Country Meadows Entrance, and that an interim servicing strategy may be required by directing sanitary sewage to the existing West Highlands Sewer Trunk Extensions or Tartan Link.	**Info**
	BB indicated that the City of Lethbridge's CIP did not account for the Metis Trail Access to Country Meadows, and the Developer and City would need to come to an agreement on how the Developer could "front-end" the construction costs of the required segment of Metis Trail and be paid back in the future. Note: The cost of 2-lane arterial road construction is estimated at $3 Million/km. Approximately 500m of arterial would need to be constructed along with additional offsite utilities should the Bridge Drive Utility Corridor not be available to connect to.	**Info**
	SE Quadrant Layout and ATCO Pipelines	
	BS presented the attached conceptual layout (#3) that represents one possible layout with the gas line remaining in place.	**Info**
	BS indicated that the community access will be located midway between the Metis Trail and the Garry Station Community Access.	**Info**
	The resultant dimension of approximately 85m was identified from the south boundary of the R/W to the north boundary of the Garry Station R/W.	**Info**
	AA indicated that the City would not permit accesses to the commercial site or multi site within this 85m. Right-In, Right Out's would not be considered.	**Info**
	Modifications to the layout of this area and City Transportation preferences for potential access points was discussed. Refer to Sketch #4 for a summary of the proposed changes.	**Info**

5.	**Outcomes and Next Steps**	
	City Transportation and Urban Construction indicated that the proposals as outlined on the attached would be supported and that they did not foresee any technical concerns to the proposals other than those indicated. However, design concepts will need to be confirmed during the Gate 4 TIA for the Country Meadows Outline Plan	**Info**
	City of Lethbridge Planning will be consulted about the proposed changes and any further requirements as they relate to the ASP and Public Consultation.	**Info**

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING LTD.

Brad Schmidtke, C.E.T.
Senior Civil Technologist
brad.schmidtke@stantec.com

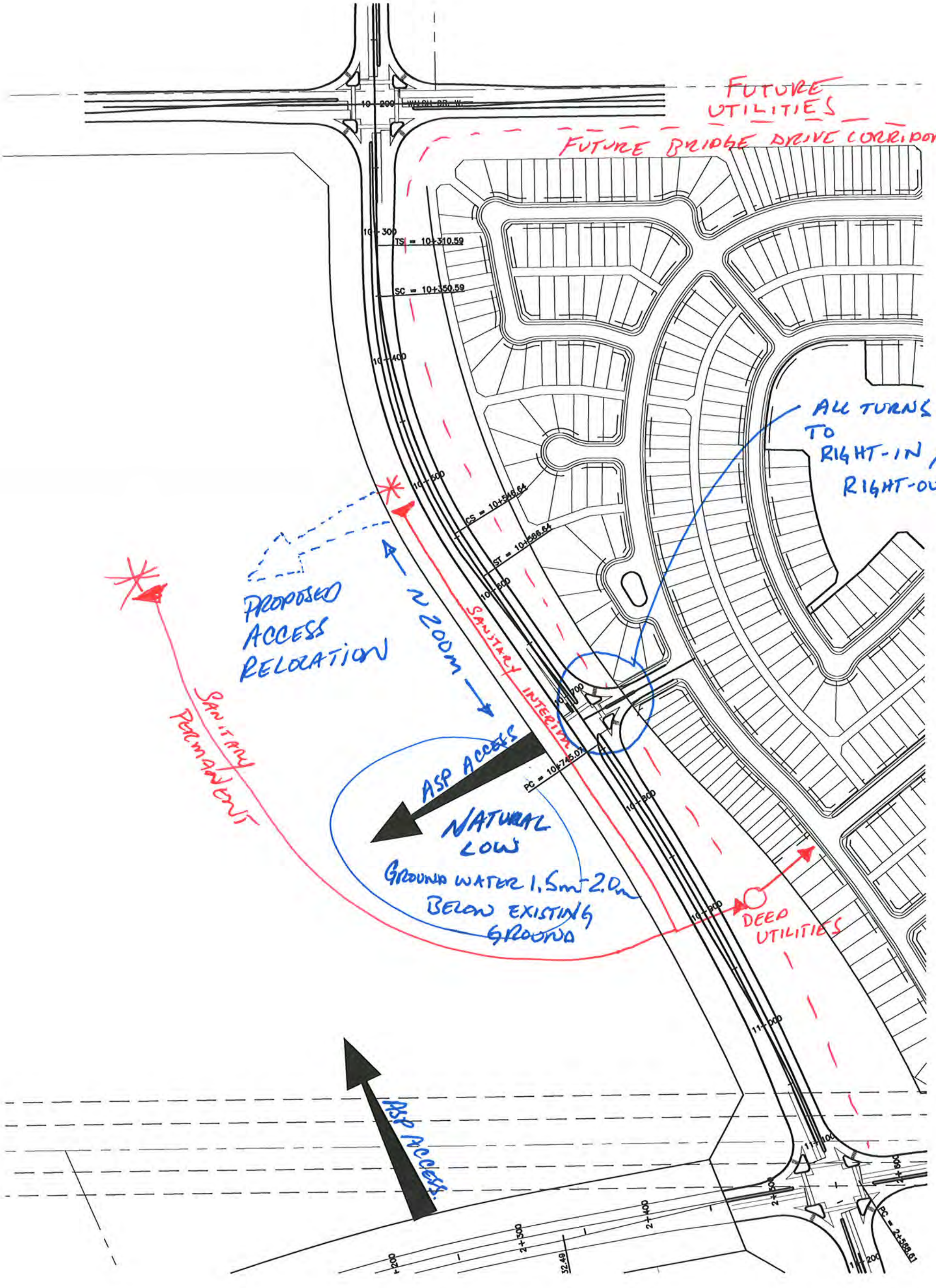
#1

COUNTRY MEADOWS - LAND USE CONCEPT

November 11, 2010 FIGURE 1.0

Country Meadows
Scale 1:4000

#2



#3

CITY WILL NOT PERMIT ACCESS IN THIS ZONE GIVEN 85m

Country Meadows - Option 1: Concept Plan

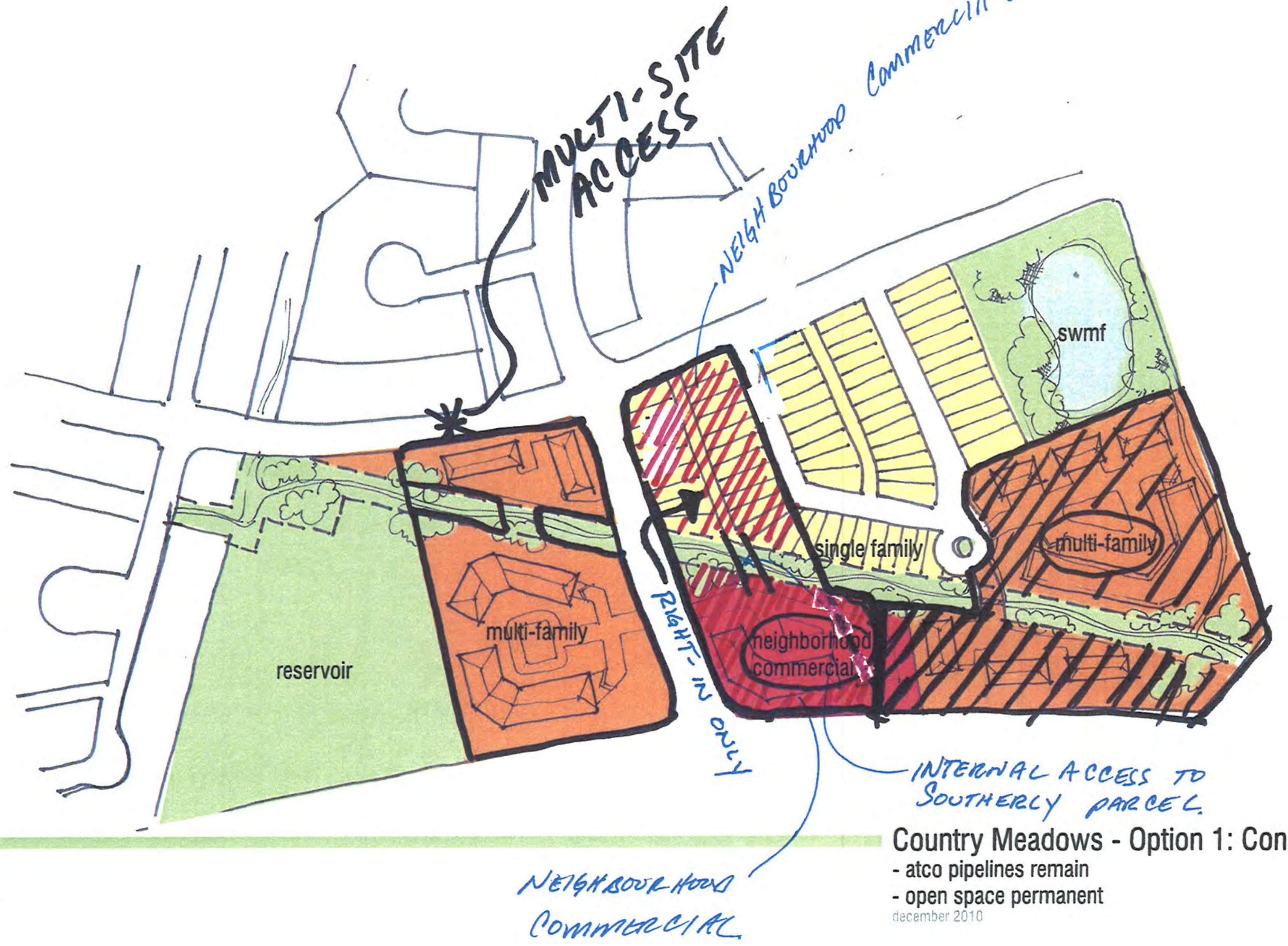
- atco pipelines remain
- open space permanent

december 2010

Stantec

GARRY STATION ACCESS.

#4



Stantec

Country Meadows - Option 1: Concept Plan

- atco pipelines remain
- open space permanent

december 2010

APPENDIX K

GATE 3 SIGN-OFF

City of Lethbridge
Outline Plan - Gated Review Process
Sign-Off Templates

Stantec Consulting Ltd.
Project: Country Meadows
File: 112945195

Gate 3 - Initial Concept

Submittal Date: June 30, 2011

1 Confirm Previous Gate

- Gate 2 completed and signed off on February 5, 2011
- *Figure 2.1 Area Context Plan*
- *Lethbridge School District Figure and Sign-Off - Future Appendix*

2 Refined Land Use Plan

- *Figure 7.1 Proposed Land Use Designations*
- Land Use, Parcel Sizes, Dwelling Unit Projections and Population Estimates identified in document.

3 Transportation Network Layout and Preliminary Road Classifications

- *Figure 9.1 Preliminary Transportation Network*
- *Figure 9.2 Roundabouts; Lotting Concept & Restrictions*
- *Figure 10.1 Preliminary Transit & Bus Stops*

4 Park and Pathway Network Classification

- *Figure 6.1 Open Space Network*

5 Infrastructure and Transportation Connection Point Details

- *Figure 6.1 Open Space Network*
- *Figure 9.1 Preliminary Transportation Network*
- *Figure 10.1 Preliminary Transit & Bus Stops*
- *Figure 11.1 Storm Water Management & Connection Points*
- *Figure 11.2 Sanitary Servicing & Connection Points*
- *Figure 11.3 Water Servicing & Connection Points*

6 Preliminary Sewage Generation, Storm Pond Size, Storm Overland Routes

- *Figure 11.2 Storm Water Management & Conntection Points*
- *Figure 11.2 Sanitary Servicing & Connection Points*
- *Figure 11.3 Water Servicing & Connection Points*
- Refer to Country Meadows Gate 3 Document (enclosed)

7 Future Service Area

- Sanitary Sewer - No upstream contributions
- Water- large diameter feeder mains will complete grid network along adjacent arterial right of ways
- Storm Water Management - no upstream contributions

8 Agreement on Final Document Format

- Document format finalized at initiation of Gate 3

Gate 3 Sign Off: Barry Peat
City of Lethbridge
Print Name
July 6/11
Date

Gate 3 Sign Off: JOE MESZAROS
Southgate Commercial
Lands Corp.
Print Name
JUNE 30 2011
Date

APPENDIX L

WALSH DRIVE IMPROVEMENTS

ORIGINAL SHEET - ANSI D 22"x34"

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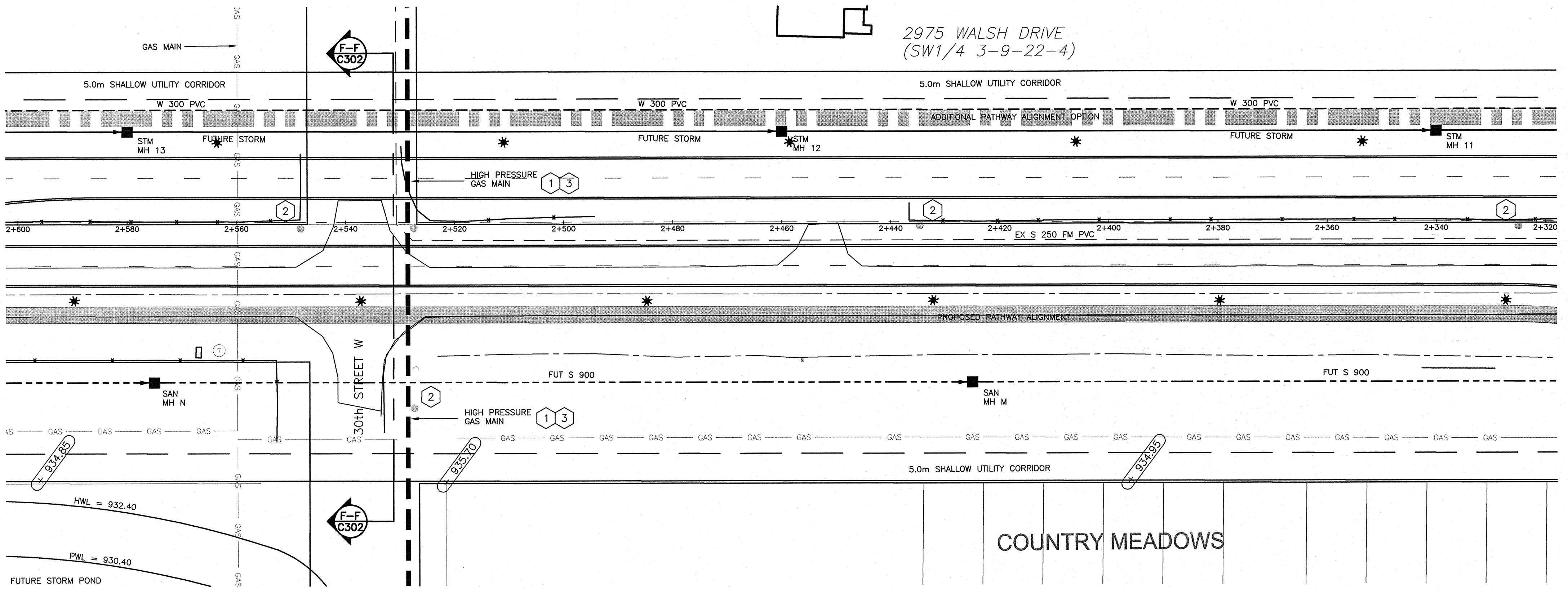
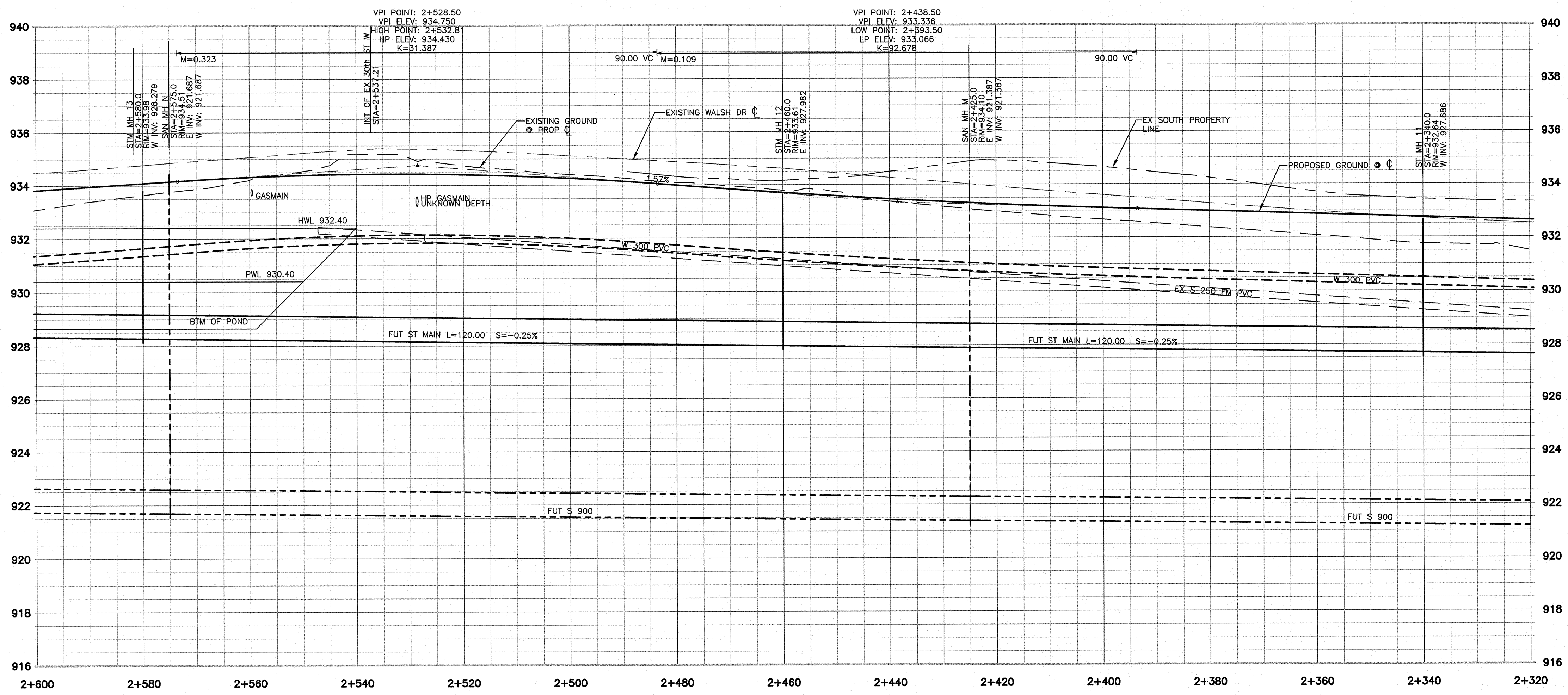


WALSH DRIVE W



Stantec

Stantec Consulting Ltd.
290, 220 - 4 Street S
Lethbridge AB Canada
T1J 4J7
Tel. 403.329.3344
Fax. 403.328.0664
www.stantec.com

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Legend	Proposed	Existing
WATERMAIN	— — — —	— — — —
SANITARY SEWER	— - - - —	— - - - —
STORM SEWER	———	———
SANITARY FORCEMAIN		— — —
LNID		— · · —
MANHOLE TYPE 1	●	○
MANHOLE TYPE 3	■	□
PATHWAY	▨	
PATHWAY (OPTIONAL)	▨ ▨ ▨	
ATCO GAS		— GAS —
TELUS		— TEL —
UG POWER		— UG —
SHAW		— SHW —
HIGH PRESSURE ATCO PIPELINES		▬ ▬ ▬
POWER POLE		●
GUY POLE		)
STREET LIGHT BASE	✳	
FINISHED GRADE ELEVATION	(+ 934.00)	

Notes

DESIGN CONSIDERATIONS:

1. HIGH PRESSURE GAS MAIN WILL NEED TO BE LOWERED TO MAINTAIN REQUIRED COVER
2. OVERHEAD POWER c/w POWER POLES AND GUY WIRES TO BE DECOMMISSIONED AND REMOVED BY OTHERS
3. HIGH-PRESSURE GAS MAIN SHOULD BE HYDROVAC'D PRIOR TO DETAILED DESIGN TO CONFIRM DEPTH AND NEED FOR RELOCATION

Issued		By	Appd.	YY.MM.DD
E				
D				
C	ISSUED FOR FINAL REPORT	AR	BS	12.12.05
B	ISSUED FOR 70% REVIEW	AR	BS	12.08.21
A	ISSUED FOR 30% REVIEW	AR	BS	12.06.11

	Dwn.	Chkd.	Dsgn.	YY.MM.DD
Client Number -	AR	BS	HP	12.04.15

Permit-Seal

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STANTEC CONSULTING LTD
Signature
Date Dec 3, 2012
PERMIT NUMBER: P 258
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

DON WAITE
Dec 3, 2012

Client/Project

CITY OF LETHBRIDGE

WALSH DRIVE IMPROVEMENTS
PRELIMINARY ROADWAY DESIGN
LETHBRIDGE AB CANADA

Title

WALSH DRIVE PROFILE
STA 2+320 TO STA 2+600

Project No. 112945750

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1:100V 0 1 3 5m

Drawing No. C206

Issue/Revision C /

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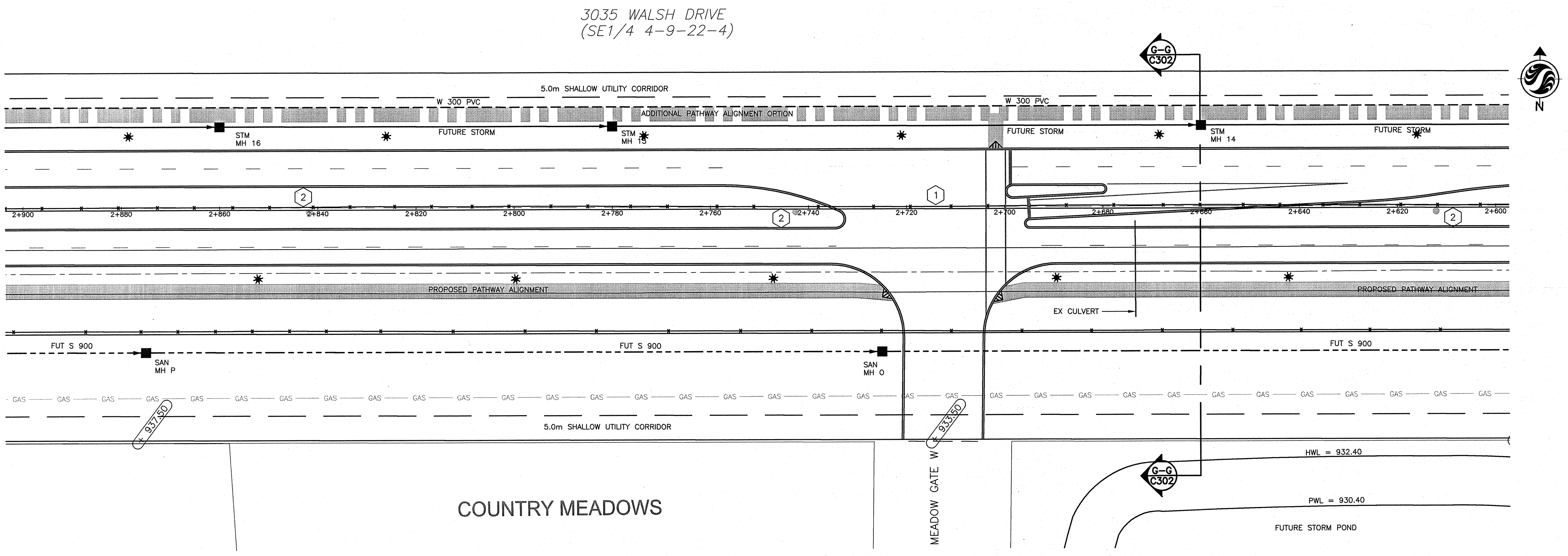

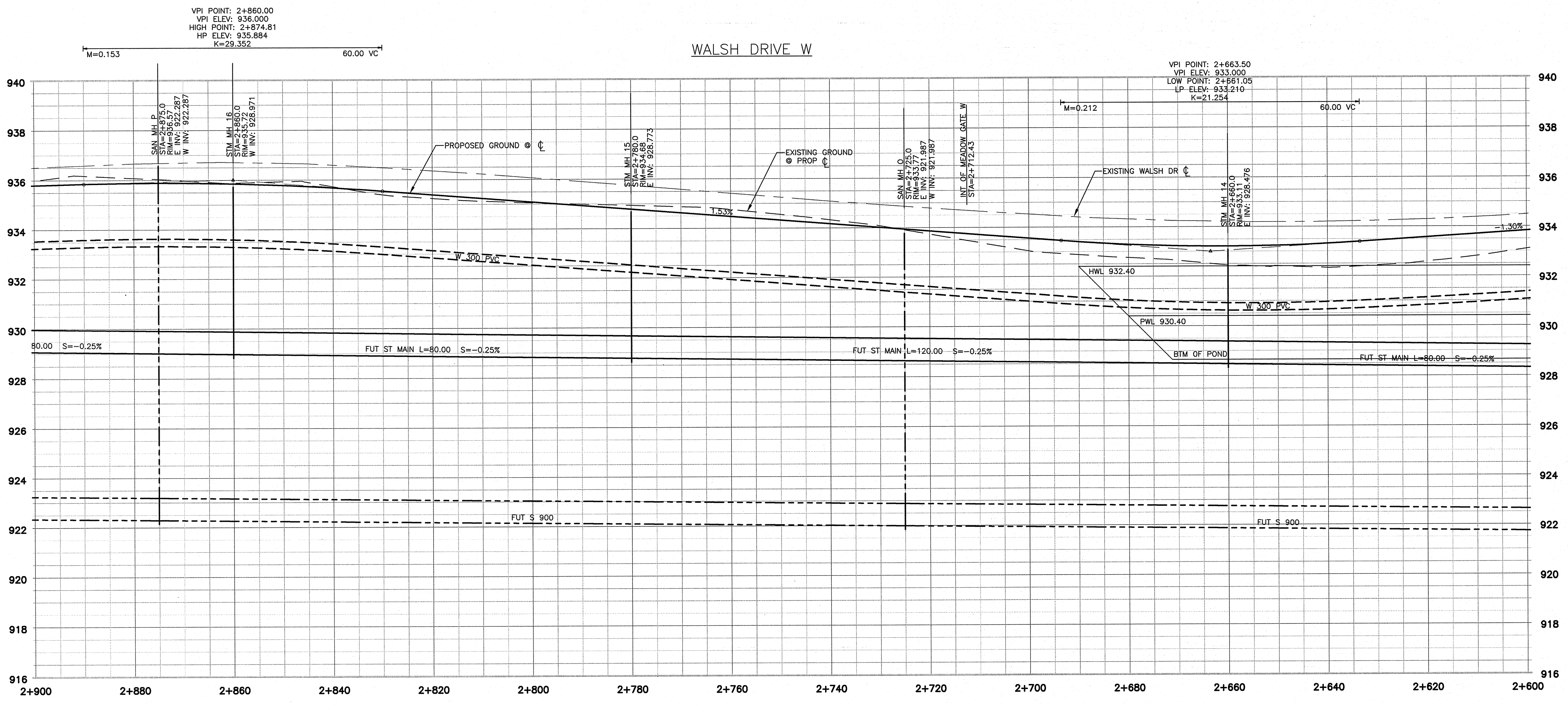

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Legend	Proposed	Existing
WATERMAIN	— — — — —	— — — — —
SANITARY SEWER	— - - - - —	— - - - - —
STORM SEWER	———	———
SANITARY FORCEMAIN		— — —
LNID		— · · —
MANHOLE TYPE 1	●	○
MANHOLE TYPE 3	■	□
PATHWAY	▨	
PATHWAY (OPTIONAL)	▨ ▨ ▨ ▨	
ATCO GAS		———
TELUS		— TEL —
UG POWER		— UG —
SHAW		— SHW —
BELL		— BEL —
POWER POLE		●
GUY POLE		)
STREET LIGHT BASE	✱	
FINISHED GRADE ELEVATION	+ 934.00	

Notes

DESIGN CONSIDERATIONS:

1. 4–WAY INTERSECTION FOR ACCESS TO WEST LETHBRIDGE EMPLOYMENT CENTRE. REFER TO REPORT FIG. 2.4 FOR OPTIONAL ROUNDABOUT AT THIS LOCATION
2. OVERHEAD POWER c/w POWER POLES AND GUY WIRES TO BE DECOMMISSIONED AND REMOVED BY OTHERS

E				
D				
C	ISSUED FOR FINAL REPORT	AR	BS	12.12.05
B	ISSUED FOR 70% REVIEW	AR	BS	12.08.21
A	ISSUED FOR 30% REVIEW	AR	BS	12.06.11
Issued		By	Appd.	YY.MM.DD

	AR	BS	HP	12.04.15
Client Number -	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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DON WAITE
Dec 3, 2012

Client/Project

CITY OF LETHBRIDGE

WALSH DRIVE IMPROVEMENTS
PRELIMINARY ROADWAY DESIGN
LETHBRIDGE AB CANADA

Title

WALSH DRIVE PROFILE
STA 2+600 TO STA 2+900

Project No. 112945750

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Drawing No. C207

Issue/Revision C /

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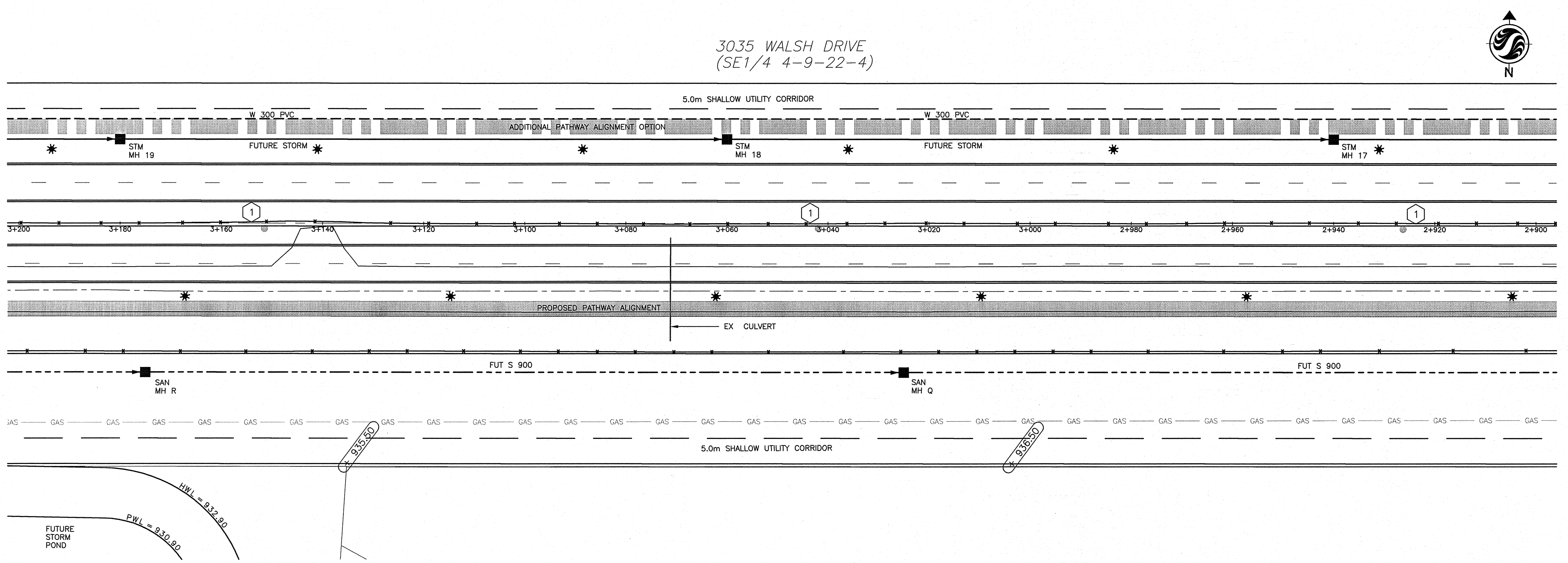

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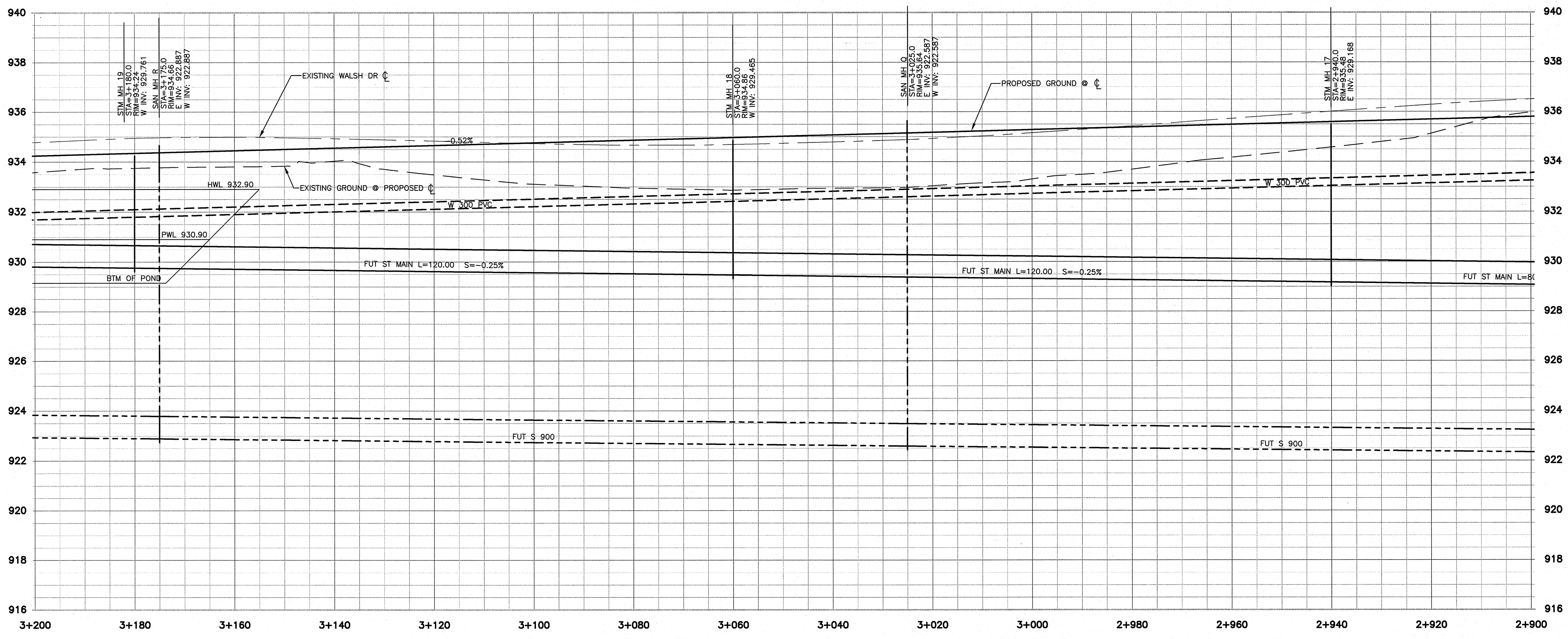

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Fax. 403.328.0664
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Legend	Proposed	Existing
WATERMAIN	— — — — —	— — — — —
SANITARY SEWER	— - - - - —	———————
STORM SEWER	———————	———————
SANITARY FORCEMAIN		— — — — —
LNID		—— · · ——
MANHOLE TYPE 1	●	○
MANHOLE TYPE 3	■	□
PATHWAY	▨	
PATHWAY (OPTIONAL)	▨ ▨ ▨	
ATCO GAS		
TELUS		—— TEL ——
UG POWER		—— UG ——
SHAW		—— SHW ——
BELL		—— BEL ——
POWER POLE		●
GUY POLE		)
STREET LIGHT BASE	✱	
FINISHED GRADE ELEVATION	(+ 934.00)	

Notes

DESIGN CONSIDERATIONS:

1. OVERHEAD POWER c/w POWER POLES AND GUY WIRES TO BE DECOMMISSIONED AND REMOVED BY OTHERS

E				
D				
C	ISSUED FOR FINAL REPORT	AR	BS	12.12.05
B	ISSUED FOR 70% REVIEW	AR	BS	12.08.21
A	ISSUED FOR 30% REVIEW	AR	BS	12.06.11
Issued		By	Appd.	YY.MM.DD

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Dec 3, 2012

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CITY OF LETHBRIDGE

WALSH DRIVE IMPROVEMENTS
PRELIMINARY ROADWAY DESIGN
LETHBRIDGE AB CANADA

Title

WALSH DRIVE PROFILE
STA 2+900 TO STA 3+200

Project No. 112945750

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Drawing No. C208

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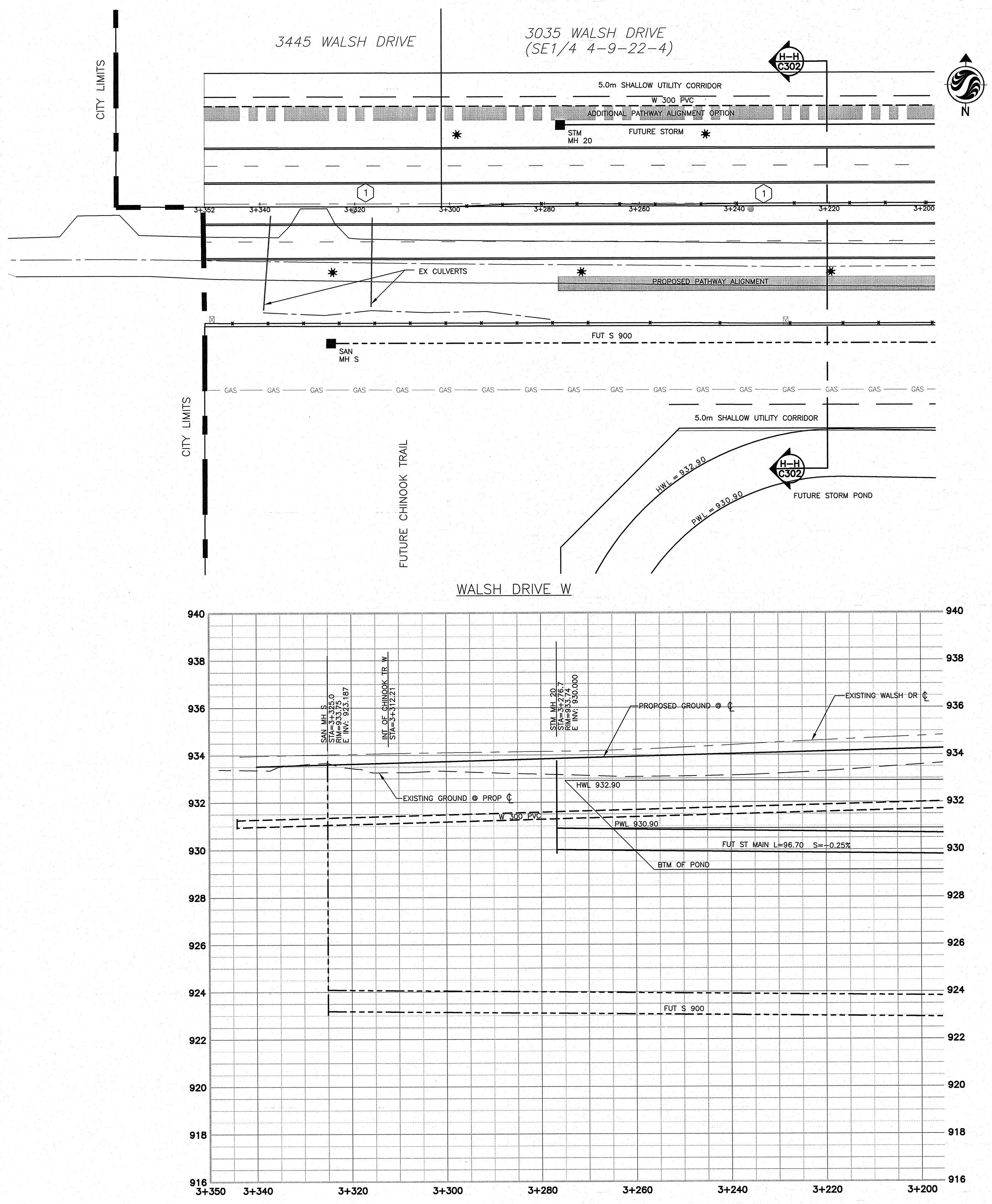

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Legend	Proposed	Existing
WATERMAIN	— — — — —	— — — — —
SANITARY SEWER	— - - - - —	———————
STORM SEWER	———————	———————
SANITARY FORCEMAIN		— — — — —
LNID		—— · · ——
MANHOLE TYPE 1	●	○
MANHOLE TYPE 3	■	□
PATHWAY	▨	
PATHWAY (OPTIONAL)	▨ ▨ ▨ ▨	
ATCO GAS		
TELUS		—— TEL ——
UG POWER		—— UG ——
SHAW		—— SHW ——
BELL		—— BEL ——
POWER POLE		●
GUY POLE		)
STREET LIGHT BASE	✷	

Notes

DESIGN CONSIDERATIONS:

1. OVERHEAD POWER c/w POWER POLES AND GUY WIRES TO BE DECOMMISSIONED AND REMOVED BY OTHERS

E				
D				
C	ISSUED FOR FINAL REPORT	AR	BS	12.12.05
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Issued		By	Appd.	YY.MM.DD

	AR	BS	HP	12.04.15
Client Number -				
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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CITY OF LETHBRIDGE

WALSH DRIVE IMPROVEMENTS
PRELIMINARY ROADWAY DESIGN
LETHBRIDGE AB CANADA

Title

WALSH DRIVE PROFILE
STA 3+200 TO STA 3+350

Project No.
112945750

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Drawing No.
C209

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C /

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APPENDIX M

ATCO CONFIRMATION

From: Van Maanen, Marvin
To: Lombardo, Christina
Cc: Bourgoin, Sheri
Subject: FW: Country Meadows Gas Line
Date: Tuesday, November 26, 2024 7:11:16 AM
Attachments: image001.png
image002.png

FYI

Marvin Van Maanen C.E.T.
Associate
Community Development Manager
Office Leader, Lethbridge
Direct: 403 332-4882
Mobile: 403 795-1078
marvin.vanmaanen@stantec.com

Stantec
Unit 230, 704-4th Ave South
Lethbridge AB T1J 0N8

From: Diep, Raymond <Raymond.Diep@atco.com>
Sent: Tuesday, November 26, 2024 6:58 AM
To: Van Maanen, Marvin <marvin.vanmaanen@stantec.com>; Ibrahim, Anas <Anas.Ibrahim@atco.com>
Cc: Bud Hogeweide (budhogeweide@me.com) <budhogeweide@me.com>; Bourgoin, Sheri <sheri.bourgoin@stantec.com>; Byron Buzunis <byron.buzunis@lethbridge.ca>; Hutchings, Tyler <tyler.hutchings@atco.com>
Subject: Re: Country Meadows Gas Line

Morning Marvin,

Apologies for the delay in getting back.

1. ATCO(Raymond) to confirm the blow down valve will be removed and how it will be removed.
   ATCO would remove the existing blow down valve within property prior to the remainder of the pipeline being able to be removed by the developer

2. ATCO(Raymond) will look further into the City's request to decommission the transmission line in the Metis Trail and Garry Dr right of way so it will not be considered a live line.
   It is unlikely that ATCO is able to decommission the transmission line within the Metis Trail / Garry Dr intersection. After the line is abandoned, it would still be considered a live line.

Tyler Hutchings will be taking over my role as PM on the Transmission (HP line) project. Any further questions please direct them to him.

Thanks,

Raymond Diep P.Eng, PMP

Senior Engineer, Project Manager - Construction

C. 587 216 7527

From: Van Maanen, Marvin <marvin.vanmaanen@stantec.com>
Sent: Wednesday, November 20, 2024 8:05 AM
To: Diep, Raymond <Raymond.Diep@atco.com>; Ibrahim, Anas <Anas.Ibrahim@atco.com>
Cc: Bud Hogeweide (budhogeweide@me.com) <budhogeweide@me.com>; Bourgoin, Sheri <sheri.bourgoin@stantec.com>; Byron Buzunis <byron.buzunis@lethbridge.ca>
Subject: RE: Country Meadows Gas Line

Good morning Raymond,

I don't believe we have received a response to the questions below. Can you please provide a response, thank you.

APPENDIX N

LANDOWNER SIGN OFFS

Stantec

Stantec Consulting Ltd.
230, 704 - 4 Avenue S
Lethbridge AB T1J 0N8

November 19, 2024
Project/File: 116549082

Reference: Country Meadows - Outline Plan Amendment Application

I, (We) Debra L Dudley-Olafson,

being the owner of Lot: ______, Block: ______, Plan: ______________

Legal Description:

Quadrant SE ¼ Section 33 Township 8 Range 22 West of the 4 Meridian,

Acknowledge Stantec on behalf of Southgate Commercial Lands Corp. has submitted an application to the City of Lethbridge to amend a portion of the Country Meadows Outline Plan.

Regards,

Sheri Bourgoin.

Sheri Bourgoin C.Tech
Senior Project Coordinator/Designer.
Phone # 403.332.4854
Email: sheri.bourgoin@stantec.com

stantec.com

Southgate Commercial Lands Corp. Representative:
Bud Hogeweide
President, Hogeweide Management & Consulting Inc.
Phone # 403.360.4139
Email: budhogeweide@me.com

Land Owner or Representative

Name:

Title: Debra L Dudley-Olafson

Phone #: 403-328-8022
403-330-4616

Email: lsakamoto@wesbridgeconstruction.com
Debbio60@gmail.com

Date: November 29, 2024

Stantec

Stantec Consulting Ltd.
230, 704 - 4 Avenue S
Lethbridge AB T1J 0N8

November 19, 2024
Project/File: 116549082

Reference: Country Meadows - Outline Plan Amendment Application

I, (We) 2014836 Alberta Ltd.,

being the owner of Lot: ______, Block: ______, Plan: ________________

Legal Description:

Quadrant NE ¼ Section 33 Township 8 Range 22 West of the 4 Meridian,

Acknowledge Stantec on behalf of Southgate Commercial Lands Corp. has submitted an application to the City of Lethbridge to amend a portion of the Country Meadows Outline Plan.

Regards,

Sheri Bourgoin

Sheri Bourgoin C.Tech
Senior Project Coordinator/Designer.
Phone # 403.332.4854
Email: sheri.bourgoin@stantec.com

stantec.com

Southgate Commercial Lands Corp. Representative:
Bud Hogeweide
President, Hogeweide Management & Consulting Inc.
Phone # 403.360.4139
Email: budhogeweide@me.com

Land Owner or Representative

Name: John Wickey

Title: Director

Phone #: 403 320-1989

Email: john@avonleahomes.ca

Date: 11/26/24

Stantec

Stantec Consulting Ltd.
230, 704 - 4 Avenue S
Lethbridge AB T1J 0N8

November 19, 2024
Project/File: 116549082

Reference: Country Meadows - Outline Plan Amendment Application

I, (We) BW3 Developments Ltd.,

being the owner of Lot: ______, Block: ______, Plan: ________________

Legal Description:

Quadrant NE ¼ Section 33 Township 8 Range 22 West of the 4 Meridian,

Acknowledge Stantec on behalf of Southgate Commercial Lands Corp. has submitted an application to the City of Lethbridge to amend a portion of the Country Meadows Outline Plan.

Regards,

Sheri Bourgoin

Sheri Bourgoin C.Tech
Senior Project Coordinator/Designer.
Phone # 403.332.4854
Email: sheri.bourgoin@stantec.com

stantec.com

Southgate Commercial Lands Corp. Representative:
Bud Hogeweide
President, Hogeweide Management & Consulting Inc.
Phone # 403.360.4139
Email: budhogeweide@me.com

Land Owner or Representative

Name: John Wickey

Title: Director

Phone #: 403 320-1989

Email: john@avonleahomes.ca

Date: 11/26/24