PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-44**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 658 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL SYMBOL	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	▲POCKETPEN. (kPa)▲ 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOPE INDICATOR	Elevation (m)
40			-Below 39.3m: bentonitic, moderately hard to hard						
41		CS	-Below 39.4m: moderately hard, slicken-sides, slightly blocky						617
			-Below 40.1m: moderately hard to hard						
42			-Below 40.7m: moderately hard						616
			-At 40.9m: approximately 5" thick Bentonite seam, soft to moderately hard, blocky						
43			-Below 41.1m: clayshale, moderately hard to hard						615
			-Below 42.4m: bentonitic, moderately hard to hard						
44			-Below 43.0m: blocky, slicken-sides, moderately hard						614
			-At 43.9m: burnt shale for 0.3m, moderately hard						
45			-Below 44.2m: moderately hard, slightly blocky, slicken-sides						613
			END OF TESTHOLE @ 44.8 m. No water and no slough on completion of testhole.						
46			Well 1: Slotted standpipe installed to 0 m.						612
47									611
48									610
49									609
50									608
51									607
52									606
53									605
54									604
55									603
56									602
57									601
58									600
59									599
60									

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LOGGED BY: L Falk | COMPLETION DEPTH: 44.81 m
REVIEWED BY: R Evans | COMPLETION DATE: 12/3/13
Fig. No: 44

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-1**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 679.945 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** : clayey, black, moist — 0 mm			
		460 mm			
		CLAY : silty, some sand, moist, medium plastic, stiff to very stiff, brown			
1		-Below 0.9m: trace white residue, slightly friable	12		679
	CI				
2		-Below 1.8m: brown mottled			678
		2.1 m			
	CH	**CLAY** : silty, moist, high plastic, very stiff, grey			
		2.4 m			
		CLAY : very silty, moist, medium plastic, stiff to friable, brown mottled grey, trace oxides		**Shelby Tube:** QU: 232 kPa DD: 1396 Kg/m^3 MC: N/A	
3	CI				677
4		4.1 m	11		676
	CL-CI	**CLAY** : very sitly, moist, low to medium plastic, friable, brown, trace oxides		-No pocket pen at 4.6m because sample was to friable	
		4.9 m			
5		**CLAY** : very sitly, very moist, medium plastic, firm, brown, trace oxides	12		675
6					674
	CI	-Below 6.4m: very moist to wet, soft to firm, slightly sensitve		P.L. = 21.5 L.L. = 35.6 M.C. = 31.3 **Soluble Sulphates:** Negligible	
7		-Below 7.3m: wet, sensitive, greyish brown	12		673
8		-Below 8.2m: firm, very moist	12		672
9		**END OF TESTHOLE @ 8.8 m.** No water and 0 m of slough on completion of testhole.			671
		30 day waterlevel reading: Dry to 8.84 m bgs.			
		44 day waterlevel reading: Dry to 8.84 m bgs.			
10					670
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-2**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 677.262 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	▲POCKETPEN. (kPa)▲ 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm – 460 mm				677
	SC	**SAND** : clayey, silty, moist, fine-grained, loose, brown – 910 mm		15.4		
1	CI-CH	**CLAY** : moist, medium to high plastic, very stiff, greyish brown, trace rootlets – 1.2 m	13	20.8		676
		SAND : very sitly, damp to moist, fine grained, compact, light brown		5.9		
2				6.1		675
		2.4 m				
		-Below 2.4m: clayey, brown, trace oxides	18	13.4		
3	SM			17.7		674
				15.6		
4			15	16		673
				16.3		
5		5.2 m				
	CL-CI	**CLAY** : silty, moist, low to medium plastic, stiff to friable, brown		32.5		672
			14	33.4		
6		6.1 m				
		CLAY : silty, very moist, medium plastic, firm to stiff, brown		27.5		671
				35		
7			10	28.3		670
		7.3 m				
	CI	-Below 7.3m: very silty, very moist to wet, sensitive		33		
8				35.3		669
		-Below 8.2m: very moist, firm			**Shelby Tube:** QU: 118 kPa; DD: 1445 Kg/m³; MC: N/A	
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.				668
		30 day waterlevel reading: Dry to 8.84 m bgs. 44 day waterlevel reading: Dry to 8.84 m bgs.				
10						
10.4						667

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-3**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 682.979 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OH	**TOPSOIL** 0 mm – 460 mm					682
1	CI	**CLAY** : silty, sandy, damp to moist, medium plastic, friable, light brown		7	14.5, 14.4, 10.7	-At 1.5m sample was to friable for pocket pen	
2	CI-CH	**CLAY** : silty, moist, medium to high plastic, very stiff, friable, brown – 2.1 m		13	20, 20.7		681
3	CI	**CLAY** : silty, moist, medium plastic, stiff, brown, trace oxides – 2.7 m			28.6, 29.2	**Shelby Tube:** QU: 182 kPa; DD: 1476 Kg/m³; MC: N/A	680
4		-Below 4.0m: very moist, soft			35.9 (20.5 – 49)	P.L. = 20.5 L.L. = 49.0 M.C. = 35.9 **Soluble Sulphates:** Negligible	679
5		-Below 4.9m: moist to very moist, stiff – 5.8 m		10	23.4, 28.2		678
6	CL-CI	**CLAY** : very silty, sandy, moist, low to medium plastic, friable, brown			31.4	-At 6.1m sample was to friable for pocket pen	677
7		-Below 6.4m: very moist, soft to firm, trace oxides			32.1		676
8	ML-CL	-Below 7.0m: very moist to wet, low plastic, soft, sensitive, greyish brown		12	32.8, 31.5		675
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.		10	31.5, 30.4		674
10		30 day waterlevel reading: Dry to 8.84 m bgs. 44 day waterlevel reading: Dry to 8.84 m bgs.					673
10.4							

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-4**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.516 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm – 266.7 mm			
	CI	**CLAY** : silty, sandy, moist to very moist, medium plastic, stiff, brown, rootlets – 760 mm			
1	CI-CH	**CLAY** : silty, moist, medium to high plastic, very stiff, grey and brown, trace rootlets – 1.2 m -Below 1.2m: medium to high plastic, trace white residue	17		
2		– 2.4 m -Below 2.4m: medium plastic	16		
3					
4	CI	**CLAY** : very silty, very moist, medium plastic, soft to firm, brownish grey, trace coal and oxides – 4.0 m	8		
5					
6		**SILT** : clayey, very moist to wet, low plastic, soft, sensitive, grey – 5.5 m			
7	CL-ML		18		
8			10		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. 30 day waterlevel reading: 6.4 m bgs. 44 day waterlevel reading: 4.92 m bgs.			
10					
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

Moisture content values: 22.7, 22.7, 22.8, 23.4, 23.9, 28.3, 32, 35, 35.6, 35.8, 33.9, 32.7, 33, 34.7, 35.2, 34.5

P.L. = 21.2 L.L. = 37.8 M.C. = 34.7

Soluble Sulphates: Considerable

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		REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12
			Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-5**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 683.605 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm – 250 mm			683
	CL-CI	**CLAY** : very sandy, moist to very moist, low to medium plastic, firm to stiff, brown — 760 mm			
1		**CLAY** : silty, moist, medium to high plastic, very stiff, brown, trace oxides	13		
2	CI-CH			P.L. = 20.8 L.L. = 75.2 M.C. = 28.2 **Soluble Sulphates:** Negligible **Shelby Tube:** QU: 195 kPa DD: 1413 Kg/m^3 MC: N/A	682
3					681
4	CI	**CLAY** : silty, sandy, moist to very moist, medium plastic, firm to stiff, brown, trace oxides — 4.0 m	6		680
5	CL-ML	**SILT** : clayey, wet, low plastic, soft, sensitive, grey brown, trace coal and oxides — 4.6 m	5		679
6					678
7		-Below 7.3m: grey — 7.3 m	7		677
8			6		676
9		**END OF TESTHOLE @ 8.8 m.** No water and 0.61 m of slough on completion of testhole.			675
10		30 day waterlevel reading: 6.04 m bgs. 44 day waterlevel reading: 5.28 m bgs.			674
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC — M.C. — LIQUID: 20 40 60 80

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REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-6**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 682.9 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) / PLASTIC M.C. LIQUID	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm – 460 mm				
	CI	**CLAY** : silty, moist, medium plastic, very stiff, brown 460 mm – 760 mm		23.7, 46.6/49.7	P.L. = 40.6 L.L. = 49.7 M.C. = 23.7 **Soluble Sulphates:** Negligible	
1		-Below 0.8m: medium to high plastic, trace rootlets	9	27.2		682
	CI-CH			24.2		
2				24.1		681
			9	25.6		
		2.7 m				
3		**CLAY** : silty, moist, medium plastic, stiff, brown, trace oxides		31.9		680
				33.2		
4					Shelby Tube: QU: 124 kPa DD: 1369 Kg/m^3 MC: N/A	679
		4.7 m		34.7		
5		-Below 4.7m: very moist to wet, soft				678
		5.5 m				
	CI	**SILT** : wet, low plastic, soft, sensitive, grey	8	40		
6				39.6		677
		CLAY LAMINATION: medium plastic, firm, grey		39.4		
7			9	38.3		676
				38		
8				36.5		675
			12	32.9		
9		**END OF TESTHOLE @ 8.8 m.** No water and 0.61 m of slough on completion of testhole.				674
		30 day waterlevel reading: 5.78 m bgs. 44 day waterlevel reading: 4.95 m bgs.				
10						673
10.4						

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LOGGED BY: L Falk | COMPLETION DEPTH: 8.84 m

REVIEWED BY: R Evans | COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-7**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 683.467 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm – 250 mm			683
	CI	**CLAY** : silty, sandy, moist to very moist, medium plastic, firm to stiff, brown, trace oxides			
		910 mm			
1		**CLAY** : silty, moist, medium to high plastic, very stiff, grey modelled brown, trace oxides			682
2				P.L. = 19.2 L.L. = 66.1 M.C. = 29.4 **Soluble Sulphates:** Negligible	681
3		3.1 m	11		
	CI-CH	-Below 3.1m: stiff			
4			7		680
5					679
			6	**Shelby Tube:** QU: 125 kPa DD: 1560 Kg/m^3 MC: 35.4 %	678
6		5.8 m			
	MI	**SILT** : clayey, wet, low plastic, soft, sensitive, brown-grey	5		677
7					676
8			8		675
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.			674
		30 day waterlevel reading: 5.49 m bgs. 44 day waterlevel reading: 3.94 m bgs.			
10					
10.4					

POCKETPEN. (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-8**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.575 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm / 50 mm			684
	CI	**CLAY** : silty, sandy, moist to very moist, medium plastic, firm to stiff, brown			
		760 mm			
1		**CLAY** : silty, moist, medium to high plastic, very stiff, light brown	10		683
2	CI-CH				
			15		682
3					
		3.7 m			681
		-Below 3.7m: medium plastic, stiff, trace oxides			
4		4.0 m			
		-Below 4.0m: medium to high plastic			680
	CI				
5		-Below 4.9m: very moist, medium plastic, firm			
		5.5 m			679
		SILT : clayey, wet, low plastic, soft, sensitive, grey	6		
6				P.L. = 21.1 L.L. = 40.6 M.C. = 35.8	678
				Soluble Sulphates: Negligible	
7	CL-ML		8		677
8			7		676
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.			675
		30 day waterlevel reading: 3.94 m bgs.			
10		44 day waterlevel reading: 3.45 m bgs.			
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

Pocketpen values: 24.2, 26.4, 22.1, 24, 26, 31.1, 30.5, 35.9, 36.8, 35.9, 35.8, 21.1, 40.6, 38.4, 36.2, 37.8, 34.3, 33.8

3145

684.13

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 19/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-9**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 682.363 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OH	**TOPSOIL** 0 mm 457 mm			682
1	CI-CH	**CLAY** : silty, moist, medium to high plastic, stiff to very stiff, greyish brown 1.5 m	9		681
2		**CLAY** : very silty, damp to moist, medium plastic, stiff, brown, some high plastic lenses		P.L. = 18.4 L.L. = 56.4 M.C. = 23.3 **Soluble Sulphates: Negligible**	680
3		-Below 2.7m: oxides	8		
4	CI	-Below 3.2m: very moist			679
5		-Below 5.3m: very moist, slightly sensitive 5.8 m	8		678
6	CH	**CLAY** : silty, very moist, high plastic, stiff, brown and grey, oxides			677
7		7.3 m	9		676
8	CI	**CLAY** : very silty, very moist to wet, medium plastic, soft, grey, sensitive, some high plastic lenses			675
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. 22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.	10		674
10					673
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-10**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.026 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm 406 mm			
		CLAY : silty, moist, high plastic, very stiff, grey and brown, trace oxides			
1	CH		14		683
2			12		682
		2.7 m			
3		**CLAY** : very silty, moist, low to medium plastic, stiff, brown, oxides, some high plastic lenses			681
4		4.3 m	8	P.L. = 20.5 L.L. = 60.5 M.C. = 27.2 **Soluble Sulphates:** Negligible	680
		-Below 4.3m: very silty, very moist, greyish brown, sensitive, soft			
5	CL-CI				679
6					678
7			10		677
8					676
9		**END OF TESTHOLE @ 8.8 m.** No water and 0 m of slough on completion of testhole. 22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.	15		675
10					674
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT values: 19.7, 21.4, 20, 21.3, 20.3, 23.9, 27.2, 20.5, 60.5, 32.9, 36.7, 35, 26.7, 27.9, 29.8, 26.3, 36.2, 36.2, 36.7

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-11**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.776 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	▲POCKETPEN. (kPa)▲ 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm / 200 mm				684
1	CH	**CLAY** : silty, damp to moist, high plastic, friable, greyish brown	15	19.3, 19.9, 18.5		683
2		2.1 m				
3	CI-CH	-Below 2.1m: medium to high plastic, brown	12	25.7, 23.1, 27.3, 24.4		682
4	CI	4.0 m **CLAY** : very silty, damp to moist, medium plastic, brown, trace oxides, very silty layers, some high plastic layers			**Shelby Tube:** QU: 176 kPa DD: 1435 Kg/m^3 MC: N/A	681
5		-Below 4.6m: moist, low plastic, trace oxides	10	25.4, 21.7		680
6	CL			26.1		679
7			8	26, 32		678
8				33.6		677
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.	10	31.7, 30.6		676
10		22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.				675
10.4						

SLOTTED PIEZOMETER

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-12**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 683.099 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC / M.C. / LIQUID (20 40 60 80)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm / 300 mm					683
		CLAY : silty, high plastic, very stiff, greyish brown		22.7			
1			20	20.1			682
	CH			19.5			
2				21			681
		2.7 m					
3	CI-CH	**CLAY** : silty, moist, medium to high plastic, stiff to very stiff, brown, oxides, some very silty layers		26.7	19.7 — 59.8	P.L. = 19.7 LL. = 59.8 M.C. = 26.7 **Soluble Sulphates:** Negligible	680
		3.8 m		33.8			
4		**CLAY** : very silty, very moist, low plastic, stiff	8	32.8			679
	CL			24.9			
5				21.9			678
		-Below 5.3m: medium plastic, greyish brown, some clayey layers	12	20.1			
6				32.8			677
				23.8			
7	CI		8	21.1			676
		-Below 7.6m: very moist to wet, sensitive		34.5			
8				34.5			675
			10	34.8			
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.					674
		22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.					
10							673
10.4							

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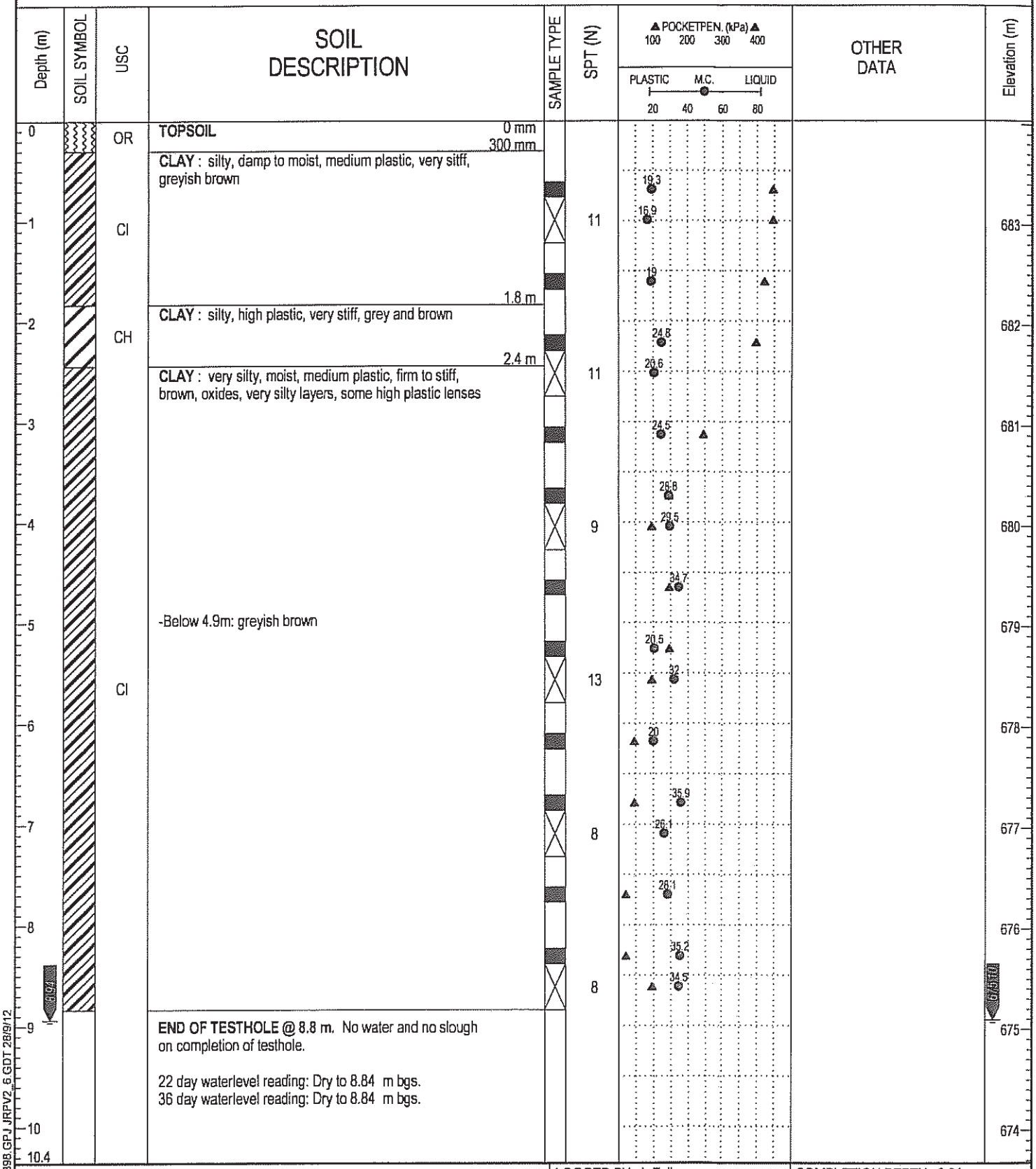
LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-13**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.039 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



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		REVIEWED BY:	COMPLETION DATE: 27/6/12
			Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-14**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.596 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm / 300 mm			685
		CLAY : silty, moist, high plastic, very stiff, greyish brown	14		
1	CH				684
2			14		683
		2.6 m			
3	CI	**CLAY** : silty, moist, medium plastic, stiff, brown, trace oxides, very silty layers			682
		4.0 m			
4	CH	**CLAY** : silty, moist, high plastic, stiff, grey, trace oxides		**Shelby Tube:** QU: 232 kPa; DD: 1415 Kg/m^3; MC: N/A	681
		4.9 m			
5	CI	**CLAY** : very silty, very moist, medium plastic, firm, greyish brown	8	P.L. = 21.7 L.L. = 44.6 M.C. = 36.9; **Soluble Sulphates:** Moderate	680
6		-Below 5.8m: very moist to wet, soft, sensitive			679
7			7		678
8			8		677
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.			
		22 day waterlevel reading: Dry to 8.84 m bgs.			
10		36 day waterlevel reading: Dry to 8.84 m bgs.			
10.4					676

POCKETPEN. (kPa): 100 200 300 400

PLASTIC — M.C. — LIQUID: 20 40 60 80

M.C. values: 21.2, 20.3, 21.4, 23, 22.5, 26.3, 32.2, 34.1, 35.9, 21.7, 44.6, 22.7, 32.7, 24.3, 35.7, 30.6, 34, 35.9

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-15**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.891 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC / M.C. / LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm 200 mm					
		CLAY : silty, moist, high plastic, very stiff, brown, trace precipitates					
1			12	22.6 19.8			685
		1.4 m -Below 1.4m: very silty layer 300mm		19			
	CH						
2		2.1 m -Below 2.1m: brown and grey		22.2			684
			11	23			
3				22.6			683
		3.4 m **CLAY** : very silty, moist, medium plastic, very stiff, brown and grey, some high plastic layers interbedded		23.7			
4			11	27.9			682
		4.3 m **CLAY** : silty, moist, medium plastic, stiff, greyish brown, trace oxides		33			
	CI						
5		-Below 4.9m: very moist, firm		36.2			681
			6	35.3			
6		-Below 6.1m: very silty, moist to wet, low to medium plastic, grey, sensitive		31.7			680
				36.4			
7			8	27.5			679
	CL-CI			26.9			
8				35.2			678
			7	33.1			
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.					677
		22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.					
10							676
10.4							

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-16**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.068 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm **CLAY** : silty, moist, high plastic, very stiff, grey 200 mm			685
1	CH	1.2 m -Below 1.2m: medium to high plastic, some very silty layers interbedded, trace oxides	8	P.L. = 18.9 L.L. = 59.2 M.C. = 20.5 **Soluble Sulphates: Mild**	684
2					683
3	CI-CH				682
4			10		681
5		5.3 m **CLAY** : very silty, very moist, medium plastic, soft to firm, grey, sensitive	8		680
6		6.3 m -Below 6.3m: soft, grey			679
7	CI		5		678
8		8.1 m -Below 8.1m: wet	5		677
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. 22 day waterlevel reading: Dry to 8.84 m bgs. 36 day waterlevel reading: Dry to 8.84 m bgs.			676
10					675
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 27/6/12
	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-17**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 686.507 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 0 mm **CLAY** : silty, moist, high plastic, very stiff 200 mm			686
1			8		
	CH				685
2					
			8		684
3		3.1 m -Below 3.1m: medium to high plastic, very silty layers interbedded			
					683
4			11		
	CI-CH				682
5		4.9 m -Below 4.9m: more silty, very moist, firm			
		5.5 m			681
6		**CLAY** : very sitly, very moist, low plastic, stiff, greyish brown		**Shelby Tube:** QU: N/A DD: 1526 Kg/m^3 MC: N/A	
					680
7	CL		8		
					679
8					
9			9		678
		END OF TESTHOLE @ 8.8 m. No water and no slough on completion of testhole. 22 day waterlevel reading: 8.21 m bgs. 36 day waterlevel reading: 8.17 m bgs.			677
10					
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID

20 40 60 80

8.7 10.7 17.5 18.8 25.1 24.4 23.4 28.4 34.8 37 26.4 21.8 23.8 20.8 23 32.1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-18**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.064 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			685
	CI	**CLAY** : Very silty, medium plastic, damp to moist, stiff, brown.	16		
1		1.2 m			684
	CH	**CLAY** : High plastic, moist, very stiff, brown.	14	P.L. = 19.7 L.L. = 61.1 M.C. = 20.8 **Soluble Sulphates:** Negligible	
2		2.7 m			683
	CI	**CLAY** : Very silty, medium plastic, moist, very stiff, brown, friable layers.	9		
4		4.9 m			681
5	ML	**SILT** : Moist, medium dense, grey.	10		680
6		- below 6.7m: wet, soft.			679
7		7.3 m	12		678
8	CI	**CLAY** : Very silty, medium plastic, very moist to wet, firm to very soft, grey.	6		677
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 8.38 m bgs. 35 day waterlevel reading: 8.36 m bgs.			676
10					675
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SLOTTED PIEZOMETER

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 18	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-19**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 686.758 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	Elevation (m)
0	OR	**TOPSOIL** 125 mm			
	ML	**SILT** : Clayey, damp to moist, light brown.		18.4	
1		1.1 m	10	13.2	686
	CI	**CLAY** : Silty, medium plastic, moist, very stiff, brown.		19.9	
		1.8 m			685
2	ML	**SILT** : Sandy, fine grained, damp to moist, light brown.		9.7	
		2.7 m	22	8.9	
3	CI	**CLAY** : Silty, medium plastic, moist, stiff, brown.		23.9	684
		3.4 m			
	ML	**SILT** : Sandy, fine grained, damp to moist, light brown.		9.6	
4		4.3 m	19	9.1	683
		CLAY : Silty, medium to high plastic, moist, very stiff, brown.		25.9	
5				34.2	682
			11	19.8	
6				32.1	681
	CI-CH	- below 6.4m: Very moist, firm.		34.7	
7		- below 7.0m: Wet, soft.	5	36.5	680
				35.5	
8					679
				34.2	
9			7	33.9	678
		END OF TESTHOLE @ 8.8 m. No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 8.07 m bgs. 35 day waterlevel reading: 8.09 m bgs.			
10					677
10.4					

OTHER DATA

SLOTTED PIEZOMETER

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 19	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-20**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 687.856 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL SYMBOL	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOTTED PIEZOMETER	Elevation (m)
0		OR	**TOPSOIL** 150 mm						
		CI	**CLAY** : Silty, medium plastic, moist, very stiff to hard, brown. 620 mm						
1			**CLAY** : High plastic, damp to moist, very stiff to hard, brown.		14	18.9, 20.4, 20.4			687
2		CH				22.5	**Shelby Tube:** QU: 222 kPa DD: 1545 Kg/m^3 MC: N/A		686
3						28.9			685
4			4.6 m		10	25.7, 23.2			684
5		CI	**CLAY** : Silty, medium plastic, very moist, firm.			33.2, 34.3			683
6			- below 5.8m: wet, soft, sensitive, less clay content with depth.		7	34.9, 33.6 (20.5 40.4)	P.L. = 20.5 L.L. = 40.4 M.C. = 33.6 **Soluble Sulphates:** Considerable		682
7			6.9 m **SILT** : Moist to very moist, medium dense.		10	35.1, 30.4			681
8		ML				21.1, 32.6			680
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 9.06 m bgs. 35 day waterlevel reading: 9.05 m bgs.		8	37.4			679
10									678
10.4									

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 20	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-21**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.884 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			
	CI	**CLAY** : Silty, medium plastic, moist, very stiff, brown.			
		910 mm			
1		**CLAY** : High plastic, moist, very stiff, brown.	13		688
2	CH			P.L. = 19.2 L.L. = 61.2 M.C. = 21.7 **Soluble Sulphates: Negligible**	687
3			13		686
		3.4 m			
	ML	**SILT** : Trace of clay, moist, brown and grey.			
4		4.3 m	10		685
		CLAY : Silty, very moist to wet, firm to soft, brown.			
5	CI		5		684
6					683
7		7.3 m	11		682
		SILT : Wet, soft, grey.			
8	ML				681
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: Dry to 8.84 m bgs. 35 day waterlevel reading: Dry to 8.84 m bgs.	6		680
10					679
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT (N) values: 22.2, 19.2, 20.4, 21.7, 18.2, 15.5, 28.8, 19.6, 26.3, 36.6, 38.3, 36.6, 37.1, 35, 28.7, 26.9, 33.1, 32.7

SLOTTED PIEZOMETER

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 21	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-22**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.198 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL SYMBOL	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOTTED PIEZOMETER	Elevation (m)
0		OR	**TOPSOIL** 150 mm						689
			CLAY : Silty, medium to high plastic, damp to moist, very stiff, brown.						
1		CI-CH	1.2 m		15	16.8, 17.1			688
			CLAY : High plastic, damp to moist, very stiff to hard, brown.			18.9			
2						19.4			687
					12	21.2			
3		CH				25.8			686
						29.4			
4			4.9 m		9	28			685
			SILT : clayey, moist, brown.			30.2			
5		ML	5.8 m			23.1			684
			CLAY : Very silty, medium plastic, very moist to wet, firm to soft, brown.		9	39.2			
6						34.4			683
		CI				34.7			
7			7.3 m		7	35.2			682
			SILT : Very moist to wet, soft, grey.			31.5			
8		ML				37.2			681
					9	34.3			
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: Dry to 8.84 m bgs. 35 day waterlevel reading: Dry to 8.84 m bgs.						680
10									
10.4									679

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 22	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-23**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.795 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm **CLAY** : High plastic, damp to moist, very stiff to hard, brown.	17.9, 23.2		688
1			15		
2			20.6, 20.4, 21.6		687
3	CH	- below 3.0m: Slicksides in high plastic clay.	15	P.L. = 23.2 L.L. = 78.7 M.C. = 29.7 **Soluble Sulphates:** Negligible	686
4		4.9 m	29.7, 31.3, 30, 11		685
5		**CLAY** : Silty, medium plastic, very moist, firm, brown.	31, 34.4, 35		684
6			7		
7	CI	- below 7.3m: Wet, soft.	37, 35, 37.3, 33.5		683
8			6		682
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 9.23 m bgs. 35 day waterlevel reading: 9.13 m bgs.	34.1, 31.9 5		681
10					680
10.4					679

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SLOTTED PIEZOMETER

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 23	Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-24**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.45 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm **CLAY** : Medium to high plastic, moist, very stiff, brown and grey.			688
1			7		
2	CI-CH				687
3			5		686
4		3.4 m **CLAY** : Silty, medium to low plastic, wet, soft, sensitive.	6	P.L. = 20.5 L.L. = 41.2 M.C. = 39.8 **Soluble Sulphates:** Negligible	685
5	CI-CL				684
6		5.3 m **SILT** : Trace of clay, wet, soft, sensitive, brown. - below 6.1m: Free water on auger.	5		683
7	ML		6		682
8					681
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 0.65 m bgs. 35 day waterlevel reading: 0.6 m bgs.	9		680
10					679
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT (N) values: 30.4, 27.7, 31.9, 37.3, 36.4, 36.4, 39.8, 20.5, 41.2, 37.2, 33.3, 39.4, 37.4, 33.3, 37.4, 35.1, 33.4, 30.7, 29.7

SLOTTED PIEZOMETER: 8.8 m

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 24	Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-25**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.042 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 100 mm				
	CI	**CLAY** : Medium plastic, moist, stiff, brown and grey.				
1		1.2 m	10	26.3, 27.8		688
2	CH	**CLAY** : High plastic, moist, very stiff, brown and grey.	12	24.2, 25, 24.1, 26.7		687
3						686
4			8	26.2, 35.7, 36.9		685
5		5.2 m				684
6	CI	**CLAY** : Silty, medium plastic, very moist, firm, brown. - below 6.1m: Wet, soft, sensitive.	5	36.6, 36.3, 34.1		683
7			6	34.7, 33.4		682
8				35.6, 32.5		681
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 21 day waterlevel reading: 1.5 m bgs. 35 day waterlevel reading: 1.43 m bgs.	5	35.0		680
10						679
10.4						

SLOTTED PIEZOMETER: 1.43 m (21 day), 1.69 m (35 day)

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REVIEWED BY:	COMPLETION DATE: 28/6/12
Fig. No: 25	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-26**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.817 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			
	CI	**CLAY** : Very silty, medium plastic, very moist to moist, firm to stiff, brown.	6		
1.2					
	CH	**CLAY** : High plastic, moist, very stiff, brown and grey.	7		
3.1					
	CI-CL	**CLAY** : Silty, medium to low plastic, moist to very moist, stiff to firm, brown.	7	P.L. = 17.0 L.L. = 47.3 M.C. = 28.5 **Soluble Sulphates:** Negligible	
4.9					
	ML	**SILT** : Clayey, saturated, soft, sensitive, brown.	12		
			13		
			6		
8.84		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 2.26 m bgs. 34 day waterlevel reading: 1.79 m bgs.			
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

Pocket pen values: 20.6, 21.3, 21.6, 28.4, 31.7, 28.5, 33.6, 32.2, 37, 34.6, 32.2, 35.9, 33.6, 32.1, 30.9, 32, 30.8

Atterberg limits: 17 — 47.3

SLOTTED PIEZOMETER: 2.79 m

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REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 26	Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-27**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.015 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE · CORE SAMPLE · SPT SAMPLE · GRAB SAMPLE · NO RECOVERY

BACKFILL TYPE: BENTONITE · PEA GRAVEL · SLOUGH · GROUT · DRILL CUTTINGS · SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)
0 – 200 mm	OR	**TOPSOIL**	
200 mm – 620 mm	SM	**SAND** : Silty, trace of clay, medium to fine grained, moist, brown.	
620 mm – 4.6 m	CH	**CLAY** : High plastic, moist, very stiff, brown and grey. - below 3.0m: Slickensides in high plastic clay.	6 (≈1.0 m); 13 (≈2.5 m); 10 (≈4.0 m)
4.6 m – 8.8 m	CI	**CLAY** : Silty, medium plastic, moist to very moist, firm to stiff, brown. - below 5.5m: wet, soft, saturated.	4 (≈5.5 m); 5 (≈7.0 m); 6 (≈8.5 m)

END OF TESTHOLE @ 8.8 m. No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m.
20 day waterlevel reading: 2.33 m bgs.
34 day waterlevel reading: 1.76 m bgs.

POCKETPEN. (kPa): 100 200 300 400
PLASTIC M.C. LIQUID: 20 40 60 80

Moisture content (%) with depth: 15.9, 23.9, 23.4, 23.2, 23.1, 35.1, 35.3, 36.5, 37.2, 38.1, 36.8, 38.2, 33.3, 39.7, 32.9, 31.4, 31.5

OTHER DATA

SLOTTED PIEZOMETER

Water level marker: 1.76 (depth), 686.26 (elevation)

Elevation (m): 687, 686, 685, 684, 683, 682, 681, 680, 679, 678

Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 10.4

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 27	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-28**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.457 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			688
		CLAY: High plastic, moist, very stiff, brown and grey.	10		
1					687
2					
	CH		12		686
3					
					685
4				**Shelby Tube:** QU: 132 kPa; DD: 1388 Kg/m³; MC: N/A	
				P.L. = 20.5 L.L. = 54.2 M.C. = 36.4 **Soluble Sulphates:** Negligible	684
4.9 m					
5		**CLAY**: Silty, medium plastic, very moist, firm, brown.	7		683
6		- below 5.8m: wet, soft, sensitive.			
	CI		5		682
7					
					681
8			5		
					680
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 4.06 m bgs. 34 day waterlevel reading: 3.09 m bgs.			
10					679
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

Slotted Piezometer: 685.37

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REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 28	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-29**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.992 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm **CLAY** : High plastic, moist, very stiff, brown.				
1			10	21.6, 24.4		688
2				25.4		687
3	CH		14	30, 31.3		686
4				29.6		685
4.67			10	35.6, 35.7		
4.9 m				33.5		
5		**CLAY** : Silty, medium plastic, very moist, firm, brown.		35.7		684
6		- below 5.8m: wet, soft, sensitive.	7	39.1		683
7	CI			36.1		682
8			5	34.7, 34.1		681
9				33.4		680
10			6	33.7, 33.2		679
10.4		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 5.55 m bgs. 34 day waterlevel reading: 4.62 m bgs.				

SLOTTED PIEZOMETER: 4.67, 684.57

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LOGGED BY: D Zacharuk	COMPLETION DEPTH: 8.84 m
REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 29	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-30**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 687.562 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm **CLAY** : High plastic, moist, very stiff, brown and grey.	25, 24.5, 23.4, 21	**Shelby Tube:** QU: 220 kPa DD: 1609 Kg/m^3 MC: N/A	687
1			15		
2	CH				686
3		3.4 m	24.5		685
4		**CLAY** : Silty, medium plastic, wet, soft, sensitive, brown.	19.8 (16.4, 42.7), 33.1	P.L. = 16.4 L.L. = 42.7 M.C. = 19.8 **Soluble Sulphates: Negligible**	684
5			10, 34.1		683
6	CI		39.2, 35.8		682
7			7, 34.9		681
8			36.2, 34.4		680
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 5.97 m bgs. 34 day waterlevel reading: 5.29 m bgs.	5, 34.4		679
10			31.5, 33, 7		678
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SLOTTED PIEZOMETER

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REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 30	Page 1 of 1

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-31**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 686.239 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm **CLAY** : High plastic, moist, very stiff, brown and grey.			686
1			13		685
2	CH		10		684
3					683
4		4.9 m	8		682
5		**CLAY** : Silty, medium plastic, very moist to wet, firm to soft, sensitive, brown.			681
6			3		680
7	CI		4		679
8			6		678
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 3.94 m bgs. 34 day waterlevel reading: 3.25 m bgs.			677
10					
10.4					676

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT (N) values: 22.8, 23.1, 22.2, 23.6, 29.3, 32.1, 32.9, 29.3, 33.9, 35.3, 36.6, 34.7, 35.6, 34.6, 32.6, 33.0, 33.9

SLOTTED PIEZOMETER: SAND

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REVIEWED BY:	COMPLETION DATE: 29/6/12
Fig. No: 31	Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Geotechnical Pre-Purchase Assessments, Riverview Area	PROJECT NO: 1166-398	BOREHOLE NO: **2012-32**
CLIENT: Qualico Developments West LTD.	DRILL METHOD: Solid Stem Auger	ELEVATION: 687.562 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			687
	SM	**SAND** : Silty, medium to fine grained, moist, brown and grey. 760 mm			
1		**CLAY** : High plastic, moist, very stiff, brown and grey.	14		686
2					
3	CH		11	P.L. = 21.2 L.L. = 76.1 M.C. = 28.1 **Soluble Sulphates:** Negligible	685
4		4.6 m	6		684
5		**CLAY** : Silty, medium plastic, very moist to wet, firm to soft, brown.			683
6		- below 5.8m: wet to saturated, soft, sensitive.	4		682
7	CI		4		681
8			4		680
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Slotted standpipe installed to 8.84 m. 20 day waterlevel reading: 3.22 m bgs. 34 day waterlevel reading: 2.46 m bgs.	4		679
10					678
10.4					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

Pocket pen values: 18.1, 24.2, 26.6, 28.1, 21.2, 76.1, 26.5, 33.1, 39.7, 36.4, 38.2, 37.5, 34.1, 34.4, 34.5, 32.9, 33.6, 33, 33.6

SLOTTED PIEZOMETER: 2.46 m

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		COMPLETION DEPTH: 8.84 m COMPLETION DATE: 29/6/12 Page 1 of 1

JRP 1166-398.GPJ JRPV2_6.GDT 28/9/12

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-1**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.5 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 300 mm					688
1	1.02		**CLAY** : silty, medium to high plastic, moist to very moist, stiff, brown and grey, trace oxides	9	28.8, 32.7			687
2			-Below 1.8m: very silty, very moist, soft to firm		32.8	22 — 76.2	P.L. = 22.0 L.L. = 76.2 M.C. = 32.8 **Soluble Sulphates:** Mild	686
3		CI-CH		5	36.4, 35.5			685
4			-Below 3.7m: brown		36.5, 36, 36.5		-Shelby Tube was attempted at 3.8m, sample was to frialble	684
5			4.3 m -Below 4.3m: wet, low to medium plastic, slightly sensitive, imbedded high plastic clay inclusions throughout	4	36			683
6				9	32.7, 33.2			682
7		CL-CI	-Below 6.4m: grey		32.5, 29.1, 31.5			681
8				7	33.1, 32.7			680
9			**END OF TESTHOLE @ 8.8 m.** 0.61 m of water and 2.44 m of slough on completion of testhole.	7	31.9			679
10			5 day waterlevel reading: 1.49 m bgs. 19 day waterlevel reading: 1.02 m bgs.					678
11								677
11.9								

687.48

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/10/12

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-2**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.32 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 150 mm					688
	1.15		**CLAY** : silty, medium to high plastic, very moist, firm to stiff, light grey, trace oxides	7	24, 29.9			
1			-Below 1.2m: brown and grey					687
					26.9			
2		CI-CH	-Below 2.3m: very silty	7	34.2, 36.3			686
3					35.8			685
					36.8	20.9 32.8 52.4	P.L. = 20.9 L.L. = 52.4 M.C. = 36.8 **Soluble Sulphates:** Negligible	
4			4.3 m	9				684
			-Below 4.3m: very silty, low to medium plastic, wet, slightly sensitive, grey, imbedded high plastic clay inclusions throughout		34.1			
5					32.2		-Free water noted on the auger at 4.9m	683
				6	33.6		-Shelby Tube was attempted at 5.3m, sample was to wet for QU or dry density	
6					32.6			682
		CL-CI			33.3			
7				11	31			681
					32.8			
8					31.1			680
				9	30.1			
9			**END OF TESTHOLE @ 8.8 m.** 2.44 m of water and 2.44 m of slough on completion of testhole.					679
			5 day waterlevel reading: 1.02 m bgs. 19 day waterlevel reading: 1.15 m bgs.					
10								678
11								677
11.9								

687.17

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/10/12

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-3**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.5 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa)	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 460 mm				689
1			**CLAY** : silty to very silty, medium to high plastic, moist to very moist, firm to stiff, brown and grey	9	21.4, 29.2, 34.4		
1.96	▼						687.54
2		CI-CH		10	28.4, 26.5		688
3			-Below 2.7m: trace oxides		29.6		687
			3.5 m				
4			-Below 3.5m: very silty, low to medium plastic, wet, soft, imbedded high plastic clay inclusions throughout	2	36.7, 38.1	-At 4.3m free water noted on auger	686
5			-Below 5.0m: sensitive	10	38.4, 38.7, 38.4		685
6		CL-CI			36.3 (22.4 3 2.5)	P.L. = 22.4 L.L. = 32.5 M.C. = 36.3 **Soluble Sulphates:** Negligible	684
7				9	34.6, 34.2		683
8					33.3		682
			-Below 8.4m: grey	9	33.1, 30.1		681
9			**END OF TESTHOLE @ 8.8 m.** 2.44 m of water and 3.66 m of slough on completion of testhole.				680
10			4 day waterlevel reading: 1.84 m bgs. 18 day waterlevel reading: 1.96 m bgs.				679
11							678
11.9							

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/11/12
	Page 1 of 1

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-4**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.96 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 150 mm **CLAY** : silty to very silty, medium plastic, moist to very moist, stiff, brown and grey					688
1				7	20.5, 35.2			
2		CI-CH	-Below 1.8m: very moist to wet, trace oxides		34			687
2.89				4	35.8, 41.5			686.07
3			-Below 3.2m: wet, soft to very soft		40.1			686
			3.8 m		39.6			
4			-Below 3.8m: low to medium plastic, wet	5	39.3			685
			-Below 4.3m: trace coal		35.2			
5			-Below 5m: grey		35.9			684
				6	37.9			
6		CL-CI	-Below 6.4m: sensitive		36.8			683
					34.4			
7				16	34.9			682
					35.2, 22.49		P.L. = 22.4 L.L. = 29.0 M.C. = 35.2 **Soluble Sulphates:** Considerable	
8					36.7			681
				8	36.8			
9			**END OF TESTHOLE @ 8.8 m.** 4.42 m of water and 1.22 m of slough on completion of testhole. 4 day waterlevel reading: 2.82 m bgs. 18 day waterlevel reading: 2.89 m bgs.					680
10								679
11								678
11.9								

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/11/12
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PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-5**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.3 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 150 mm						689
			CLAY : silty to very silty, medium plastic, very moist, stiff, brown and grey			26.2			
1					9	30.9			
						32.9	21.1 : 37.6	P.L. = 21.1 L.L. = 37.6 M.C. = 32.9	688
	2.03							**Soluble Sulphates:** Negligible	687.27
2			-Below 1.8m: very moist, firm to stiff			38.5			
		CI			5	39.6			687
3			-Below 2.7m: very silty, wet, soft, trace oxides						
						38.9			686
4			4.3 m			35.9			
					4	37.5			
			SILT : clayey, low plastic, wet, soft, slightly sensitive, brown, imbedded high plastic clay inclusions throughout					-Free water noted on auger at 4.3m	685
5						36.7			
						34.2			684
6					9	34.3			
						33.7			683
		ML				34.4			
7			-Below 7.0m: grey		6	31.6			682
						31.1			
8						32.6			681
					9	33.7			
9			**END OF TESTHOLE @ 8.8 m.** 1.83 m of water and 3.66 m of slough on completion of testhole.						680
			7 day waterlevel reading: 2.03 m bgs.						
10									679
11									678
11.9									

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 22/10/12
	Page 1 of 1

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-6**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.88 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 300 mm				688
		CLAY : silty to very silty, medium plastic, moist to very moist, stiff, brown and grey		20.4, 26.3		
1			8			
1.81 ▼				34.7		687.07 ▼
2	CI	-Below 1.8m: very moist to wet, trace oxides		36, 38.2		687
			8			
3				39.8		686
		3.4 m				
		SILT : clayey, medium plastic, very moist to wet, soft, slightly sensitive, brown, imbedded high plastic clay inclsuions throughout		40.2		
4			6	35.4		685
				38.4 (20.8 – 53.2)	P.L. = 20.8 L.L. = 53.2 M.C. = 38.4 **Soluble Sulphates:** Considerable	
5				35.4		684
		-Below 5.5m: grey	5	35.5		
6	MI			35.7	-Free water noted on auger at 5.9m	683
				33.4		
7			8	33.8		682
				33.9		
8				34.8		681
			8	31.1		
9		**END OF TESTHOLE @ 8.8 m.** No water and 0.61 m of slough on completion of testhole.				680
		7 day waterlevel reading: 1.81 m bgs.				
10						679
11						678
11.9						

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 22/10/12
	Page 1 of 1

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-7**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.13 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 150 mm			689
		CLAY : silty to very silty, medium to high plastic, moist to very moist, very stiff, brown modeled grey, trace oxides			
1			8		688
1.74	CI-CH				687.39
2				P.L. = 20.7 L.L. = 65.0 M.C. = 36.4 **Soluble Sulphates:** Negligible	687
			6		
3		3.1 m -Below 3.0m: medium plastic, wet, soft to firm			686
4			7		685
5	CI				684
6			11	-At 5.8m: free water was noted on the auger	683
7		6.9 m **CLAY** : very silty, medium plastic, very moist, firm to stiff, grey, trace coal	9		682
8	CI				681
9		**END OF TESTHOLE @ 8.8 m.** No water and 3.35 m of slough on completion of testhole.	11		680
10		4 day waterlevel reading: 1.72 m bgs. 18 day waterlevel reading: 1.74 m bgs.			679
11					678
11.9					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT (N) values: 28.2, 23.7, 31.9, 36.4, 20.7, 39.1, 65, 38.4, 35.9, 35.1, 36.6, 35.5, 35.3, 38, 31.1, 32.9, 32.6, 30.1, 29.2

JRP 1166-401.GPJ JRPV2_6.GDT 11/12/12

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/11/12

PROJECT: Riverview Pre-purchase	PROJECT NO: 1166-401	BOREHOLE NO: **2012-8**
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.38 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 300 mm				689
	CI-CH	**CLAY** : silty, medium to high plastic, moist, very stiff, brown modeled grey	9	28.5, 29.9		
1		1.4 m				688
		-Below 1.4m: medium plastic, very moist, stiff		31.8		
2		-Below 2.3m: very moist to wet, trace oxides	2	37.5, 39.1	**Shelby Tube:** QU: N/A DD: 1317 Kg/m^3 MC: 39.1 %	687
3				35.9		686
	CI	-Below 3.4m: very silty, soft	6	31, 32.7	-Sample was to short for QU	
4				26.1		685
5		-Below 4.9m: wet, soft to very soft, slightly sensitive	8	33.1, 35.1		684
		5.8 m				
6		**CLAY** : silty to very silty, medium plastic, very moist, stiff, grey, trace coal and oxides		30.2		
7.02						683 (682.36)
7			11	28.9 (18.1 – 31.4 – 51.9)	P.L. = 18.1 L.L. = 51.9 M.C. = 28.9 **Soluble Sulphates:** Severe	
	CI	-Below 7.0m: very silty, wet, soft		31.3		682
8				30.9		
		-Below 8.4m: stiff	25	29.7		681
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole.				
		4 day waterlevel reading: 7.09 m bgs.				680
10		18 day waterlevel reading: 7.02 m bgs.				
						679
11						
11.9						678

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/11/12

PROJECT: Riverview Pre-Purchase 184 Street and 23 Ave NW	PROJECT NO: 1166-402	BOREHOLE NO: 2012-1
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.98 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	TOPSOIL 300 mm						685
			CLAY : silty, medium plastic, moist, very stiff to friable, brown and grey			17			
1					15	20.8			
						22.2			684
2						23			
					16	23.2			
3		CI-CH				31.4			683
			-Below 3.4m: stiff, trace oxides			30			
4					10	34.1			682
						32.5			
5						36.5			681
					9	36.1			
6			SILT : clayey, non tolow plastic, moist to very moist, soft to very soft, sensitive, grey 5.8 m			36.8			680
	6.84					35.7		Soluble Sulphates: Moderate -Non-plastic	679.14
7		ML			8	35.4			679
						36.5			
8						35.5			678
			END OF TESTHOLE @ 8.8 m. 0.61 m of water and no slough on completion of testhole.		11	36.3		-Free water noted in SPT at 8.4m	
9			7 day waterlevel reading: 6.67 m bgs.						677
			28 day waterlevel reading: 6.84 m bgs.						
10									676
11									675
11.9									

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: C Watson	COMPLETION DATE: 22/10/12

PROJECT: Riverview Pre-Purchase 184 Street and 23 Ave NW	PROJECT NO: 1166-402	BOREHOLE NO: 2012-2
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 685.93 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	SOIL SYMBOL	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400	PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0			OR	TOPSOIL 300 mm						685
				CLAY : silty, high plastic, moist, stiff to friable, brown and grey			19.4			
1						15	21			
							22.4			684
2							27.1			
			CH				30.1		Shelby Tube: QU: 249 kPa DD: 1544 Kg/m^3 MC: 30.1 %	
3				-Below 3.1m: trace oxides			34	20.9 63.1	P.L. = 20.9 L.L. = 63.1 M.C. = 34.0	683
							32.2		Soluble Sulphates: Negligible	
4						9	34.6			682
				-Below 4.6m: very silty, soft			38.4			
5	▼		CI				40.8			681
				5.8 m		5	33.8			
6				SILT : clayey, low plastic, moist to wet, soft to very soft, sensitive, grey			35.7			680
							39.3			
7						6	33.9			679
			ML				33.3			
8							34.1			678
						7	34.3			
9				END OF TESTHOLE @ 8.8 m. 0.91 m of water and no slough on completion of testhole.						677
				7 day waterlevel reading: 5.25 m bgs. 28 day waterlevel reading: 5.2 m bgs.						
10										676
11										675
11.9										

68.7

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: C Watson	COMPLETION DATE: 22/10/12
	Page 1 of 1

PROJECT: Riverview Pre-Purchase 184 Street and 23 Ave NW	PROJECT NO: 1166-402	BOREHOLE NO: 2012-3
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 680.92 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
0	OR	TOPSOIL			680.92
0.78		750 mm			680.14
1	CL	CLAY : silty, sandy, low plastic, moist to very moist, soft, grey	6		680
		1.2 m			
	CI	CLAY : very silty, medium plastic, moist, soft, brown, trace oxides			
		1.8 m			
2		SILT : clayey, non to low plastic, very moist to wet, soft, sensitive, brown	3		679
3					678
4	ML		3		677
5		-Below 5.2m: grey	5	Soluble Sulphates: Negligible -Non Plastic	676
6					675
7		END OF TESTHOLE @ 6.9 m. No water and 4.57 m of slough on completion of testhole.			674
8		7 day waterlevel reading: 0.83 m bgs. 28 day waterlevel reading: 0.78 m bgs.			673
9					672
10					671
11					670
11.9					

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SPT (N) values: 28.1, 27.7, 28.7, 34.1, 35.5, 34.7, 35.3, 34.4, 33.7, 31.9, 32.3, 31.1

J.R. Paine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
GEOTECHNICAL · ENVIRONMENTAL · MATERIALS
17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: L Falk	COMPLETION DEPTH: 6.86 m
REVIEWED BY: C Watson	COMPLETION DATE: 22/10/12

JRP 1166-402.GPJ JRPV2_6.GDT 22/11/12

PROJECT: Riverview Pre-Purchase 184 Street and 23 Ave NW	PROJECT NO: 1166-402	BOREHOLE NO: 2012-4
CLIENT: Qualico Developments West Ltd.	DRILL METHOD: Solid Stem Auger	ELEVATION: 684.69 m
OWNER:	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	TOPSOIL 600 mm					684
1			CLAY : silty, medium to high plastic, moist, firm to stiff, brown and grey -Below 0.9m: stiff to very stiff		11	16.4, 23.9		683
2						23.8		682
3	4	CI-CH			12	24.3, 20, 25.1, 53.6	P.L. = 20.0 L.L. = 53.6 M.C. = 24.3 Soluble Sulphates: Negligible	681
4			-Below 4.3m: trace oxides			31.7, 33.7, 35.6	Shelby Tube: QU: 123 kPa DD: 1398 Kg/m³ MC: 35.6 %	680
5		CI	-Below 5.0m: very silty, medium plastic, soft 5.5 m			32.6, 41.4		679
6			SILT : clayey, non to low plastic, moist to very moist, soft, slightly sensitive, brown -Below 6.1m: grey		6	39, 37.9		678
7		ML			5	33.1	-No recovery of SPT at 6.9m	677
8						32.7		676
9			END OF TESTHOLE @ 8.8 m. 1.52 m of water and 0.3 m of slough on completion of testhole. 7 day waterlevel reading: 3.49 m bgs. 28 day waterlevel reading: 3.54 m bgs.		7	35.7, 33.8		675
10								674
11								673
11.9								

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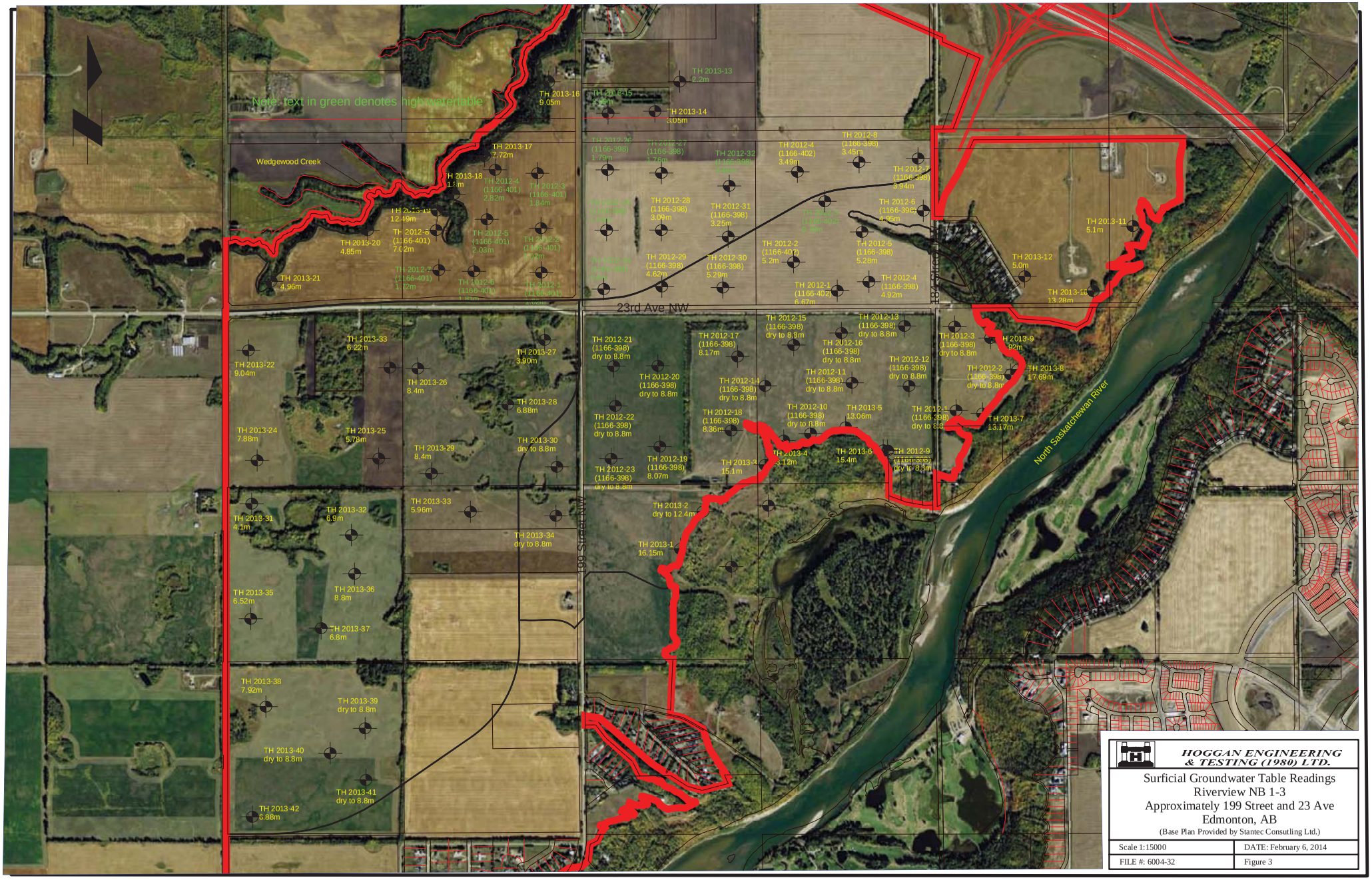
LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: C Watson	COMPLETION DATE: 22/10/12

A P P E N D I X B

Watertable Plan, Quarter Section Plan, Soil Category Chart, Soil Category Plan

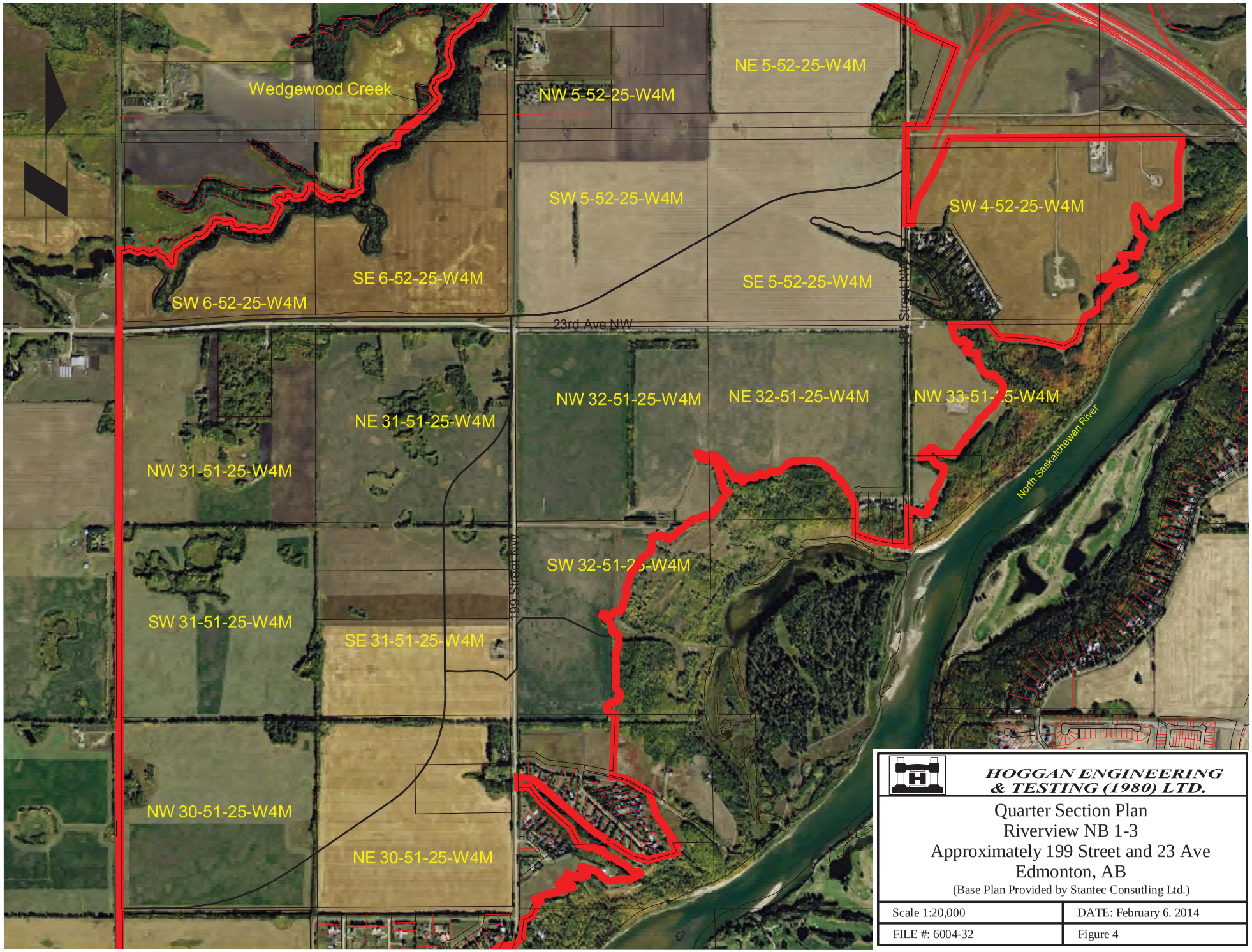


HOGGAN ENGINEERING & TESTING (1980) LTD.

Surficial Groundwater Table Readings
Riverview NB 1-3
Approximately 199 Street and 23 Ave
Edmonton, AB

(Base Plan Provided by Stantec Consulting Ltd.)

Scale 1:15000	DATE: February 6, 2014
FILE #: 6004-32	Figure 3



HOGGAN ENGINEERING & TESTING (1980) LTD.

Quarter Section Plan
Riverview NB 1-3
Approximately 199 Street and 23 Ave
Edmonton, AB
(Base Plan Provided by Stantec Consutling Ltd.)

Scale 1:20,000	DATE: February 6. 2014
FILE #: 6004-32	Figure 4

Soil Category Chart

Riverview Neighborhoods 1-3

	2013 Testholes																				
Soil Category	2013-1	2013-2	2013-3	2013-4	2013-5	2013-6	2013-7	2013-8	2013-9	2013-10	2013-11	2013-12	2013-13	2013-14	2013-15	2013-16	2013-17	2013-18	2013-19	2013-20	2013-21
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	9.1	4.6	9.9	8.8	4.3	6.5	5	None	8.8	8.4	Below 8.4	None	3.5	3.1	2.7	4.5	4	2.4	2.4	Below 6.4	3
C	None	None	None	None	None	8.7	None	None	None	None	3.8	5	4.1	4.3	4.3	9.1	9.1	None	5.8	2.7	5.3

	2013 Testholes																				
Soil Category	2013-22	2013-23	2013-24	2013-25	2013-26	2013-27	2013-28	2013-29	2013-30	2013-31	2013-32	2013-33	2013-34	2013-35	2013-36	2013-37	2013-38	2013-39	2013-40	2013-41	2013-42
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	4.6	4.3	4.9	4.3	4.6	3.0	4.0	5.0	4.6	5.8	5.8	5.8	4.6	4.6	5.6	6.7	5.9	5.8	5.8	5.8	7.6
C	None	6.4	None	5.5	None	None	None	None	6.1	None	None	10.4	8.1	None	None	7.3	None	None	None	None	None

	JRP File 1166-398																				
Soil Category	2012-1	2012-2	2012-3	2012-4	2012-5	2012-6	2012-7	2012-8	2012-9	2012-10	2012-11	2012-12	2012-13	2012-14	2012-15	2012-16	2012-17	2012-18	2012-19	2012-20	2012-21
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	4.9	7.3	5.8	4.0	None	None	None	None	7.3	4.3	6.0	3.8	5.5	4.9	4.9	5.3	4.9	6.7	6.4	4.6	4.3
C	None	None	None	None	4.6	5.5	5.8	5.5	None	None	None	None	None	None	None	None	None	None	None	None	7.3

	JRP File 1166-398										
Soil Category	2012-22	2012-23	2012-24	2012-25	2012-26	2012-27	2012-28	2012-29	2012-30	2012-31	2012-32
A	0	0	0	0	0	0	0	0	0	0	0
B	5.8	4.9	3.4	5.2	3.1	4.6	4.9	4.9	3.4	None	4.6
C	None	7.3	5.3	6.1	4.9	5.5	5.8	5.8	6.0	4.9	5.8

	JRP File 1166-401									JRP File 1166-402			
Soil Category	2012-1	2012-2	2012-3	2012-4	2012-5	2012-6	2012-7	2012-8	Soil Category	2012-1	2012-2	2012-3	2012-4
A	0	0	0	0	0	0	0	0	A	0	0	None	0
B	1.8	2.3	3.5	1.8	1.8	1.8	None	2.3	B	4.0	4.6	0	5.0
C	4.3	4.3	5.0	3.2	2.7	3.4	3.1	None	C	5.8	5.8	1.8	6.0

Legend and Notes

Testholes with relatively shallow C Category soils Less than 3 meters depth

Testholes with moderate depth to C Category soils, 3.1- 6.0 meters depth

Testholes with deep or no C Category soils, Less than 6 meters depth

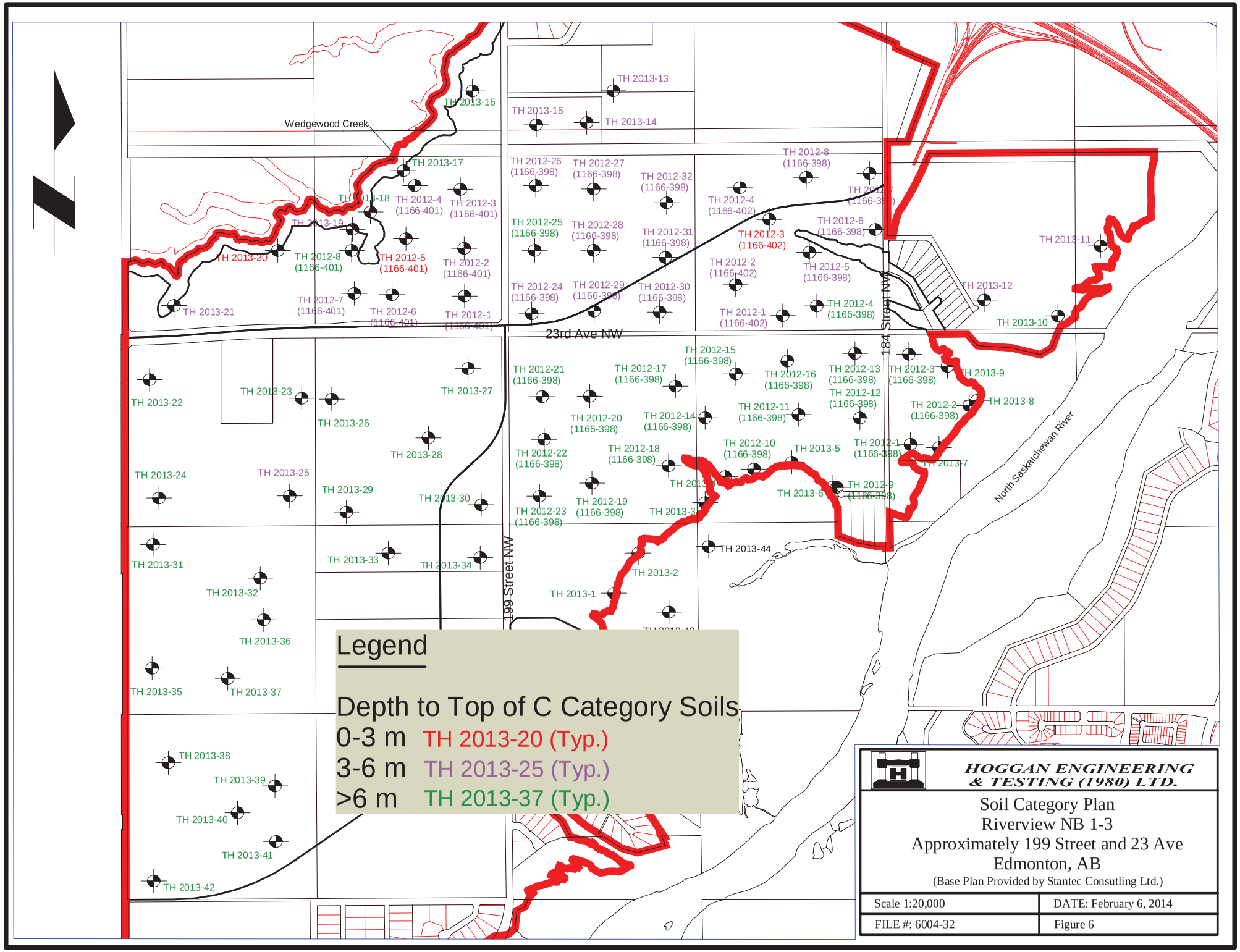
0 depth means below topsoil.

Category

A Satisfactory

B Fair

C Poor


Wedgewood Creek
23rd Ave NW
199 Street NW
184 Street NW
North Saskatchewan River
TH 2013-13
TH 2013-16
TH 2013-15
TH 2013-14
TH 2013-17
TH 2013-18
TH 2013-19
TH 2013-20
TH 2013-21
TH 2012-4 (1166-401)
TH 2012-3 (1166-401)
TH 2012-8 (1166-401)
TH 2012-5 (1166-401)
TH 2012-2 (1166-401)
TH 2012-7 (1166-401)
TH 2012-6 (1166-401)
TH 2012-1 (1166-401)
TH 2012-26 (1166-398)
TH 2012-27 (1166-398)
TH 2012-32 (1166-398)
TH 2012-8 (1166-398)
TH 2012-4 (1166-402)
TH 2012-25 (1166-398)
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TH 2012-6 (1166-398)
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TH 2012-30 (1166-398)
TH 2012-1 (1166-402)
TH 2012-4 (1166-398)
TH 2013-11
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TH 2012-16 (1166-398)
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TH 2012-12 (1166-398)
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TH 2012-9 (1166-398)
TH 2013-6
TH 2013-3
TH 2013-44
TH 2013-2
TH 2013-1
TH 2013-22
TH 2013-23
TH 2013-26
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TH 2013-30
TH 2013-31
TH 2013-33
TH 2013-34
TH 2013-32
TH 2013-36
TH 2013-35
TH 2013-37
TH 2013-38
TH 2013-39
TH 2013-40
TH 2013-41
TH 2013-42
Legend
Depth to Top of C Category Soils
0-3 m TH 2013-20 (Typ.)
3-6 m TH 2013-25 (Typ.)
>6 m TH 2013-37 (Typ.)
HOGGAN ENGINEERING & TESTING (1980) LTD.
Soil Category Plan
Riverview NB 1-3
Approximately 199 Street and 23 Ave
Edmonton, AB
(Base Plan Provided by Stantec Consulting Ltd.)
Scale 1:20,000
DATE: February 6, 2014
FILE #: 6004-32
Figure 6

Slope Stability Assessment completed by

Hoggan Engineering & Testing (1980) Ltd. (March 2014)

E00540A

FILE NO: 6004-32

SLOPE STABILITY ASSESSMENT
WEDGEWOOD CREEK
PROPOSED RIVERVIEW NEIGHBOURHOODS 1-3
199 STREET AND 23 AVENUE NW
EDMONTON, ALBERTA

March 2014

Hoggan Engineering & Testing (1980) Ltd.
17505 - 106 Avenue
Edmonton, Alberta
T5S 1E7

PHONE: 780-489-0700
FAX: 780-489-0800

FILE NO: 6004-32

SLOPE STABILITY ASSESSMENT
WEDGEWOOD CREEK
PROPOSED RIVERVIEW NEIGHBOURHOODS 1-3
199 STREET AND 23 AVENUE NW
EDMONTON, ALBERTA

TABLE OF CONTENTS

SLOPE STABILITY ASSESSMENT

PROJECT: Proposed Riverview Neighbourhoods 1-3
Wedgewood Creek

LOCATION: 199th Street and 23rd Avenue NW
Edmonton, Alberta

CLIENT: Ownership Group
c/o Stantec Consulting Ltd.
10160 – 112th Street
Edmonton, Alberta
T5K 2L6

ATTENTION: Nick Dyjach

1.0 INTRODUCTION

This report presents the results of the subsurface investigation made on the site of the proposed Riverview Neighborhood development in Edmonton, Alberta. The objective of the investigation was to assess the stability of the existing Wedgewood Creek natural slope within the neighborhood and provide geotechnical discussion and recommendations based on the assessment, including development setbacks from the top-of-bank. Authorization to proceed was received from Nick Dyjach of Stantec Consulting Ltd. Fieldwork for the project was completed in September to December 2013.

Hoggan is also performing the Riverview Neighborhood geotechnical investigation for the site and other lands to the south and east and this investigation and this NSP work is described in a separate report.

2.0 SITE DESCRIPTION

The proposed development is located in southwest Edmonton, Alberta, on the south and east side of Wedgewood Creek. The intersection of 199 Street and 23 Avenue NW is adjacent to the subject site. A power line is present onsite and crosses the creek in the eastern portion of the project. There is a break in the study boundaries at this location. Overall, the site tablelands

consisted of open flat to rolling terrain all of which is being farmed. The boundaries of the slope assessment are shown on a plan in Appendix A and consist of existing 215 Street on the west and existing 199 Street on the east. Only the south/east side of the creek valley was assessed by our study. Not the entire Wedgewood Creek ravine within Riverview Neighborhoods 1-3 is included in the scope of this report. There is an area of existing houses east of 199 Street that were not analysed in this assessment.

Wedgewood Creek is a tributary to the North Saskatchewan River and has its head waters west of the city in Parkland County. The height of the slope within the assessment scope ranges from 7 meters at 215 Street to 14 meters at 199 Street. The creek valley is undeveloped except for the existing streets at the two project ends which have earthen berms across the valley with culverts carrying the creek flow through the fill.

The proposed neighborhood planning places mainly residential development along the project top-of-bank.

Access to the testholes was gained off 199 Street, 215 street, and 23 Avenue.

3.0 EXISTING REPORT REVIEW

A search for geotechnical information was requested from the City of Edmonton Engineering Services Library and resulted in no existing reports for the study area.

Hoggan, and our affiliate firm J.R. Paine & Associates Ltd., performed the following investigations on the subject site:

- Preliminary Geotechnical Assessment, Riverview Lands, 199th Street and 23rd Avenue NW, Edgemont Subdivision, Edmonton, Alberta, JRP File #1166-401, December 2012.

- Slope Stability Assessment, Proposed Edgemont Neighborhood, North and West Bank of Wedgewood Creek, 215 Street and 35 Avenue, Hoggan File #6004-22, June 2010.

Hoggan reviewed the above noted reports and found the soil conditions encountered in the existing report testholes to be basically the same as encountered in the subject slope study.

Hoggan was also supplied the following Report for our review:

- Erosion Study for Wedgewood Creek at Edmonton, Golder Associates Ltd., Report Number 12-1373-0047, December 2012.

The Golder Report contained several considerations for the slope stability of Wedgewood Creek at this site. The site reconnaissance found no erosion risk sites in the slope assessment area, although 17 sites were found downstream of 199 street, northeast of the slope site. The predicted increased Creek flow above historical levels due to land development in the Creek watershed was 11% and the Report stated no widespread erosion should occur from this increased flow. The Report stated that beaver activity greatly reduced the flows in the Creek and such rodent activity should be maintained for all future development. Hoggan agrees with this recommendation based on our slope analysis and site observations. The undersized culverts at 215 street and 199 Street were also stated in the Report to reduce Creek flows and reduce erosion. Any changes to these culverts should consider the erosion effects, stated the Golder Report.

4.0 FIELD INVESTIGATION

The soils investigation for this project was undertaken in September to December 2013 utilizing a truck mounted drill rig owned and operated by Mobile Augers and Research Ltd. of Edmonton, Alberta and SPT Drilling Ltd. of St. Albert, Alberta. A total of six testholes were drilled in the proposed project area as part of this investigation, as shown on the attached site plan. The testholes were advanced to depths between 13.4 and 31.0 meters below ground surface. The testholes were advanced at locations chosen, and surveyed by Hoggan.

The testholes were advanced with 150-millimeter diameter solid or hollow stem augers in 1.5-meter increments. A continuous visual description was recorded on site, which included the soil types, depths, moisture, transitions, and other pertinent observations. Disturbed samples were removed from the auger cuttings at 750-millimeter intervals for laboratory testing. Standard Penetration Tests c/w split spoon sampling or Shelby Tube samples were also taken at regular 1.5-meter intervals in the testholes.

Following the drilling operation, slotted piezometric standpipes were inserted into all testholes for watertable level determination. The testholes were backfilled with cuttings, with a bentonite seal placed at the surface of the testholes. Watertable readings were obtained between 1 and 58 days after drilling.

5.0 LABORATORY TESTING

All disturbed bag samples returned to the laboratory were tested for moisture content. In addition, the plastic and liquid Atterberg Limits and soluble soil sulphate concentrations were determined on selected samples. The Shelby Tube samples were tested for unconfined compressive strength and dry density. Lab results are included on the attached testhole logs located in the Appendix.

6.0 SOIL CONDITIONS

A detailed description of the soils encountered is found on the attached testhole logs in the Appendix. In general, the soil conditions at this site consisted of topsoil, underlain by a native deposit of clay. Layers of silt material were encountered in some testholes. Within the deeper testholes, clay till was encountered below the silt or clay. The geology of the soils is given in Section 10.0.

TOPSOIL

Surficial topsoil was the first soil encountered in the majority of the testholes. This material was generally moist, black in color, and extended to between 50 and 750 millimeters below ground surface (BGS). Topsoil depths are known at the testhole locations only and may vary between testholes.

CLAY

In all of the testholes, a lacustrine clay material was encountered near the surface. The material was typically brown to grey in colour, soft to stiff, silty to very silty, low to high plastic, and damp to wet. With depth, the clay material typically became very silty, soft, moist to wet, and very sensitive or transitioned into silt. Within the high plastic clay, slicken sides were noted. Within the low plastic layers, odd high plastic seams were noted. The moisture content of this material was typically between 10 and 40 percent. Atterberg Limit tests on this soil revealed plastic limits between approximately 16 to 20 percent, and liquid limits from approximately 29 to 78 percent. Standard Penetration Test “N” values were normally in the range of 2 to 19 blows per 300 millimeters. Testholes 2013-20 and 2013-21 were terminated within this clay material.

SILT

Silt was encountered in Testhole 2013-16 below the lacustrine clay material noted. The silt material was typically clayey, sandy, low plastic, moist to wet, firm to very soft, grey, trace to very sensitive. Moisture contents typically ranged from approximately 27 to 36 percent. Atterberg Limit test on this soil revealed plastic limit of 21.1 percent, and liquid limit of 29.4 percent. Standard Penetration Test "N" values were in the range of 5 to 7 blows per 300 millimeters.

CLAY TILL

Below the silt or clay, clay till material was encountered in Testholes 2013-16 to 2013-19 at depths between 11.9 to 16.6 meters BGS. This clay till material was typically silty, sandy to very sandy, medium to high plastic, moist to very moist, firm to very stiff, brown and/or grey in color and featured trace coal, gravel and sand pockets or lens. Within the clay till sand seams and/or layers were encountered in several of the testholes. Moisture contents typically ranged from approximately 12 to 29 percent. Standard Penetration Test "N" values were typically in the range of 10 to 50 or higher blows per 300 millimeters. Testholes 2013-16 to 2013-19 were terminated in this clay till material.

At the completion of drilling, variable accumulations of free water and/or slough material were noted in some of the testholes. Only testholes that were found to have water and/or slough material accumulation at the completion of drilling are shown in the table below:

Groundwater Seepage And Sloughing Conditions At Completion		
Testholes	Approximate Water Thickness At Hole Bottom (m)	Approximate Slough Thickness At Hole Bottom (m)
2013-16	dry	11.20
2013-19	12.65	12.65
2013-20	3.05	none

7.0 GROUNDWATER CONDITIONS

The groundwater table within this study was variable, with low to moderate readings. It should be noted that water table levels may fluctuate on a seasonal or yearly basis, with the highest readings obtained in the spring or after periods of heavy rainfall. The readings below

should be below the seasonal average levels, as they were recorded in the months of November, December and January. Three sets of water table readings were taken, with the results as follows:

Groundwater Table Readings
Riverview Neighbourhood 1-3, Wedgewood Creek Slope Assessment
(Metres Below Ground Surface)

Testhole	Surface Elev. (m)	Date Drilled	Depth(days)			Watertable Elevation (m)	Elev. Date
			Initial	Second	Third		
2013-16	690.3	Nov. 8, 2013	9.05 (11)	9.17 (25)	9.13 (62)	681.3	Nov. 19
2013-17	689.3	Nov. 12, 2013	7.72 (7)	7.8 (21)	7.68 (58)	681.6	Jan. 4/14
2013-18	689.2	Nov. 13, 2013	16.0 (6)	11.8 (20)	8.98 (57)	680.2	Jan. 4/14
2013-19	689.1	Nov. 13, 2013	16.40 (6)	12.49 (20)	9.1 (57)	680.0	Jan. 4/14
2013-20	689.9	Nov. 13, 2013	4.82 (6)	4.85 (20)	4.92 (57)	685.1	Nov. 19
2013-21	689.1	Nov. 12, 2013	4.96 (7)	5.04 (21)	5.05 (58)	684.1	Nov. 19

8.0 AIR PHOTO REVIEW

Several sets of aerial photography covering the subject site and surrounding area were obtained from the City of Edmonton Mapping Department and the Alberta Sustainable Resource Development Library with the years of the photos attained as follows:

Year Viewed	Scale
1962	1:31,680
1974	1:12,000
1993	1:20,000
2001	1:20,000

Photos dated 2004 and 2012 were viewed on *Google Earth*. The photos were carefully reviewed for slope stability considerations and copies of selected photos are located in Appendix B.

All of the air photos showed the Wedgewood Creek area within the study boundary to remain the same shape. No signs of slope movement were observed in any of the photos. The viewed photos had no signs of toe erosion observed. The creek flow appeared slow in all the photos, likely due to the beaver dams evident in all of the photos.

9.0 SITE OBSERVATIONS

The south/east side of the Wedgewood Creek slope was visited by the writer over several days in the Fall of 2013 in order to observe the ground conditions and slope stability issues. The following observations and discussion are provided and it starts spatially at the west end of the project at 215 street and moves eastward to the end of the project at 199 Street. No snow cover was present during any of the site visits.

The Creek valley is filled in across 215 Street at the start of the project. The slope height is relatively small at approximately 8 meters and the slope angle is approximately 3H:1V or shallower. Vegetation cover is dense with grasses, bush, poplar and the odd spruce tree. The observed toe erosion was minimal and not a concern. A beaver dam was present in this area and several more dams were observed throughout the study scope. An old slump was observed which was approximately 25 meters wide. The slump was not recent as all of the vegetation cover was upright and unaffected by the slump.

At the start of the first tributary ravine east of 215 Street, a possible crack was observed near the top-of-bank. It appeared as a small depression in the ground. No signs of recent movement were observed on the slope in the depression area. The slope was steeper in this zone at approximately 2H:1V. An old scarp was observed in the southern portion of this first tributary. Similar to the other observed scarp, the vegetation was unaffected overtop the area.

The first tributary area was well vegetated and the ravine bottom was dry with slight erosion observed. Old slump blocks were observed in the south portion of the ravine.

The slope area east of the first tributary had no slope concerns observed and was well vegetated with slope angles of 3-5H:1V. The exceptions were two areas of toe erosion observed where the ground formed a peninsula out from the top-of-bank. Some bare ground was observed in these areas although the water was not adjacent to the slope at the time of our visit. Beaver dams in the area had virtually stopped the creek flow. The toe areas were vegetated below the bare soil. Toe erosion was deemed not to be concern for setback determination in these two areas due to the erosion location being away from the main slope.

The second tributary ravine was well vegetated with no concerns. At the junction of the tributary and the creek, erosion was observed approximately 0.6 meters deep at the ravine bottom. No flow of water was present during our visit.

East of the tributary the slope was well vegetated with no signs of toe erosion. An area of dense spruce trees was observed. Overall slope angles were approximately 3 to 5H:1V. Some hummocky areas were observed but were deemed not a concern for setback values. There was one area of a likely old large slump just south of the powerline crossing where the slope from the top-of-bank was steeper for a portion then became shallower. The top-of-bank area was circular shaped at this old slump. The slope movement appeared relatively old in age as the vegetation was unaffected by the slope and large spruce trees were present on the slope. No setback increase was deemed necessary for this old movement area.

The slope portion below the powerlines is technically outside the scope of this report however observations were made of the ground. The slope was void of any large trees except at the slope toe where large spruce were present, likely because the powerlines require the tree clearing to avoid contact. There was one concern observed which was an erosion gully located at the south end of the powerline ROW. Small slumps were observed in the gully. A shallow trough in the farmland was noted that lead up to the gully and likely supplied the run-off that caused the erosion. This erosion gully should not affect the adjacent slopes in the study boundaries provided the land development removes the trough that leads to the slope. This trough can be seen in air photos and starts from a low area adjacent to 199 Street.

As noted in the air photo section, the second tributary also has a shallow trough that leads to it and likely supplies run-off to the ravine. Land development design in this location should also reduce the flow to the tributary.

North of the powerlines, the slope continues to be well-vegetated and have angles of 3 to 7H:1V. Very slight toe erosion was observed in one area just north of the powerlines but was deemed not an issue. Some small slumps less than 1 meter high were observed at the slope toe but were also deemed not an issue. The trees for a portion of the slope carried over the top-of-bank onto the prairie surface away from the top-of-bank. The edge of the trees is not the top-of-bank for this slope portion. Some old slumping was observed at the top-of-bank in one area but it was small in nature and not deemed an issue. The vegetation was unaffected in the area and the overall slope remained at 3H:1V.

One area of old slope movement was observed near the north end of the study scope consisting of a 3-4 meter ridge, some bare soil, and fallen trees; all of which were in the bottom one-third of the slope. No toe erosion was observed in this area. An old dirt road was present in this area as well, the construction of which may have formed the observed ridges and caused some of the slope movement. No signs of recent movement were observed in the area.

10.0 GEOLOGY

The geology of the site starts with the deposition of the bedrock soils in shallow seas present during the Cretaceous period. Clayey sandstone, shale, and bentonitic mudstones were formed at the bottom of these seas and are termed the Horseshoe Canyon Formation (Khc) of the Edmonton Group. For the Wedgewood Creek site, bedrock was not encountered in the testholes as is therefore not a factor at this site.

Long after the bedrock formation, but before the ice age, a river flowed through the Edmonton area which also had several significant tributaries. Deep granular deposits termed Saskatchewan sands and gravels were formed in this river. This river was not the North Saskatchewan River as this flowed after the ice age came and went.

The next major geologic event was the several advances of large ice sheets across most of North America. These large ice sheets plowed along the bedrock, then deposited a mixture of clay, silt and sand during their retreat, termed glacial clay till. A large lake formed over much of Edmonton near the end of the ice retreat. This lake deposited clay and silt soils, termed Lake Edmonton deposits. Aeolian deposits are present north of the site but no such soils were encountered in the site testholes.

The North Saskatchewan River flowed through central Edmonton after the glaciers retreated and Lake Edmonton had emptied, initially downcutting its valley into the lacustrine clays and glacial clay tills. Approximately 6500 years ago, the River bottom hit the harder bedrock soils and started migrating laterally. It was during the down cutting of the River that its tributaries formed downcutting their own valleys. Wedgewood Creek is one of these tributaries to the North Saskatchewan River.

The clay and silt encountered in the testholes are considered Lake Edmonton deposits while the clay till encountered below is considered a glacial deposit.

11.0 SOILS DESIGN PARAMETERS AND COMPUTER ANALYSIS

For slope stability modeling using GSlope software, the soil properties including unit weights and effective strength parameters were required. These values as summarized below were determined from evaluation of the field and laboratory data outlined in this geotechnical report and our experience in the Edmonton area.

Soil Type	Unit Weight (kN/m^3) γ	Effective Cohesion (kPa) (c')	Effective Angle of Friction (ϕ')
Clay or Silt	19	0	23-25
Clay Till	20	5	30

The groundwater table for the slope analysis was raised 4 meters from the recorded values to estimate the possible long-term rise in the watertable due to residential development. For seasonal fluctuation consideration, another 0.6 meters was added to the recorded values. It is noted that this long-term developmental watertable rise was limited to a maximum 2.0 meters below the existing ground surface as house basement weeping tile groundwater collection should prevent the watertable from rising higher.

It is noted that the effective cohesion value of the clay till is relatively low however the stability analysis showed a higher cohesion value in the till does not raise the slope factor-of safety (FOS). Raising the effective cohesion till value does not affect the setback analysis.

GSlope slope stability software and Bishop's Modified Method were utilized to obtain theoretical (FOSs) for the slope sections surveyed onsite. The point of interception of the ground surface with the 1.5 FOS and the 1.3 FOS were obtained for each section. Circular slip surfaces were deemed appropriate for the computer analysis and translational failure surface were not deemed necessary. Drawings showing the GSlope analysis along with the slope profiles are located in Appendix C.

The slope profiles utilized in the GSlope computer analysis were produced at locations chosen by Hoggan from the LIDAR plans of the site supplied by Stantec. The profile locations were selected as representative of the various portions of the overall slope profiles. A

surveyed/geo-referenced top-of-bank line was also forwarded to our office by Stantec and was stated to be the official top-of-bank line as defined in the City of Edmonton top-of-bank Policy C542. The LIDAR data is located in Appendix B and profile locations are shown on a drawing located in Appendix C.

12.0 SLOPE DISCUSSION AND RECOMMENDATIONS

In general, the purpose of this slope stability assessment is to provide recommended setback distances from the top-of-bank so that for the 150 year design period, any future slope movement will not affect the development on the prairie surface. The juxtaposition is also important in that setting development away from the top-of-bank helps reduce the human impact on slope stability. This human impact is well documented in reviewed literature by others. Recommendations are provided later in this report that will help limit the impact of development on the slope. Land development in the City of Edmonton is guided by the Top-of-bank Policy C542 (2010) which should be followed for this project.

Setback distances were determined for this project based on all of assessment data, observations, and computer stability analysis. Engineering judgement was also used in establishing these distances and they are shown in the following table:

Recommended Setback Distances (m) Wedgewood Creek			
Cross Section	**Property Line/Road Setback**	**Building Setback**	**SWMF and Water Features**
7C	20	25	75
8C	20	25	75
9C	10	15	50
10C	10	15	50

The above recommended setbacks are shown on site plans in Appendix C. The setback distances should be measured from the established top-of-bank survey line as prepared by Stantec Consulting Ltd. Thus the setbacks can be geo-referenced from this recorded survey line.

It is noted that Hoggan modified this line in some areas to make it straighter and easier to measure the setbacks from. This modification always moved farther away from the Stantec top-of-bank line.

Based on our site observations and the Golder Erosion Study, the slope setbacks at this site do not require any allowance for future toe erosion.

It is considered general practice to setback buildings to a FOS of 1.5 or greater and roads to a FOS of 1.3 or greater, and this is also the City of Edmonton Top-of-Bank Policy (C542). Unoccupied structures such as decks and gazebos are considered acceptable to adhere to the UDL setback with care taken not to rigidly attach these structures to any buildings.

The protection of private property and public walkways in the City of Edmonton is not so universally accepted as buildings and roads. The developer, City of Edmonton, and future lot owners all have different perspectives on the acceptable risk for these items. It is understood that FOS of 1.3 is assigned to private property in the City of Edmonton top-of-bank policy. Hoggan has followed these items in our analysis and has provided a second line on our drawings showing the urban development line (UDL) which is another name for the road and property setback line.

The current City of Edmonton Policy states that a minimum 10 meter setback from the top-of-bank is required for property lines and roads for all new development. It is understood that the City of Edmonton Policy allows walkways within the area of the Top-of-bank and the development setback. Hoggan sees no site specific stability reasons not to follow this walkway policy.

The current City of Edmonton Policy states that in slope areas of higher geotechnical risk, a top-of-bank road should be the predominant development type. In our opinion, none of the slopes in this study are a high enough risk for this policy item to apply.

The following design and construction recommendations are very important to help maintain the stability of the slope and limit the human impacts upon the river bank.

Park walkways should not concentrate surface water run-off at any locations on the top-of-bank. Asphaltic concrete walkway surfacing is acceptable for this site. Disturbance to the existing vegetation should be minimized and the vegetation replaced where disturbance occurs outside the path area. Walkways should be set as near to the development setback line as possible. Hoggan should review walkway locations prior to final design.

All structures adjacent to the top-of-bank setbacks should have weeping tile and roof leaders connected to the storm sewer. Lot grading should direct water away from the ravine where possible. Split drainage of the top-of-bank lots is acceptable. No water should be allowed to collect or concentrate, and drain over the top-of-bank. A small amount of diffuse surface lot drainage is acceptable. Any surface erosion should be immediately corrected and vegetation started to prevent further erosion.

No fills or other loads should be placed within the top-of-bank and property line or road. Fills on top-of-bank lots should be limited to 0.5 meters. Fills of greater depths should be further analysed by Hoggan for the effect on slope stability. No over bank dumping should be allowed. Slope below the top-of-bank should not be disturbed, unless properly engineered and maintained for features like public stairs or walkways for ravine access.

It is good practice for top-of-bank development that sources of water should be eliminated or minimized. Lawns should not be over watered and significant vegetation free areas should not be utilized. Swimming pools, ornamental ponds, and other bodies of water are not recommended within 50-75 meters of the top-of-bank. In addition, no underground automatic watering should be permitted within 50-75 metres of the top-of-bank as leaks in these pipes can go unnoticed for a long time. Stormwater management facilities are not recommended within 50-75 meters of the top-of-bank unless further analysis is performed. These water feature setbacks are shown on the drawings in Appendix C.

All underground utility lines, especially waterlines and hydrants, near the top-of-bank should be carefully constructed to help prevent leaks. The standard exfiltration rates from well-constructed sewers should not affect the stability of the subject slopes provided the setbacks are maintained.

13.0 CLOSURE

This report has been prepared for the exclusive and confidential use of Qualico Developments West Ltd., Walton Development and Management LP, City of Edmonton, MMM Group, Stantec Consulting Ltd., and their authorized agents. Use of this report is limited to the subject Wedgewood Creek site only. The recommendations given are based on the subsurface soil conditions encountered during test boring, current construction techniques and generally accepted

engineering practices. No other warranty, expressed or implied, is made. Due to geological randomness of many soils formations, no interpolation of soil conditions between or away from the testholes has been made or implied. Soil conditions are known only at the test boring location. Should other soils be encountered during construction or other information pertinent becomes available, the undersigned should be contacted as the recommendations may be altered or modified.

With regards to the slope stability assessment conducted for the subject property, the Owner(s) should be aware that our analysis has endeavoured to describe the risk of developing at this site, and limit the risk with engineering analysis. The risk can only be limited and not eliminated, therefore slope movement risk must be accepted by all current and future landowners.

We trust this information is satisfactory. If you should have any questions, please contact our office.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Apr. 4/14

Rick Evans, P. Eng.
Manager, Geotechnical Engineering

Reviewed by,
Abe Rahime, P. Eng.

APEGA Permit to Practice #P3691

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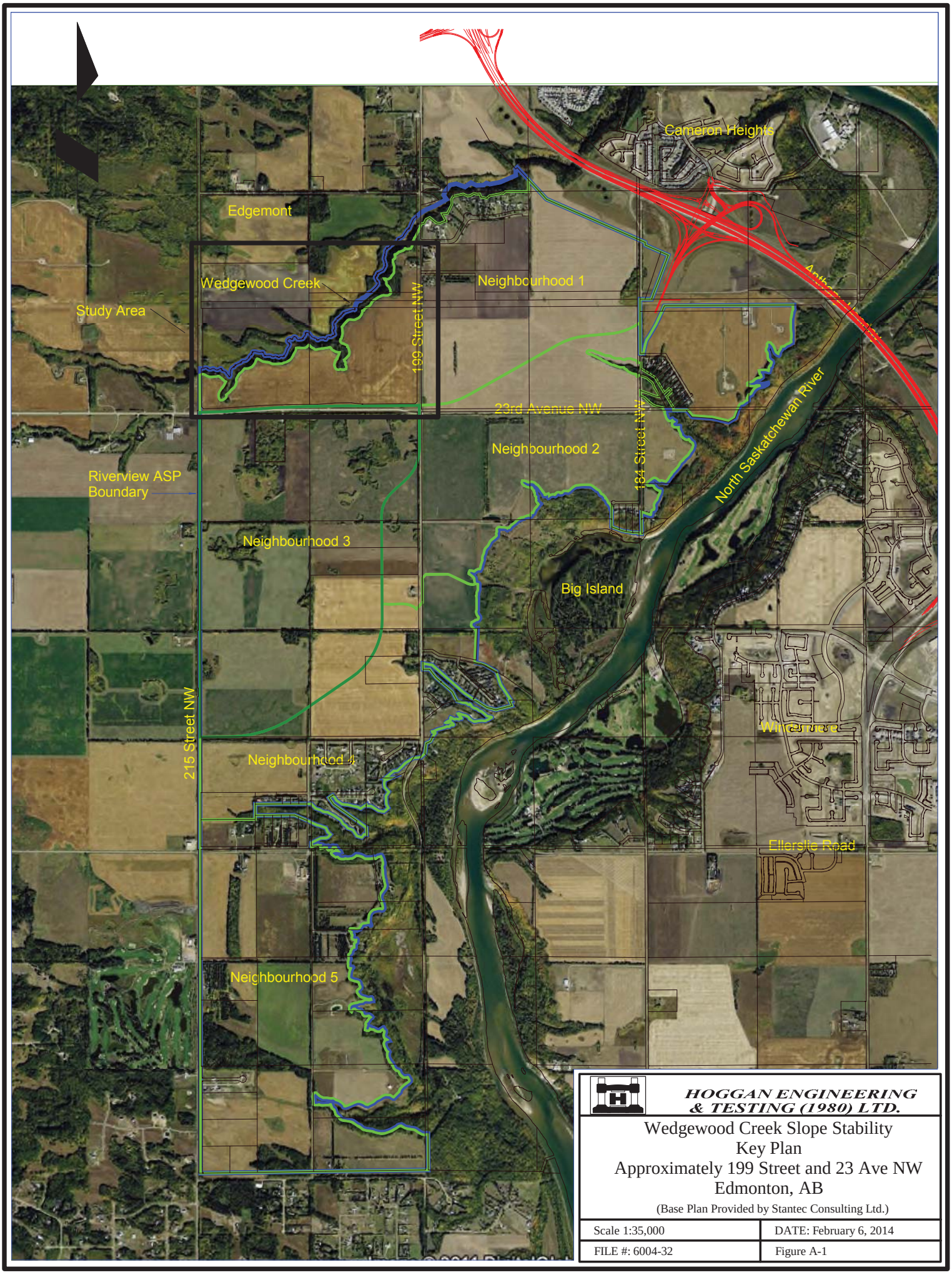
APPENDIX A
Site Plans and Testhole Logs



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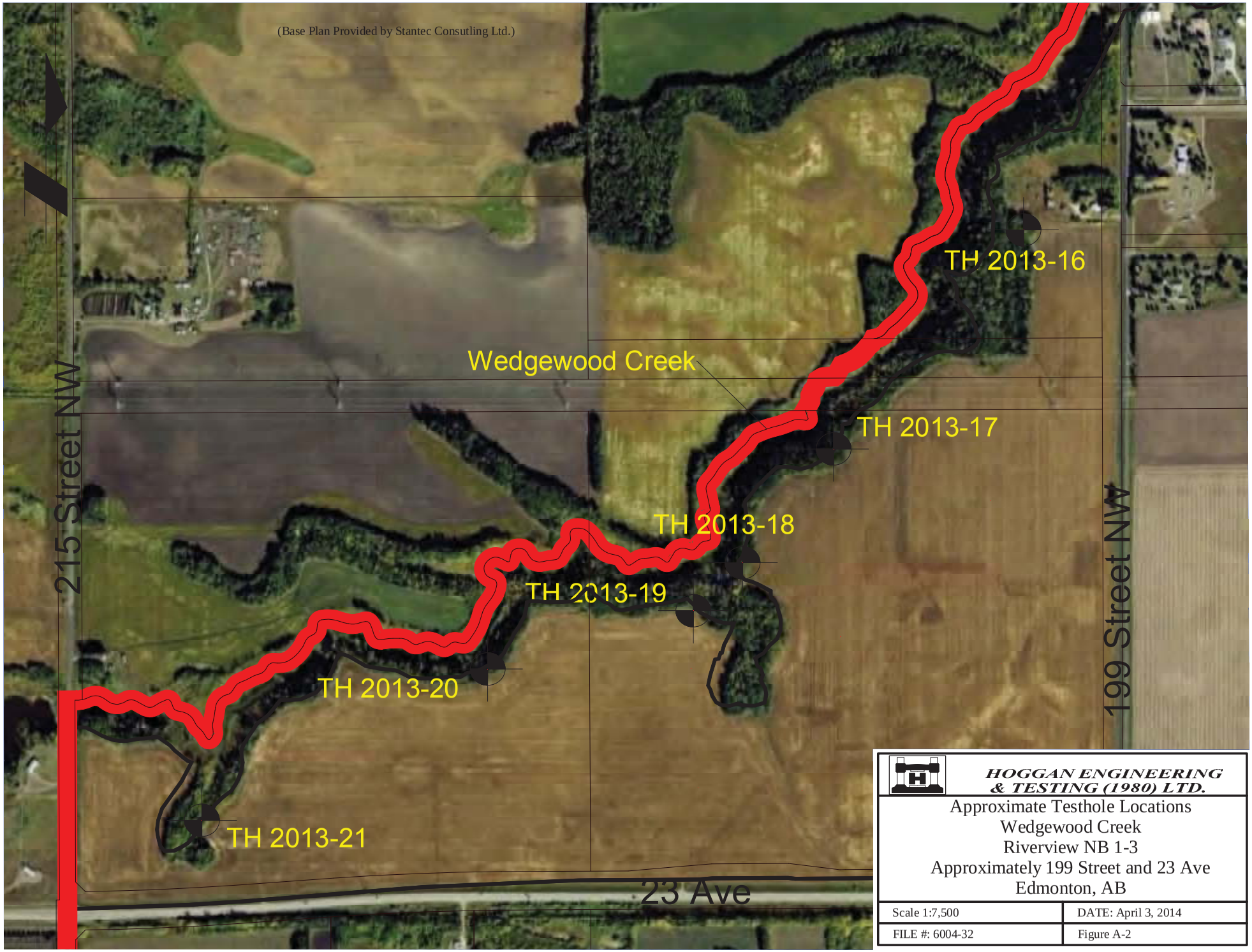
Wedgewood Creek Slope Stability
Key Plan
Approximately 199 Street and 23 Ave NW
Edmonton, AB

(Base Plan Provided by Stantec Consulting Ltd.)

Scale 1:35,000	DATE: February 6, 2014
FILE #: 6004-32	Figure A-1



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Approximate Testhole Locations
Wedgewood Creek
Riverview NB 1-3
Approximately 199 Street and 23 Ave
Edmonton, AB

Scale 1:7,500	DATE: April 3, 2014
FILE #: 6004-32	Figure A-2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-16**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem	ELEVATION: 690.3 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	Elevation (m)
0	OR	**TOPSOIL** : very sandy, very silty, non to low plastic, moist, friable, dark brown to black — 350 mm			690
1	ML	**SILT** : sandy, non to low plastic, friable, light brown to black, trace organics - Below 0.6 m: light brown, no organics - Below 1.2 m: moist to very moist		5	689
2					688
3	CL	**CLAY** : silty, sandy, low plastic, very moist, soft to friable, light brown — 2.7 m		15	687
4	CI	**CLAY** : silty to very silty, medium plastic, moist to very moist, stiff, brown and grey mottled, trace oxides — 4.0 m		10	686
5					685
6		- Below 6.1 m: very moist, firm, olive grey to dark grey, trace coal — 7.0 m		10	684
7		**SILT** : trace clay, low plastic, wet, soft to firm, brown, trace oxides		5	683
8		- Below 7.6 m: very soft, olive grey			682
9		- Below 9.1 m: wet, olive grey to dark grey		6	681
10				7	680
11		- Below 10.7 m: clayey, low to medium plastic in seams, dark grey, trace sensitive		5	679
12	ML	- Below 12.2 m: wet, very soft, dark grey		6	678
13					677
14		- Below 13.7 m: sensitive, trace free water		7	676
15					675
16				17	674
17		**CLAY TILL** : silty, sandy, medium plastic, moist to very moist, stiff, dark grey, trace coal and gravel — 16.6 m		22	673
18	CI				672
19				22	671
20					

SPT (N) values: 5.7, 7.9, 12.9, 19.5, 14.8, 21.1, 24, 32.8, 36.6, 34.7, 34.7, 38, 39.3, 38.6, 37.4, 35.5, 37.4, 32.1, 29.4, 33, 36.1, 32.7, 31.1, 31.7, 31, 33.4, 31.9, 31.8, 31.2, 31.9, 30.9, 29.5, 27.7, 16.8, 17.6, 16.7, 18.6, 17.3, 14.3

POCKETPEN. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

OTHER DATA

P.L. = 21.1 L.L. = 29.4 M.C. = 32.1

Soluble Sulphates: Negligible

Sieve Analysis
Gravel: 0 %
Sand: 2.5 %
Fines: 97.5 %

-At 19.1 m: to much slough in testhole, switched to hollow stem

Well 1: 9.13

Well 1: 681.17

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LOGGED BY: D. Trommelen	COMPLETION DEPTH: 31.00 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/8/13
Fig. No: 16	Page 1 of 2

JRP 6004-32.GPJ JRPV3_0.GDT 2/7/14

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-16**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem	ELEVATION: 690.3 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL SYMBOL	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOTTED PIEZOMETER	Elevation (m)
20									670
21		CI	-At 20.6m: silty, sandy, medium plastic, moist to very moist, stiff, dark grey, trace coal and gravel		17	15.8 ▲			669
22			- At 22.0 m: hard drilling, possible rock near auger tip		50@ 3"				668
23									667
24		CI	- At 23.6 m: moist, very stiff, dark grey, trace coal and gravel		32	15.3 ▲			666
25			-At 25.2m: no recovery		21				665
26									664
27		CI	-At 26.7m: moist, very stiff, dark grey, trace coal and gravel		21	15.4 ▲			663
28		CI	-At 28.2 m: hard, trace coal and bedrock pieces		41	14.1 ▲			662
29									661
30		CI	-At 29.7m: hard drilling, poor recovery in SPT		50@ 1"	10.6 ▲			660
31			**END OF TESTHOLE @ 31.0 m.** No water and 11.2 m of slough on completion of testhole. Well 1: Slotted standpipe installed to 19.8 m.						659
32									658
33									657
34			11 day waterlevel reading: 9.05 m bgs.						656
35			25 day waterlevel reading: 9.17 m bgs.						655
36			62 day waterlevel reading: 9.13 m bgs.						654
37									653
38									652
39									651
40									

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LOGGED BY: D. Trommelen	COMPLETION DEPTH: 31.00 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/8/13
Fig. No: 16	Page 2 of 2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-17**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.3 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL SYMBOL	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOTTED PIEZOMETER	Elevation (m)
0		OR	**TOPSOIL/ORGANICS** 300 mm						689
1		CI	**SILT** : clayey silty to very silty clay, medium plastic, damp, friable 1.2 m -Below 1.1m: sandy		12	5.4, 11			688
2						20.8			
3			**CLAY** : silty, sandy, medium plastic, moist, stiff, brown, trace oxides		8	29.6, 27			687
4			-Below 1.8m: silty to very silty, odd high plastic seam, very stiff, brown and grey			32			686
5		CI	-Below 4.0m: soft, wet		7	33.9, 34.4			685
6	Well 1: 7.68		-Below 6.1m: trace sensitive		7	36.2, 34.9, 35.5, 32.3		Well 1: 681.62	684
7			-Below 7.0m: trace sand seams		6	32, 35.3			683
8			-Below 7.6m: very moist to wet			33, 34.9, 35			682
9			-At 8.5m: trace free water on SPT 9.1 m		7	33.5, 33.1, 33.5, 29			681
10			**CLAY** : very silty, low to medium plastic, wet, very soft, grey		5	17.7			680
11		CL-CI				18.7, 13, 32.8	P.L. = 13.8 L.L. = 32.8 M.C. = 18.7 **Soluble Sulphates:** Negligible		679
12			12.2 m		9	18.3, 16.7, 16.9, 17.5, 16.6, 14.2	-At 11.6m: testhole squeezing		678
13			**CLAY TILL** : silty, sandy, medium plastic, moist, stiff to very stiff, grey, trace coal, oxides and gravel		15	13.3			677
14						14.4, 25.8			676
15					16	16, 16.2, 15.9, 16.2, 16.6, 13.9			675
16						14.7, 15.6, 15.2, 16.8, 18.4			674
17			-Below 16.5m: very stiff		24				673
18		CI	-At 17.5m: sand in SPT, possible slough		31				672
19									671
20					20				670
21									669
22					37				668
23									667
24					30				666
25			**END OF TESTHOLE @ 23.6 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 10.97 m.						665
26									664
27									663
28									662
29			7 day waterlevel reading: 7.72 m bgs. 21 day waterlevel reading: 7.80 m bgs.						661

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LOGGED BY: S MacFarlane	COMPLETION DEPTH: 23.62 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/12/13
Fig. No: 17	Page 1 of 2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-18**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.2 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	OTHER DATA	Elevation (m)
0	ML	**SILT** : very sandy, clayey, low plastic, damp to moist, friable, dark brown				689
1		-At 0.9m: approximately 100mm thick medium to high plastic clay lens, grey		11		688
1.1 m						
2		**CLAY** : very silty, medium plastic, moist, firm to stiff, light brown, some grey regions				687
3		-Below 2.4m: very moist, soft to firm, trace oxides		7		686
4				7		685
5	CI					684
6		-Below 5.8m: very moist to wet, very soft, dark brown, slightly sensitive		9		683
7				7		682
8						681
8.8 m				14		
9		**CLAY** : silty, sandy, medium to high plastic, moist, firm to stiff, trace coal, oxides and gravel, till like			P.L. = 16.8 L.L. = 46.0 M.C. = 28.9 **Soluble Sulphates:** Negligible	680
10	CI-CH	-Below 9.8m: very silty, very moist, slightly sensitive		10		679
11						678
11.9 m						
12		**CLAY TILL** : silty, sandy, medium plastic, moist, stiff, trace coal, oxides and gravel		12		677
13		-Below 12.2m: occasional high plastic lens		16		676
14						675
15	CI	-At 14.5m: free water noted on SPT		14	P.L. = 13.6 L.L. = 32.5 M.C. = 17.1 **Soluble Sulphates:** Negligible	674
16				15		673
17						672
18				16		671
19		**END OF TESTHOLE @ 18.0 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 17.98 m.				670
20						669
21						668
22		6 day waterlevel reading: 16.00 m bgs. 20 day waterlevel reading: 11.80 m bgs. 57 day waterlevel reading: 8.98 m bgs.				667
23						

Well 1: 8.98

Well 1: 680.22

POCKETPEN. (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

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LOGGED BY: B Burke	COMPLETION DEPTH: 17.98 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/13/13
Fig. No: 18	Page 1 of 1

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PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-19**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.1 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	SOIL SYMBOL	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	SLOTTED PIEZOMETER	Elevation (m)
0			ML-MI	**SILT** : sandy, low to medium plastic, damp to moist, friable, brown — 900 mm						689
1				**CLAY** : silty, sandy, medium to high plastic, damp to moist, very stiff, light brown						688
2				-Below 1.4m: very silty, moist, friable, trace oxides						687
3						7				686
4			CI-CH					P.L. = 20.3 L.L. = 53.8 M.C. = 31.8 **Soluble Sulphates:** Negligible		685
5				-Below 4.3m: very silty clay or clayey silt		9				684
6				-Below 5.2m: very moist, slightly sensitive -At 5.6m: high plastic seam, brown						683
7				-Below 6.4m: very soft, dark brown		11				682
8			CH	-Below 7.3m: very sensitive -Below 7.6m: transition to high plastic clay, less silt content — 8.5 m		7				681
9	Well 1: 9.10			**CLAY** : silty, high plastic, moist, stiff, dark brown to grey, some very silty zones		9			Well 1: 680.00	680
10			CH	-Below 8.8m: soft to firm, grey -Below 9.5m: very silty, very moist, firm, slightly sensitive — 10.8 m		7				679
11			SA	-Below 10.0m: sandy, grey, moist to very moist, trace coal — 11.9 m		10				678
12			CH	**SAND** : clayey, silty, medium to coarse grained, very moist to wet, trace gravel — 12.2 m						677
13				**CLAY** : very silty, wet slightly sensitive, soft		11				676
14				**CLAY TILL** : silty, sandy, medium to high plastic, very moist to wet, trace coal and gravel						675
15				-At 13.1m: sand seam, silty, coarse to medium grained, medium dense, wet, grey, trace gravel -Below 14.3m: very sandy, firm to stiff		20				674
16			CI			15				673
17										672
18						20				671
19										670
20				**END OF TESTHOLE @ 19.5 m.** 12.65 m of water and 12.65 m of slough on completion of testhole. Well 1: Slotted standpipe installed to 17.68 m.		24				669
21										668
22										667
23										666
24				6 day waterlevel reading: 16.40 m bgs. 20 day waterlevel reading: 12.49 m bgs. 57 day waterlevel reading: 9.10 m bgs.						665
25										

HOGGAN ENGINEERING & TESTING (1980) LTD.
17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: B Burke	COMPLETION DEPTH: 19.51 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/13/13
Fig. No: 19	Page 1 of 1

JRP 6004-32.GPJ JRPV3_0.GDT 2/7/14

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-20**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.9 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	Water Level	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		ML	**SILT** : clayey, damp to moist, friable, dark brown					689
			750 mm					
1			**CLAY** : silty to very silty, medium plastic, moist, light brown mottled grey, trace oxides		10	15.3, 24.8, 31.8		
2						34.1, 36.8		688
3			-Below 2.7m: very silty, very moist, soft to very soft, slightly sensitive		6	37.6		687
4	Well 1: 4.92	CI			4	39.2, 35.8		686
5			-Below 4.3m: very moist to wet, highly sensitive, very soft			38.3		685
6			-Below 5.8m: slightly sensitive, becoming dark brown and grey, very moist		7	39.3, 25.3		684
			6.4 m			33.4 (20.3 36.9)	P.L. = 20.3 L.L. = 36.9 M.C. = 33.4	
7			**CLAY** : silty, medium to high plastic, moist, stiff, grey, trace gravel and coal		8	32.4, 31.8	**Soluble Sulphates:** Moderate	683
8						26.8		682
9			-Below 8.8m: silty, sandy, till like		7	23.6, 23.4, 18.7		681
10		CI-CH				17.6, 20.3	**Shelby Tube:** QU: 152 kPa DD: 1751 Kg/m^3 MC: 20.3 %	680
11			-At 10.4m: very silty, slightly sensitive			19.6		679
12					9	23.4, 22.2		678
13						22.5, 21.4, 21.7		677
					19			
14			**END OF TESTHOLE @ 13.4 m.** 3.05 m of water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 11.58 m.					676
15								675
16			6 day waterlevel reading: 4.82 m bgs. 20 day waterlevel reading: 4.58 m bgs. 57 day waterlevel reading: 4.92 m bgs.					674
17								673

HOGGAN ENGINEERING & TESTING (1980) LTD.
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Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: B Burke	COMPLETION DEPTH: 13.41 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/13/13
Fig. No: 20	Page 1 of 1

JRP 6004-32.GPJ JRPV3_0.GDT 2/7/14

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-21**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.1 m
OWNER: Ownership Group	LOCATION: As per site plan	

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

Depth (m)	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa) / PLASTIC M.C. LIQUID	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL/ORGANICS** 200 mm					689
0	CI-CH	**CLAY** : silty, medium to high plastic, moist, very silty in seams, brown and grey 600 mm					
1		**CLAY** : very silty, medium plastic, stiff, dark brown, odd grey high plastic seams, firm to stiff with friable seams		11	22.7, 27.7		688
2					31.4		
2					30.3		687
3	CI-CH			8	18.7, 36.9, 52.3	P.L. = 18.7 L.L. = 52.3 M.C. = 30.3 **Soluble Sulphates:** Negligible	
3		Below 3.0 m: increased moisture, softer with depth			37.4		686
4					40.9, 39.8		
4				5			685
4		4.6 m			34.7		
5	CH	**CLAY** : silty, high plastic, stiff, grey 5.3 m			36.9, 36.1		684
5		**CLAY** : very silty, very moist to wet, soft, medium plastic, grey, sensitive		5			
6					33.8		683
7					32.5, 33.3		
7				2			682
8		At 7.9 m: high plastic clay seam			49		
8	CI				45.7		681
9				7	35.6		
9					35.5		680
10					40.5		
10				7	30.8		679
11		Below 10.7 m: very sensitive			31.1		
11					31.6, 33.5		678
11		11.9 m		8			
12		**NOTE** : drilled past 11.9 metre to find till. No till to 17.5 m					677
13							676
14							675
15							674
16							673
17							672
18		**END OF TESTHOLE @ 17.5 m.** No water and no slough on completion of testhole.					671
19							670
20							669
21		7 day waterlevel reading: 4.96 m bgs.					668
22		21 day waterlevel reading: 5.04 m bgs.					667
23		58 day waterlevel reading: 5.05 m bgs.					

Well 1: 5.05 m (Depth 4 m)

Well 1: 684.05 (Elevation 684 m)

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Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: S MacFarlane | COMPLETION DEPTH: 17.53 m

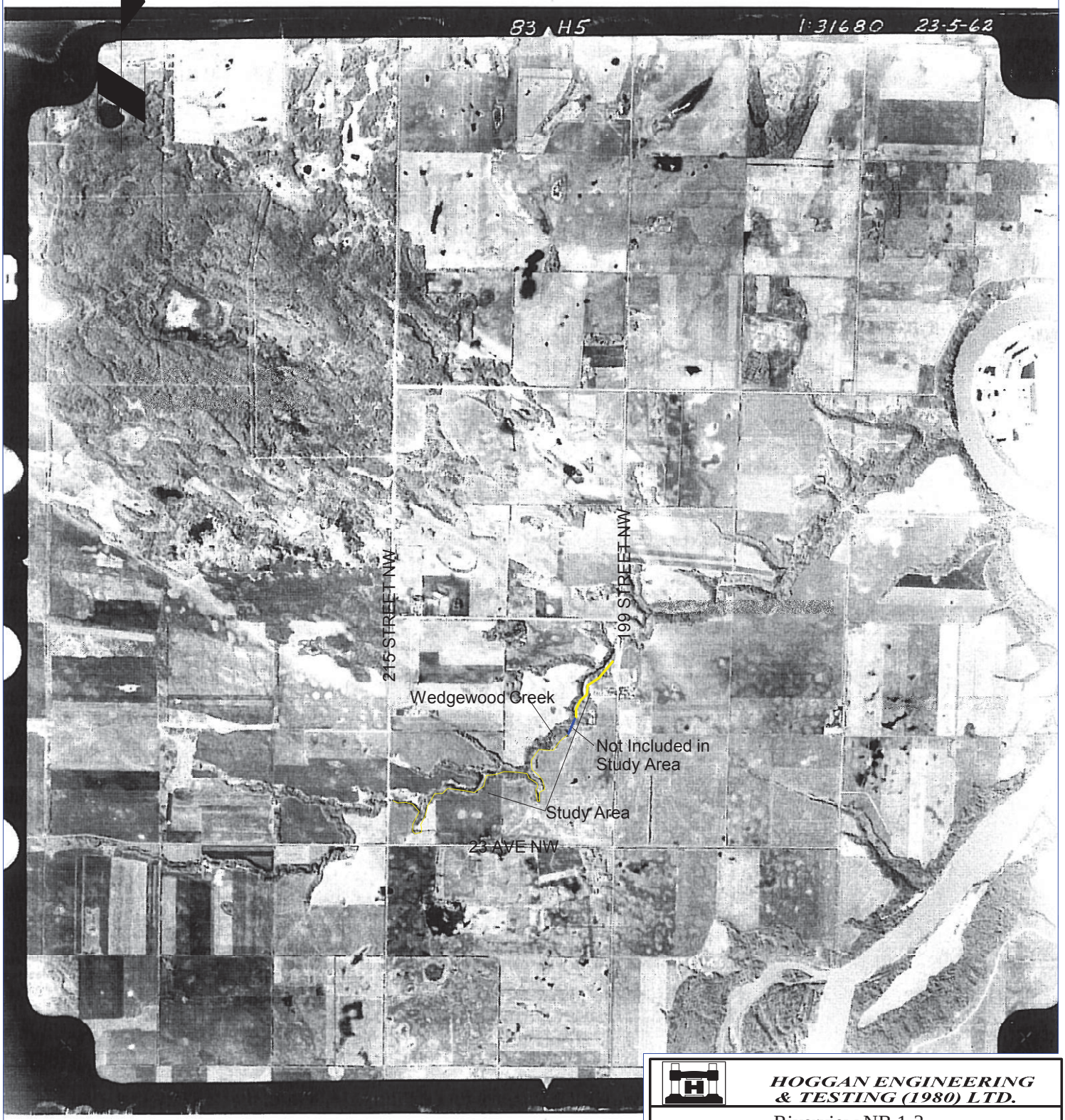
REVIEWED BY: R Evans | COMPLETION DATE: 11/12/13

Fig. No: 21 | Page 1 of 1

JRP 6004-32.GPJ JRPV3_0.GDT 2/7/14

APPENDIX B

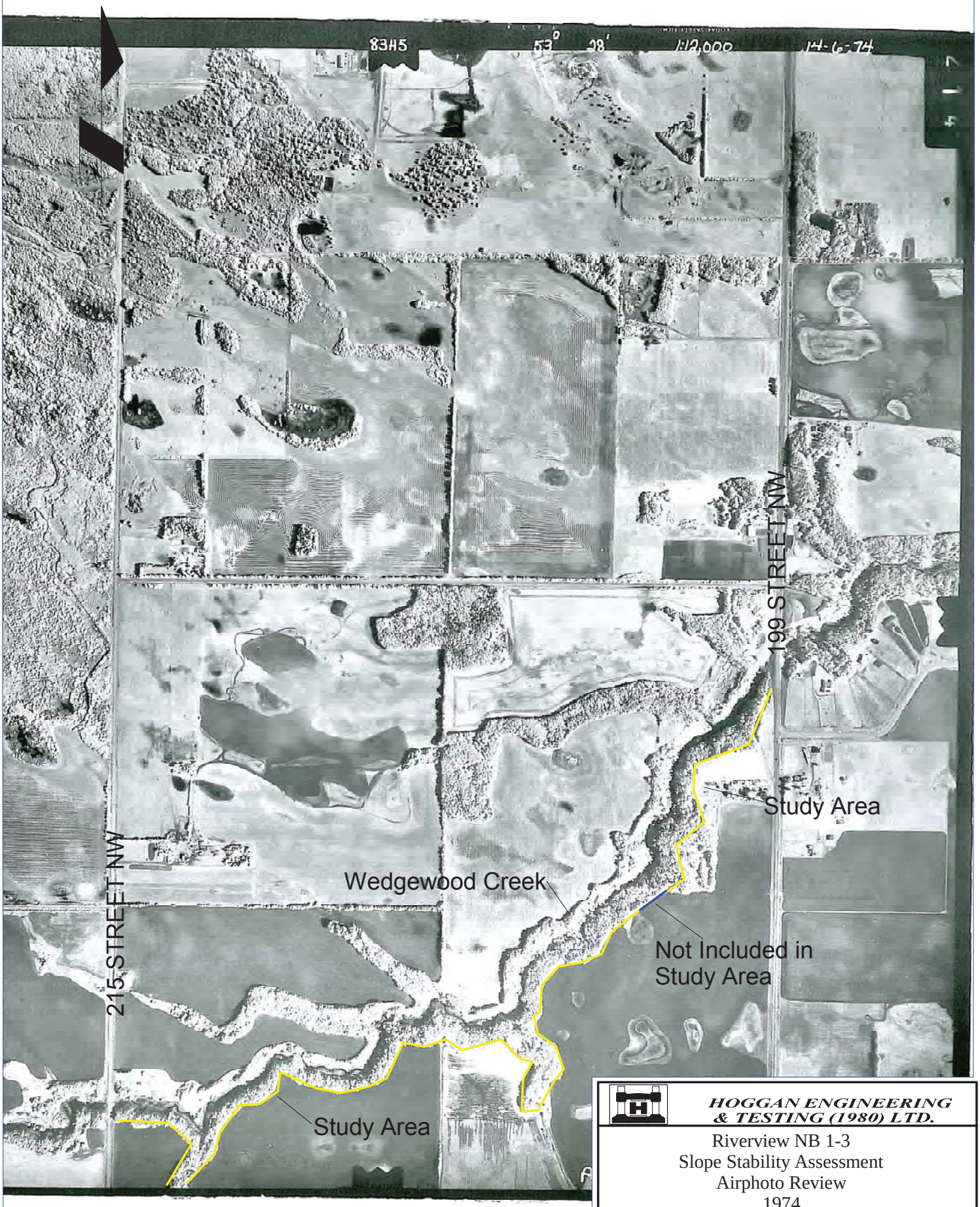
Air Photos, LIDAR Drawing, and Site Photos



HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Slope Stability Assessment
Airphoto Review
1962
Edmonton, AB

NOT TO SCALE	DATE: April 2, 2014
FILE #: 6004-32	Figure B-1



HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Slope Stability Assessment
Airphoto Review
1974
Edmonton, AB

NOT TO SCALE	DATE: April 2, 2014
FILE #: 6004-32	Figure B-2

HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Slope Stability Assessment
Airphoto Review
1993
Edmonton, AB

NOT TO SCALE	DATE: April 3, 2014
FILE #: 6004-32	Figure B-3

HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Slope Stability Assessment
Airphoto Review
2001
Edmonton, AB

NOT TO SCALE	DATE: April 3, 2014
FILE #: 6004-32	Figure B-4

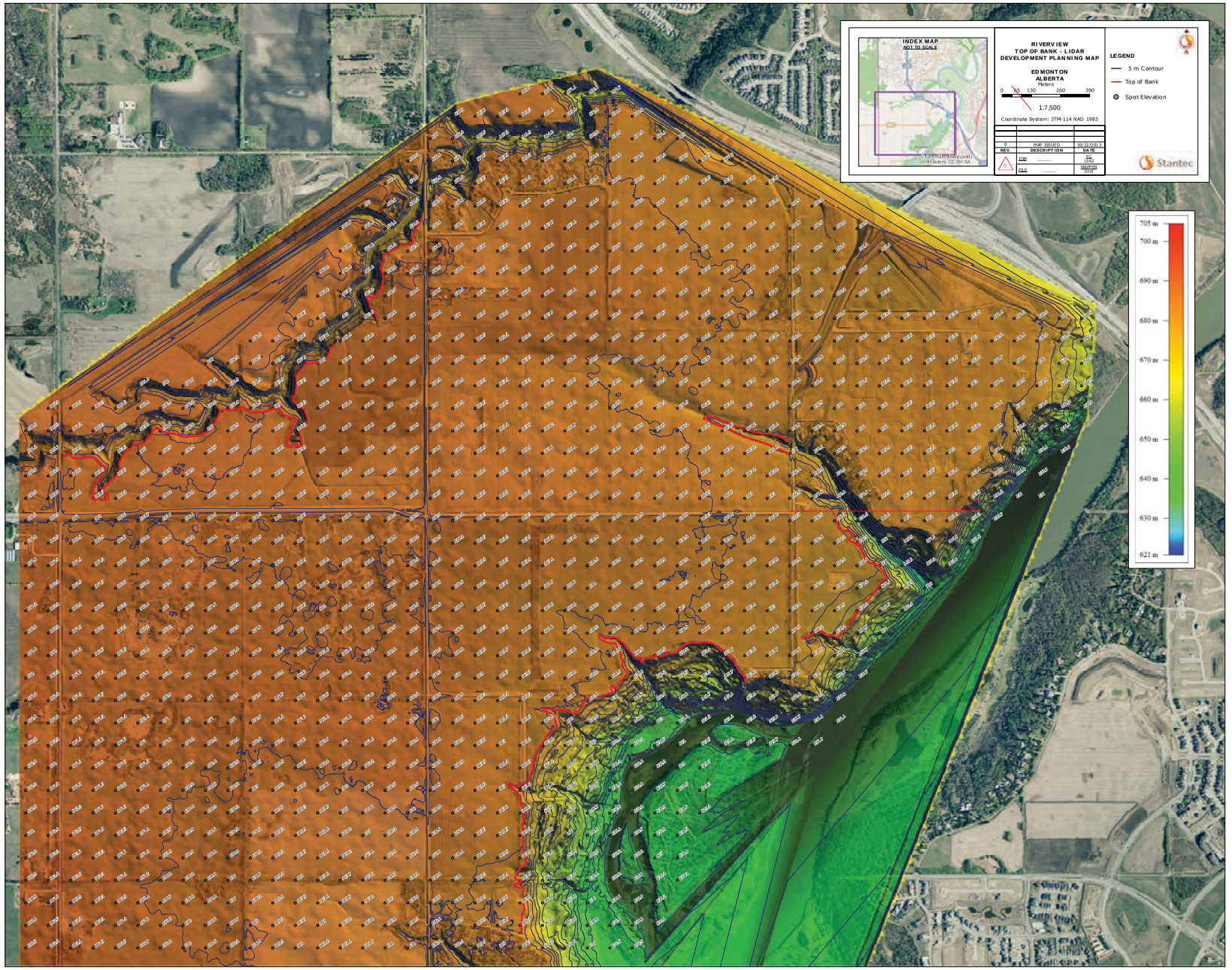

INDEX MAP
NOT TO SCALE
RIVERVIEW
TOP OF BANK - LIDAR
DEVELOPMENT PLANNING MAP
EDMONTON
ALBERTA
Meters
0 65 130 260 390
1:7,500
Coordinate System: 3TM-114 NAD 1983
REV.
DESCRIPTION
DATE
0
HAP ISSUED
10/27/2017
LEGEND
5 m Contour
Top of Bank
Spot Elevation
Stantec
705 m
700 m
690 m
680 m
670 m
660 m
650 m
640 m
630 m
621 m

Photo #1 – West end, 215 Street in background

Photo #2 – West end, toe area and beaver dam

Photo #3 – West end, typical vegetation cover

Photo #4 – West end, toe area and creek

Photo #5 – West end, beaver activity on slope

Photo #6 – West end, creek area

Photo #7 – Middle of site, toe area, shallow slope

Photo #8 – Middle of site, toe area

Photo #9 – East end, disturbed area

Photo #10 – East end, 199 Street berm

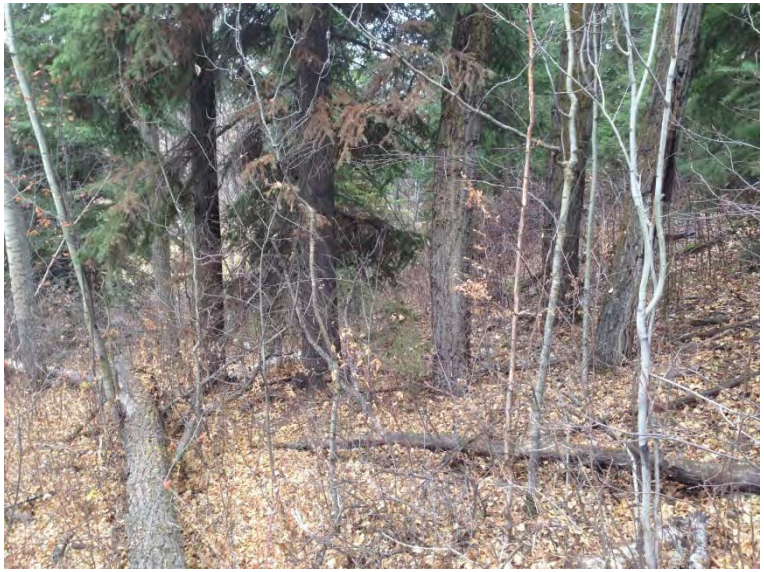


Photo #11 – East end, vegetation cover typcial

Photo #12 – East end, toe area and beaver dam

Photo #13 – Middle of site, toe area

Photo #14 – Middle of site, creek area, looking upstream

Photo #15 – Middle of site , toe area

Photo #16 – East end, creek area

Photo #17 – Middle of site, toe area

Photo #18 – Middle of site, toe area

Photo #19 – Tributary, erosion near outlet to creek

Photo #20 – Middle of site, overall slope

Photo #21 – Middle of site, top-of-bank area, typical

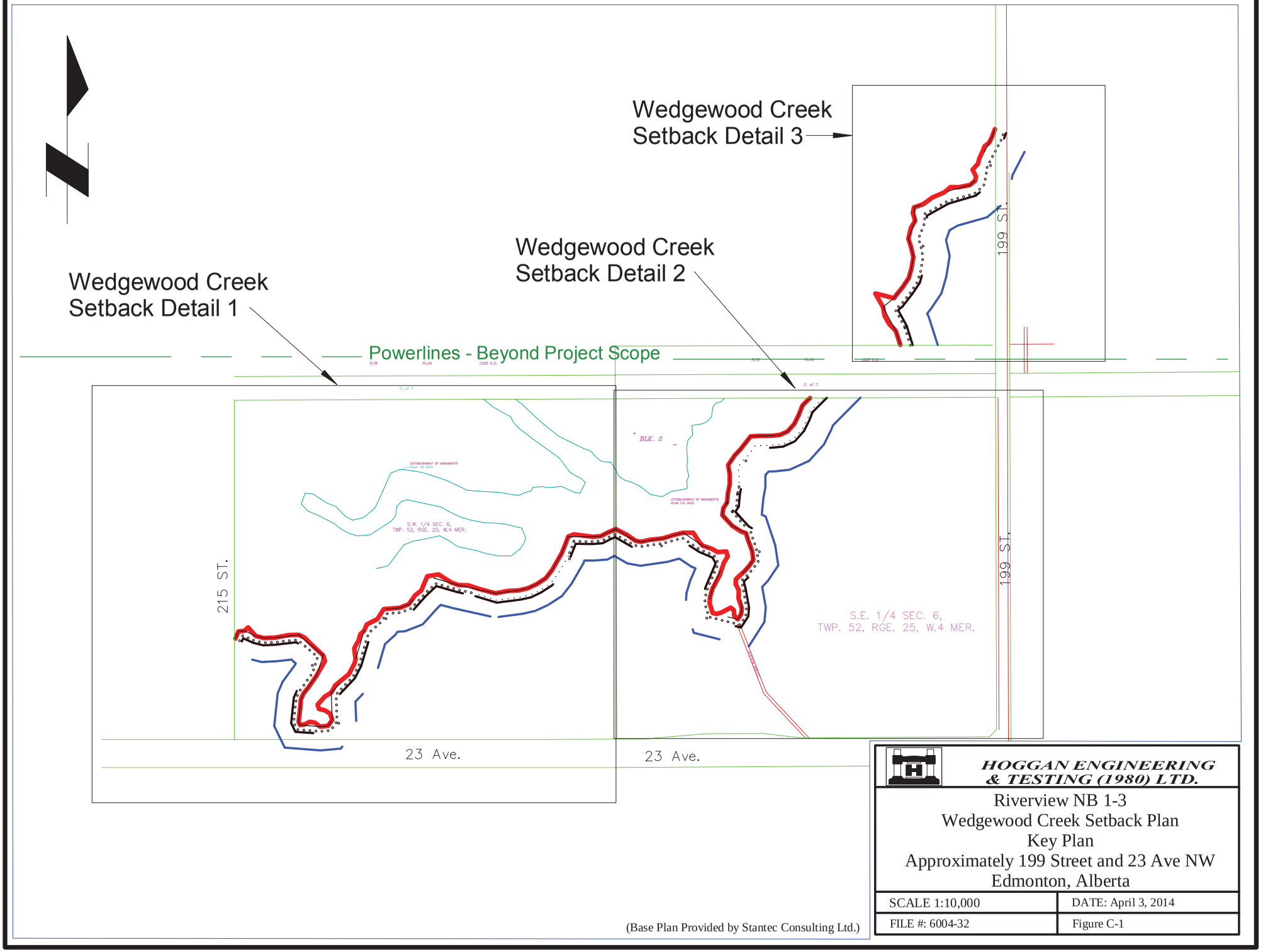
Photo #22 – Middle of site, top-of-bank area typical

Photo # 23 – Old movement area, south powerlines, upper slope

Photo #24 – Powerline area, offsite

APPENDIX C

Setback Drawings and GSlope Analysis Printouts

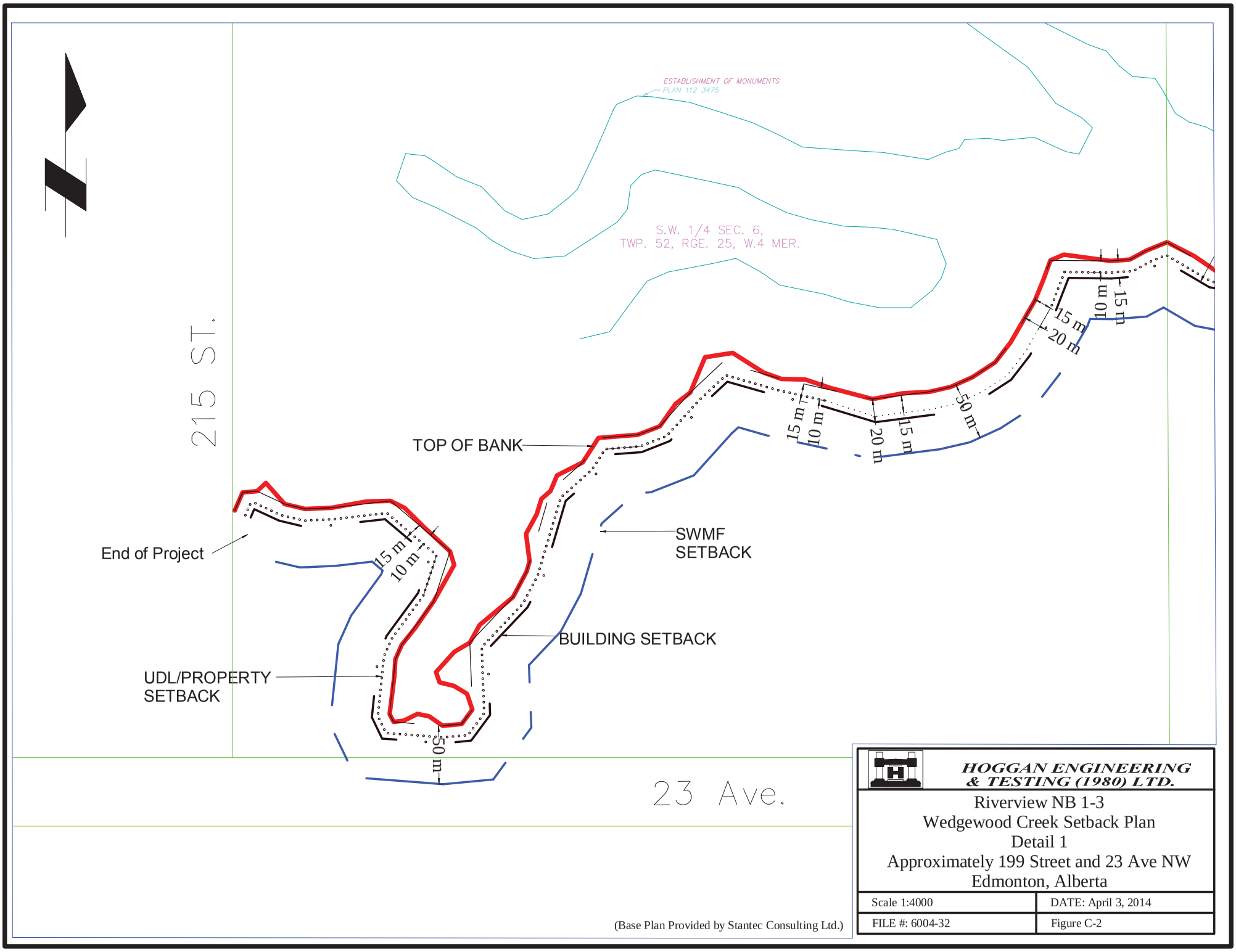


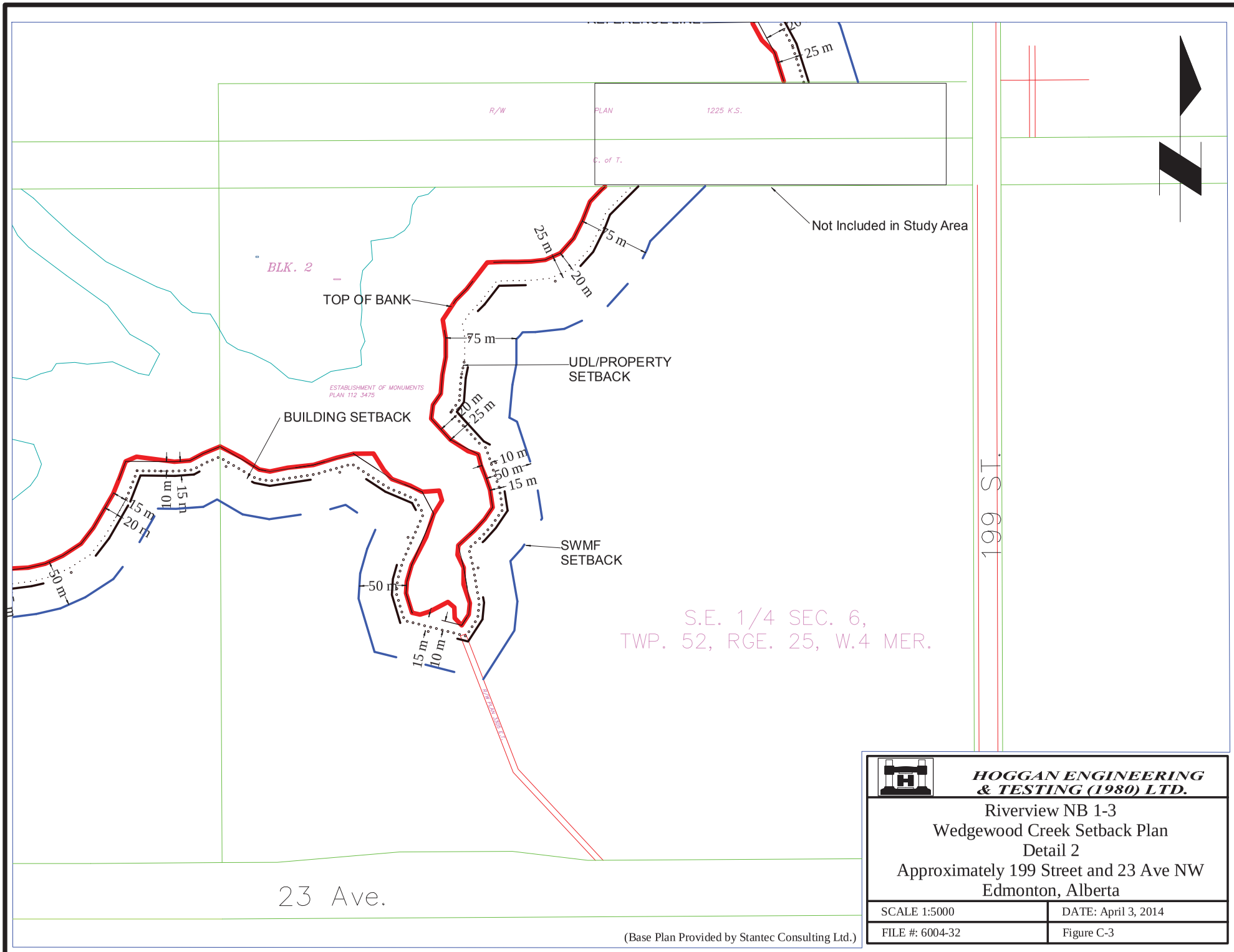
(Base Plan Provided by Stantec Consulting Ltd.)

HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Wedgewood Creek Setback Plan
Key Plan
Approximately 199 Street and 23 Ave NW
Edmonton, Alberta

SCALE 1:10,000	DATE: April 3, 2014
FILE #: 6004-32	Figure C-1

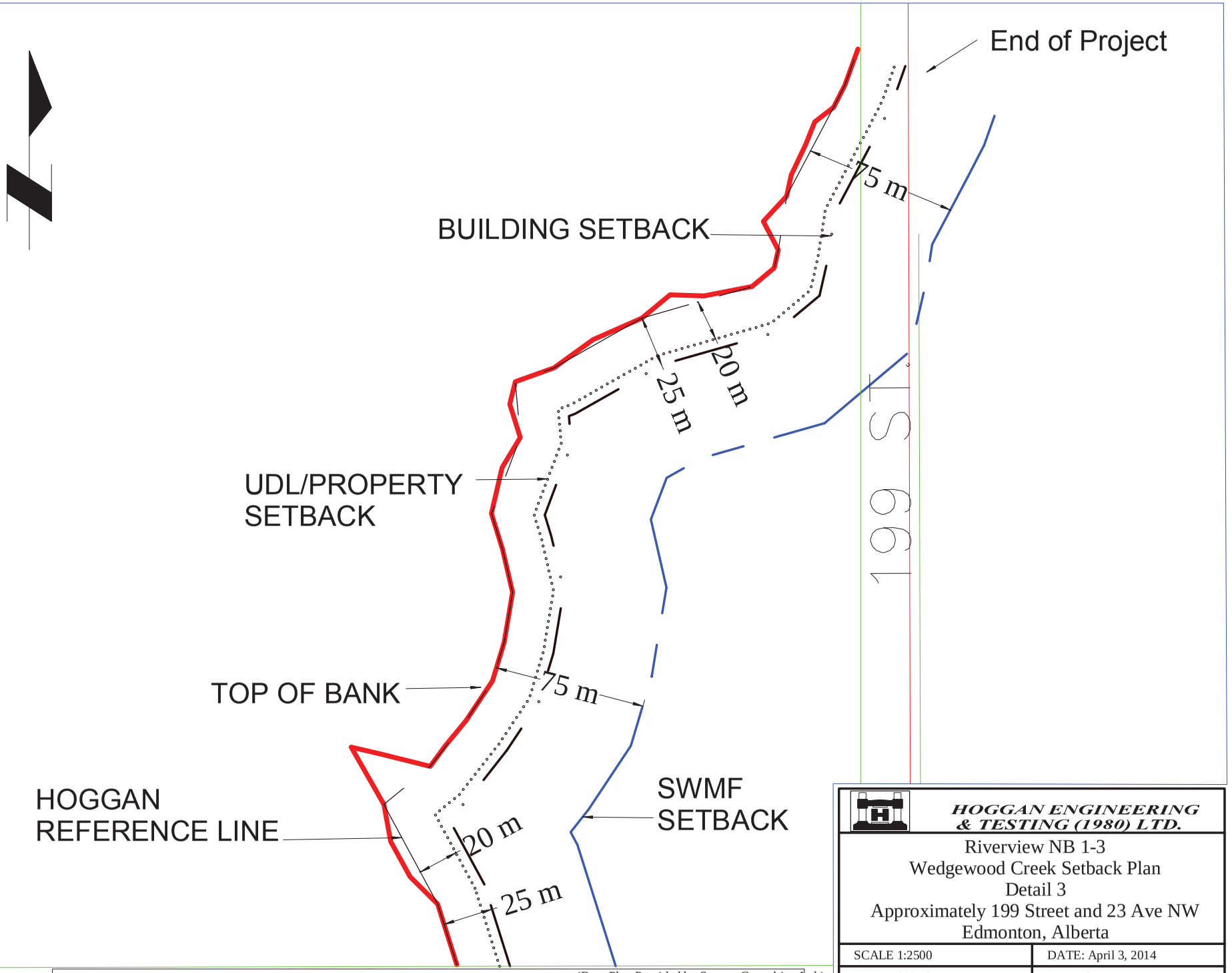

ESTABLISHMENT OF MONUMENTS
PLAN 112 3475
S.W. 1/4 SEC. 6,
TWP. 52, RGE. 25, W.4 MER.
215 ST.
TOP OF BANK
End of Project
SWMF
SETBACK
BUILDING SETBACK
UDL/PROPERTY
SETBACK
15 m
10 m
20 m
50 m
23 Ave.
(Base Plan Provided by Stantec Consulting Ltd.)
HOGGAN ENGINEERING
& TESTING (1980) LTD.
Riverview NB 1-3
Wedgewood Creek Setback Plan
Detail 1
Approximately 199 Street and 23 Ave NW
Edmonton, Alberta
Scale 1:4000
DATE: April 3, 2014
FILE #: 6004-32
Figure C-2



HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Wedgewood Creek Setback Plan
Detail 2
Approximately 199 Street and 23 Ave NW
Edmonton, Alberta

SCALE 1:5000	DATE: April 3, 2014
FILE #: 6004-32	Figure C-3

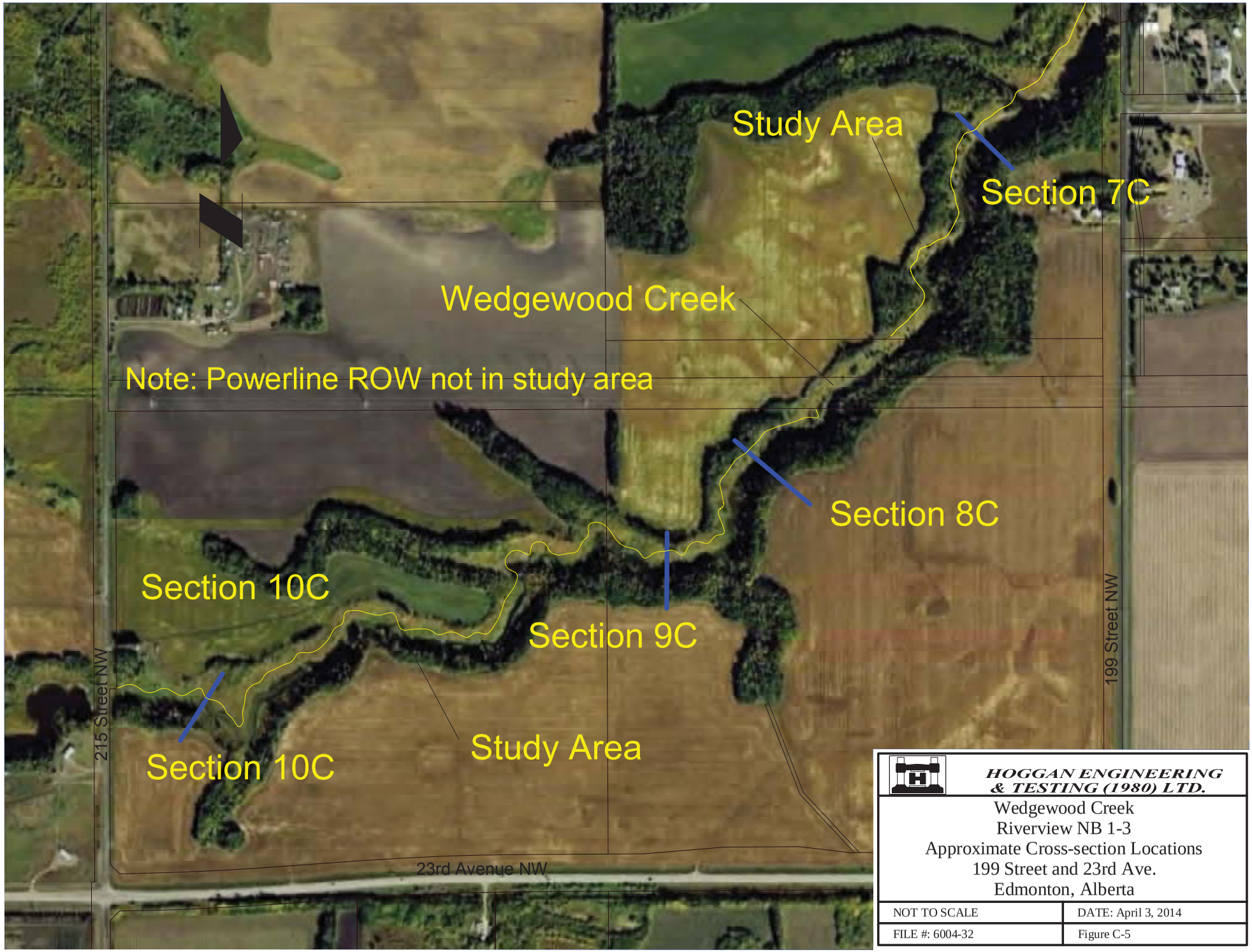


(Base Plan Provided by Stantec Consulting Ltd.)

HOGGAN ENGINEERING & TESTING (1980) LTD.

Riverview NB 1-3
Wedgewood Creek Setback Plan
Detail 3
Approximately 199 Street and 23 Ave NW
Edmonton, Alberta

SCALE 1:2500	DATE: April 3, 2014
FILE #: 6004-32	Figure C-4



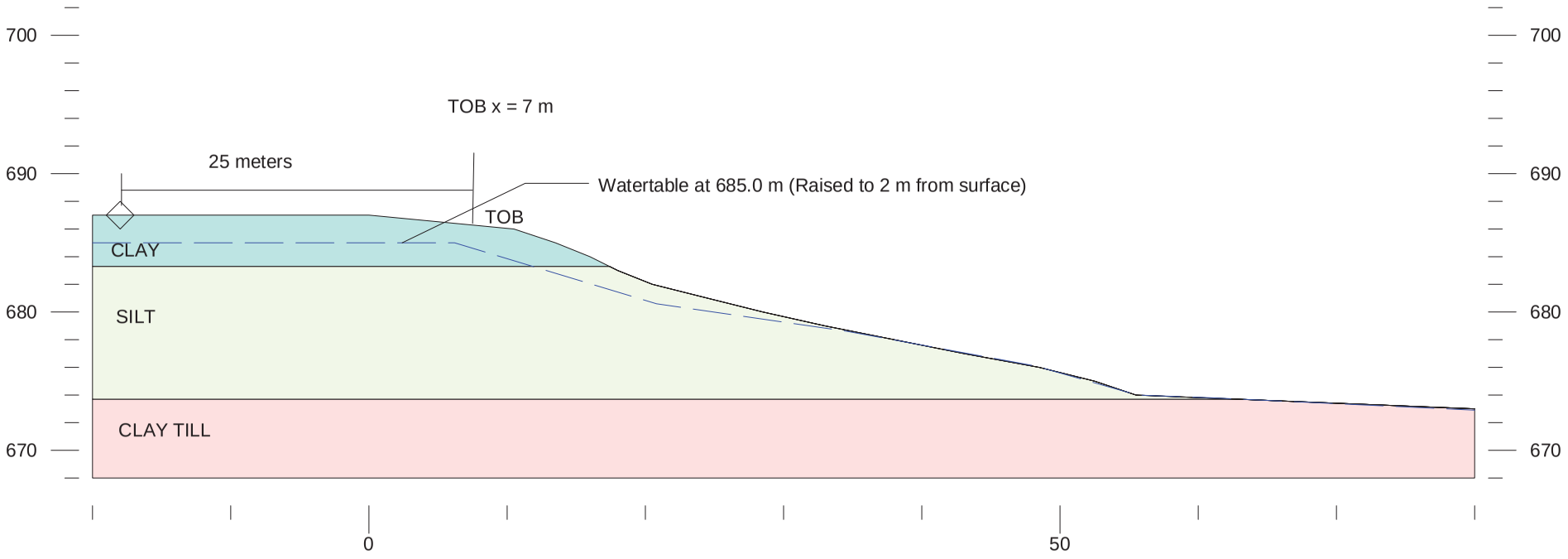
HOGGAN ENGINEERING & TESTING (1980) LTD.

Wedgewood Creek
Riverview NB 1-3
Approximate Cross-section Locations
199 Street and 23rd Ave.
Edmonton, Alberta

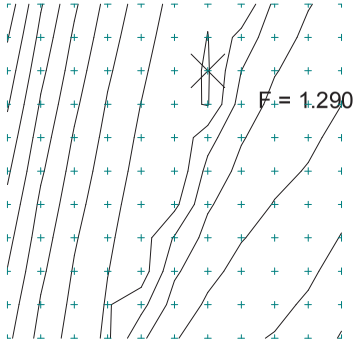
NOT TO SCALE	DATE: April 3, 2014
FILE #: 6004-32	Figure C-5

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Clay	19	0	25	1
Silt	19	0	23	1
Clay Till	20	5	30	1

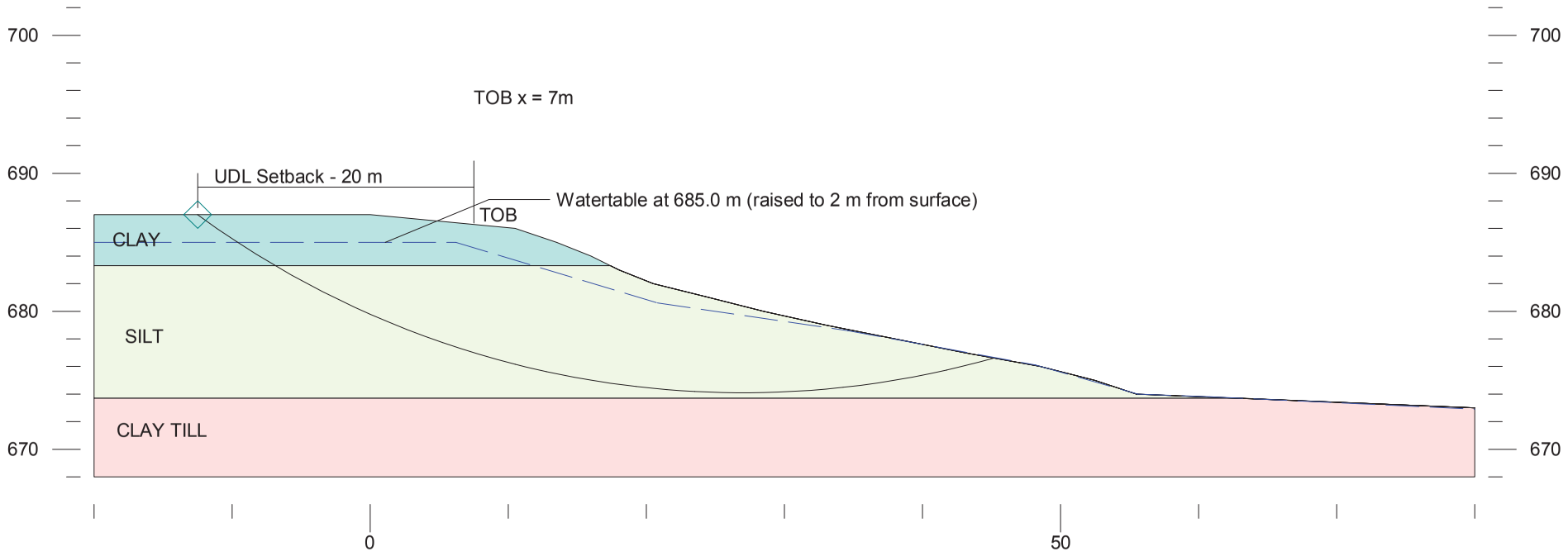
Hoggan Engineering & Testing Ltd.
6004-32
Riverview Neighborhoods 1-3
December 2013
Section 7C
Wedgewood Creek



	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Clay	19	0	25	1
Silt	19	0	23	1
Clay Till	20	5	30	1

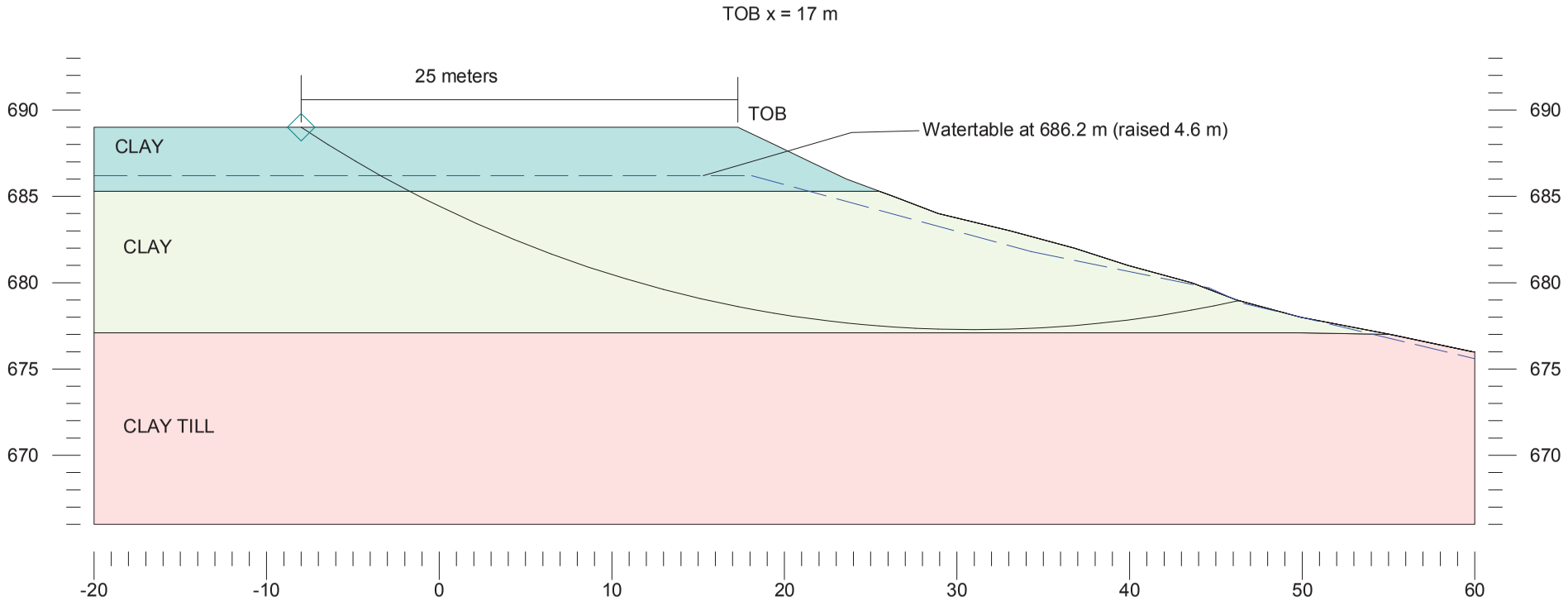


6004-32
Riverview Neighborhoods 1-3
December 2013
Section 7C
Wedgewood Creek



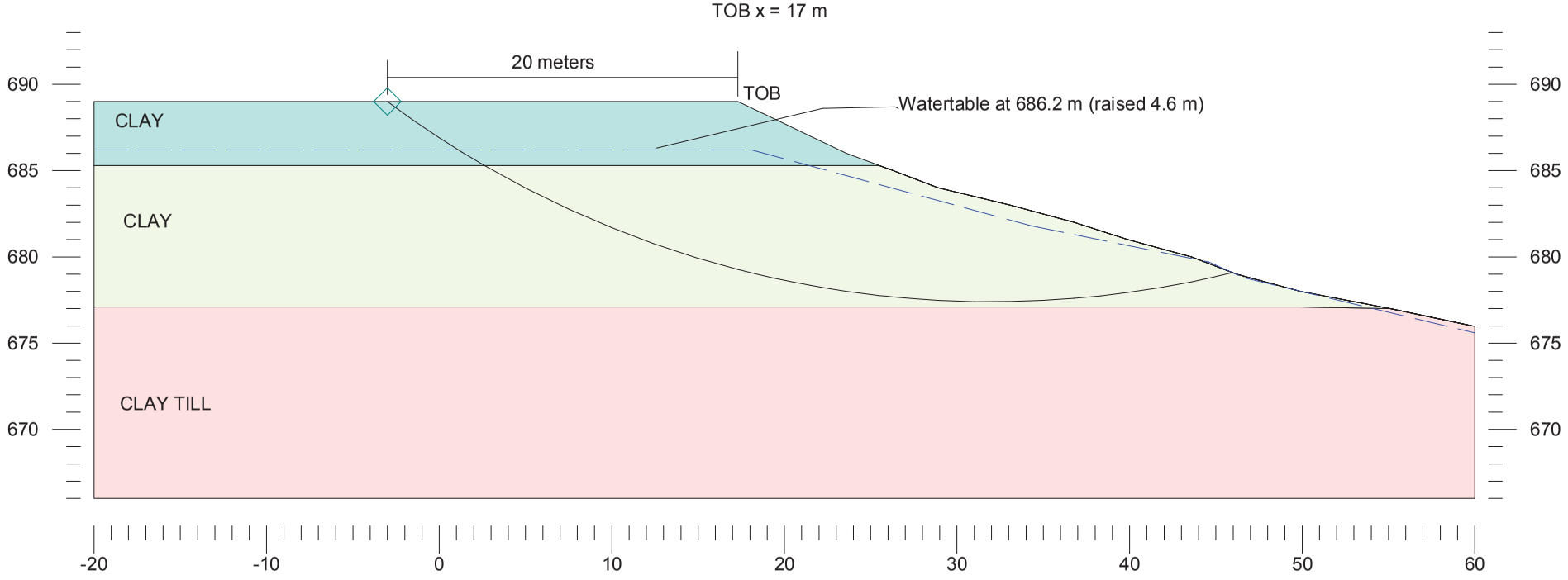
	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
CLAY	19	0	25	1
CLAY	19	0	23	1
CLAY TILL	20	5	30	1

6004-32
Riverview NB 1-3
December 2013
Section 8C
Wedgewood Creek



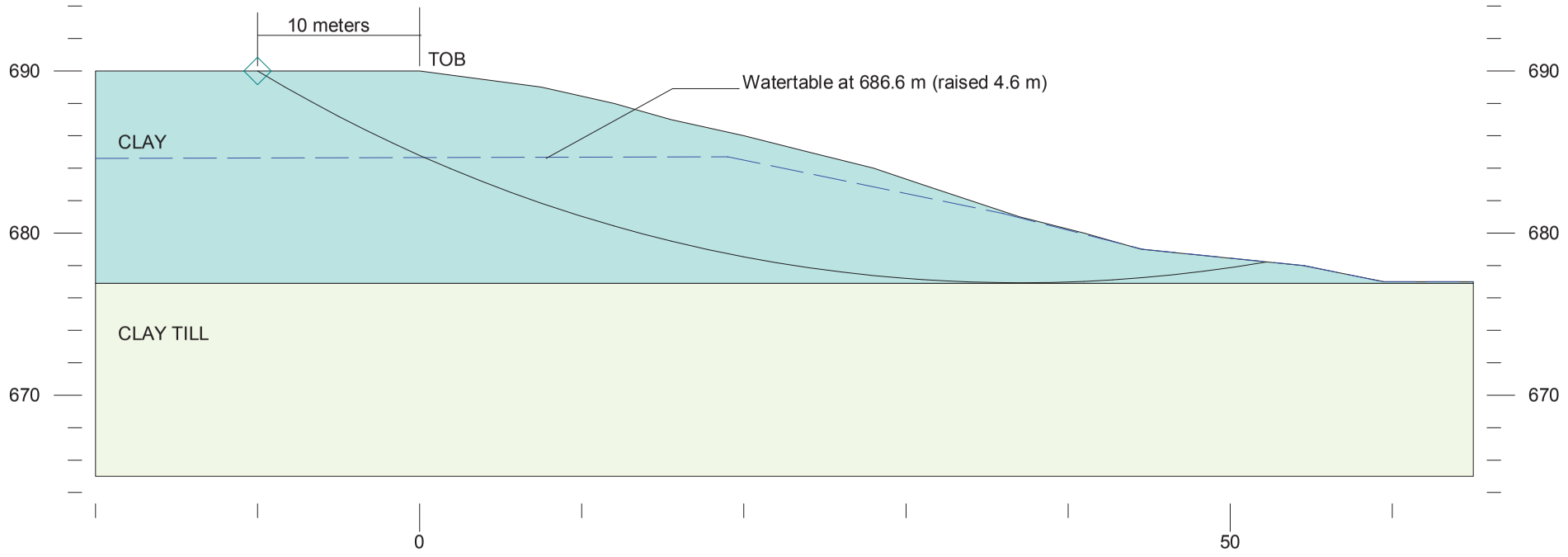
	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
CLAY	19	0	25	1
CLAY	19	0	23	1
CLAY TILL	20	5	30	1

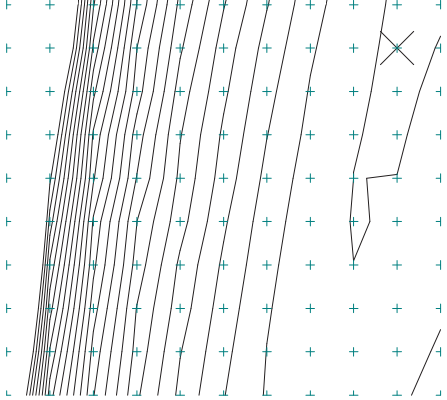
6004-32
Riverview NB 1-3
December 2013
Section 8C
Wedgewood Creek



	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
CLAY	19	0	25	1
CLAY TILL	20	5	30	1

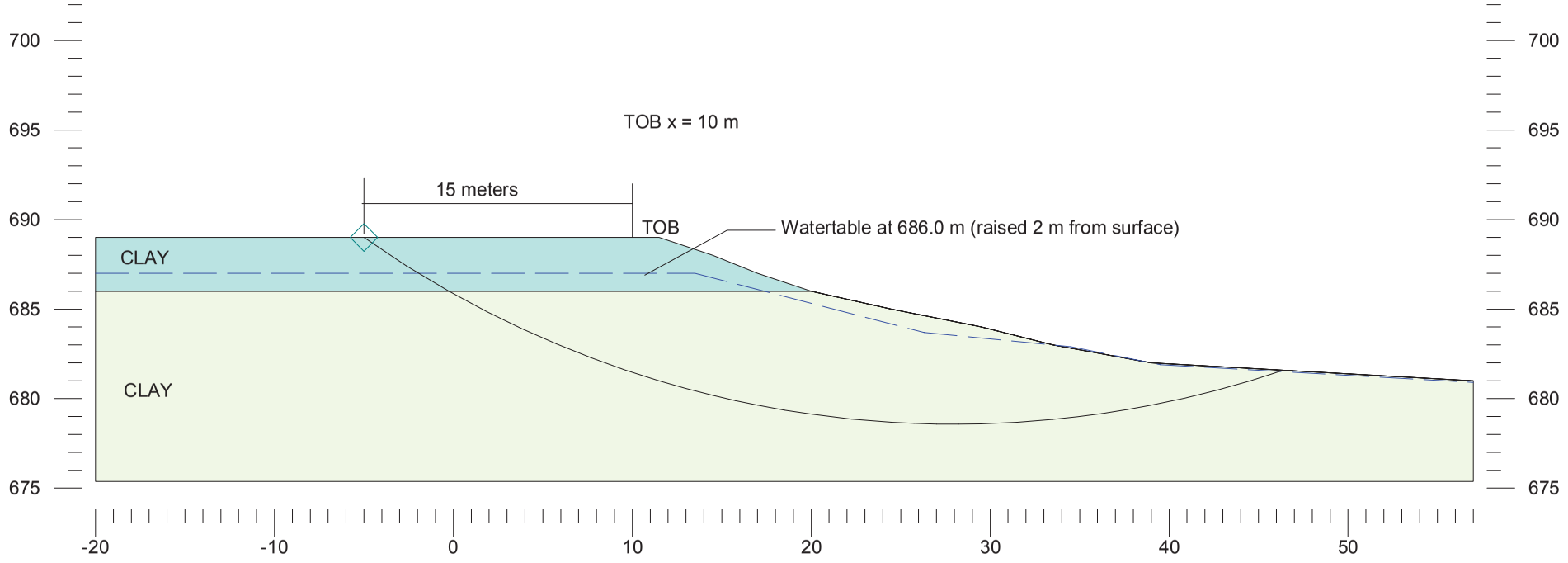
6004-32
Riverview NB 1-3
December 2013
Section 9C
Wedgewood Creek



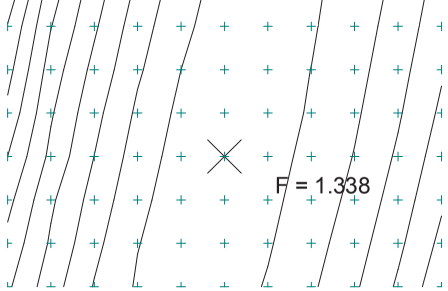


	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
CLAY	19	0	25	1
CLAY	19	0	23	1

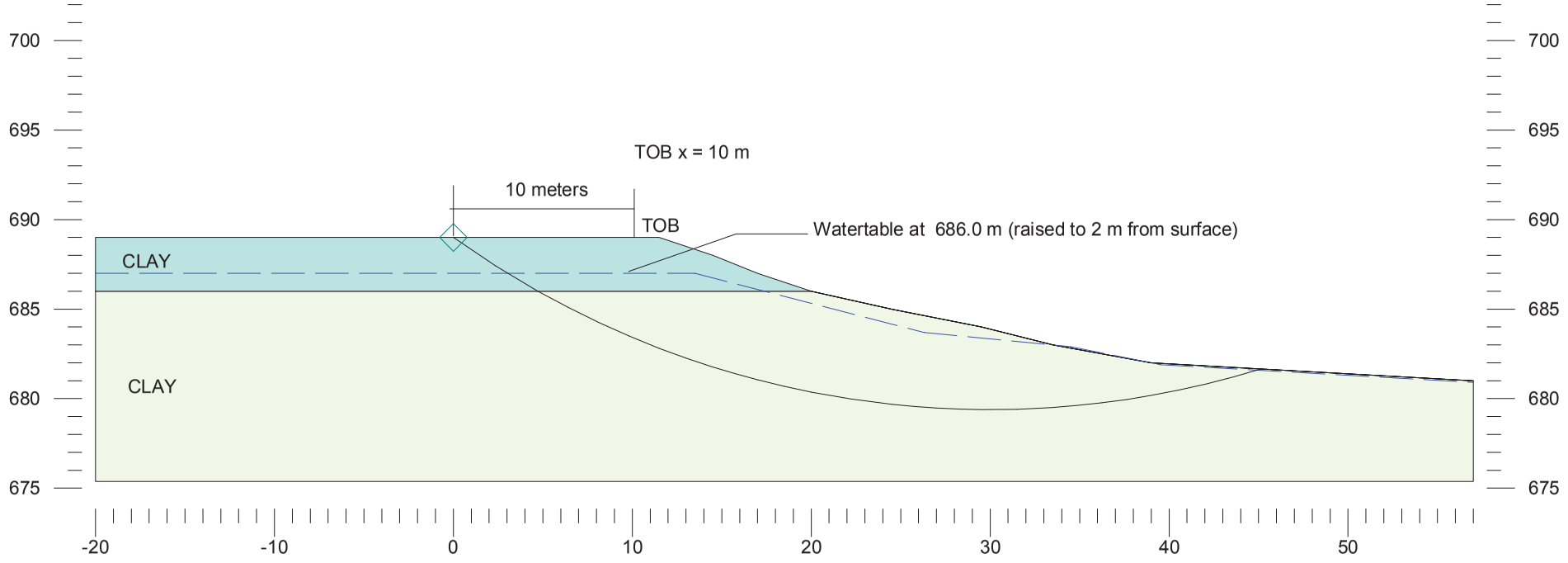
6004-32
Riverview NB 1-3
December 2013
Section 10C
Wedgewood Creek

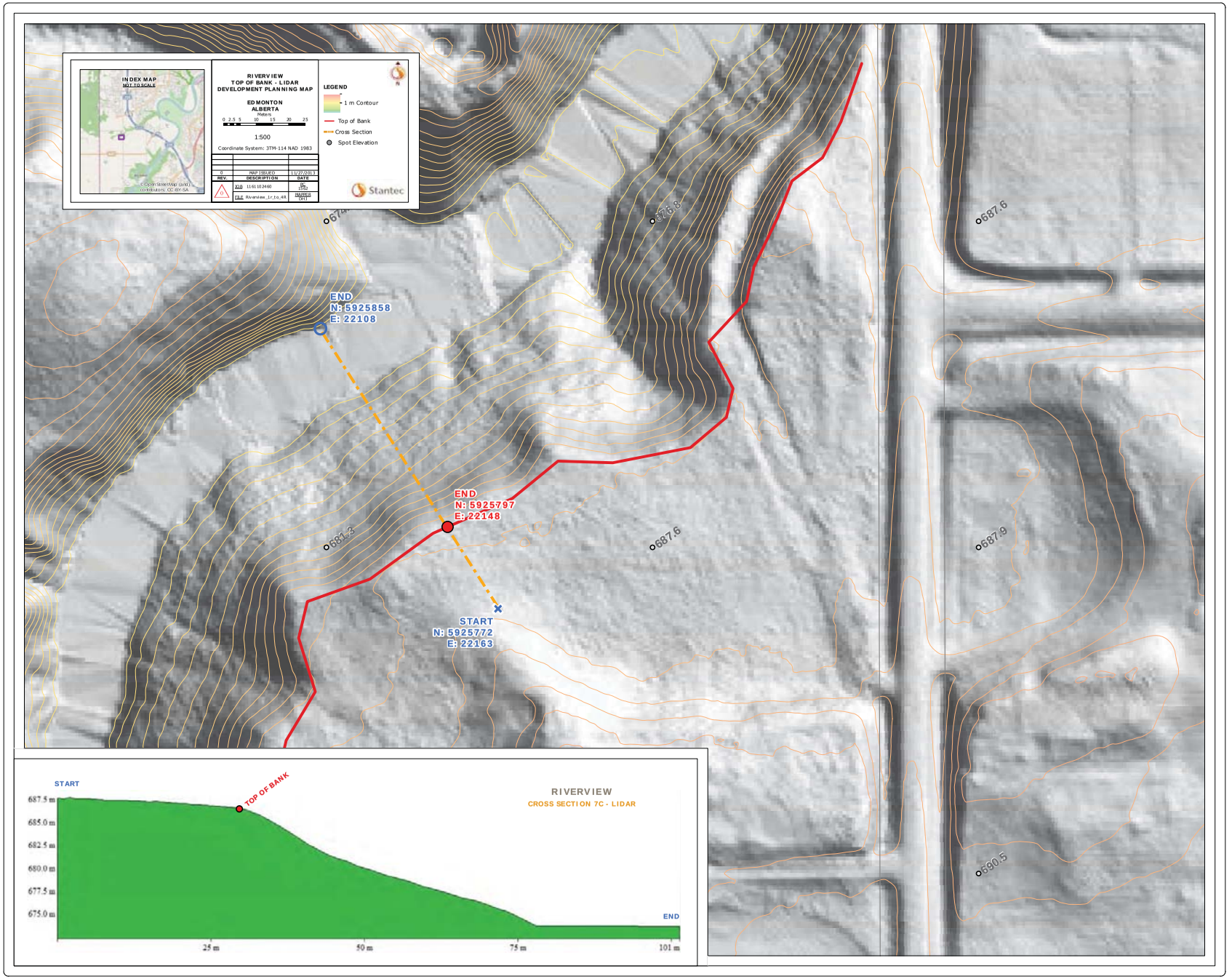


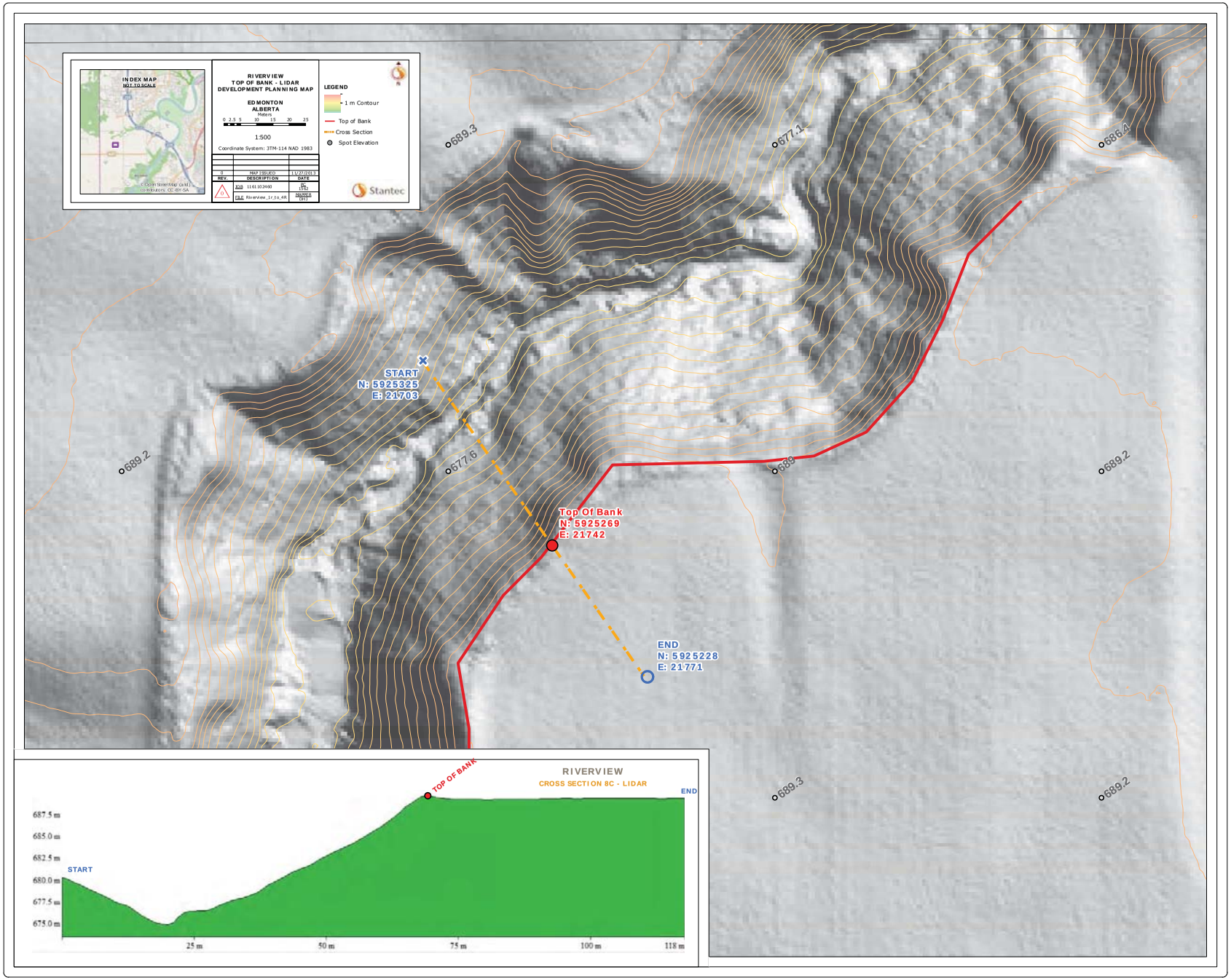
	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
CLAY	19	0	25	1
CLAY	19	0	23	1

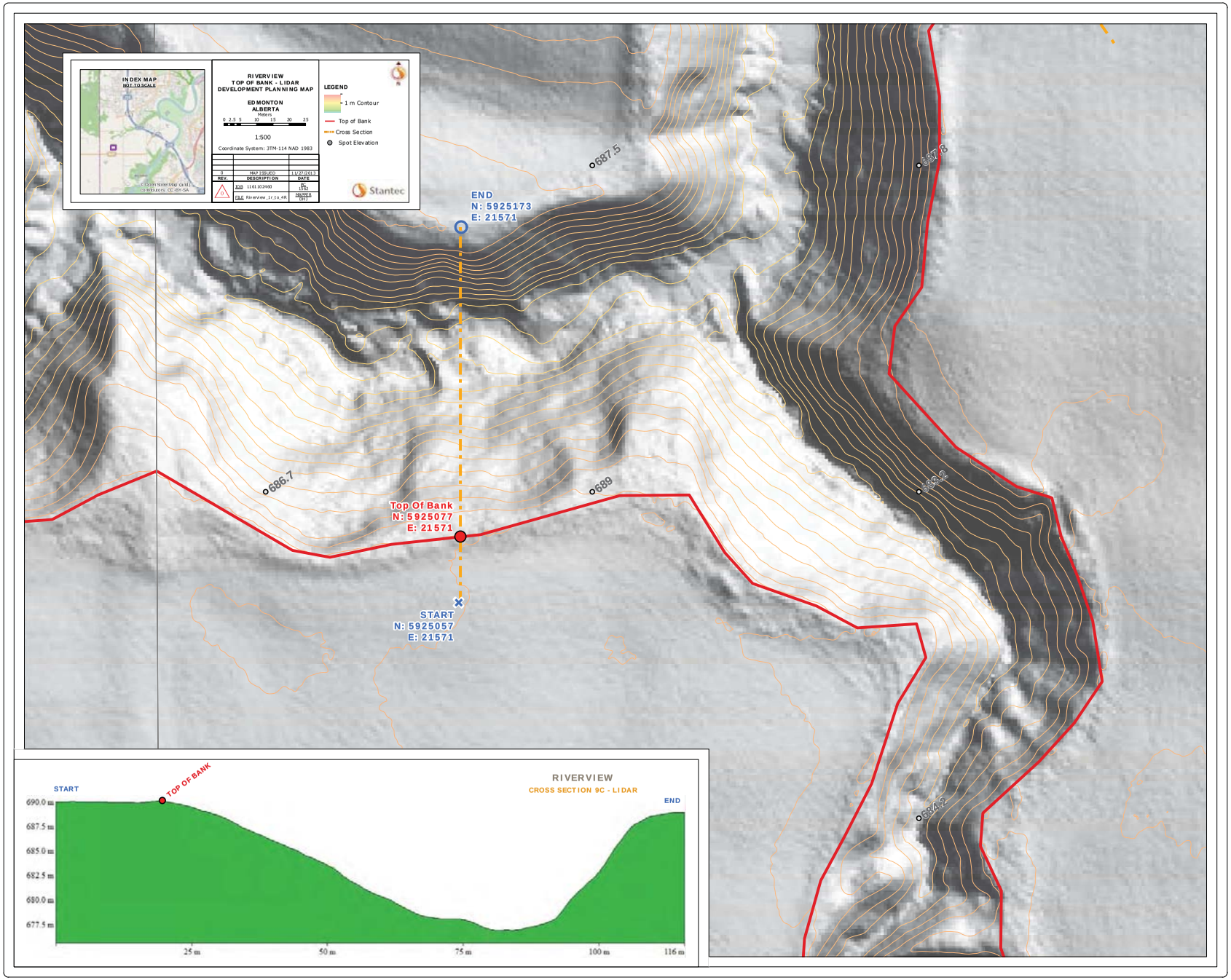


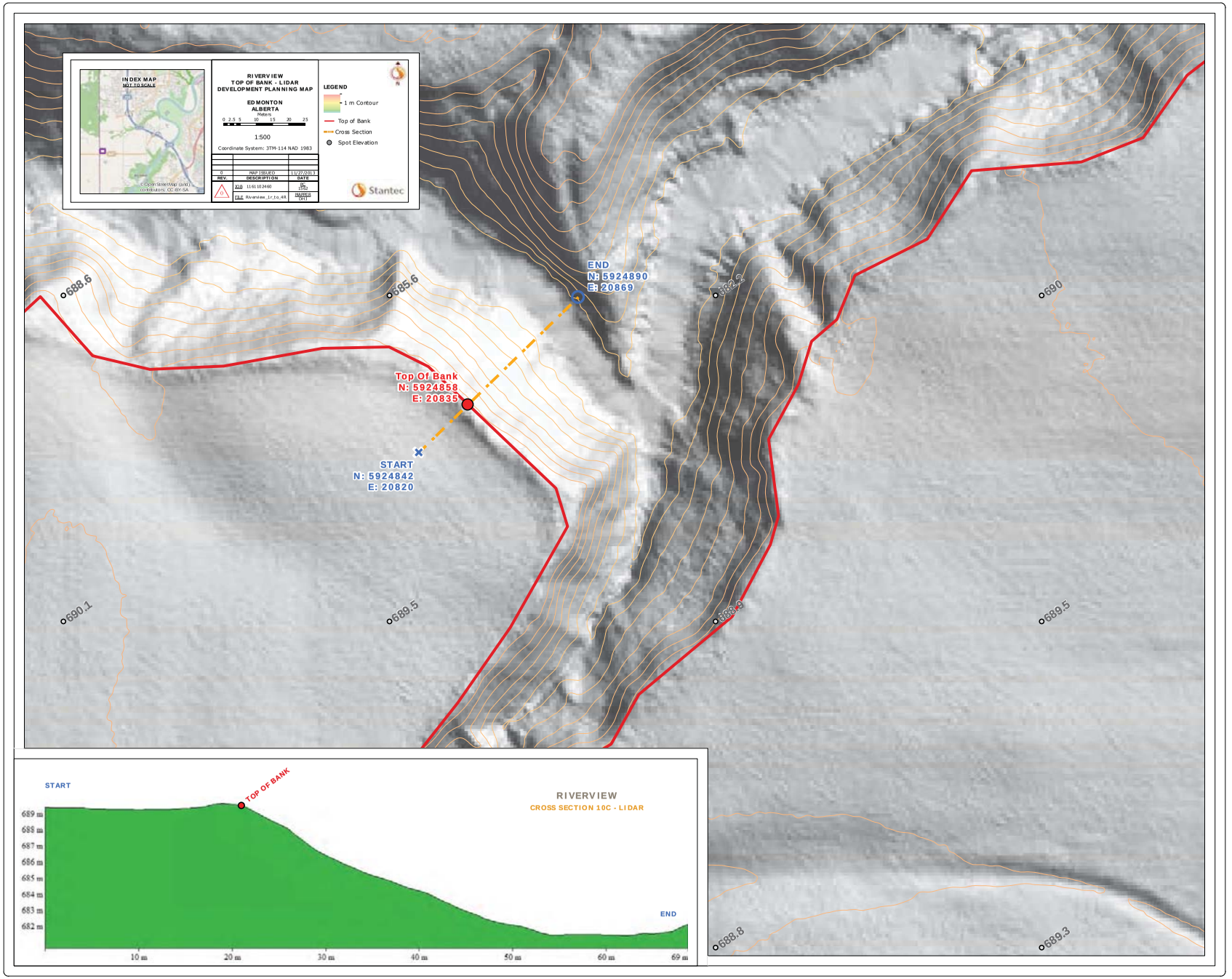
6004-32
Riverview NB 1-3
December 2013
Section 10C
Wedgewood Creek




INDEX MAP
NOT TO SCALE
RIVERVIEW
TOP OF BANK - LIDAR
DEVELOPMENT PLANNING MAP
EDMONTON
ALBERTA
Meters
0 2.5 5 10 15 20 25
1:500
Coordinate System: 3TM-114 NAD 1983
REV.
DESCRIPTION
DATE
0
MAP ISSUED
11/27/2013
XYB 1161102460
PLE Riverview_1r_to_4R
LEGEND
1 m Contour
Top of Bank
Cross Section
Spot Elevation
Stantec
END
N: 5925858
E: 22108
END
N: 5925797
E: 22148
START
N: 5925772
E: 22163
581.3
575.8
587.6
587.6
587.9
590.5
START
TOP OF BANK
END
687.5 m
685.0 m
682.5 m
680.0 m
677.5 m
675.0 m
25 m
50 m
75 m
101 m
RIVERVIEW
CROSS SECTION 7C - LIDAR


INDEX MAP
NOT TO SCALE
RIVERVIEW
TOP OF BANK - LIDAR
DEVELOPMENT PLANNING MAP
EDMONTON
ALBERTA
Meters
0 2.5 5 10 15 20 25
1:500
Coordinate System: 3TM-114 NAD 1983
LEGEND
1 m Contour
Top of Bank
Cross Section
Spot Elevation
Stantec
689.3
677.1
686.4
689.2
677.6
688
689.2
START
N: 5925325
E: 21703
Top Of Bank
N: 5925269
E: 21742
END
N: 5925228
E: 21771
689.3
689.2
RIVERVIEW
CROSS SECTION 8C - LIDAR
TOP OF BANK
START
END
687.5 m
685.0 m
682.5 m
680.0 m
677.5 m
675.0 m
25 m
50 m
75 m
100 m
118 m


INDEX MAP
NOT TO SCALE
RIVERVIEW
TOP OF BANK - LIDAR
DEVELOPMENT PLANNING MAP
EDMONTON
ALBERTA
Meters
0 2.5 5 10 15 20 25
1:500
Coordinate System: 3TM-114 NAD 1983
REV.
DESCRIPTION
DATE
0
MAP ISSUED
11/27/2013
XXB 1161102460
PLE Riverview_1r_to_4R
LEGEND
1 m Contour
Top of Bank
Cross Section
Spot Elevation
Stantec
END
N: 5925173
E: 21571
Top Of Bank
N: 5925077
E: 21571
START
N: 5925057
E: 21571
687.5
687.8
686.7
689
684.2
684.2
RIVERVIEW
CROSS SECTION 9C - LIDAR
START
TOP OF BANK
END
690.0 m
687.5 m
685.0 m
682.5 m
680.0 m
677.5 m
25 m
50 m
75 m
100 m
116 m


INDEX MAP
NOT TO SCALE
RIVERVIEW
TOP OF BANK - LIDAR
DEVELOPMENT PLANNING MAP
EDMONTON
ALBERTA
Meters
0 2.5 5 10 15 20 25
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LEGEND
1 m Contour
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JOB 116102460
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689.3
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Top Of Bank
N: 5924858
E: 20835
START
N: 5924842
E: 20820
START
TOP OF BANK
END
RIVERVIEW
CROSS SECTION 10C - LIDAR
689 m
688 m
687 m
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684 m
683 m
682 m
10 m
20 m
30 m
40 m
50 m
60 m
69 m

APPENDIX G

Traffic Impact Assessment

TRANSPORTATION PLANNERS AND ENGINEERS

Riverview Neighbourhoods 1, 2, & 3 Neighbourhood Structure Plans
Transportation Impact Assessment

Final Draft Report

Prepared for

Qualico Development West
Walton Development and Management LP
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Melcor Developments Ltd.
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Date

November 17, 2014

Prepared by

Bunt & Associates

Project No.

3366.03

TABLE OF CONTENTS

EXHIBITS

TABLES

1. INTRODUCTION

1.1 Background

The Riverview Area Structure Plan (ASP) was adopted by City of Edmonton council on July 3, 2013. Shortly thereafter, planning was initiated on the first three neighbourhoods within the ASP. Neighbourhoods (NBHDs) 1, 2, and 3 generally encompass the northern two thirds of the ASP area and provide the opportunity to extend infrastructure and services into Riverview. As part of the Neighbourhood Structure Plan (NSP) process, a Transportation Impact Assessment (TIA) was initiated to confirm the transportation infrastructure required to support the ASP area and to identify internal transportation elements within the three initial neighbourhoods.

1.2 Study Purpose

The purpose of the Riverview NBHDs 1, 2, and 3 TIA is to update the conclusions and recommendations identified in the Riverview ASP TIA prepared by Bunt & Associates in 2013 to reflect current land use and trip generation assumptions as well as to identify the transportation infrastructure requirements within the first three Riverview neighbourhoods.

1.3 Study Scope

The scope of the Riverview NBHDs 1, 2, and 3 TIA reflects the requirement to revisit technical aspects of the original Riverview ASP TIA as well as provide neighbourhood level details for the first three neighbourhoods. The following elements were considered to be within the overall scope of the assignment:

ASP TIA Update Components

- A review of the arterial roadway network within Riverview; and,
- Confirmation of the proposed arterial/arterial intersection geometry within Riverview.

NBHDs 1, 2, and 3 TIA Components

- A review of the collector roadway network within NBHDs 1, 2, and 3;
- A review of arterial/collector and collector/collector intersection geometry within NBHDs 1, 2, and 3;
- A review of the active modes network within NBHDs 1, 2, and 3, including potential connections to and through adjacent communities; and,
- A review of potential transit operations through NBHDs 1, 2, and 3.

1.4 Study Methodology

The methodology for the completion of an ASP TIA is not significantly different from the completion of an NSP TIA. The primary difference is the level of detail included in a neighbourhood level assessment. The land use concepts are more detailed at the neighbourhood level; therefore, a more detailed analysis of the transportation infrastructure can be completed. Based on the above, the following methodology was used in the assessment:

- An examination of the development area with respect to existing conditions: land use, roadways, and traffic conditions;
- An examination of the proposed future roadway network within and adjacent to the area;
- The identification of future background traffic volumes in the vicinity of the neighbourhoods;
- The review of land use assumptions identified within the ASP and NSP documents;
- The identification of traffic on the proposed roadway network that is anticipated to be generated by Riverview based on trip generation, trip distribution, mode split, and trip assignment assumptions;
- An analysis of the vehicle based roadway network based on the background and site generated traffic estimates;
- The identification of an active modes network within NBHDs 1, 2, and 3 that provides both commuter and recreation opportunities; and,
- A review of the collector roadway network to identify potential transit opportunities and constraints within NBHDs 1, 2, and 3.

2. SITE CONTEXT – AREA CONDITIONS

2.1 Site Location

Riverview is located in southwest Edmonton and encompasses in the order of 1,430 hectares. The area is bounded by the North Saskatchewan River to the east, 33 Avenue SW to the south (south City limits), 215 Street to the west (west City limits), Wedgewood Ravine to the north, and Anthony Henday Drive to the northeast. Riverview NBHDs 1, 2, and 3 encompass the northern two thirds of the ASP area with NBHD 1 located north of 23 Avenue, NBHD 2 located north and west of Quadrant Avenue/199 Street, and NBHD 3 located east of 199 Street.

Exhibit 2-1 illustrates the location of the Riverview ASP within the context of the greater City of Edmonton area while **Exhibit 2-2** illustrates locations of the three neighbourhoods and identifies the existing roadway network within the Riverview ASP area.

2.2 Existing Land Use Characteristics

The majority of the lands within Riverview are currently zoned AG – Agricultural Zone. Country residential land uses are also accommodated in a number of areas under the RR – Rural Residential zone, generally along the banks of the North Saskatchewan River. A small country residential subdivision is also located on the south side of Wedgewood Creek, east of 199 Street. Other approved land uses in the area are Metropolitan Recreation Zone (Zone A) and Public Parks Zone (Zone AP).

In addition to the above, Riverview currently includes a number of pipeline corridors and oil wells and also includes an Altalink Power Corridor that runs east/west through the north portion of the plan area.

A number of natural areas have been identified within and adjacent to the ASP area. The North Saskatchewan River Valley forms the east boundary of the plan area and includes Big Island, which is an oxbow that is a critical habitat for ungulate, songbird, and waterfowl species. Wedgewood Ravine generally forms the north boundary of the ASP area and is an important extension of the North Saskatchewan River Valley. A major wetland (NW 355) and a remnant woodlot (NW 384) have been identified along with a number of smaller natural areas within the ASP boundaries.

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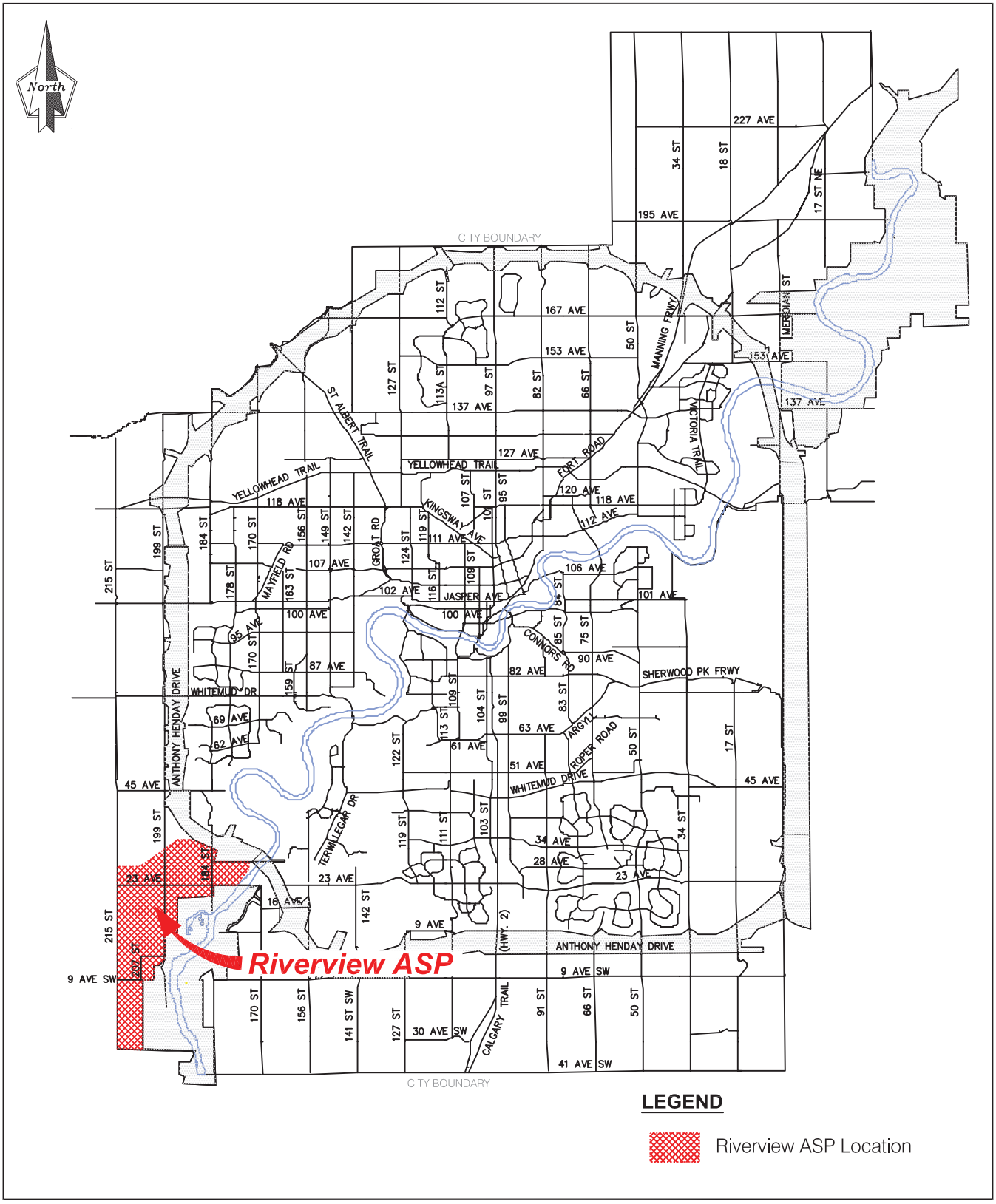

Exhibit 2-1

N.T.S.

Riverview ASP Location

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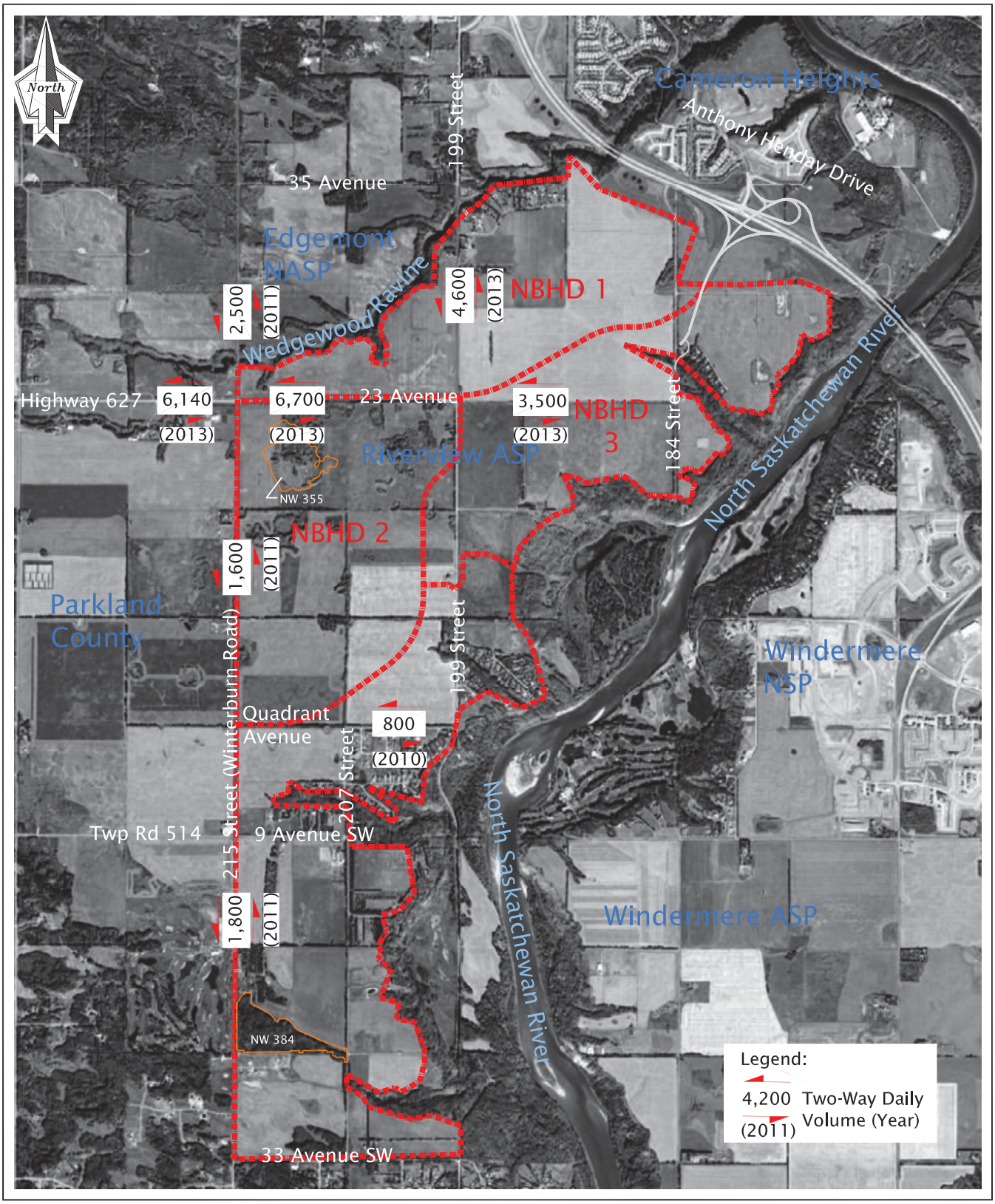

Exhibit 2-2

N.T.S.

Site Context Plan

2.3 Existing Transportation System

2.3.1 Existing Roadway Network

Based on the City of Edmonton Transportation System Bylaw 15101, the plan area is currently accessed via the following arterial roadways:

- ***23 Avenue*** is a rural arterial roadway that runs east/west through the north portion of the plan area from 184 Street to 215 Street. A portion of the future 23 Avenue was recently completed between Anthony Henday Drive and 184 Street with the construction of the Anthony Henday Drive/Cameron Heights interchange. The posted speed limit on 23 Avenue is 60 km/hr between 184 Street and 199 Street and is 80 km/hr between 199 Street and 215 Street. West of the City limits, 23 Avenue extends into Parkland County as Highway 627.

- ***Quadrant Avenue*** is an east/west two-lane rural arterial roadway between 199 Street and 207 Street. Although identified as an arterial in the Transportation System Bylaw, the roadway predominantly provides access to country residential land uses. The posted speed limit on Quadrant Avenue is 60 km/hr.

- ***9 Avenue SW*** is an east/west two-lane rural arterial roadway between 207 Street and 215 Street with a posted speed limit of 60 km/hr. Similar to Quadrant Avenue, 9 Avenue SW primarily provides access to country residential land uses.

- ***Township Road 514 (Twp. Rd. 514)*** is a two-lane cold mix asphalt road between 215 Street and Highway 60 within Parkland County. The posted speed limit along Twp. Rd. 514 is 80 km/hr.

- ***184 Street*** is a north/south rural arterial roadway between the Transportation Utility Corridor (TUC) and 23 Avenue and currently provides interim access between the Anthony Henday Drive/Cameron Heights interchange and the existing 23 Avenue corridor. The posted speed limit along 184 Street is 60 km/hr. South of 23 Avenue, 184 Street is a two-lane rural roadway that provides access to existing country residential land uses.

- ***199 Street*** is a north/south two-lane rural arterial roadway that extends from Quadrant Avenue to Wedgewood Creek, bisecting the plan area. The posted speed limit along 199 Street within Riverview is 80 km/hr. 199 Street continues north of Wedgewood Creek providing access to Edgemont, The Hamptons, and Glastonbury, and also connects to Lewis Estates Boulevard in the Lewis Farms area north of Whitemud Drive. South of Quadrant Avenue, 199 Street continues as a local roadway providing access to the North Saskatchewan River Valley.

- ***215 Street (Winterburn Road)*** is a north/south two-lane rural arterial roadway that runs along the west boundary of Riverview and also forms the west boundary of the City of Edmonton. The posted speed limit along 215 Street adjacent to Riverview is 80 km/hr.

In addition to the above arterial roadways, Anthony Henday Drive is currently developed as a freeway to Alberta Transportation standards along the northeast edge of the area, and a trumpet interchange is currently constructed at Cameron Heights Drive. The west leg of the Cameron Heights interchange provides access to Riverview.

2.3.2 Existing Traffic Volumes

Existing and historic traffic flows on arterial roadways immediately adjacent to the development area were ascertained based upon a review of the most current City of Edmonton and Alberta Transportation traffic volume data bases. **Table 2-1** summarizes the historic Average Annual Weekday Traffic (AAWDT) volume or Average Annual Daily Traffic (AADT) volume information. The most current daily volumes are also illustrated on Exhibit 2-2.

Table 2-1: Historic AAWDT Volumes

Roadway	2007	2008	2009	2010	2011	2012	2013
23 Avenue West of 184 Street	-	200	-	-	200	-	3,500
23 Avenue West of 199 Street	-	6,300	-	-	4,400	-	6,700
199 Street North of 23 Avenue	-	-	-	-	5,600	-	4,600
215 Street North of 23 Avenue	-	-	-	-	2,500	-	-
215 Street South of 23 Avenue	1,800	2,400	-	-	1,600	-	-
215 Street North of 25 Avenue SW	1,800	2,000	1,500	2,100	1,800	-	-
Quadrant Avenue SW West of 199 Street	-	800	-	800	-	-	-
Highway 627 East of RR 261 (Fleming Road)*	4,740	4,740	4,780	6,040	6,160	6,060	6,140

*Highway 627 Volumes represent Average Annual Daily Traffic Volumes from Alberta Transportation's website.

The overall magnitude of traffic identified on the existing roadways in Riverview is not substantial; however, based on the locations where the volumes were measured and a review of the overall country residential development existing within the plan area, not all of the traffic on the existing roadways is anticipated to be generated by land uses within Edmonton. It is anticipated that some of the traffic along 23 Avenue to 215 Street, 199 Street, and Anthony Henday Drive represents trips between Parkland County

and the City of Edmonton. As well, the majority of traffic along 215 Street is anticipated to represent trips between Parkland County and the City of Edmonton.

2.3.3 Existing Transit Routes

Edmonton Transit System (ETS) does not currently provide service within the Riverview ASP area. The nearest bus route to the plan area is Route 103, which provides transit service to the existing Cameron Heights neighbourhood. Route 103 operates between West Edmonton Mall and Cameron Heights with a 30 minute frequency on weekdays between 6:00 AM and 9:45 PM and Saturdays between 9:15 AM and 6:45 PM (start/end times as per Cameron Heights Way stop). The route also operates with an hourly frequency on Sundays between 10:30 AM and 6:15 PM.

A second route, Route 117, currently operates during peak hours between the Lewis Farms Transit Centre and the southern portion of The Hamptons.

2.3.4 Existing Truck Routes

There are currently no truck routes identified within Riverview; however, three routes operate adjacent to the plan area as follows:

- Anthony Henday Drive located northeast of the plan area is a dangerous goods route and truck route;
- 215 Street from 23 Avenue to Whitemud Drive is designated a 24-hour truck route; and,
- Highway 627 west of 215 Street is designated a 24-hour truck route.

2.3.5 Horizon Year

Based on a review of the Riverview ASP, it is anticipated that the plan area will be fully developed within 30 to 40 years, or between approximately 2042 and 2052. To be consistent with City of Edmonton Transportation Services' department planning horizons, the 2047 horizon was selected for assessment purposes.

2.4 2047 Study Area Conditions

2.4.1 Future Arterial Roadway Network

The following arterial roadway network is planned within and adjacent to Riverview.

- It is anticipated that ***Anthony Henday Drive*** will be upgraded to include six travel lanes on the mainline within the 2047 horizon. The ***Cameron Heights interchange*** was constructed to its ultimate configuration in 2010/2011 and no improvements are planned for the interchange in the 2047 horizon.

- ***23 Avenue*** between Anthony Henday Drive and 215 Street is designated as a highway connector within the Transportation Master Plan: The Way We Move. The City of Edmonton has prepared concept

plans for the corridor which include the development of a six-lane divided arterial roadway with a posted speed limit of 70 km/hr and intersection spacing of approximately 400 metres.

- ***199 Street*** will be upgraded to an urban standard as it extends south from Edgemont. Within the plan area, 199 Street is proposed to follow the existing right-of-way to a point approximately 300 metres south of 23 Avenue, and then curve west, intersecting with Riverview Way approximately 280 metres west of the existing 199 Street right-of-way. 199 Street is proposed to continue south for another 800 metres before curving west to intersect 215 Street at approximately ***Quadrant Avenue***. 199 Street is anticipated to be developed as a standard four-lane divided arterial through the plan area.

- ***215 Street*** is proposed to be upgraded to an urban arterial along the existing roadway alignment along the west side of the plan area. At this time, it is anticipated that 215 Street will be developed as a four-lane divided arterial south of 23 Avenue, expanding to a six-lane divided arterial north of 23 Avenue.

2.4.2 Future Truck Routes

Anthony Henday Drive is anticipated to be maintained as a dangerous goods route and truck route, and 215 Street between 23 Avenue and Whitemud Drive and Highway 627 west of 215 Street are anticipated to be maintained as 24-hour truck routes in the long term. In addition to these existing routes, it is anticipated that 23 Avenue will be identified as a 24-hour truck route when it is upgraded to an urban standard based on its classification as a highway connector.

2.4.3 2047 Background Traffic Volumes

Background traffic is the component of traffic on the adjacent road system that would be present regardless of development within Riverview. The City of Edmonton provided a standard model package and a gate analysis from a special west Edmonton run of their 2047 regional travel model to assist in the development of background traffic volumes for use in this assessment.

The gate analysis provided origin and destination information between eight locations adjacent to the boundaries of Riverview. This information was used to develop 2047 background turning movement volumes at the intersections within Riverview.

For study area intersections outside the boundaries of Riverview (i.e. Lessard Road/199 Street and Lessard Road/215 Street), 2047 background turning movement volumes were developed based on the following methodology:

- Intersection turning movement volumes were estimated based on link volumes from the standard model package for the Lessard Road intersections as well as the Edgemont access intersections along 199 Street, 215 Street, and Lessard Road;

- The AM and PM peak hour volumes at the nearest gate were used to establish the 2047 background volumes on 199 Street and 215 Street north of Wedgewood Creek; and,
- Traffic volumes at the intersections north of Wedgewood Creek were reduced to reflect the 2047 gate volumes. This included a reduction in traffic through Edgemont as well as traffic generated within Edgemont.

Exhibit 2-3 illustrates the 2047 AM and PM peak hour background traffic volume estimates. For the purposes of this assessment, daily background traffic volumes were estimated by multiplying the sum of the AM and PM peak hour turning movements by a factor of six. **Exhibit 2-4** illustrates the estimated 2047 two-way daily traffic volumes along the arterial roadway network. The City of Edmonton's standard model package and traversal gate map and matrix are provided in **Appendix A** for reference.

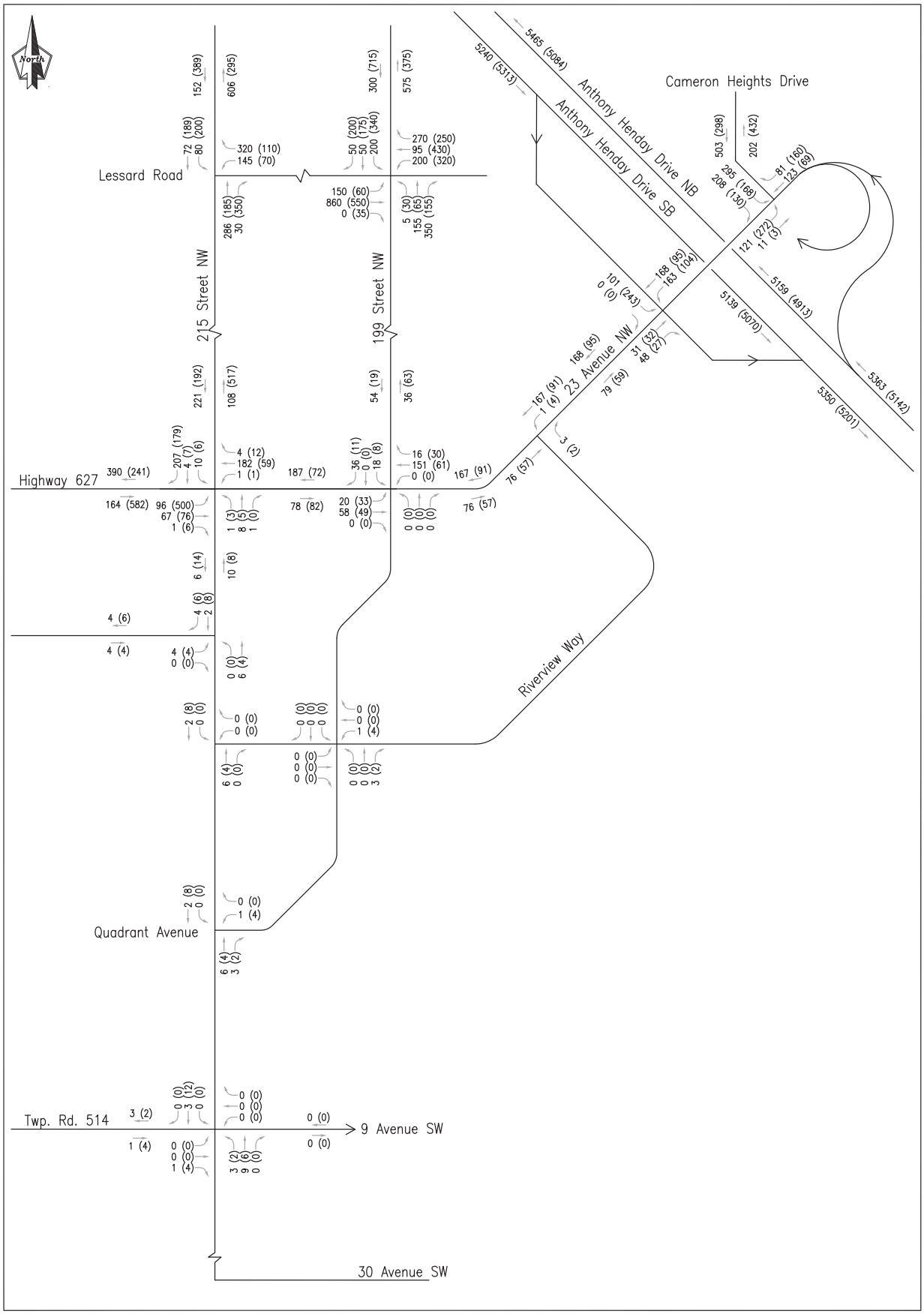

Exhibit 2-3

N.T.S.

2047 Background Traffic Volume Estimates
AM (PM) Peak Hours

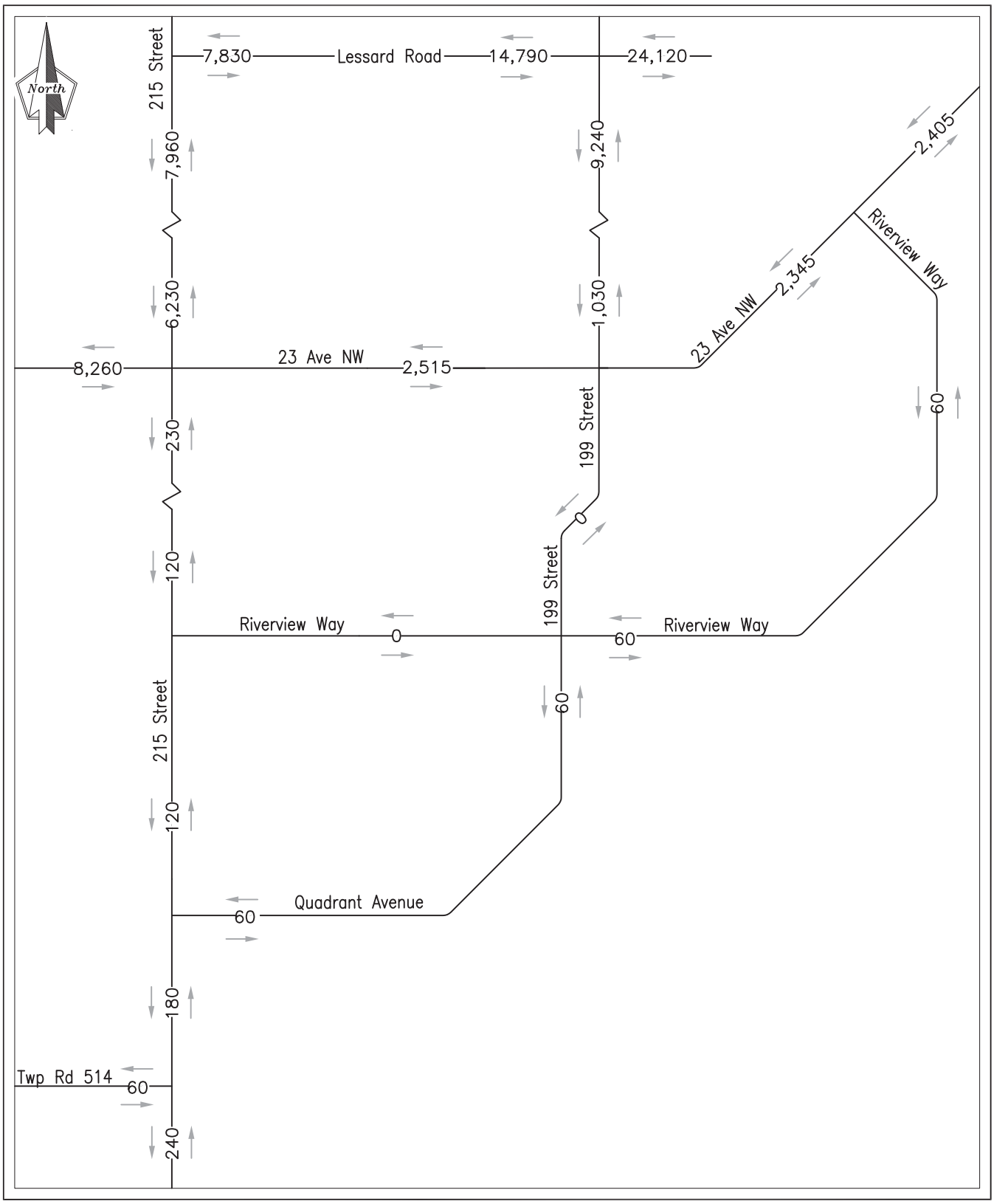

Exhibit 2-4

2047 Daily Background Traffic Volume Estimates

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3. PROPOSED LAND USE CONCEPT

3.1 Development Concepts

3.1.1 Riverview ASP

Land Use Concept

The Riverview ASP land use concept is illustrated in **Exhibit 3-1**. As shown in Exhibit 3-1, the plan is proposed to include a mix of residential, commercial, business employment, and parks/open spaces. Residential development is anticipated to predominantly include low density residential land uses; however, row housing, low-rise/medium density housing, and medium to high rise housing are also proposed to be developed within the plan area.

A town centre commercial area is proposed within the north central portion of the Riverview ASP area. The town centre designation encompasses the northeast, northwest, and southwest corners of the 23 Avenue/199 Street intersection and is complemented by a future transit centre on the southeast corner of the 23 Avenue/199 Street intersection. Although these elements span three separate neighbourhoods, the intent is to provide complementary uses within the town centre that create a central focal point for Riverview as a whole.

Arterial Roadway Network

In addition to the arterial roadway upgrades noted in Section 2.4.1, the Riverview ASP identifies the construction of a new east/west arterial in the plan area. ***Riverview Way*** is proposed to extend south from 23 Avenue at approximately 190 Street, parallel the North Saskatchewan River Valley to the southwest, and then continue west to 215 Street. Within the proposed Riverview ASP amendment, the alignment has been revised to connect to 215 Street north of the wetland area to facilitate water flow to the retained wetland area. Riverview Way is proposed to be developed as a four-lane roadway between Riverview Way and 199 Street and a two-lane arterial between 199 Street and 215 Street.

3.1.2 Riverview NBHDs 1, 2, and 3 NSPs

The land use concepts for Riverview NBHDs 1, 2, and 3 are illustrated on **Exhibit 3-2**.

Riverview NBHD 1

Riverview NBHD 1 is bounded by Wedgewood Creek to the north, 23 Avenue to the south, the TUC to the east, and 215 Street to the west. The neighbourhood includes business employment land uses in the east, towards the TUC and Anthony Henday Drive, and town centre land uses on the northeast and northwest corners of the 23 Avenue/199 Street intersection. Residential land uses complemented by a series of parks, open spaces, and storm water management facilities make up the remainder of Riverview NBHD 1.

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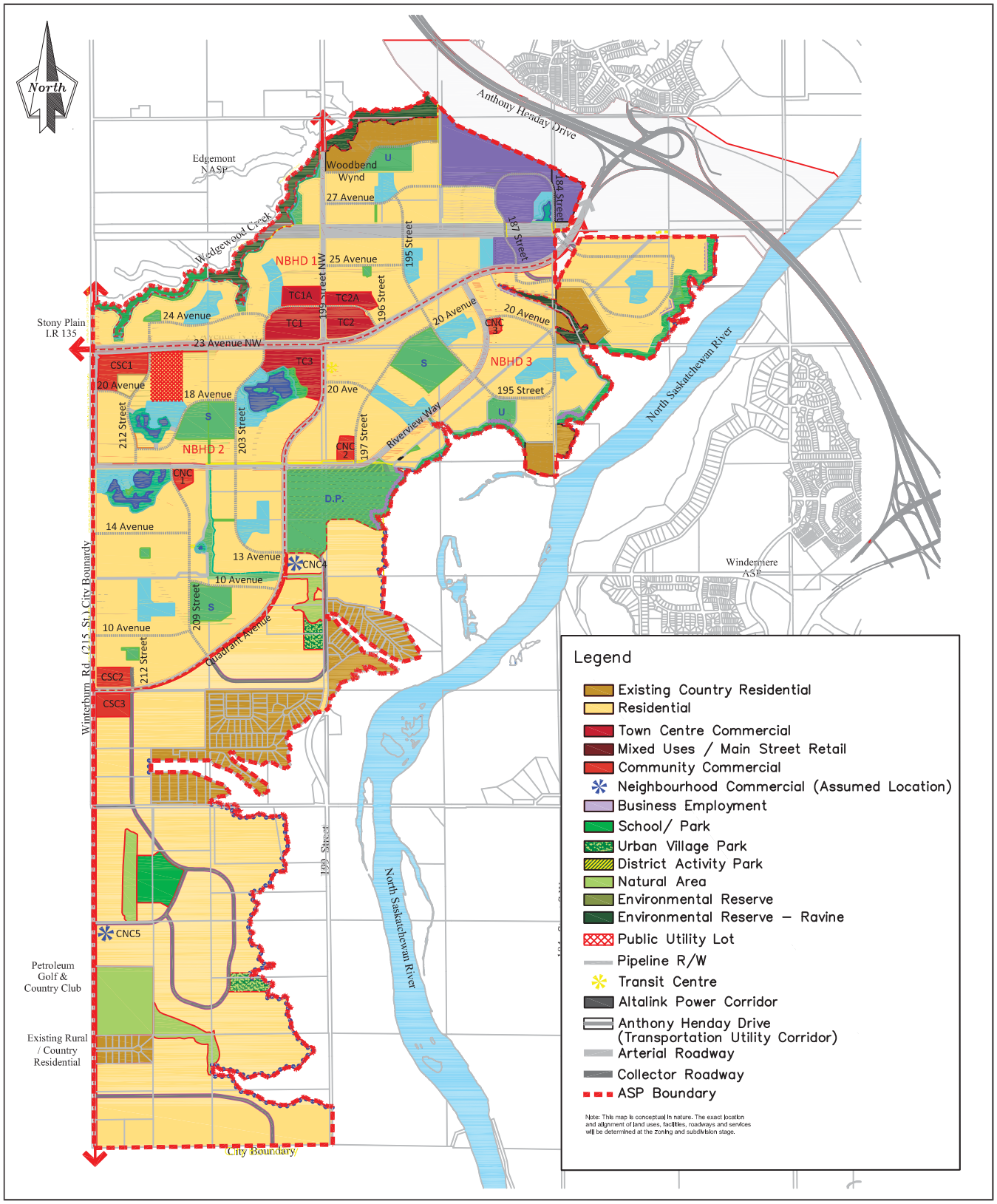

Exhibit 3-1

N.T.S.

Riverview ASP Land Use Concept

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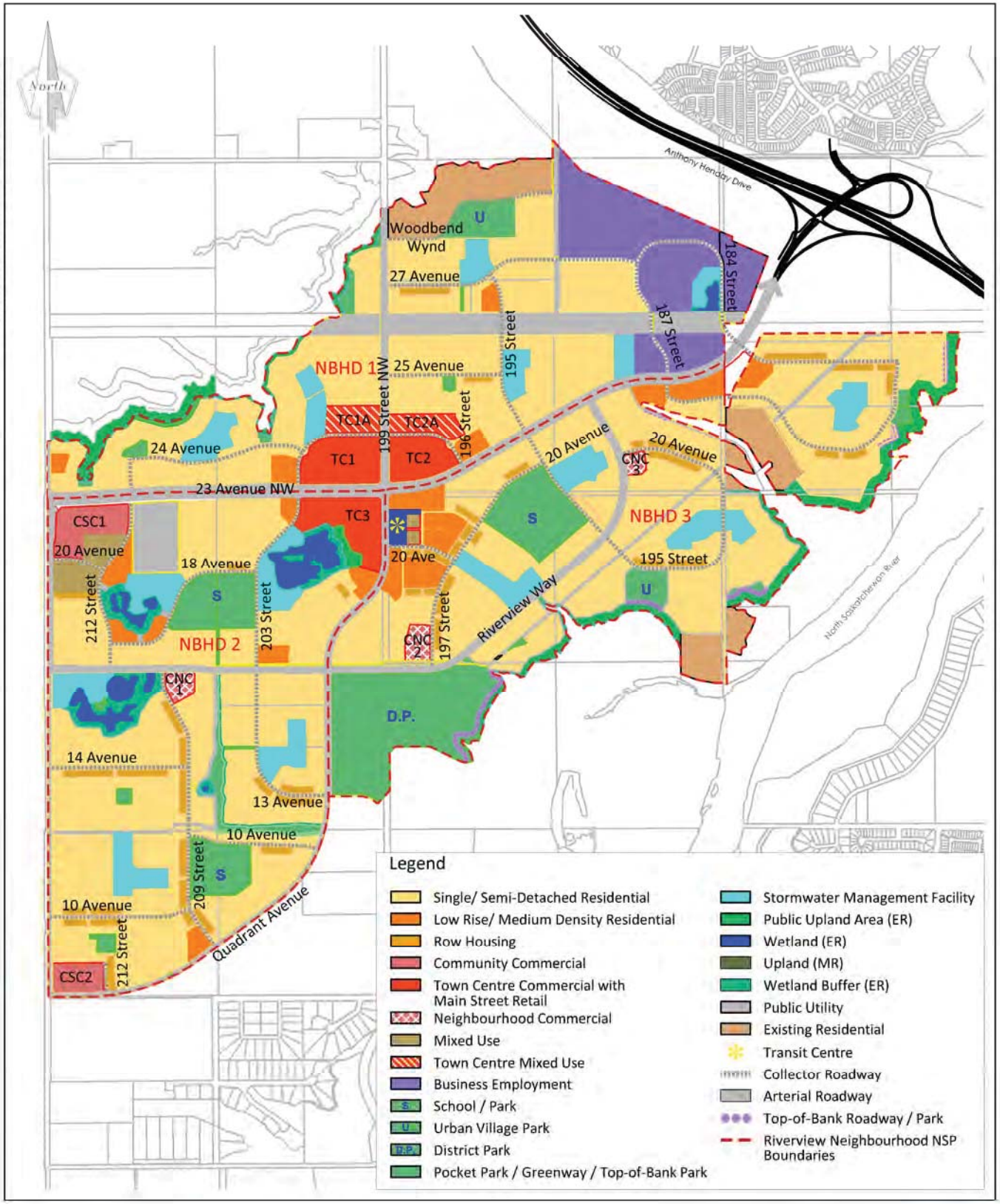

Exhibit 3-2

N.T.S.

Riverview NBHDs 1, 2 and 3 Land Use Concepts

Riverview NBHD 2

Riverview NBHD 2 is bounded by 23 Avenue to the north, 199 Street/Quadrant Avenue to the east and south, and 215 Street to the west. The proposed development concept includes a portion of the town centre in the northeast corner of the neighbourhood, community commercial (CSC) land uses along 215 Street, a neighbourhood commercial (CNC) site located centrally within the neighbourhood, a public K-9 school in the north central portion of the neighbourhood, and a catholic K-9 school located in the south central portion of the neighbourhood. Riverview NBHD 2 includes significant retained natural areas that have been incorporated into the plan area. Low density and row housing residential land uses are provided throughout the neighbourhood, with multi-family parcels focused around the town centre, the northwest CSC site, and at key arterial/collector intersections.

The land uses in the northwest corner of Riverview NBHD 2 include a combination of commercial, residential/mixed use, and medium density residential land uses. The intent of this development is to incorporate a mix of housing options and commercial uses within a comprehensively planned development. At this time, opportunities to implement seniors/lifestyle residential mixed use have been discussed for this area; however, typical medium and medium to high density land uses have been assumed in this assessment.

Riverview NBHD 3

Riverview NBHD 3 is bounded by 23 Avenue to the north, the North Saskatchewan River Valley to the south, the TUC to the east, and 199 Street to the west. The neighbourhood predominantly includes residential land uses with the majority of the density provided around the future transit centre on the southeast corner of the 23 Avenue/199 Street intersection. In addition to residential land uses, two CNC sites, a public/catholic K-9 school, and the district park are planned within Riverview NBHD 3.

3.1.3 Land Use Statistics

Land use statistics for the first three Riverview NSPs were provided by Stantec on October 9, 2014 for use in TIA. Land use information for Riverview NBHDs 4 and 5 was taken from the March 20, 2014 Riverview ASP amendment developed by Stantec. A full summary of the Riverview land use statistics are included in **Appendix B**.

3.1.4 Non-Residential Land Uses

Table 3-1 summarizes the non-residential trip generating land uses by neighbourhood.

Table 3-1: Riverview ASP Non-Residential Trip Generating Land Uses by Neighbourhood

Development Component	NBHD 1	NBHD 2	NBHD 3	NBHD 4	NBHD 5	Total
Town Centre Commercial	21.37 ha	8.74 ha	0.49 ha[1]	-	-	30.60 ha
CSC Sites	-	9.94 ha	-	4.00 ha	-	13.94 ha
CNC Sites	-	1.76 ha	2.95 ha	1.00 ha	1.00 ha	6.71 ha
Business Employment	41.72 ha	-	-	-	-	41.72 ha
School/Park[2]	-	16.44 ha	12.10 ha	-	9.50 ha	38.04 ha
District Activity Park[2]	-	-	34.29 ha	-	-	34.29 ha

[1]Transit Centre Mixed Use Site – Commercial Component

[2]Trip generating land uses on school/park sites and the district park site include schools and major recreation facilities.

The following assumptions were made regarding the potential development characteristics of non-residential land uses.

Town Centre

It is anticipated that an overall master plan will be developed for the town centre commercial sites that also considers the integration of the transit centre and adjacent transit supportive land uses. However, until such time as additional planning work is completed, the following key ideas/elements have been considered in the identification of land use and trip generation assumptions for use in the TIA.

- Four town centre sites: two commercial and two mixed use, have been identified within NBHD 1. For the purposes of this assessment, the town centre commercial sites (TC1 and TC2) are assumed to be developed as typical CSC sites with an average floor area ratio (FAR) of 0.25, while the mixed use sites (TC1A and TC2A) are assumed to be developed at a higher density, including an FAR of 0.50 for commercial land uses plus a density of 90 du/ha over 50% of the site for residential land uses.

- The town centre commercial site in NBHD 2 (TC3) is proposed to include a main street retail component. For the purposes of this assessment, 1.0 ha of TC3 is assumed to be developed as a main street style commercial area at an FAR of 1.0, with the remaining area transitioning to a more typical CSC site at an FAR of 0.25.

- A mixed use/apartment site is proposed adjacent to the transit centre in NBHD 3. For the purposes of this assessment, an FAR of 1.0 was assumed for the commercial component of the mixed use site. While the commercial and residential areas have been calculated separately, it is anticipated that the land uses will be integrated into one comprehensive development.

Table 3-2 summarizes the commercial land use assumptions for the town centre area.

Table 3-2: Town Centre Non-Residential Land Use Assumptions

Town Centre Site	Area	Commercial FAR	GFA[1]
TC1 – commercial	8.47 ha	0.25	227,900 SF
TC1A – mixed use	3.48 ha	0.50	187,300 SF
TC2 – commercial	6.16 ha	0.25	165,800 SF
TC2A – mixed use	3.26 ha	0.50	175,500 SF
TC3 –commercial	7.74 ha	0.25	208,300 SF
TC3 - main street	1.00 ha	1.00	107,600 SF
Transit Centre Mixed Use	0.49 ha	1.00	52,700 SF
Total	**30.60 ha**		**1,125,100 SF**

[1] Gross Floor Area (GFA)

Community Commercial (CSC) Sites

Three CSC sites are identified within the Riverview ASP area; two within NBHD 2 (CSC1 and CSC2) and one within NBHD 4 (CSC3). These sites are assumed to be developed as typical grocery anchored commercial sites at an FAR of 0.25.

Neighbourhood Commercial (CNC) Sites

A total of five CNC sites have been identified within the Riverview ASP area; one in NBHD 2 (CNC1), two in NBHD 3 (CNC2 and CNC3), one in NBHD 4 (CNC4), and one in NBHD 5 (CNC5). Two of the sites, CNC1 and CNC2, are assumed to be developed as mixed use sites with approximately half the area developed as commercial land uses at an FAR of 0.25 and the other half developed as medium density land uses at a density of 90 du/ha. The remaining three sites (CNC3, CNC4, and CNC5) are assumed to be developed as typical neighbourhood commercial sites at an FAR of 0.25.

Table 3-3 summarizes the assumed GFA and residential densities for the CSC and CNC sites.

Table 3-3: CSC and CNC Commercial GFA Assumptions

Commercial Site	Area	Commercial FAR	GFA
CSC1	6.40 ha	0.25	172,200 SF
CSC2	3.54 ha	0.25	95,300 SF
CSC3	4.00 ha	0.25	107,600 SF
CNC1	0.88 ha	0.25	23,700 SF
CNC2	0.985 ha	0.25	26,500 SF
CNC3	0.98 ha	0.25	26,400 SF
CNC4	1.00 ha	0.25	26,900 SF
CNC5	1.00 ha	0.25	26,900 SF
Total[1]	**18.79 ha**		**505,500 SF**

[1]Does not include residential portions of CNC1 and CNC2.

Business Employment

The land use statistics identify 41.72 ha of business employment land uses, which are proposed in the northeast corner of Riverview NBHD 1 adjacent to Anthony Henday Drive. Based on a review of the land use concept, this is anticipated to represent the net developable area within the business employment area (collector road right-of-way and storm water management facility areas removed).

- The business employment area is anticipated to be similar to the Ellerslie Industrial area in southeast Edmonton. The Ellerslie Industrial area includes a mix of highway commercial land uses such as hotels and car dealerships and business land uses such as office buildings and light industrial land uses. For the purpose of this assessment, it is assumed that about 12.0 ha would be developed as highway commercial land uses and the remaining 29.72 ha would be developed as a mix of business land uses.

- The 12.0 ha of highway commercial land uses is assumed to include three-1.5 ha hotel sites accommodating an average of 250 rooms/hotel and five-1.5 ha car dealerships accommodating 30,000 SF buildings.

- Based on information provided by Colliers International, an FAR of 0.40 and a ratio of 400 SF per employee were assumed to estimate the total employee population that could be generated by the business employment land uses. Based on these assumptions 3,200 people could potentially be employed in the business employment area.

District Park

The district park is assumed to include a community recreation centre (pool, saunas, whirlpools, fitness area, and community multi-purpose rooms) and two arenas. Based on a review of a similar facility planned for The Meadows, the community recreation centre component is anticipated to be approximately 100,000 SF and the arenas are assumed to accommodate a total of 700 seats.

A number of playing fields are anticipated to be developed on the district park site. Information regarding the number of fields is not available at this time; however, based on a review of The Meadows District Park site, seven sports fields have been assumed in the assessment.

School Sites

One public high school and one catholic high school are also anticipated to be accommodated on the district park site. It is assumed that the public high school will accommodate 1,550 students and the catholic high school will accommodate 800 students.

Five elementary/junior high schools (K-9) (three Public, two Catholic) are planned within the Riverview ASP area. It is assumed that the elementary/junior high schools could each accommodate 750 students.

3.1.5 Residential Land Uses

Table 3-4 summarizes the residential land use statistics used in the preparation of the TIA.

Table 3-4 Riverview ASP Residential Area by Neighbourhood

Residential Land Use	NBHD 1	NBHD 2	NBHD 3	NBHD 4	NBHD 5	Total
Existing Country Residential	15.60 ha	0.0 ha	15.83 ha	66.40 ha	18.60 ha	116.43 ha
Single/Semi-Detached	86.14 ha	121.65 ha	118.85 ha	60.20 ha	163.80 ha	550.64 ha
Row Housing	1.23 ha	11.29 ha	11.33 ha	6.00 ha	6.00 ha	35.85 ha
Low-rise/Multi/Medium Units	4.65 ha	8.42 ha	14.17 ha	4.00 ha	9.00 ha	40.24 ha
Residential Mixed Use[1]	3.37 ha	6.18 ha	1.465 ha	0.0 ha	0.0 ha	11.015 ha
High Density	0.0 ha	0.0 ha	0.0 ha	0.0 ha	1.00 ha	1.00 ha
Total	**110.99 ha**	**147.54 ha**	**161.645 ha**	**136.60 ha**	**198.40 ha**	**755.175 ha**

[1]Includes residential land uses associated with the town centre mixed use sites, the transit centre mixed use site, the NW NBHD 2 residential mixed use sites, CNC1, and CNC2.

The number of residential dwelling units and associated population anticipated to be developed within the plan area are based on estimates included in the ASP and NSP land use statistics provided by Stantec using the following residential and population densities:

- Single/Semi-Detached – 25 du/ha, 2.8 people/du
- Row Housing – 45 du/ha, 2.8 people/du
- Low-rise/Multi/Medium Units – 90 du/ha, 1.8 people/du
- Residential Mixed Use – 90 du/ha to 150 du/ha, 1.8 people/du
- High Density – 225 du/ha, 1.5 people/du

The dwelling unit and population estimates for the existing country residential land uses are based on 2012 municipal census information.

Table 3-5 summarizes the housing estimates and **Table 3-6** summarizes the population estimates used in the preparation of this TIA.

Table 3-5: Riverview ASP Housing Unit Estimates

Residential Land Use	NBHD 1	NBHD 2	NBHD 3	NBHD 4	NBHD 5	Total
Existing Country Residential						180
Single/Semi-Detached	2,154	3,041	2,971	1,505	4,095	13,766
Row Housing	55	508	510	270	270	1,613
Low-rise/Multi/Medium Units	419	758	1,275	360	810	3,622
Residential Mixed Use	304	874	197	0	0	1,375
High Density	0	0	0	0	225	225
Total	**2,932**	**5,181**	**4,953**	**2,135**	**5,400**	**20,781**

Table 3-6: Riverview ASP Population Estimates

Residential Land Use	NBHD 1	NBHD 2	NBHD 3	NBHD 4	NBHD 5	Total
Existing Country Residential						496
Single/Semi-Detached	6,031	8,515	8,319	4,214	11,466	38,545
Row Housing	154	1,422	1,428	756	756	4,516
Low-rise/Multi/Medium Units	754	1,364	2,295	648	1,458	6,519
Residential Mixed Use	547	1,573	355	0	0	2,475
High Density	0	0	0	0	338	338
Total	**7,486**	**12,874**	**12,397**	**5,618**	**14,018**	**52,889**

As shown in Tables 3-5 and 3-6, a total of 20,781 residential dwelling units are projected to be developed within Riverview, accommodating a potential population of 52,889 people.

3.2 Riverview NBHDs 1, 2, & 3 Collector Roadway Network

The collector roadway network within Riverview has been revised since the completion of the Riverview ASP to reflect new information regarding retained natural areas and to create opportunities for a modified grid of local roadways within the residential areas. Transit looping and intersection spacing along the arterial roadways continued to be considered as the collector roadway network was revised. The following modifications from the collector roadway network originally proposed within the Riverview ASP are noted:

- As shown in **Exhibit 3-3**, a number of intersections have been relocated along 23 Avenue as compared to the Riverview ASP. The 23 Avenue/184 Street intersection has been moved to the southwest, outside of the Altalink right-of-way, to avoid existing transmission facilities. In addition to slightly increasing the distance between the Anthony Henday Drive/Cameron Heights Interchange South Ramp Intersection and 184 Street, the revision allows for greater use of the existing 184 street right of way and a perpendicular crossing of the Altalink right-of-way. West of 184 Street, a minimum spacing of 400 metres (centreline to centreline) has been provided for the majority of the intersections along the corridor. The exception is the 23 Avenue/196 Street intersection, where a minimum spacing of 340 metres has been achieved between 196 Street and Riverview Way to the east and between 196 Street and 195 Street to the west.

- A collector roadway has been identified through the town centre land uses north of 23 Avenue. This represents a new collector roadway east of 199 Street and a relocated collector roadway west of 199 Street.

- The eastern north/south collector in NBHD 2 was re-aligned to provide improved connectivity between NBHD 1 to the north and NBHD 4 to the south.

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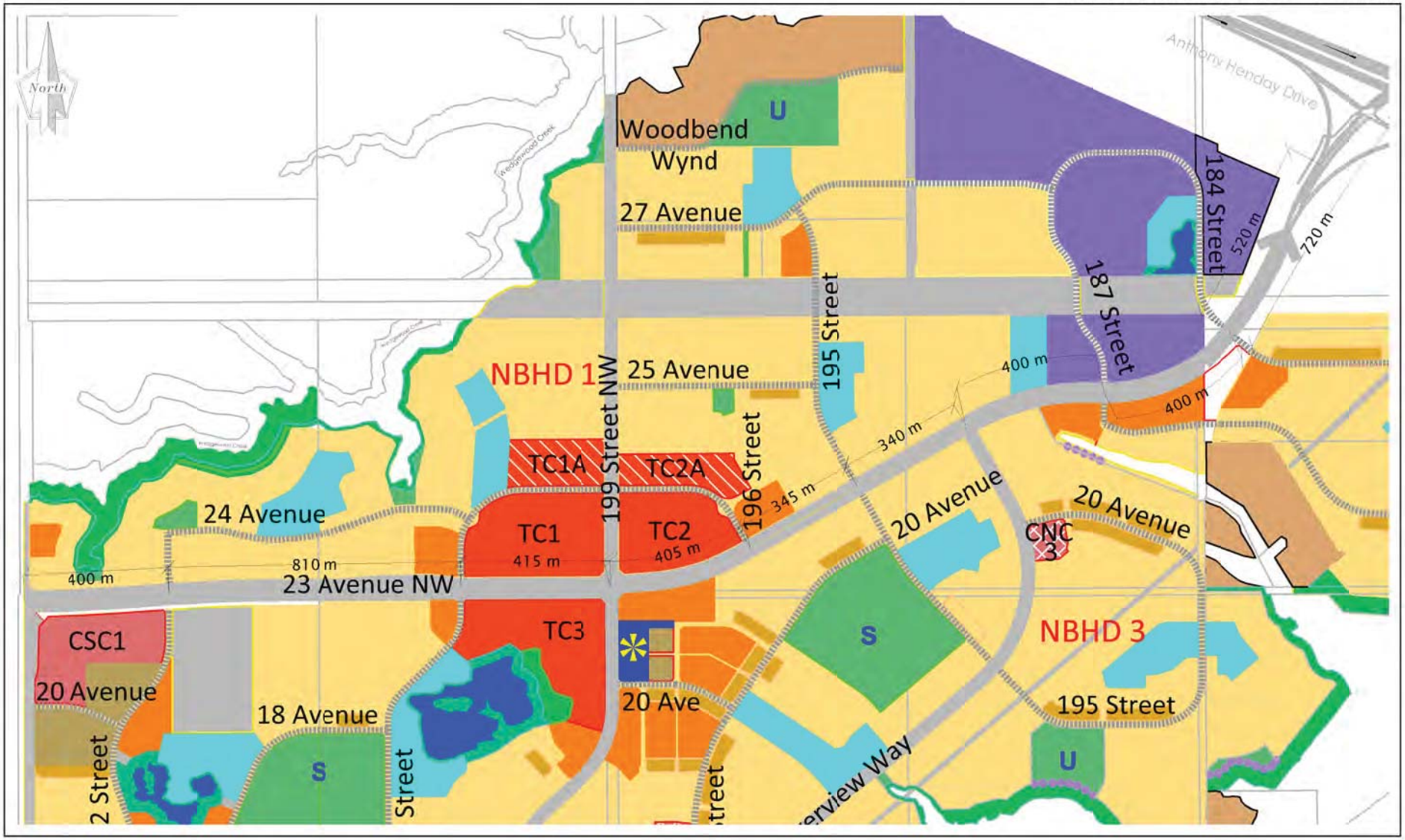

Exhibit 3-3

N.T.S.

Proposed 23 Avenue NW Intersection Spacing

- A collector connection to 215 Street was eliminated north of the wetland area and a collector connection to 215 Street was added south of the wetland area with the re-alignment of Riverview Way.

- The collector network in the central portion of NBHD 3 was revised to improve connections between the transit centre/town centre and the district park site. Active modes connections between the North Saskatchewan River Valley and the town centre will continue to be provided along the previous collector alignment.

3.3 Active Transportation

3.3.1 Active Modes Network

Exhibit 3-4 illustrates the proposed active modes transportation network. The proposed network includes commuter and recreational routes providing connections to the following major destinations within and external to Riverview NBHDs 1, 2, and 3.

Within/Adjacent to Riverview

- North Saskatchewan River Valley;
- Wedgewood Creek;
- Town Centre;
- Transit Centre;
- School Sites;
- Commercial Sites; and,
- Business Employment Area.

External to Riverview

- Cameron Heights;
- Edgemont;
- Parkland County, and,
- TUC.

The Riverview NBHDs 1, 2, and 3 NSPs identify the following active modes transportation elements:

- ***Arterial Roadway Shared Use Path (SUP)*** – City of Edmonton standard arterial roadway cross-sections include a SUP on one side and a sidewalk on the other side.

- ***Top-of-bank SUP*** – As per City policies, SUPs will be developed along the top-of-bank along the North Saskatchewan River Valley and Wedgewood Creek when new development occurs. At this time SUPs will not be developed along the top-of-bank adjacent to existing country residential subdivisions.

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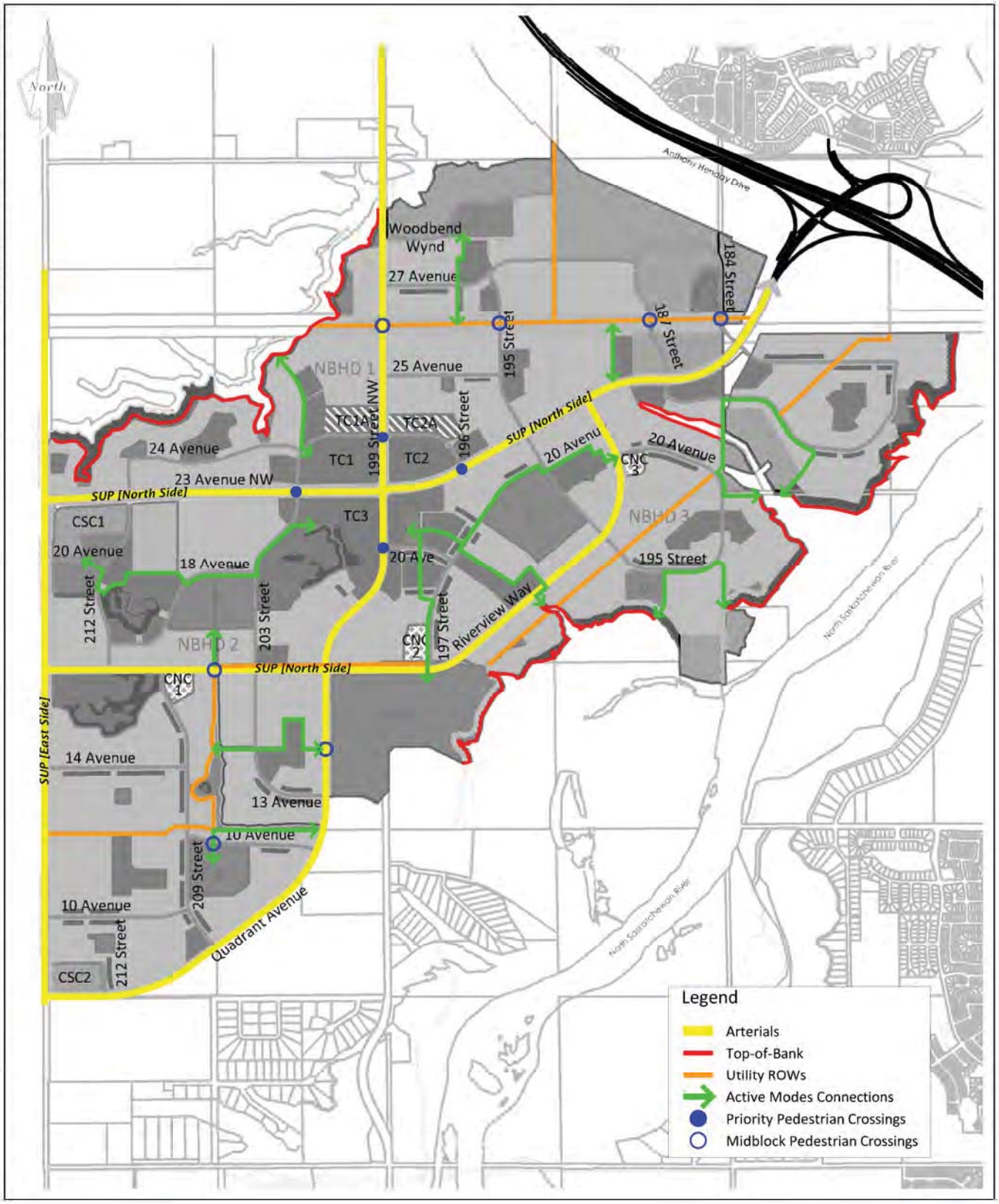

Exhibit 3-4

N.T.S.

Riverview NBHDs 1, 2 and 3 Active Modes Network

- ***Utility Right-of-Way SUP*** – As per City policies, and with approval from the respective utility companies, SUPs will be developed along utility rights-of-way within the plan area.

The development of SUPs noted above will create an overall active modes network that spans Riverview NBHDs 1, 2, and 3 and also provides connections to adjacent communities. In addition to the above, SUPs will be developed along a minimum of 50% of the perimeter of storm water management facilities and within ER buffers where appropriate. The following active modes connections have been identified to take advantage of the SUPs along storm water management facilities and natural areas to broaden the overall active modes network.

Riverview NBHD 1

- The eastern north/south link utilizes a storm water management facility SUP to provide a connection between the SUP along 23 Avenue and the SUP within the Altalink ROW.
- The central north/south link provides a connection between an urban park and the SUP proposed within the Altalink right-of-way along a storm water management facility and a proposed greenway.
- The western link is proposed to connect the Wedgewood Creek top-of-bank SUP to the town centre along the west side of two storm water management facilities.

Riverview NBHD 2

- An east/west SUP connection is proposed between the town centre and the northwest commercial/residential mixed use area using SUPs along storm water management facilities, park space, natural areas, and road right-of-way.
- An east/west link is proposed between the north/south utility SUP and the district park site along a combination of greenways and a storm water management facility.
- An east/west link is proposed along one side of the east/west natural area north of 10 Avenue.
- Greenway connections are proposed to extend the north/south utility SUP to the public school site to the north and the catholic school site to the south.

Riverview NBHD 3

- Two active modes connections are identified to extend the North Saskatchewan River top-of-bank around existing country residential land uses. These are anticipated to be developed within local and/or collector road rights-of-way.
- Three active modes connections have been identified in the northwest portion of Riverview NBHD 3 to provide access to the transit centre and mixed use development area. These facilities are proposed along a combination of storm water management facilities, parks, greenways, and road right-of-way.

3.3.2 Facility Types

SUPs along arterial roadways, top-of-bank, utility rights-of-way, greenways, and storm water management facilities will be developed with a 3.0 metre paved surface. SUPs along natural areas will need to be implemented in consultation with the City of Edmonton's Parks and Biodiversity Section and may include paved or granular paths.

Active modes connections identified within local or collector roadways may include shared lanes (in-line or side-by-side), bike lanes, buffered bike lanes, and/or SUPs. The type of facility selected for these locations should consider the adjacent land use, roadway traffic volumes, and the type of facility developed along the remainder of the link. For example, the majority of the links identified within road rights-of-way represent the extension of off-street SUPs; therefore, the extension of a SUP may be appropriate for shorter segments. As well, it is noted that a key element along links within local or collector roadways is way-finding information.

Where multiple facilities can be provided within parallel rights-of-way or corridors only one facility is required to be constructed. The type of facility selected along the segment should provide a logical consistent extension of the overall active modes network.

Wherever possible, the SUPs should be extended to adjacent intersections to facilitate pedestrian crossings. However, the active modes network illustrated in Exhibit 3-4 also identifies a number of potential mid-block pedestrian crossing locations that are anticipated to be required based on the proposed alignments of SUP facilities. As well, Exhibit 3-4 identifies proposed priority pedestrian crossing locations around the town centre. This means that minimum pedestrian crossing times across 23 Avenue and 199 Street should be provided during all time periods (no pedestrian actuation).

In addition to the active modes network components identified above, sidewalks and on-street bicycle access will be available along arterial, collector, and local roadways as per existing standards.

3.4 Parking

Parking for vehicles will generally be provided off-street in accordance with the parking requirements outlined in the Edmonton Zoning Bylaw. As per the existing Zoning Bylaw, reduced parking requirements may be considered within 400 metres of the transit centre.

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4. SITE TRAFFIC CHARACTERISTICS

4.1 Trip Generation Rate Assumptions

The AM peak hour, PM peak hour, and daily trip generation rates used in the assessment are based on a combination of City of Edmonton recommended rates and trip generation rates published in the Institute of Transportation Engineers' (ITE's) Trip Generation, 9th Edition. The following sections summarize the land use category and rates selected based on the trip generating land uses anticipated to be developed within Riverview.

4.1.1 Non-Residential Land Uses

Town Centre

Trip generation for the town centre commercial and mixed use sites was developed by intersection quadrant. For example, trip generation for the town centre land uses in the northwest quadrant of the intersection (TC1 and TC1A) assumes that both sites would be constructed as one comprehensive development. Therefore, the combined total GFA was used in the trip generation calculations.

TC1 and TC1A are anticipated to include a combined total GFA of 415,200 SF. As the largest potential commercial site in Riverview, it is assumed that the site could include a mix of commercial uses anchored by a larger regional grocery store. The trip generation rates for TC1 and TC1A were based on a combination of trip rates published for City of Edmonton - Superstore/ITE LUC 813 – Free Standing Discount Superstore, City of Edmonton/ITE LUC 934 – Fast Food Restaurant with Drive-Through Window, and ITE LUC 820 – Shopping Centre. To account for synergy between the grocery store and other commercial land uses on the site, the total site area was used in the fitted curve equations for ITE LUC 820 – Shopping Centre (i.e. 415,200 SF). This resulted in reductions for synergy in the order of 7% to 9%.

TC2/TC2A are anticipated to include a combined total GFA of 341,300 SF, while TC3 is anticipated to include a total GFA of 315,900 SF. These sites are assumed to include a mix of retail land uses anchored by a grocery store. The trip generation rates for these town centre sites were based on a combination of trip rates published for ITE LUC 850 – Grocery Store, City of Edmonton/ITE LUC 934 – Fast Food Restaurant with Drive-Through Window, and ITE LUC 820 – Shopping Centre. To account for synergy between the grocery store and other commercial land uses on the sites, the total site areas were used in the fitted curve equations for ITE LUC 820 – Shopping Centre (i.e. 341,300 SF and 315,900 SF). This resulted in reductions for synergy in the order of 3% to 4%.

Community Commercial

CSC2 and CSC3 are assumed to fall within the range of sites surveyed as part of Trip Generation in Edmonton[1]; therefore, the AM and PM peak hour trip rates are based on City of Edmonton measured rates. The daily rates are based on the fitted curve equation for ITE LUC 820 – Shopping Centre.

CSC1 is estimated to be in the order of 172,200 SF, which is outside of the range of sites surveyed in Edmonton; therefore, the trip generation for CSC1 is based on a combination of trip rates published for ITE LUC 850 – Grocery Store, City of Edmonton/ITE LUC 934 – Fast Food Restaurant with Drive-Through Window, and ITE LUC 820 – Shopping Centre. To account for synergy between the grocery store and other commercial land uses on the sites, the total site areas were used in the fitted curve equations for ITE LUC 820 – Shopping Centre (i.e. 172,200 SF). This resulted in reductions for synergy in the order of 5% to 6%.

Transit Centre Mixed Use

The Transit Centre Mixed Use site is estimated to include 52,700 SF of GFA. This magnitude of commercial GFA falls within the range of sites surveyed for CSC sites in Edmonton; therefore, the AM and PM peak hour trip generation rates are based on City of Edmonton measured rates for CSC sites. The daily rate is based on the fitted curve equation for ITE LUC 820 – Shopping Centre.

Neighbourhood Commercial

All of the CNC sites fall within the range of sizes included for CNC sites in Trip Generation in Edmonton; therefore, the City of Edmonton AM and PM measured trip rates were used in the assessment. The daily rates are based on the fitted curve equation for ITE LUC 820 – Shopping Centre.

Business Employment

Trip generation rates for the business employment land uses were based on published rates for ITE LUC 710 – General Office Building.

Trip generation rates for the highway commercial land uses assumed to be developed within the business employment area were based on rates published for ITE LUC 310 – Hotel and ITE LUC 841 – New Car Sales.

District Park

The district park is assumed to include a 100,000 SF recreation centre, twin ice arenas, and seven playing fields. Therefore, rates published for ITE LUC 495 – Recreational Community Centre, ITE LUC 465 –

[1] Bunt & Associates. 2011. Trip Generation in Edmonton: Identification of Local Trip Generation Rates for Select Residential and Commercial Land uses and A Review of Best Practices for Trip Generation Associated with Mixed-Use, Transit Oriented, and Infill Development.

Skating Rink, and ITE LUC 488 – Soccer Complex were included in the assessment. As an AM peak hour rate is not available for ITE LUC 465 – Skating Rink, a rate of 0.05 trips/seat was assumed for the arena, which assumes morning hockey practices ending during the AM peak hour.

Schools

As the peak hours of school traffic do not typically coincide with the peak hour of adjacent street traffic, no traffic is assumed to be generated by the schools in the AM or PM peak hours.

Daily trip generation rates for the high schools are based on ITE LUC 530 – High School, while daily trip generation rates for the elementary/junior high schools are based on an average of ITE LUC 520 – Elementary School and ITE LUC 522 – Middle/Junior High School.

Table 4-1 summarizes the assumed trip generation rates used in the assessment for the various non-residential land uses proposed to be developed within the Riverview ASP area.

Table 4-1: Non-Residential Trip Generation Rates

Site	Sources	AM Peak Hour	PM Peak Hour	Daily
TC1 & TC1A	City/ITE LUC 813 City/ITE LUC 934 ITE LUC 820	1.48 trips/1,000 SF	4.87 trips/1,000 SF	50.16 trips/1,000 SF
TC2 & TC2A	ITE LUC 850 City/ITE LUC 934 ITE LUC 820	1.57 trips/1,000 SF	4.87 trips/1,000 SF	58.46 trips/1,000 SF
TC3	ITE LUC 850 City/ITE LUC 934 ITE LUC 820	1.65 trips/1,000 SF	5.02 trips/1,000 SF	60.63 trips/1,000 SF
CSC1	ITE LUC 850 City/ITE LUC 934 ITE LUC 820	2.38 trips/1,000 SF	6.43 trips/1,000 SF	80.96 trips/1,000 SF
CSC2	City/ITE LUC 820	4.02 trips/1,000 SF	8.38 trips/1,000 SF	69.06 trips/1,000 SF
CSC3	City/ITE LUC 820	4.02 trips/1,000 SF	7.90 trips/1,000 SF	66.19 trips/1,000 SF
Transit Centre Mixed Use	City/ITE LUC 820	4.02 trips/1,000 SF	10.38 trips/1,000 SF	84.98 trips/1,000 SF
CNC Sites	City/ITE LUC 820	5.62 trips/1,000 SF	8.72 trips/1,000 SF to 9.69 trips/1,000 SF	107.53 trips/1,000 SF to 112.40 trips/1,000 SF
Business Employment	ITE LUC 710	0.48 trips/employee	0.46 trips/employee	3.32 trips/employee
Highway Commercial	ITE LUC 310 ITE LUC 841	0.53 trips/room 1.92 trips/1,000 SF	0.60 trips/room 2.62 trips/1,000 SF	8.17 trips/room 32.30 trips/1,000 SF
District Park	ITE LUC 495 ITE LUC 465 ITE LUC 488	2.05 trips/1,000 SF 0.05 trips/seat 1.12 trips/field	2.74 trips/1,000 0.12 trips/seat 17.70 trips/field	33.82 trips/1,000 SF 1.26 trips/seat 71.33 trips/field
High School	ITE LUC 530	N/A	N/A	1.71 trips/student
Elementary/Junior High School	ITE LUC 520 ITE LUC 522	N/A	N/A	1.46 trips/student

4.1.2 Residential Land Uses

The trip generation rates assumed for residential land uses are based on the following:

- The City's measured low density residential trip generation rates were applied to the existing and single/semi-detached residential units.
- The City's RF5 – row housing trip generation rates were applied to the row housing units.
- The City's RA7 & RA8 – apartment housing trip generation rates were applied to the low-rise/multi/medium density housing, the high density housing, and all residential units within the town centre and mixed use sites.

Table 4-2 summarizes the assumed trip generation rates used in the assessment for the various residential land uses proposed to be developed within Riverview.

Table 4-2: Residential Trip Generation Rates

Land Use	Source	AM Peak Hour	PM Peak Hour	Daily
Existing and Single/Semi-detached	C of E	0.69 trips/du	0.79 trips/du	7.92 trips/du
Row Housing	C of E	0.46 trips/du	0.58 trips/du	6.59 trips/du
Low-rise/Multi/ Medium Units	C of E	0.34 trips/du	0.40 trips/du	5.81 trips/du
Residential Mixed Use	C of E	0.34 trips/du	0.40 trips/du	5.81 trips/du
High Density	C of E	0.34 trips/du	0.40 trips/du	5.81 trips/du

4.2 Gross Trip Generation Estimates

Table 4-3 summarizes the projected two-way AM peak hour, PM peak hour, and daily vehicle trips anticipated to be generated by the Riverview ASP area upon full build out. As shown in Table 4-3, the area is anticipated to generate in the order of 18,448 two-way gross vehicle trips in the AM peak hour, 26,647 two-way gross vehicle trips in the PM peak hour, and 293,504 two-way gross vehicle trips on a typical weekday. Detailed summaries of the trip generation estimates are included in **Appendix C**.

Table 4-3: Gross Trip Generation Estimates

Land Use	Intensity (Total)	AM Peak Hour		PM Peak Hour		Daily	
		In	Out	In	Out	In	Out
Town Centre Sites	1,072,400 SF	1,023	648	2,646	2,623	29,966	29,966
CSC Sites	375,100 SF	674	550	1,334	1,422	13,823	13,823
Transit Centre Mixed Use	52,700 SF	112	100	263	284	2,239	2,239
CNC Sites	130,400 SF	403	330	592	642	7,085	7,085
Business Employment	3,200 employees	1,352	184	250	1,222	5,312	5,312
Highway Commercial	675,000 SF	451	235	387	457	5,487	5,487
District Park	163,000 SF	150	98	284	198	2,382	2,382
High School	2,350 students	0	0	0	0	2,009	2,009
Elementary/Junior High School	3,750 students	0	0	0	0	2,738	2,738
Total Non-Residential		**4,165**	**2,145**	**5,756**	**6,848**	**71,041**	**71,041**
Existing and Single/Semi-detached	13,946 du	1,828	7,794	7,382	3,636	55,226	55,226
Row Housing	1,613 du	156	586	608	327	5,315	5,315
Low-rise/Multi/ Medium Units	3,622 du	209	1,022	913	536	10,522	10,522
Residential Mixed Use	1,375 du	79	388	347	204	3,994	3,994
High Density	225 du	13	63	57	33	654	654
Total Residential	**20,781 du**	**2,285**	**9,853**	**9,307**	**4,736**	**75,711**	**75,711**
Total Gross Site Generated Traffic		**6,450**	**11,998**	**15,063**	**11,584**	**146,752**	**146,752**
		18,448		**26,647**		**293,504**	

4.3 Net Internal and External Trip Generation Estimates

The gross trip generation estimates summarized in Table 4-3 reflect all trips anticipated to access the individual land uses. Within the process used to identify the potential traffic volumes within the neighbourhood and on the adjacent arterial roadway network, a number of factors are applied to determine the potential net new traffic on the network. For example, the trips identified in Table 4-3 for commercial sites include both pass-by and primary trips, where only primary trips represent new trips on the network.

As well, the gross trips noted in Table 4-3 do not reflect the potential interaction between land uses within Riverview. Where both the origin and destination of a trip are within the study area, there is the potential to double count the trips. For example, a trip from a residence to the town centre is generated by both land uses, but ultimately represents only one trip on the network.

In addition to the above, the City of Edmonton's Transportation Master Plan: The Way We Move, focuses on increasing the use of transit and non-motorized transportation modes and decreasing passenger vehicle trips, which can be reflected in the use of mode split factors.

The following sections summarize the adjustment factors used in the assessment.

4.3.1 Non-Residential Trips

Pass-by Trips

For the purpose of this assessment, commercial trips have been divided into pass-by and primary trips. Primary trips have a destination that is the primary purpose of the trip, while pass-by trips represent an intermediate stop along the way from an origin to a primary destination. The PM peak hour pass-by trip percentages for the town centre and CSC sites are generally based on the fitted curve equation for percent pass-by trips from the ITE Trip Generation Handbook, 2nd Edition. Information is not available regarding AM peak hour or daily pass-by percentages; therefore, 20% was used in the AM peak hour for all sites and a general average of the AM and PM peak hour percentages was used for the daily trips.

Based on the application of the fitted curve equation for the CNC sites, the percent pass-by trips could range from 55% to 65%; however, to be conservative, pass-by percentages of 50% were used in the assessment for all time periods. A pass-by trip rate of 10% was assumed for the town centre mixed use site for all time periods as it is anticipated to predominantly serve surrounding residential land uses and the adjacent transit centre, rather than attract vehicle trips from the adjacent roadway network. As well, the PM peak hour and daily pass-by rates for CNC1 were reduced to 25% as future volumes along Riverview Way west of 199 Street are anticipated to be too low to support a 50% pass-by rate. **Table 4-4** summarizes the percent pass-by trips assumed for the commercial land uses.

Table 4-4: Pass-by Trip Percentages

Commercial Land Use	AM Peak Hour	PM Peak Hour	Daily
TC1 & TC1A	20%	20%	20%
TC2 & TC2A	20%	25%	25%
TC3	20%	30%	25%
CSC1	20%	35%	25%
CSC2 & CSC3	20%	40%	30%
Town Centre Mixed Use	10%	10%	10%
CNC1	50%	25%	25%
CNC Sites 2-5	50%	50%	50%

Although the hotel and car dealerships are considered commercial land uses, they are not anticipated to accommodate significant pass-by traffic.

Mode Split

The Riverview ASP area is anticipated to be serviced by bus transit, with links to the future Lewis Farms LRT station and transit centre, the Leger transit centre, and the future Heritage Valley Town Centre LRT station and transit centre. Although the LRT is not planned to extend to Riverview, the Transportation Master Plan: The Way We Move identifies a mode shift to transit and active modes as a strategic goal over the next 30 years. Based on the initiatives and strategies outlined in The Way We Move and the subsequent The Way We Move Implementation Plan, it is anticipated that the City of Edmonton will experience an overall increase in the mode split to transit as the LRT is expanded to the southeast and west, and bus transit is planned to provide connections to the LRT stations. As well, the City of Edmonton has typically assumed a 5% reduction in residential trips in the longer term as employment alternatives, such as telecommuting, become more common.

For the purpose of the assessment it is assumed that an increase in the mode split to transit and active modes would primarily impact the business employment and residential land uses. Therefore, a 5% mode split has been applied to the business employment land uses in the 2047 horizon.

In addition to the above, a mode split of 50% was assumed for the commercial component of the transit centre mixed use site. This site is anticipated to primarily provide convenience oriented services to transit centre patrons and residents of the immediately surrounding area.

Internal Versus External Non-Residential Trips

The percentage of internal trips associated with the non-residential land uses was established based on a review of the potential catchment area that may be associated with a particular land use as follows.

- It was assumed that the town centre sites located on the northeast, northwest, and southwest corners of the 23 Avenue/199 Street intersection would draw traffic from residential and employment areas within Riverview, as well as from other residential areas in West Edmonton and Parkland County within an approximate seven kilometre radius (north to Whitemud Drive). It is assumed that residents outside this assumed catchment area would have multiple other commercial opportunities within a closer proximity, reducing the attraction to the Riverview sites. It was assumed that the community commercial sites along 215 Street would primarily draw traffic from residential areas within Riverview, with some trips also being attracted from Cameron Heights, Edgemont, and Parkland County.

- All of the vehicle trips to the commercial component of the transit centre mixed use site are assumed to be drawn from the Riverview area.

- For the neighbourhood commercial sites, it was assumed that all of the primary trips would be drawn from the adjacent residential units within Riverview.

- Internal trips in the order of 10% were assumed for the business employment area to reflect the live/work/play concept that is a key focus of the Riverview ASP vision.

- It is anticipated that the highway commercial land uses may draw 10% of their traffic from within Riverview. The majority of the internal trips are assumed to be associated with the car dealerships (service centres); however, the hotel land uses are ideally located for business travellers with a destination within the business employment area.

- Based on information provided by the City of Edmonton, it is anticipated that the district park site will serve the Riverview ASP area, as well as the Edgemont and Cameron Heights neighbourhoods. Some people from Parkland County may also use the district park site on a regular basis.

- It is assumed that the high school could serve a number of areas within west Edmonton and that the elementary/junior high schools could serve the Riverview, Edgemont, and Cameron Heights neighbourhoods.

Available City of Edmonton census information and approved ASPs and NSPs were used to estimate the future population within an approximate seven kilometre radius of the town centre. As there are a number of existing and planned future commercial sites within Windermere, the catchment area for land uses within Riverview was focused north of the North Saskatchewan River. Based on the review, it is estimated that approximately 40% of the trips to the town centre sites and the high schools may be generated from within Riverview, while the remaining 60% could have an origin or destination outside of Riverview. Similarly, a review of the future populations within Riverview, Edgemont, and Cameron Heights

identified that approximately 70% of the trips generated by the community commercial, district park, and elementary/junior high schools may be generated from within Riverview. **Table 4-5** summarizes the assumed internal and external trip percentages anticipated for the non-residential land uses. A summary of the neighbourhoods and associated populations within the assumed catchment area is included in **Appendix D**.

It should be noted that these percentages were applied to the total primary trips, i.e. pass-by trips were already removed from the gross trip generation estimates.

Table 4-5: Internal and External Trip Percentages

Non-Residential Land Use	Internal	External
Town Centre	40%	60%
Community Commercial	70%	30%
Transit Centre Mixed Use	100%	0%
Neighbourhood Commercial	100%	0%
Business Employment	10%	90%
Highway Commercial	10%	90%
District Park	70%	30%
High Schools	40%	60%
Elementary/Junior High Schools	70%	30%

For the purpose of this assessment, the trips anticipated to stay within Riverview (internal trips) were assigned to the internal roadway network and were then subtracted from the trips generated by the residential land uses. In this way, trips between the different land uses within the area are accounted for on the internal roadway network but are not double counted.

Net Non-Residential Trips

The pass-by, mode split, and internal trip percentages were applied to the gross trip generation estimates to determine the net new trips anticipated to be generated by the non-residential land uses. **Table 4-6** summarizes the net non-residential site generated traffic. A detailed summary of the application of the pass-by, mode split, and internal trip percentages is included in **Appendix E**.

Table 4-6: Non-Residential Net Trip Generation

Trip Component	AM Peak Hour		PM Peak Hour		Daily	
	In	Out	In	Out	In	Out
Total Gross Non-Residential Trips	4,165	2,145	5,756	6,848	71,041	71,041
Total Non-Auto Trips	124	59	144	203	1,385	1,385
Total Pass-by Trips	410	410	1,416	1,416	14,091	14,091
Total Internal Trips	1,320	835	2,088	2,240	26,539	26,539
Net External Trips	**2,311**	**841**	**2,108**	**2,989**	**29,026**	**29,026**

4.3.2 Residential Trips

Internal versus External Trips

The internal neighbourhood trips generated by the non-residential land uses are assumed to access the residential land uses within the Riverview ASP area. As can be determined from Table 4-6, the non-residential land uses are anticipated to generate in the order of 2,155 two-way AM peak hour internal trips, 4,328 two-way PM peak hour internal trips, and 53,078 two-way daily internal trips. The allocation of non-residential trips to the residential areas was based on the potential trip generating characteristics of the different residential land uses.

Mode Split

A 5% mode split to transit was also assumed for the residential land uses in the plan area to account for the success of the goals and strategies of the Transportation Master Plan: The Way We Move over the next 30 years.

The internal trips and mode split assumptions were applied to the gross residential trips to identify the net external vehicle trips anticipated to be generated by the residential land uses. **Table 4-7** summarizes the residential trips adjusted for internal trips and mode split and the overall total number of external trips anticipated to be generated by the Riverview ASP area.

Table 4-7: Residential Net Trip Generation

Trip Component	AM Peak Hour		PM Peak Hour		Daily	
	In	Out	In	Out	In	Out
Total Gross Residential Trips	2,285	9,853	9,307	4,736	75,711	75,711
Total Non-Auto Trips	114	493	465	237	3,786	3,786
Total Internal Trips	835	1,320	2,240	2,088	26,539	26,539
Net External Trips	1,336	8,040	6,602	2,411	45,386	45,386
% Internal Trips by Direction	37%	13%	24%	44%	35%	35%
% Internal Trips	18%		31%		35%	
Total External Riverview Trips	**3,647**	**8,881**	**8,710**	**5,400**	**74,412**	**74,412**
	12,528		**14,110**		**148,824**	

As shown in Table 4-7, approximately 18% of the residential AM peak hour trips, 31% of the residential PM peak hour trips, and 35% of the residential daily trips are anticipated to remain within Riverview. The percent of internal residential trips by direction shows higher percentages for the off-peak direction (37% AM peak hour inbound, 44% PM peak hour outbound) which is consistent with origin-destination information available for the west suburb from the City of Edmonton's 2013 Origin-Destination Car Drive Trip Tables.

4.4 Trip Distribution

4.4.1 Non-Residential Trip Distribution

Internal Trip Distribution

The distribution of the non-residential internal trips was based on the approximate location of residential land uses within the neighbourhood.

External Trip Distribution

The distribution of external trips was primarily based on the population estimates within the assumed catchment areas as described in Section 4.3.1.

The external trips associated with the business employment and highway commercial land uses are anticipated to be distributed to all areas of the City as per the City's Origin-Destination Car Driver Trips 2013 spreadsheets. Copies of the tables are provided in **Appendix F**.

4.4.2 Residential Trip Distribution

The distribution of residential trips was based on the City of Edmonton's Origin-Destination Car Driver Trips 2013 spreadsheets, adjusted to reflect the trips anticipated to remain within Riverview as part of the west suburb. For example, of the 48% of the inbound AM peak hour trips, 37% are assumed to be from the Riverview ASP area and the reaming 11% would be from other areas within the west suburb. Subtracting out the percentage of internal trips equals a revised total external distribution of 63%. The percentages were adjusted to reflect external trips only (i.e. existing percentage multiplied by 100 and divided by 63). **Table 4-8** summarizes the revised origin-destination percentages, while **Exhibit 4-1** illustrates the overall distribution to the different sectors of the Edmonton region.

Table 4-8: Adjusted Residential Origin-Destination Percentages

Sector	AM Peak Hour		PM Peak Hour		Daily	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Downtown	1.4%	5.5%	4.1%	2.0%	3.1%	2.8%
University	1.3%	4.4%	3.0%	1.3%	2.6%	2.2%
Downtown Fringe	3.0%	4.6%	3.3%	3.4%	3.5%	3.5%
NW Inner City	3.6%	3.8%	3.4%	4.3%	3.7%	4.0%
NE Inner City	2.8%	2.1%	2.0%	2.7%	2.2%	2.0%
SE Inner City	1.9%	2.2%	1.8%	1.6%	1.8%	1.8%
SW Inner City	2.8%	3.6%	3.6%	4.1%	3.5%	4.0%
West Inner City	14.8%	12.7%	14.1%	20.4%	18.2%	17.7%
NW Suburb	8.4%	18.0%	16.3%	13.2%	15.5%	15.1%
NE Suburb	3.8%	2.2%	2.0%	3.0%	2.0%	1.9%
SE Suburb	6.5%	11.1%	8.8%	6.1%	7.1%	7.1%
SW Suburb	9.6%	5.8%	5.8%	8.9%	7.1%	7.1%
West Suburb	18.2%	14.2%	20.7%	9.1%	16.1%	19.0%
Sherwood Park / Strathcona County	3.2%	1.6%	1.3%	2.2%	1.4%	1.2%
St. Albert & Sturgeon County	8.0%	3.3%	4.4%	7.2%	5.6%	4.8%
Leduc County	3.0%	2.2%	2.0%	2.3%	1.8%	1.5%
Parkland County	7.7%	2.7%	3.4%	8.2%	4.8%	4.3%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

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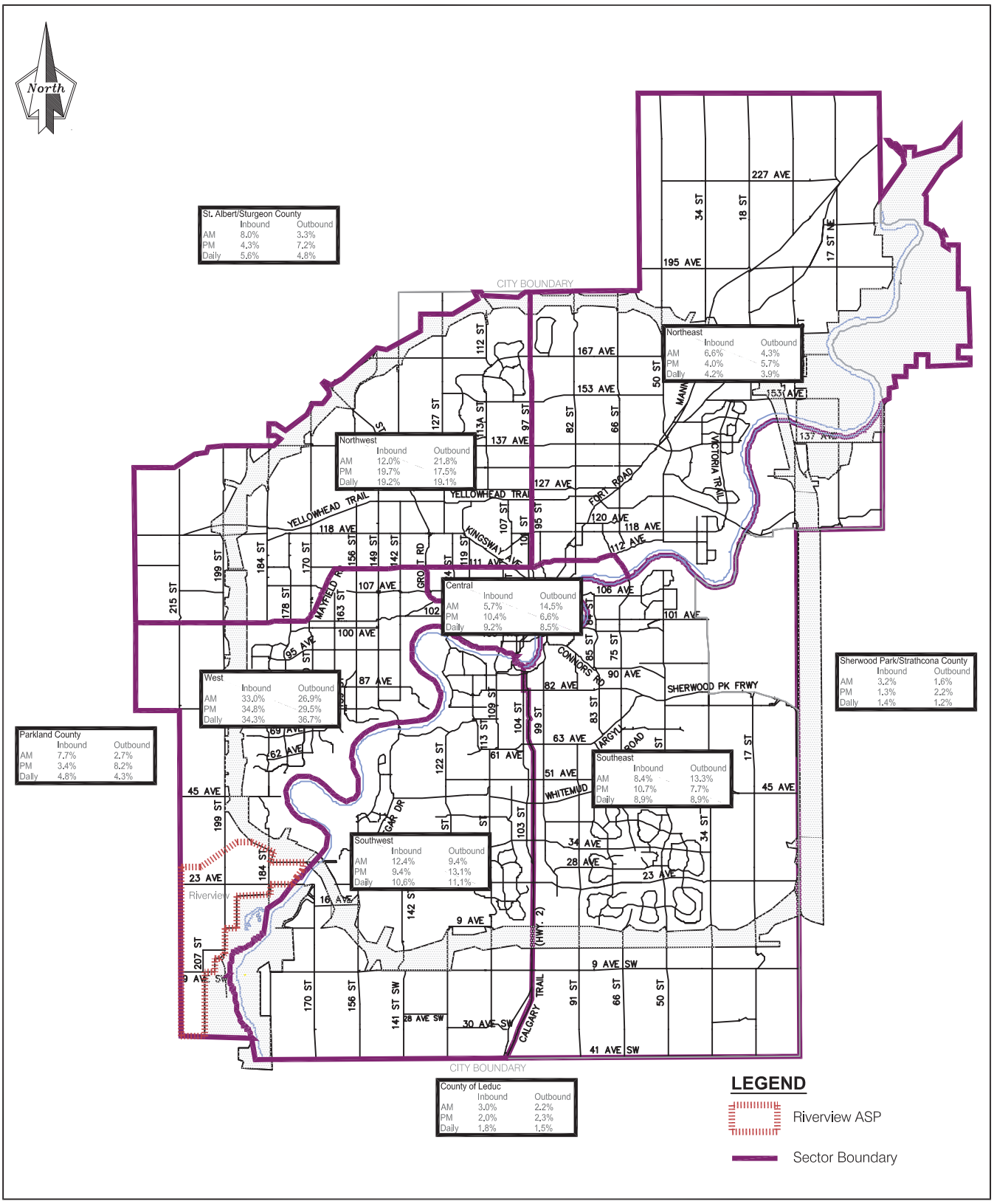

Exhibit 4-1

N.T.S.

Riverview External Residential Trip Distribution

4.5 Site Generated Traffic Volume Estimates

The traffic anticipated to be generated by the land uses within Riverview were assigned to the roadway network based on the assumed distribution and the availability of roadways and access points. **Exhibit 4-2** illustrates the daily site generated traffic volume estimates on the Riverview arterial roadway network in the 2047 horizon, while **Exhibit 4-3** illustrates the AM and PM peak hour site generated traffic volume estimates on the Riverview arterial roadway network in the 2047 horizon. **Exhibit 4-4** illustrates the site generated traffic volume estimates at the arterial/collector intersections within Riverview NBHDs 1, 2, and 3, while **Exhibit 4-5** illustrates the site generated daily volumes on the collectors and the AM and PM peak intersection volumes at the collector/collector intersections within Riverview NBHDs 1, 2, and 3.

4.6 Total Traffic Volume Estimates

The site generated traffic volumes were superimposed on the background traffic volumes to determine total traffic volumes for use in the assessment. **Exhibits 4-6** and **4-7** respectively illustrate the total daily traffic volume estimates and AM and PM peak hour traffic volume estimates on the Riverview arterial roadway network, while **Exhibit 4-8** illustrates the total arterial/collector intersection traffic volume estimates for Riverview NBHDs 1, 2, and 3 in the AM and PM peak hours. No background traffic was projected along the collector roadways within Riverview NBHDs 1, 2, and 3; therefore, Exhibit 4-5 also represents the total collector volumes within these neighbourhoods.

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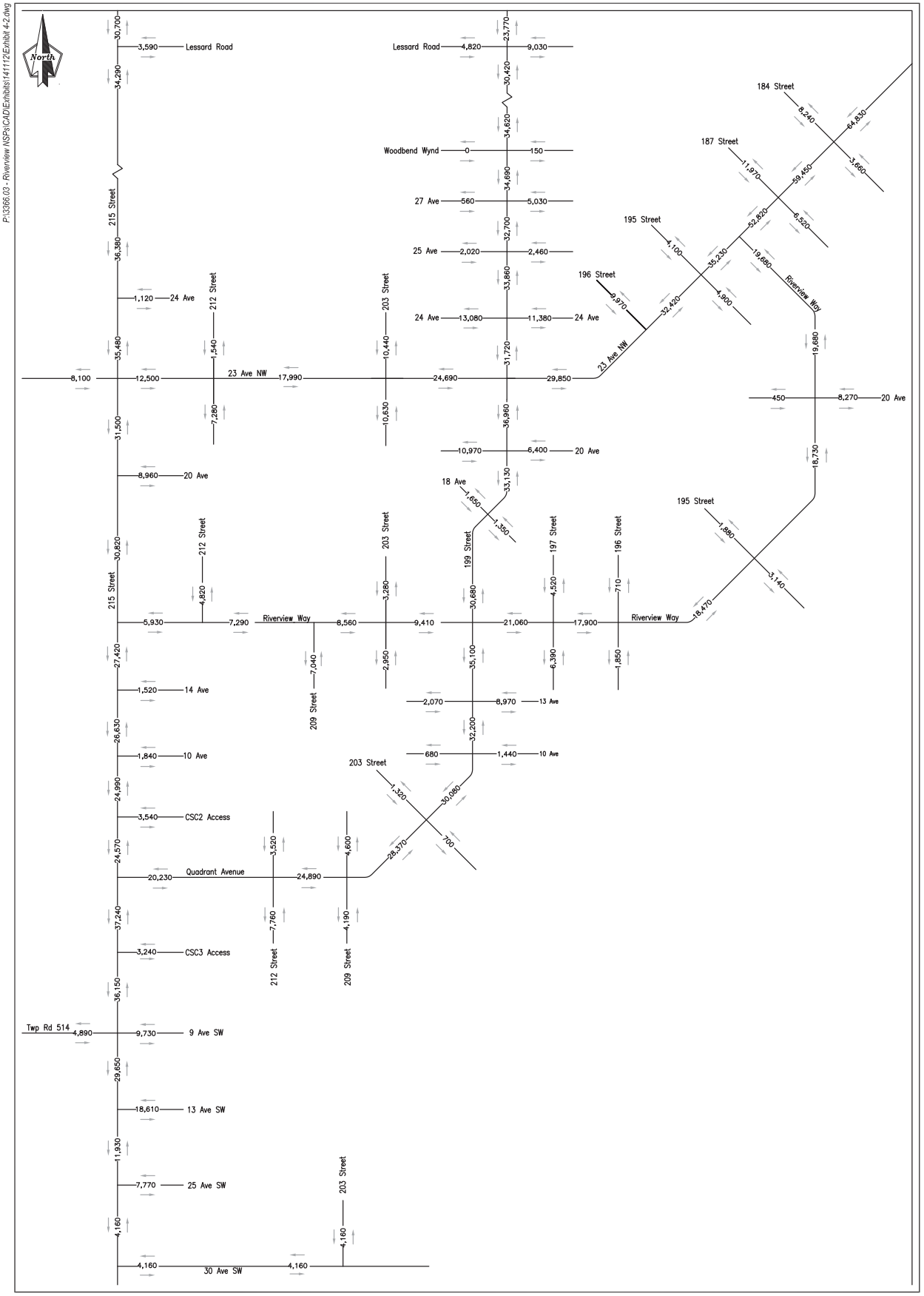

Exhibit 4-2

N.T.S.

Riverview Site Generated Daily Arterial Roadway Traffic Volume Estimates

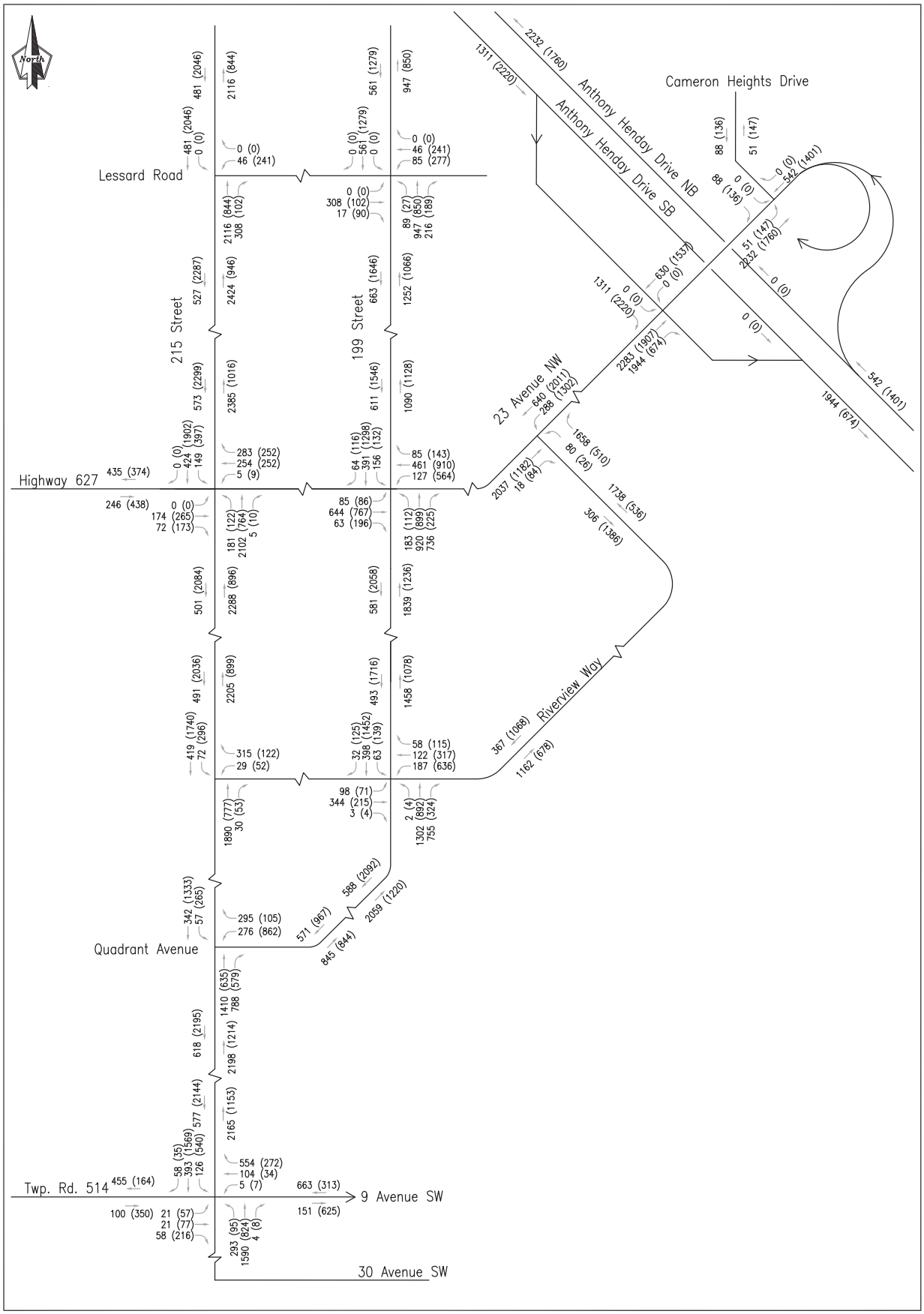

Exhibit 4-3

N.T.S.

Riverview Site Generated Arterial/Arterial Intersection Traffic Volume Estimates AM (PM) Peak Hours

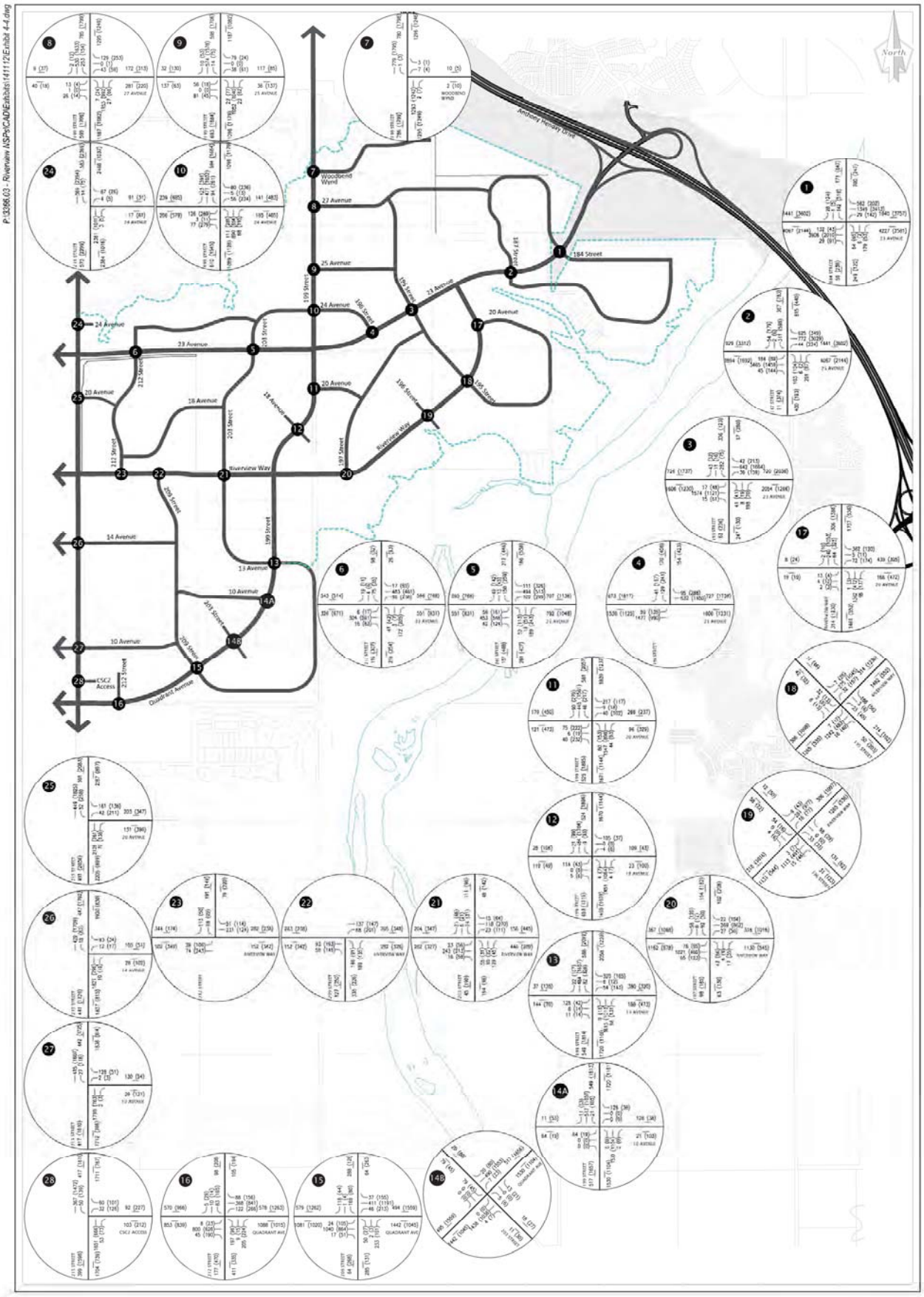

Exhibit 4-4

N.T.S.

Riverview Site Generated Arterial/Collector Intersection Traffic Volume Estimates AM (PM) Peak Hours

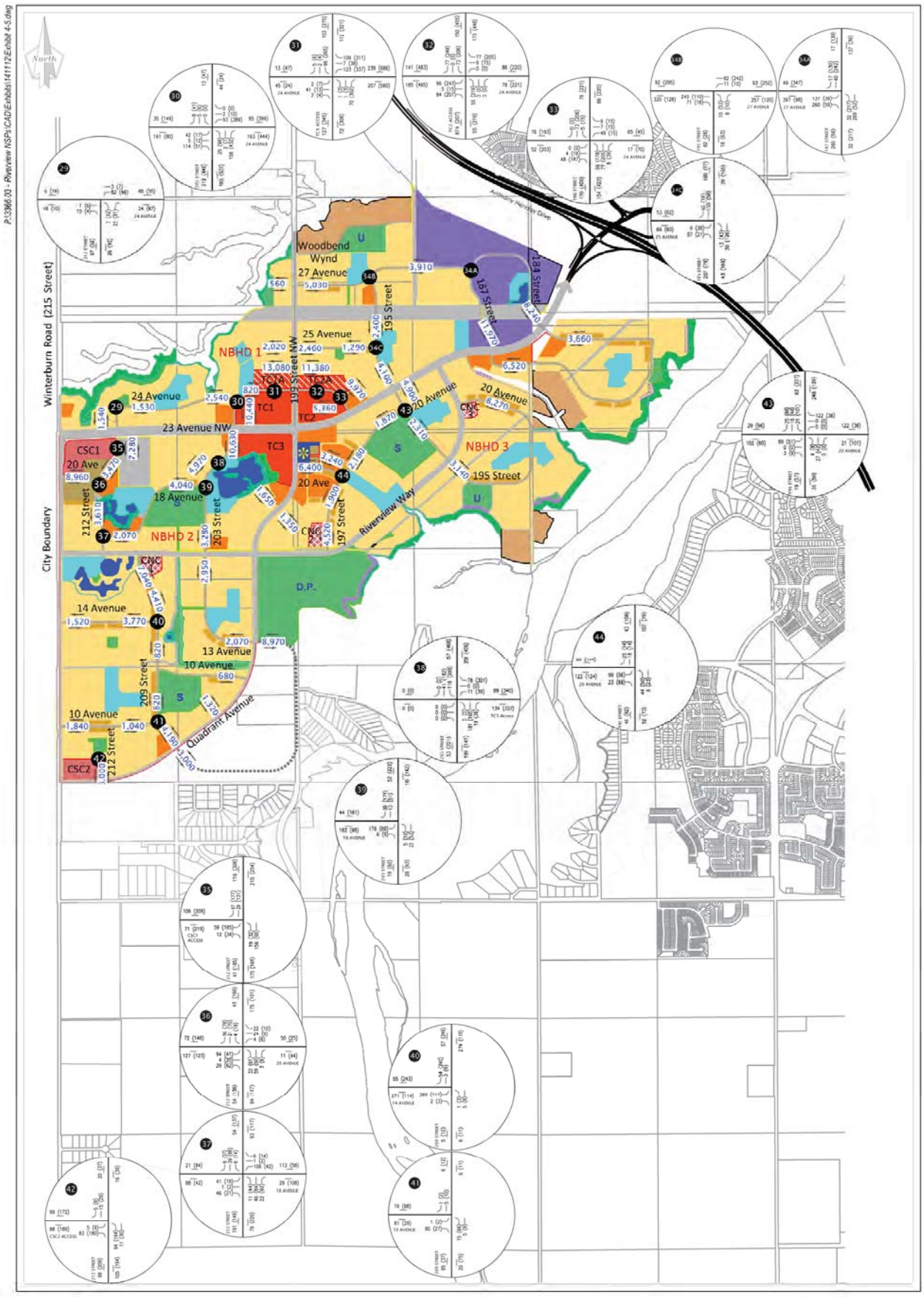

Exhibit 4-5

N.T.S.

Riverview Site Generated Daily Collector Link and Collector/Collector Intersection Traffic Volume Estimates AM (PM) Peak Hours

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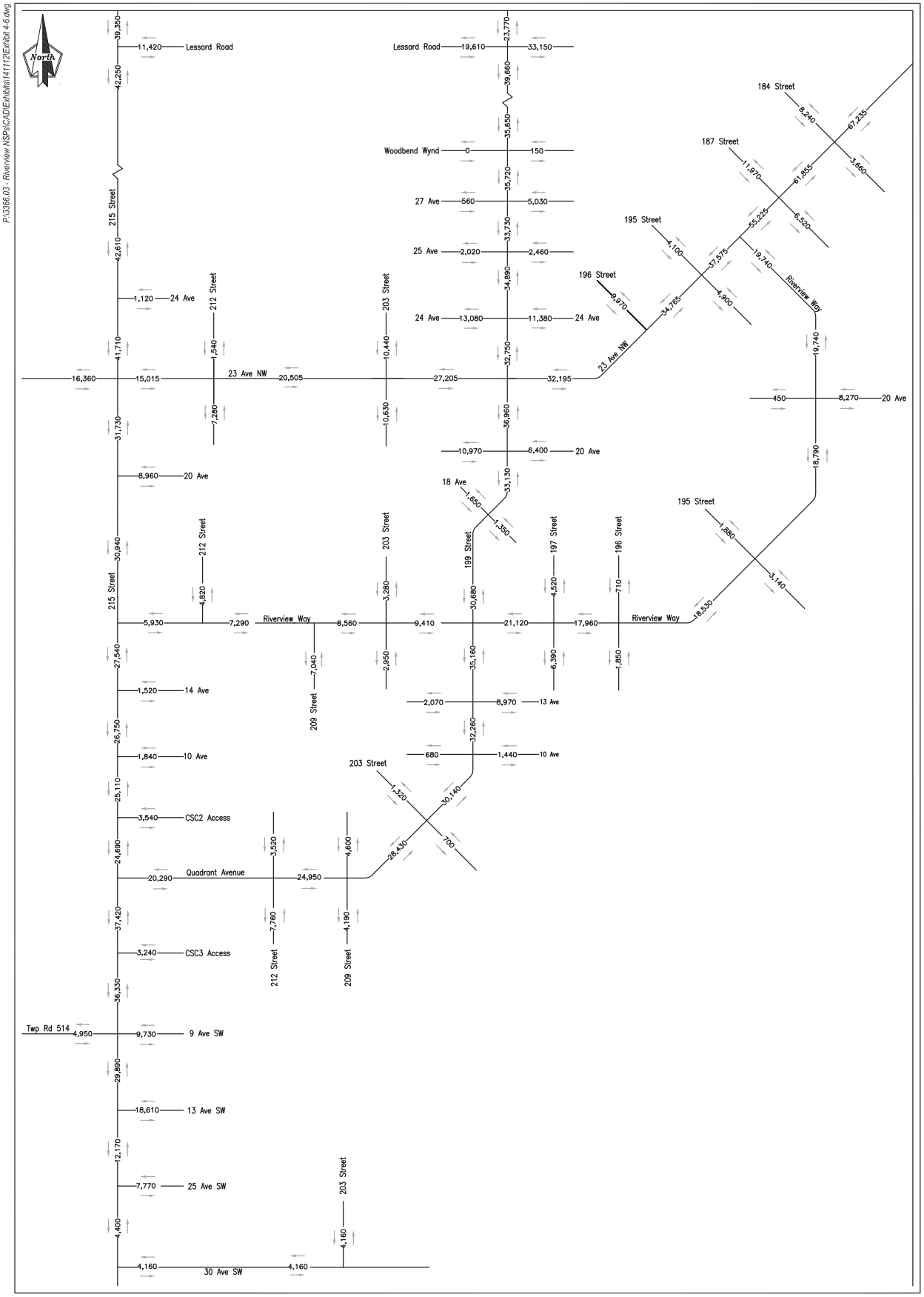

Exhibit 4-6

N.T.S.

Riverview Total Daily Arterial Roadway Traffic Volume Estimates

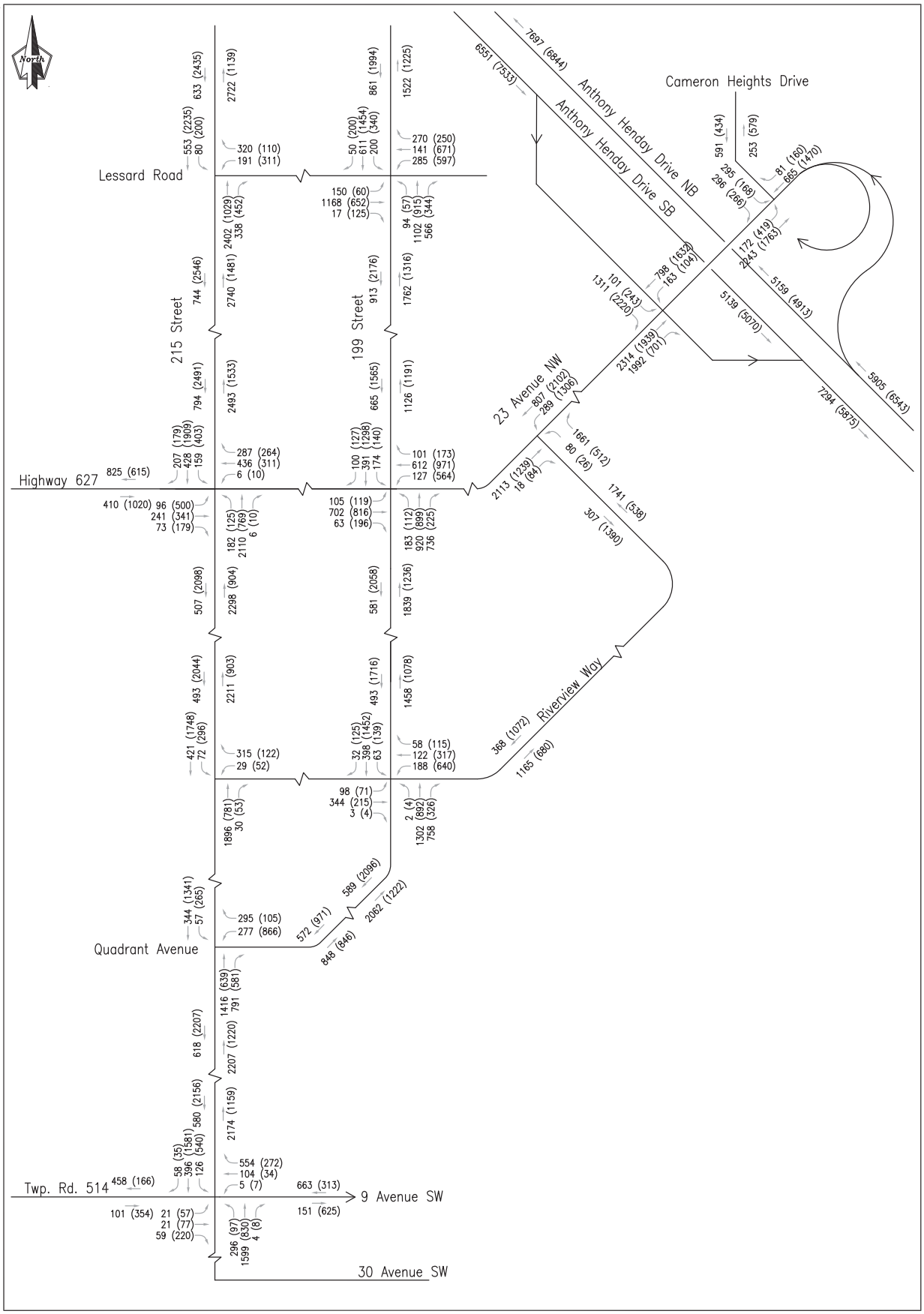

Exhibit 4-7

N.T.S.

2047 Total Arterial/Arterial Intersection Traffic Volume Estimates AM (PM) Peak Hours

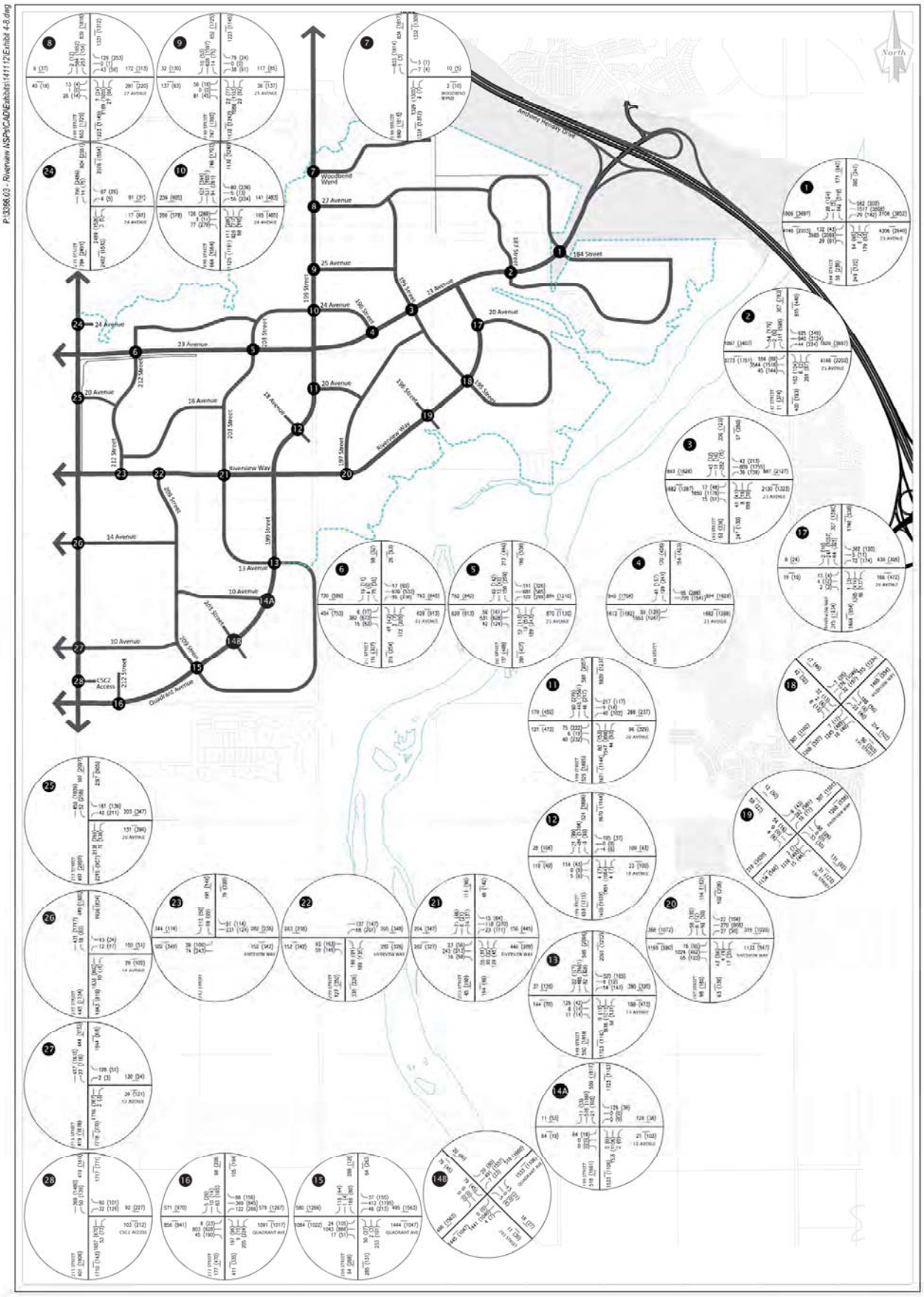

Exhibit 4-8

N.T.S.

2047 Total Arterial/Collector Intersection Traffic Volume Estimates AM (PM) Peak Hours

5. ASP ROADWAY ASSESSMENT

5.1 Assumed Arterial Roadway Geometry

The 2047 total traffic projections outlined in Section 4.0 are lower than previously identified in the Riverview ASP TIA; therefore, it is anticipated that there is the potential to reduce arterial roadway cross-sections and intersection configuration requirements. As a starting point for the evaluation, the 2047 daily total volumes were reviewed to identify potential cross-sections along the arterial roadway network. Intersection capacity assessments were then completed for the AM and PM peak hours to identify the potential intersection configurations required to accommodate projected 2047 total peak hour turning movement volumes.

5.1.1 Assumed Arterial Roadway Cross-Sections

Table 5-1 summarizes the capacity ranges assumed to establish the potential arterial roadway requirements within Riverview. The ranges are based on typical City of Edmonton thresholds as well as a review of historic daily traffic volumes on key arterials in the City of Edmonton.

Table 5-1: Arterial Roadway Traffic Volume Ranges

Roadway Cross-Section	Projected Volume Range
Two-Lane Undivided Arterial	8,000 vpd to 12,000 vpd
Three-Lane or Four-Lane Undivided Arterial	12,000 vpd to 25,000 vpd
Four-Lane Divided Arterial	16,000 vpd to 45,000 vpd
Six-Lane Divided Arterial	45,000 vpd to 65,000 vpd

The above thresholds were used to identify the proposed cross-sections for use in the assessments. **Table 5-2** summarizes the key arterial roadway links within Riverview, the projected 2047 daily traffic volume, and the cross-section assumed as the basis for the completion of the intersection assessments.

Table 5-2: Arterial Roadway Cross-Sections

Roadway Link	From	To	Maximum Daily Volumes	Proposed Cross-Section
23 Avenue	Anthony Henday Drive	Riverview Way	67,235 vpd	> 6-ln divided
23 Avenue	Riverview Way	199 Street	37,575 vpd	4-ln divided
23 Avenue	199 Street	215 Street	27,205 vpd	4-ln divided
Riverview Way	23 Avenue	199 Street	21,120 vpd	3-ln or 4-ln undivided
Riverview Way	199 Street	215 Street	9,410 vpd	2-ln undivided
199 Street	Wedgewood Creek	23 Avenue	35,720 vpd	4-ln divided
199 Street	23 Avenue	Riverview Way	36,960 vpd	4-ln divided
199 Street	Riverview Way	203 Street	35,160 vpd	4-ln divided
Quadrant Avenue	203 Street	215 Street	28,430 vpd	4-ln divided
215 Street	Wedgewood Creek	23 Avenue	42,610 vpd	4-ln divided
215 Street	23 Avenue	Riverview Way	31,730 vpd	4-ln divided
215 Street	Riverview Way	Quadrant Avenue	27,540 vpd	4-ln divided
215 Street	Quadrant Avenue	13 Avenue SW	37,420 vpd	4-ln divided
215 Street	13 Avenue SW	30 Avenue SW	12,170 vpd	2-ln undivided

As shown in Table 5-2, the majority of the arterial roadways within Riverview could be developed as standard four-lane arterial roadways. Currently, 23 Avenue is planned to be developed as a six-lane divided arterial along its length based on its classification as a highway connector. As shown in Table 5-2, a six-lane divided arterial is anticipated to provide surplus capacity between Riverview Way and 215 Street, but is anticipated to be undersized east of Riverview Way. Based on discussions with representatives from the City of Edmonton, 23 Avenue should be developed to a maximum six-lane divided arterial cross-section. The limits of the six-lane cross-section will be confirmed through the intersection analyses.

The potential for a reduced cross-section along Riverview Way continues to be supported based on the projected daily traffic volumes. A concept plan is currently being prepared for Riverview Way based on a four-lane cross-section without turn bays, but with a wide centre median.

It is also noted that 215 Street north of 23 Avenue is projected to accommodate daily volumes within the upper limits of the threshold for a four-lane divided arterial. Within the Riverview ASP TIA, 215 Street was identified as a potential six-lane divided arterial, which is also consistent with other TIAs completed in the

area. The number of lanes required along 215 Street in the 2047 horizon will be confirmed through the completion of the peak hour intersection assessments.

5.2 Intersection Capacity Analysis Assumptions

The intersection capacity assessments are based on the methods outlined in the Highway Capacity Manual 2000, using SYNCHRO 7.0 analysis software.

The intersection operations are typically rated by two measures. The volume-to-capacity (v/c) ratio describes the extent to which the traffic volumes can be accommodated by the physical capacity of the road configuration and traffic control. A value (measured during the peak hour) less than 0.90 indicates that generally there is sufficient capacity and the projected traffic volumes can be accommodated at the intersection. A value between 0.90 and 1.0 suggests unstable operations may occur and volumes are nearing capacity conditions. A calculated value over 1.0 indicates that traffic volumes are theoretically exceeding capacity. The second measure of performance, Level of Service (LOS), is based on the estimated average delay per vehicle among all traffic passing through the intersection. A low average delay merits a LOS A rating. Average delays greater than 80 seconds per vehicle at a signalized intersection generally produce a LOS F rating, while at unsignalized intersections a LOS F is reached when vehicles experience an average delay greater than 50 seconds.

The City of Edmonton's Roadway Planning and Design Objectives (February 2005 Edition) identifies the Peak Hour LOS Design Objectives for Signalized Arterials at LOS D in the medium term and E in the long term. At signalized intersections, LOS D generally relates to v/c ratios between 0.75 and 0.90, while LOS E generally relates to v/c ratios greater than 0.9 and less than 1.0. For the purposes of this assessment, efforts were taken to meet the City's long term design objectives for signalized arterials at LOS E.

While effort was taken to meet the City's long term design objectives, some intersection movements are shown to operate with v/c ratios greater than 1.0 during the peak hours. Overall, the recommended intersection geometry selected for the key study area intersections attempts to balance the lane arrangement by volume in consideration of typical geometric configurations and traffic control utilized in Edmonton.

The anticipated 95th percentile queue length has also been included in the following assessment summaries. The queues provided may include a footnote that relates to the ability of the program to estimate the queue accurately. The 'm' footnote indicates that the volume entering the intersection is being metered by an upstream intersection. The Synchro help file also provides the following regarding the '#' footnote:

> "The # footnote indicates that the volume for the 95th percentile cycle exceeds capacity. This traffic was simulated for two complete cycles of 95th percentile traffic to account for the effects of spill over between cycles. If the reported v/c <1 for this movement, the methods used represent a valid method for estimating the 95th percentile queue. In practice, 95th percentile queue shown

will rarely be exceeded and the queues shown with the # footnote are acceptable for the design of storage bays."[2]

The methodology includes a number of assumptions that relate to the operating conditions present at the intersections. The following assumptions were used in the assessments.

- Saturation Flow Rate – 1,900 vphg
- Minimum Lane Width – 3.6 metres
- Total Lost Time Adjustment Factor– 0.5
- Peak Hour Factor – 1.0
- %HV – 3%

The geometry assumed for each intersection is included in the assessment tables. Left turn movements, through movements, and right turn movements are represented by "L", "T", and "R" respectively in the assessment tables, and lanes are separated by a "/". For example, an approach whose geometry is described as LT/R features two lanes: one lane accommodating shared left/through movements and a second lane accommodating right turning movements.

Traffic control information is also included in the assessment tables. Upon build-out of Riverview, all arterial/arterial intersections are assumed to be signalized. Protected only phasing was assumed for all dual left turn bays and right turns on red were not permitted for all dual right turn bays. Key signal phasing is identified in the tables, with protected/permitted left turn phasing identified by "Pm+Pt" and protected only left turn phasing identified by "Prot". Permitted and overlapped right turn phasing is identified by "Pm+Ov" and free-flow right turns are denoted by "free".

Intersection capacity assessments were completed for a number of arterial/arterial, arterial/collector, arterial/access, collector/collector, and collector/access intersections within the study area based on the 2047 total traffic volume estimates. The results of the following arterial/arterial intersections are included as part of the ASP Roadway Assessment:

- Anthony Henday Drive and Cameron Heights Interchange North Ramp
- Anthony Henday Drive and Cameron Heights Interchange South Ramp
- 23 Avenue and Riverview Way
- 23 Avenue and 199 Street
- 23 Avenue and 215 Street
- Riverview Way and 199 Street
- Riverview Way and 215 Street
- Quadrant Avenue and 215 Street
- Twp. Rd. 514 and 215 Street
- Lessard Road and 199 Street
- Lessard Road and 215 Street

[2] Synchro 7.0, Help File, Chapter 7 – Timing/Signing Settings, Queue Lengths, pg. 7-28.

5.3 Arterial/Arterial Intersections

5.3.1 Anthony Henday Drive and Cameron Heights Interchange

The Cameron Heights interchange was constructed in 2010/2011, replacing the last at-grade signalized intersection along Anthony Henday Drive. The interchange is a trumpet design with a loop ramp in the northeast quadrant for northbound to westbound (23 Avenue to Anthony Henday Drive WB) and southbound to westbound (Cameron Heights Drive to Anthony Henday Drive WB) traffic (north ramp intersection). The south ramp intersection accommodates standard eastbound off and on ramps.

The ramp intersections are currently signalized and based on a review of the existing interchange geometry in conjunction with the Highway 216:06 Anthony Henday Drive and Cameron Heights Drive Interchange Functional Planning Study (Cameron Heights Drive Interchange FPS) prepared by Stantec in 2009, the following geometry was assumed in the assessment:

Anthony Henday Drive and Cameron Heights Interchange North Ramp Intersection

- ***West Approach (Cameron Heights Drive)*** – one left turn lane, one right turn lane;
- ***South Approach (23 Avenue)*** – one left turn bay, one shared left/through lane, one through lane; and,
- ***North Approach (23 Avenue)*** – two through lanes, one channelized right turn bay.

Anthony Henday Drive and Cameron Heights Interchange South Ramp Intersection

- ***West Approach (Anthony Henday Drive off ramp)*** – one left turn bay, one shared left/through lane, one channelized free flow right turn bay;
- ***South Approach (23 Avenue)*** – two through lanes, one channelized right turn bay; and,
- ***North Approach (23 Avenue)*** – one left turn bay, two through lanes.

Although the merge point for the eastbound right turn and the diverge point for the northbound right turn at the south ramp intersection are set back from the actual intersection, they were included in the analyses to provide an overview of the potential operations for these movements. As 23 Avenue is currently planned as a six-lane facility southwest of the interchange, the eastbound right turn is assumed to operate as a free flow lane and the northbound right turn is assumed to represent a lane drop.

Table 5-3 summarizes the results of the AM and PM peak hour assessments commented for the Anthony Henday Drive/Cameron Heights interchange north ramp intersection.

Table 5-3: Anthony Henday Drive and Cameron Heights Interchange North Ramp Intersection

	Eastbound		Northbound		Southbound	
Movement	**L**	**R**	**L**	**T**	**T**	**R**
AM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt NB L)						
Geometry	L/R		L/LT/T		T/T/R	
Volume (vph)	295	296	172	2243	665	81
v/c	0.88	0.57	0.28	0.91	0.30	0.07
Delay (s)	74.5	9.4	1.7	6.9	12.4	2.6
LOS	E	A	A	A	B	A
95th Queue (m)	#116	25	m2	38	52	7
Intersection Delay			**13.1**	**Intersection LOS**		**B**
PM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt NB L)						
Geometry	L/R		L/LT/T		T/T/R	
Volume (vph)	168	266	419	1763	1470	160
v/c	0.70	0.66	0.85	0.76	0.75	0.16
Delay (s)	64.8	16.7	51.7	4.9	25.2	2.5
LOS	E	B	D	A	C	A
95th Queue (m)	61	33	m#133	29	165	10
Intersection Delay			**19.1**	**Intersection LOS**		**B**

As shown in Table 5-3, the Anthony Henday Drive/Cameron Heights interchange north ramp intersection is anticipated to operate at acceptable levels of service based on the existing geometry and traffic control.

Table 5-4 summarizes the results of the AM and PM peak hour assessments completed for the Anthony Henday Drive/Cameron Heights interchange south ramp intersection.

Table 5-4: Anthony Henday Drive and Cameron Heights Interchange South Ramp Intersection

	Eastbound			Northbound		Southbound	
Movement	**L**	**T**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt SB L, Free EB R)							
Geometry	L/LT/R			T/T/R		L/T/T	
Volume (vph)	101	10*	1311	2314	1992	163	798
v/c	0.35		0.72	0.92	1.40	0.64	0.26
Delay (s)	55.5		2.5	13.4	197.1	43.7	2.9
LOS	E		A	B	F	D	A
95th Queue (m)	25		0	m#331	m#713	#64	30
Intersection Delay			**66.2**	**Intersection LOS**			**E**
PM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt SB L, Free EB R)							
Geometry	L/LT/R			T/T/R		L/T/T	
Volume (vph)	243	10*	2220	1939	701	104	1632
v/c	0.61		1.22	0.78	0.51	0.54	0.57
Delay (s)	62.6		113.9	17.4	3.0	31.1	6.0
LOS	E		F	B	A	C	A
95th Queue (m)	48		#291	226	28	m25	81
Intersection Delay			**46.4**	**Intersection LOS**			**D**

*Movement was projected to accommodate 0 vph; a nominal 10 vph was assumed in the assessment.

As shown in Table 5-4, the Anthony Henday Drive/Cameron Heights south ramp intersection is projected to be over capacity in the AM and PM peak hours in the 2047 horizon based on the assumed geometry and traffic control. Specifically, the northbound right turn and the eastbound right turn are projected to be over capacity in the AM and PM peak hours respectively.

The northbound right turn could be improved through the development of a second right turn bay. The development of a second northbound right turn bay would require the addition of a second lane on the eastbound on-ramp. Options to improve the eastbound right turn are limited based on a maximum of six lanes along 23 Avenue downstream from the interchange; however, the provision of two stop controlled northbound right turn bays was evaluated.

Table 5-5 summarizes the results of the revised assessment for the Anthony Henday Drive/Cameron Heights Interchange South Ramp Intersection based on the addition of a second northbound right turn bay and a second eastbound right turn bay. The assessment was completed assuming the dual right turns would be banned on the red phases.

Table 5-5: Anthony Henday Drive and Cameron Heights Interchange South Ramp Intersection – Revised Assessment

	Eastbound			Northbound		Southbound	
Movement	**L**	**T**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt SB L)							
Geometry	**L/LT/R/R**			**T/T/R/R**		L/T/T	
Volume (vph)	101	10*	1311	2314	1992	163	798
v/c	0.16		1.87	1.04	0.94	1.05	0.31
Delay (s)	41.5		424.6	54.2	32.0	122.2	6.1
LOS	D		F	D	C	F	A
95th Queue (m)	24		#289	#350	#268	#74	35
Intersection Delay			**115.9**	**Intersection LOS**			**F**
PM Peak Hour – Actuated-Coordinated (120s cycle, Pm+Pt SB L)							
Geometry	**L/LT/R/R**			**T/T/R/R**		L/T/T	
Volume (vph)	243	10*	2220	1939	701	104	1632
v/c	0.26		2.29	0.99	0.38	0.67	0.71
Delay (s)	36.0		606.3	47.3	17.4	46.9	16.7
LOS	D		F	D	B	D	B
95th Queue (m)	42		#489	#290	63	m28	118
Intersection Delay			**217.7**	**Intersection LOS**			**D**

As shown in Table 5-5, the projected operations for the dual eastbound stop control right turn bays are significantly worse than the projected operations assuming one free flow eastbound right turn bay. As well, the allocation of additional green time to the west approach decreases operations for the northbound and southbound through movements. On the south approach, the development of a second northbound right turn bay is anticipated to provide sufficient capacity to allow the movement to operate at acceptable levels of service in both the AM and PM peak hours.

Based on the operational analysis, the development of one free flow eastbound right turn bay and two northbound right turn bays is recommended. The development of the free flow eastbound right turn will also improve operations for the northbound right turn in the AM peak hour as it will allow for a re-allocation of green time to the north/south movements at the intersection.

Cameron Heights Merge/Diverge and Ramp Analysis

The Cameron Heights interchange ramps and merge/diverge locations were evaluated using the methodology outlined in the Highway Capacity Manual 2010.

Based on a review of 2047 total traffic volume projections, two-lanes are required on the Anthony Henday Drive northbound on-ramp to accommodate the peak hour volumes and avoid queuing on the ramp. With a two-lane on-ramp at this location, vehicles within the merge segment along Anthony Henday Drive are projected to experience LOS C.

Acceptable levels of service are projected along Anthony Henday Drive within the northbound diverge segment during the AM and PM peak hours based a single lane off-ramp. Therefore, a single diverge lane from Anthony Henday Drive that widens as it approaches the north ramp intersection is anticipated to be appropriate.

The southbound merge segment along Anthony Henday Drive is anticipated to experience LOS C or better during the peak hours based on a single lane on-ramp. However, to avoid queuing on the ramp, a two-lane on-ramp is recommended to accommodate the AM peak hour volumes appropriately.

The Anthony Henday Drive southbound off-ramp demand exceeds the capacity of a single lane ramp; therefore, two-lanes are required for the Anthony Henday Drive southbound off-ramp. The diverge segment is estimated to experience LOS B or better during the peak hours based on a two-lane southbound off-ramp.

The implementation of two lane ramps as noted above would require modifications to the ramp-freeway junctions, which may be constrained by the bridge structures at Wedgewood Creek and the North Saskatchewan River.

As well, a review of the 2047 total traffic projections identified that Anthony Henday Drive would need to be upgraded to eight lanes upstream of the diverge points and downstream of the merge points with the Cameron Heights interchange ramps.

Based on the assessments summarized above, it is recommended that an updated functional planning study be completed for the Anthony Henday Drive/Cameron Heights interchange to identify recommended long term capacity improvements for the 23 Avenue north and south ramp intersections, as well as to identify a recommended strategy for the incorporation of two-lane northbound and southbound on- and off-ramps.

5.3.2 23 Avenue and Riverview Way

Riverview Way was incorporated into the arterial roadway network to provide an alternate east/west arterial through the plan area. The intersection geometry identified in the Riverview ASP TIA only accommodated east and west through movements, westbound left turn movements, and northbound right turn movements to better facilitate turns to/from 23 Avenue to Riverview Way. Based on discussions with the client group, options to allow for all movements at the T-intersection were explored. Full operations will better support the staged development of Riverview NBHD 3 and greatly improve way finding opportunities prior to the full development of the ASP area.

23 Avenue is planned to be developed as a six-lane divided arterial; therefore, the intersection was assumed to include the following geometry:

- ***West Approach*** – three through lanes, one right turn bay;
- ***East Approach*** – two left turn bays, three through lanes; and,
- ***South Approach*** – one left turn bay, two right turn bays.

Overlap phasing was assumed and northbound right turns on red were prohibited in the assessment. **Table 5-6** summarizes the results of the analysis assuming all-directional operation.

Table 5-6: 23 Avenue and Riverview Way

	Eastbound		Westbound		Northbound	
Movement	**T**	**R**	**L**	**T**	**L**	**R**
AM Peak Hour – Pre-timed (140s cycle, Prot WB L, Over NB R)						
Geometry	T/T/T/R		L/L/T/T/T		L/R/R	
Volume (vph)	2113	18	289	807	80	1661
v/c	0.95	0.02	0.31	0.21	0.22	1.00
Delay (s)	50.4	17.5	47.5	13.0	48.7	57.5
LOS	D	B	D	B	D	E
95th Queue (m)	#219	7	58	54	36	#294
Intersection Delay			**46.4**	**Intersection LOS**		**D**
PM Peak Hour – Pre-timed (140s cycle, Prot WB L, Over NB R)						
Geometry	T/T/T/R		L/L/T/T/T		L/R/R	
Volume (vph)	1239	84	1306	2102	26	512
v/c	0.76	0.15	0.83	0.49	0.10	0.25
Delay (s)	48.2	16.0	15.6	5.5	54.3	12.9
LOS	D	B	B	A	D	B
95th Queue (m)	126	20	m118	m80	16	41
Intersection Delay			**19.2**	**Intersection LOS**		**B**

As shown in Table 5-6, the northbound right turn is projected to be at capacity in the AM peak hour. The intersection is projected to operate at acceptable levels of service in the PM peak hour based on the assumed geometry and traffic control.

The AM peak hour assessment was also completed assuming a northbound left turn is not provided at the intersection. As shown in **Table 5-7**, the intersection could operate at acceptable levels of service in the AM peak hour if the northbound left turn was not provided.

Although the intersection could accommodate slightly more traffic in the AM peak hour with a two-phase signal, the overall network benefits of providing the northbound left turn, especially in the short to medium term, are anticipated to outweigh the potential capacity improvements in the longer term. For example, the provision of the northbound left turn at 23 Avenue and Riverview Way is anticipated to reduce the magnitude of through traffic on 195 Street between Riverview Way and 23 Avenue, past the school site. Based on the assessments completed, and in consideration of the overall network implications, it is recommended that 23 Avenue and Riverview Way be developed as an all-directional T-intersection.

Table 5-7: 23 Avenue and Riverview Way – Revised Assessment

	Eastbound		Westbound		Northbound	
Movement	**T**	**R**	**L**	**T**	**-**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot WB L, Over NB R)						
Geometry	T/T/T/R		L/L/T/T/T		R/R	
Volume (vph)	2113	18	289	807	-	1661
v/c	0.93	0.02	0.16	0.15	-	0.94
Delay (s)	41.7	14.3	18.0	0.1	-	41.3
LOS	D	B	B	A	-	D
95th Queue (m)	184	6	28	0	-	#243
Intersection Delay			**33.2**	**Intersection LOS**		**C**

5.3.3 23 Avenue and 199 Street

The 23 Avenue/199 Street intersection is a key intersection within the plan area. Commercial land uses have been located on three of the four corners of the intersection providing a convenient commercial hub for residents within the neighbourhood as well as providing convenient shopping opportunities for through traffic along 23 Avenue.

The City of Edmonton is currently preparing concept plans for 23 Avenue between the Transportation Utility Corridor (TUC) and 215 Street. Based on preliminary plans, dual left turn bays were identified on all four approaches. Based on the latest 2047 total traffic projections, it is anticipated that in the 2047 horizon dual left turn bays will only be required on the east approach. As well, based on the daily volumes along the corridor, it is anticipated that 23 Avenue could be developed as a four-lane divided arterial through the 199 Street intersection.

Based on a review of initial concept plans, in combination with a review of the estimated AM and PM peak hour turning movement volumes, the following intersection geometry was assumed in the assessment:

- ***West Approach*** – one left turn bay, two through lanes, one right turn bay;
- ***East Approach*** – two left turn bays, two through lanes, one right turn bay;
- ***South Approach*** – one left turn bay, two through lanes, one right turn bay; and,
- ***North Approach*** – one left turn bay, two through lanes, one right turn bay.

Table 5-8 summarizes the results of the 23 Avenue/199 Street AM and PM peak hour intersection assessments.

Table 5-8: 23 Avenue and 199 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot WB L, Pm+Pt EB, NB, & SB L, Over NB R)												
Geometry	L/T/T/R			L/L/T/T/R			L/T/T/R			L/T/T/R		
Volume (vph)	105	702	63	127	612	101	183	920	736	174	391	100
v/c	0.38	0.86	0.14	0.16	0.42	0.13	0.46	0.89	0.82	0.79	0.37	0.17
Delay (s)	17.0	45.5	8.5	48.0	13.8	7.2	27.7	53.7	29.8	71.0	30.6	11.5
LOS	B	D	A	D	B	A	C	D	C	E	C	B
95th Queue (m)	15	#78	9	27	46	10	46	#144	175	#64	40	15
Intersection Delay						**35.9**	**Intersection LOS**					**D**
PM Peak Hour – Pre-timed (120s cycle, Prot WB L, Pm+Pt EB, NB, & SB L, Over NB R)												
Geometry	L/T/T/R			L/L/T/T/R			L/T/T/R			L/T/T/R		
Volume (vph)	119	816	196	564	971	173	112	899	225	140	1298	127
v/c	0.59	0.90	0.37	0.99	0.73	0.23	0.79	0.76	0.26	0.61	0.99	0.19
Delay (s)	23.2	34.7	6.7	68.5	26.5	5.3	69.2	56.9	16.7	24.5	57.3	14.8
LOS	C	C	A	E	C	A	E	E	B	C	E	B
95th Queue (m)	m18	#125	m15	#104	144	20	#44	139	45	m32	#211	m26
Intersection Delay						**42.5**	**Intersection LOS**					**D**

As shown in Table 5-8, the intersection is projected to operate at acceptable levels of service in the AM and PM peak hours under the assumed geometry and traffic control; although, a couple of movements are projected to approach capacity. Specifically, the westbound left turn and southbound through movements are projected to operate with v/c ratios of 0.99 and LOS E. Based on a review of the AM and PM peak hour volumes for these movements, additional lanes would not typically be warranted. Therefore, no geometry

improvements are currently recommended. As well, it is noted that the assessment confirmed that 23 Avenue could be developed as a four-lane divided arterial through the 199 Street intersection.

Although dual left turn bays are not anticipated to be required on the north, south, and west approaches in the 2047 horizon, it may be prudent to protect right-of-way for dual left turns on these approaches to allow flexibility in the intersection operations in the short to medium term. The 23 Avenue/199 Street intersection is a key intersection in the plan area, and traffic patterns at the intersection could fluctuate depending on how the arterial roadway network develops over time.

5.3.4 23 Avenue and 215 Street

The 23 Avenue/215 Street intersection is located on the City of Edmonton/Parkland County boundary and is anticipated to accommodate traffic generated by both jurisdictions. The geometry assumed in the assessments is based on a review of the Edgemont TIA, and a preliminary review of the potential intersection operations and includes the following:.

- ***West Approach*** – two left turn bays, two through lanes, one right turn bay;
- ***East Approach*** – one left turn bay, two through lanes, one right turn bay;
- ***South Approach*** – one left turn bay, three through lanes, one right turn bay; and,
- ***North Approach*** – two left turn bays, three through lanes, one right turn bay.

As shown in **Table 5-9**, the 23 Avenue/215 Street intersection is projected to operate at acceptable levels of service during the AM and PM peak hours based on the assumed intersection geometry and traffic control. It should be noted that pedestrian minimums were not respected for the east/west pedestrian movements across 215 Street. It is anticipated that these would be low volume movements and would be accommodated through pedestrian actuation. Alternate pedestrian crossing opportunities are anticipated to be available at the 20 Avenue/215 Street intersection.

It is also noted that the southbound through movement is projected to operate with a v/c ratio of 0.97 in the PM peak hour. A seven second northbound left turn permitted/protected phase was assumed, which reduced the capacity for the southbound through movement. If a northbound left turn phase was not provided, the northbound left turn is projected to be over capacity (v/c ratio of 2.05) while the southbound through movement would be well below capacity (v/c ratio of 0.77).

Table 5-9: 23 Avenue and 215 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot EB & SB L, Pm+Pt NB L)												
Geometry	L/L/T/T/R			L/T/T/R			L/T/T/T/R			L/L/T/T/T/R		
Volume (vph)	96	241	73	6	436	287	182	2110	6	159	428	207
v/c	0.48	0.19	0.11	0.02	0.50	0.55	0.33	0.87	0.01	0.80	0.18	0.23
Delay (s)	63.5	28.0	6.5	32.5	33.2	20.1	5.8	20.2	5.2	80.1	20.8	5.0
LOS	E	C	A	C	C	C	A	C	A	F	C	A
95th Queue (m)	21	31	10	m3	39	34	m12	151	m0	#39	33	6
Intersection Delay						**23.7**	**Intersection LOS**					**C**
PM Peak Hour – Pre-timed (120s cycle, Prot EB & SB L, Pm+Pt NB L)												
Geometry	L/L/T/T/T/R			L/T/T/T/R			L/T/T/T/R			L/L/T/T/T/R		
Volume (vph)	500	341	179	10	311	264	125	769	10	403	1909	179
v/c	0.93	0.21	0.20	0.04	0.34	0.43	0.79	0.53	0.02	0.85	0.97	0.26
Delay (s)	75.7	20.7	3.7	26.9	31.7	18.4	55.3	31.1	13.8	83.1	40.0	9.9
LOS	E	C	A	C	C	B	E	C	B	F	D	A
95th Queue (m)	#93	35	14	7	46	48	#49	54	m3	#77	#183	m17
Intersection Delay						**40.6**	**Intersection LOS**					**D**

5.3.5 Riverview Way and 199 Street

The Riverview Way/199 Street intersection is located centrally within Riverview with the district park site located on the southeast corner of the intersection. Based on a review of the projected peak hour turning movement volumes, and in consideration of the roadway cross-sections proposed along Riverview Way and 199 Street, the following intersection geometry was assumed in the analyses:

- ***West Approach*** – one left turn bay, one shared through/right lane;
- ***East Approach*** – dual left turn bays, one shared through/right lane;
- ***South Approach*** – one left turn bay, two through lanes, one right turn bay; and,
- ***North Approach*** – one left turn bay, two through lanes, one right turn bay.

Table 5-10 summarizes the AM and PM peak hour analyses completed for the Riverview Way/199 Street intersection. The intersection is assumed to operate as a pre-timed signal with pedestrian phases accommodated in conjunction with the main east/west and north/south signal phases.

Table 5-10: Riverview Way and 199 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot WB L)												
Geometry	L/TR			L/L/TR			L/T/T/R			L/T/T/R		
Volume (vph)	98	344	3	188	122	58	2	1302	758	63	398	32
v/c	0.33	0.74		0.72	0.27		0.00	0.69	0.79	0.53	0.21	0.04
Delay (s)	41.0	53.1		63.6	18.9		7.5	11.5	6.9	44.4	15.3	4.6
LOS	D	D		E	B		A	B	A	D	B	A
95th Queue (m)	37	116		#39	33		m0	72	m26	#21	29	4
Intersection Delay						**19.9**	**Intersection LOS**					**B**
PM Peak Hour – Pre-timed (120s cycle, Prot WB L)												
Geometry	L/TR			L/L/TR			L/T/T/R			L/T/T/R		
Volume (vph)	71	215	4	640	317	115	4	892	326	139	1452	125
v/c	0.39	0.61		0.89	0.54		0.06	0.54	0.39	0.72	0.88	0.18
Delay (s)	45.6	48.2		49.0	19.6		21.5	28.3	14.0	24.7	14.4	1.2
LOS	D	D		D	B		C	C	B	C	B	A
95th Queue (m)	m30	78		#107	106		m2	124	53	m21	96	m1
Intersection Delay						**25.1**	**Intersection LOS**					**C**

As shown in Table 5-10, the Riverview Way/199 Street intersection is anticipated to operate at acceptable levels of service as a signalized intersection based on the assumed geometry and traffic control.

5.3.6 Riverview Way and 215 Street

Riverview Way is proposed to tee into 215 Street forming a three-legged signalized intersection. The geometry assumed in the assessment includes the following:

- ***East Approach*** – one left turn lane, one right turn bay;
- ***South Approach*** – two through lanes, one right turn bay; and,
- ***North Approach*** – one left turn bay, two through lanes.

As shown in **Table 5-11** the Riverview Way/215 Street intersection is anticipated to operate at acceptable levels of service in the AM and PM peak hours.

Table 5-11: Riverview Way and 215 Street

	Westbound		Northbound		Southbound	
Movement	**L**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Pre-timed (120s cycle, Pm+Pt SB L)						
Geometry	L/R		T/T/R		L/T/T	
Volume (vph)	29	315	1896	30	72	421
v/c	0.08	0.75	0.89	0.03	0.39	0.17
Delay (s)	37.1	34.9	14.4	3.8	40.8	1.3
LOS	D	C	B	A	D	A
95th Queue (m)	14	#72	60	m1	19	3
Intersection Delay			**15.6**	**Intersection LOS**		**B**
PM Peak Hour – Pre-timed (120s cycle, Pm+Pt SB L)						
Geometry	L/R		T/T/R		L/T/T	
Volume (vph)	52	122	781	53	296	1748
v/c	0.14	0.30	0.37	0.06	0.62	0.69
Delay (s)	35.2	6.2	8.8	0.6	8.7	3.9
LOS	D	A	A	A	A	A
95th Queue (m)	m19	12	64	0	27	54
Intersection Delay			**6.2**	**Intersection LOS**		**A**

5.3.7 Quadrant Avenue and 215 Street

Quadrant Avenue represents the extension of 199 Street west to 215 Street. It is anticipated that the Quadrant Avenue/215 Street intersection will continue to be a T-intersection in the future. The following geometry was assumed in the assessment:

- ***East Approach*** – one left turn bay, one shared left/right lane;
- ***South Approach*** – two through lanes, one free flow right turn bay; and,
- ***North Approach*** – one left turn bay, two through lanes.

Table 5-12 summarizes the AM and PM peak hour analyses completed for the Quadrant Avenue/215 Street intersection.

Table 5-12: Quadrant Avenue and 215 Street

	Westbound		Northbound		Southbound	
Movement	**L**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Pre-Timed (120s cycle, Pm+Pt SB L, Free NB R)						
Geometry	L/LR		T/T/R		L/T/T	
Volume (vph)	277	295	1416	791	57	344
v/c	0.67		0.68	0.44	0.23	0.14
Delay (s)	41.0		7.2	0.4	12.2	3.8
LOS	D		A	A	B	A
95th Queue (m)	70		66	0	10	10
Intersection Delay			**11.3**	**Intersection LOS**		**B**
PM Peak Hour – Pre-Timed (120s cycle, Pm+Pt SB L, Free NB R)						
Geometry	L/LR		T/T/R		L/T/T	
Volume (vph)	866	105	639	581	265	1341
v/c	0.72		0.54	0.32	0.56	0.70
Delay (s)	41.3		22.3	0.3	9.2	10.7
LOS	D		C	A	A	B
95th Queue (m)	100		m76	m0	19	115
Intersection Delay			**18.8**	**Intersection LOS**		**B**

5.3.8 Twp. Rd. 514 and 215 Street

The Twp. Rd. 514/215 Street intersection is an existing four-legged stop-controlled intersection adjacent to the plan area. With the development of Riverview, it is anticipated that 215 Street will be upgraded to a four-lane divided arterial roadway, and Twp. Rd. 514 will be upgraded to an urban collector standard east of 215 Street (9 Avenue SW). Although it is anticipated that Twp. Rd. 514 will experience growth in traffic in the longer term, with development in the southern portion of Riverview and increased country residential development in the Woodbend area, significant improvements to Twp. Rd. 514 are not anticipated. However, any future intersection improvements at the Twp. Rd. 514/215 Street will need to include a transition along Twp. Rd. 514.

Based on a review of the projected traffic volumes, the following geometry was assumed in the analyses.

- ***West Approach*** – one left turn bay, one shared through/right lane;
- ***East Approach*** – one shared left/through lane, one right turn bay;
- ***South Approach*** – one left turn bay, one through lane, one shared through/right lane and,
- ***North Approach*** – dual left turn bays, two through lanes, one right turn bay.

As shown in **Table 5-13**, the Twp. Rd. 514/215 Street intersection is anticipated to operate at acceptable levels of service during the AM and PM peak hours in the 2047 horizon.

Table 5-13: Twp. Rd. 514 and 215 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot SB L)												
Geometry	L/TR			LT/R			L/T/TR			L/L/T/T/R		
Volume (vph)	21	21	59	5	104	554	296	1599	4	126	396	58
v/c	0.06	0.16		0.21		0.89	0.63	0.88		0.63	0.18	0.06
Delay (s)	31.7	12.7		33.7		49.3	18.0	21.5		67.3	7.0	2.2
LOS	C	B		C		D	B	C		E	A	A
95th Queue (m)	10	16		36		#166	m57	171		#27	26	0
Intersection Delay						**25.9**	**Intersection LOS**					**C**
PM Peak Hour – Pre-timed (120s cycle, Prot SB L)												
Geometry	L/TR			LT/R			L/T/TR			L/L/T/T/R		
Volume (vph)	57	77	220	7	34	272	97	830	8	540	1581	35
v/c	0.21	0.81		0.12		0.37	0.66	0.49		0.86	0.62	0.03
Delay (s)	42.2	56.3		40.2		16.1	34.2	13.9		60.9	11.3	2.2
LOS	D	E		D		B	C	B		E	B	A
95th Queue (m)	25	#106		19		48	m29	61		#93	119	3
Intersection Delay						**24.2**	**Intersection LOS**					**C**

5.3.9 Lessard Road and 199 Street

The Lessard Road/199 Street intersection is located north of Riverview in the Edgemont NASP area. Lessard Road connects to Anthony Henday Drive east of 199 Street, while 199 Street continues north into The Hamptons neighbourhood. The intersection geometry assumed in the assessment generally reflects the draft concept plans with the following modifications based on the projected 2047 traffic volumes:

- The eastbound right turn is assumed to operate as a standard right turn bay as opposed to a free flow lane;
- A single northbound right turn bay was assumed; and,
- A single northbound left turn bay was assumed.

The proposed modifications reflect the 2047 model volumes, which identified lower eastbound right, northbound left, and northbound right turns than previously identified in the Riverview ASP TIA. Based on these modifications, the intersection was assumed to include the following geometry:

- ***West Approach*** – one left turn bay, two through lanes, one right turn bay;
- ***East Approach*** – two left turn bays, two through lanes, one right turn bay;
- ***South Approach*** – one left turn bay, two through lanes, one right turn bay; and,
- ***North Approach*** – two left turn bays, two through lanes, one right turn bay.

Table 5-14 summarizes the results of the AM and PM peak hour intersection assessments completed for the Lessard Road/199 Street intersection.

Table 5-14: Lessard Road and 199 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (120s cycle, Prot WB & SB L)												
Geometry	L/T/T/R			L/L/T/T/R			L/T/T/R			L/L/T/T/R		
Volume (vph)	150	1168	17	285	141	270	94	1102	566	200	611	50
v/c	0.39	0.99	0.03	0.98	0.08	0.29	0.37	0.93	0.80	0.87	0.38	0.07
Delay (s)	30.7	59.2	8.9	102.3	18.8	6.9	20.8	34.1	15.3	88.7	23.6	5.7
LOS	C	E	A	F	B	A	C	C	B	F	C	A
95th Queue (m)	46	#190	m5	#64	16	27	m20	#168	72	#46	64	8
Intersection Delay						**40.4**	**Intersection LOS**					**D**
PM Peak Hour – Pre-timed (120s cycle, Prot WB & SB L)												
Geometry	L/T/T/R			L/L/T/T/R			L/T/T/R			L/L/T/T/R		
Volume (vph)	60	652	125	597	671	250	57	915	344	340	1454	200
v/c	0.34	0.74	0.29	0.95	0.39	0.26	0.93	0.89	0.46	0.96	0.92	0.27
Delay (s)	41.4	43.9	33.5	74.5	22.1	2.9	120.7	29.9	3.3	93.1	42.8	7.0
LOS	D	D	C	E	C	A	F	C	A	F	D	A
95th Queue (m)	24	95	36	#108	68	14	m#40	#117	5	#72	#213	22
Intersection Delay						**39.9**	**Intersection LOS**					**D**

As shown in Table 5-14, the Lessard Road/199 Street intersection is anticipated to have a number of movements approaching capacity in the AM and PM peak hours in the 2047 horizon. These predominantly include dual left turns operating under protected only phasing and the opposing through movements. A northbound left turn permitted/protected phase was not assumed in the assessment as the peak hour volumes are less than 100 vph, and it would result in additional delay to the southbound through movements.

A minimum east/west split of 35 seconds was maintained to allow for pedestrian movements across 199 Street. If pedestrian actuation was assumed, additional green time could be provided to the north/south phase and protected only phases to improve vehicle operations.

5.3.10 Lessard Road and 215 Street

The Lessard Road/215 Street intersection is anticipated to be developed as a signalized T-intersection in the 2047 horizon. The assessment was completed assuming a four-lane divided cross-section is developed along 215 Street north of Wedgewood Creek; therefore, the following intersection geometry was assumed in the assessments:

- ***East Approach*** – one left turn lane, one right turn lane;
- ***South Approach*** – two through lanes, one right turn bay; and,
- ***North Approach*** – one left turn bay, two through lanes.

As shown in **Table 5-15**, the Lessard Road/215 Street intersection is anticipated to operate at acceptable levels of service as a signalized intersection in the 2047 horizon; however, the northbound through movement is anticipated to approach capacity in the AM peak hour. There is the potential to expand to a full-six lane divided arterial cross-section if development occurs within the Enoch Cree Nation lands located west of Edmonton; however, until then, a four-lane divided arterial is recommended north of Wedgewood Creek.

Table 5-15: Lessard Road and 215 Street

	Westbound		Northbound		Southbound	
Movement	**L**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Actuated - Coordinated (120s cycle, Pm+Pt SB L)						
Geometry	L/R		T/T/R		L/T/T	
Volume (vph)	191	320	2402	338	80	553
v/c	0.64	0.83	0.99	0.28	0.50	0.21
Delay (s)	51.5	43.9	29.8	0.8	24.6	5.9
LOS	D	D	C	A	C	A
95th Queue (m)	56	63	#397	m1	21	33
Intersection Delay			**26.0**	**Intersection LOS**		**C**
PM Peak Hour – Actuated - Coordinated (120s cycle, Pm+Pt SB L)						
Geometry	L/R		T/T/R		L/T/T	
Volume (vph)	311	110	1029	452	200	2235
v/c	0.79	0.24	0.52	0.39	0.49	0.89
Delay (s)	47.7	8.5	5.8	0.8	10.7	21.7
LOS	D	A	A	A	B	C
95th Queue (m)	m#115	m21	m18	m0	24	247
Intersection Delay			**16.7**	**Intersection LOS**		**B**

5.3.11 Arterial/Arterial Intersection Summary

The arterial/arterial intersection assessments confirmed the roadway cross-sections for arterial roadways within Riverview as follows:

- 23 Avenue between Anthony Henday Drive and Riverview Way is planned as a six-lane divided arterial. Based on the arterial/arterial intersection assessments completed, capacity constraints were noted at the 23 Avenue/Riverview Way intersection in the AM peak hour and at the Anthony Henday Drive and Cameron Heights Interchange South Ramp Intersection in the PM peak hour. Based on discussions with representatives from the City of Edmonton, the six-lane divided cross-section will be maintained through this segment to be consistent with the over-arching policies identified within the Transportation Master Plan: The Way We Move. Traffic congestion during peak hours is anticipated to result in an extended peak period, where people may adjust the timing of their trips to avoid congestion; increased transit ridership or car-pooling; and/or reduced trip making activity.

- 23 Avenue is anticipated to transition from a six-lane divided arterial cross-section to a four-lane arterial cross-section between Riverview Way and 199 Street . At this time, it is anticipated that the

six-lane cross-section will transition to four-lanes between Riverview Way and 195 Street; however, this will be discussed further with the arterial/collector intersection assessments.

- 23 Avenue between 199 Street and 215 Street can be developed as a four-lane divided arterial roadway.
- Riverview Way can be developed as four-lane arterial between 23 Avenue and 199 Street and can be reduced to a two-lane roadway between 199 Street and 215 Street; and,
- 215 Street should be developed as a six-lane arterial between 20 Avenue and Wedgewood Creek. 215 Street can be maintained as a four-lane divided arterial north of Wedgewood Creek until such time as development occurs on the Enoch Cree Nation lands.

The recommended arterial roadway cross-sections are summarized in **Table 5-16** and illustrated in **Exhibit 5-1**. Exhibit 5-1 also summarizes the recommended geometry and traffic control for the arterial/arterial intersections.

Table 5-16: Arterial Roadway Cross-Sections

Roadway Link	From	To	Proposed Cross-Section
23 Avenue	Anthony Henday Drive	Riverview Way	6-ln divided
23 Avenue	Riverview Way	199 Street	4- or 6-ln divided
23 Avenue	199 Street	215 Street	4-ln divided
Riverview Way	23 Avenue	199 Street	4-ln undivided without left turn bays
Riverview Way	199 Street	215 Street	2-ln undivided
199 Street	Wedgewood Creek	203 Street	4-ln divided
Quadrant Avenue	203 Street	215 Street	4-ln divided
215 Street	Lessard Road	Wedgewood Creek	4-ln divided
215 Street	Wedgewood Creek	20 Avenue	6-ln divided
215 Street	20 Avenue	13 Avenue SW	4-ln divided
215 Street	13 Avenue SW	30 Avenue SW	2-ln undivided

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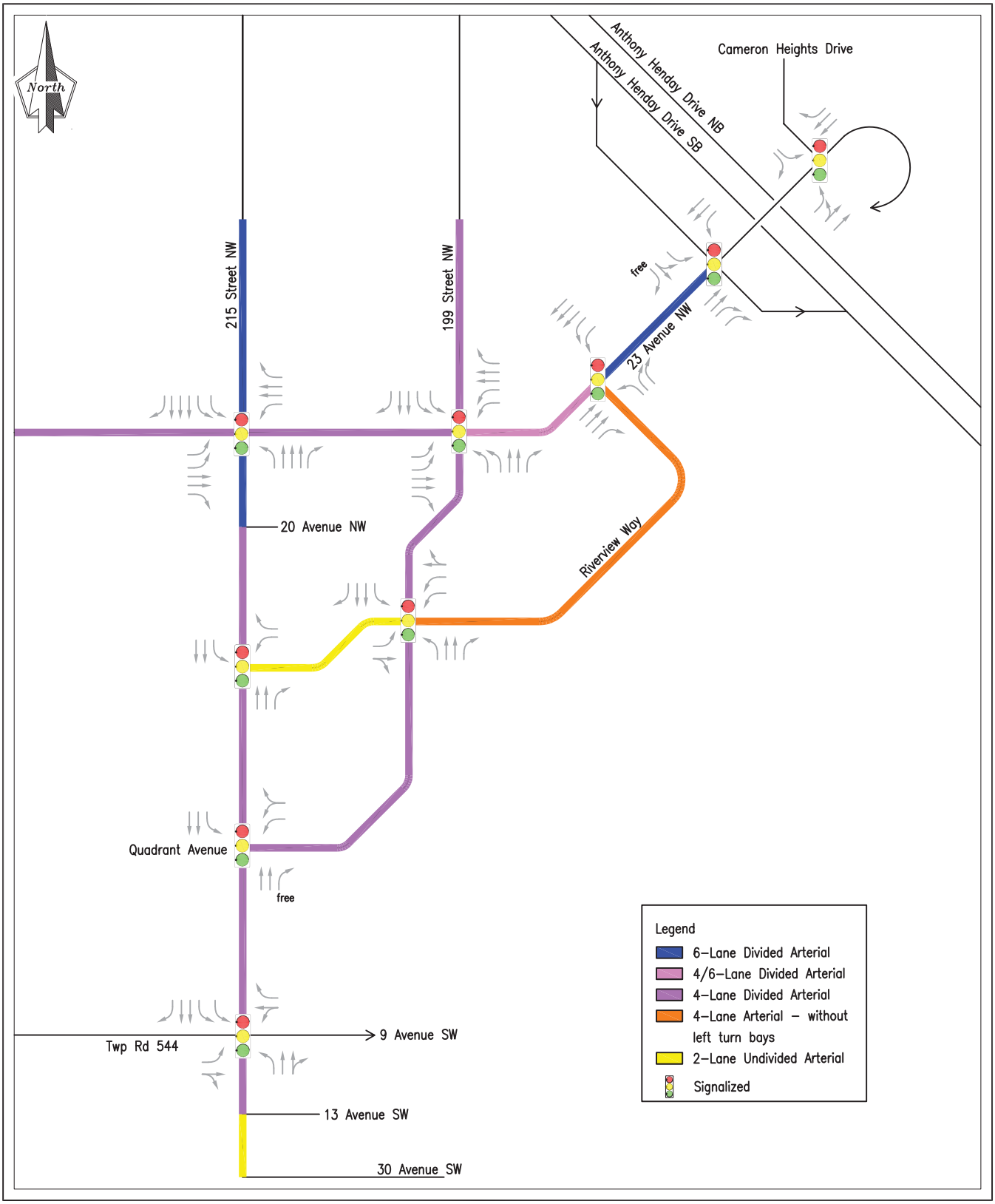

Exhibit 5-1

N.T.S.

Recommended Arterial Roadway Geometry

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6. NEIGHBOURHOOD ROADWAY ASSESSMENT

6.1 Riverview NBHDs 1, 2, and 3 Collector Roadways

Residential collector roadways typically carry daily volumes in excess of 1,000 vpd and can often accommodate daily volumes in the order of 10,000 vpd. Residential collector roadways within Edmonton typically accommodate two travel lanes and two parking lanes on an 11.5 metre roadway within a 20.0 metre right-of-way. In some instances, additional roadway width is provided at the throats of collector/arterial intersections to allow for the development of appropriate lane channelization based on arterial/collector peak hour intersection assessments.

6.1.1 High Volume Collectors

The majority of the collector roadways within Riverview NBHDs 1, 2, and 3 are projected to accommodate daily volumes in the order of 5,000 vpd or less. The following collector roadways are projected to accommodate daily volumes above 5,000 vpd, and may require additional geometry at key intersections:

- The collector roadways within the business employment area are projected to accommodate between 8,240 vpd (184 Street) and 11,970 vpd (187 Street). The design of the approaches to 23 Avenue will need to reflect the projected turning movements at the intersection and appropriate intersection spacing will be required north of 23 Avenue to allow for the development of additional turn bays.

- 196 Street north of 23 Avenue, 203 Street north of 23 Avenue, and 24 Avenue east and west of 199 Street are projected to accommodate daily volumes between 9,970 vpd and 13,080 vpd. The high volumes along these roadways are primarily associated with commercial land uses in the town centre. The development of site plans for the town centre land uses will need to include the development of an access management strategy along these roadways.

- 203 Street south of 23 Avenue is anticipated to accommodate in the order of 10,630 vpd. The majority of the traffic is associated with TC3; therefore, the design of 203 Street south of 23 Avenue will need to consider access opportunities to the town centre site. South of the town centre, 203 Street is anticipated to accommodate in the order of 4,470 vpd, which can be accommodated on a standard collector roadway.

- 20 Avenue east of Riverview Way is projected to accommodate daily volumes in the order of 8,270 vpd, of which approximately 57% is associated with CNC3. A standard collector roadway cross-section is anticipated to be appropriate; however, access to the commercial site should be aligned with local roadway access to the north and the lane arrangement at Riverview Way should be confirmed through the intersection analysis.

- 20 Avenue east of 199 Street is anticipated to accommodate in the order of 6,400 vpd, which reflects the development of more intense land uses around the transit centre. Consideration should be given

to transit turning movements in the design of 20 Avenue immediately east of 199 Street. A standard collector would be appropriate east of the first local roadway.

- 20 Avenue west of 199 Street represents a site access to TC3. The development of on-site circulation and parking plans will need to consider the lane configuration and potential queue lengths on the west approach of the 20 Avenue/199 Street intersection.

- 20 Avenue east of 215 Street is anticipated to accommodate daily volumes in the order of 8,960 vpd and 212 Street south of 23 Avenue is anticipated to accommodate daily volumes in the order of 7,280 vpd. The traffic along these corridors is predominantly associated with CSC1; therefore, further review of the cross-sections should be completed at the zoning stage, once additional information is available regarding the land uses in the area.

- 209 Street south of Riverview Way is anticipated to accommodate in the order of 7,040 vpd. About 60% of the traffic along 209 Street is anticipated to be associated with CNC1. A standard collector is anticipated to be appropriate; however, access to the commercial site should be coordinated with local roadway intersections to prevent the development of slightly off-site intersections. South of the commercial site, daily volumes are anticipated to be in the order of 4,670 vpd, which can be accommodated on a standard collector roadway.

- Based on the traffic volume estimates, 13 Avenue east of 199 Street is anticipated to accommodate in the order of 8,970 vpd. 13 Avenue east of 199 Street is on the boundary between NBHDs 3 and 4; however, it is anticipated to predominantly provide access to NBHD 4 land uses. The collector roadway should be reviewed in more detail with the NSP for NBHD 4.

6.1.2 Low Volume Collectors

The following collector roadways are anticipated to accommodate volumes in the order of 1,500 vpd or less.

- 212 Street north of 23 Avenue is anticipated to accommodate daily volumes in the order of 1,540 vpd and 24 Avenue east of 212 Street is anticipated to accommodate daily volumes in the order of 1,530 vpd. At this time it is anticipated that ETS may utilize these roadways for transit routes; however, if they ultimately determine that an ETS route is not required along these roadways, they can be constructed as local roadways.

- 209 Street between 10 Avenue and 14 Avenue is anticipated to accommodate daily volumes in the order of 820 vpd; however, it is anticipated to accommodate transit; therefore, a collector roadway with two travel lanes should be developed.

- Based on the daily volumes, 10 Avenue west of 199 Street is projected to accommodate in the order of 680 vpd, which could be accommodated on a local roadway. However, this roadway was designated a collector roadway to provide access to the south NBHD 2 school site; therefore, the roadway should be developed to include two travel lanes.

6.2 Riverview NBHDs 1, 2, and 3 Enhanced Local Roadways

It is estimated that local roadways can typically accommodate up to 1,500 vpd assuming they operate with a single travel lane that is used for both directions of travel. On typical 9.0 metre standard local roadways, parking is permitted on both sides, which leaves one travel lane down the centre of the roadway for vehicle travel. When opposing vehicles meet along a local roadway, one must pull over to the curb to allow the other to pass. This operation is considered acceptable in low volume situations, but as the volumes increase, two travel lanes (one in each direction) are recommended.

The following local roadway segments within NBHDs 1, 2, and 3 were identified as accommodating daily volumes greater than 1,500 vpd:

- 25 Avenue west of 199 Street; and,
- 18 Avenue west of 199 Street

Both roadways are anticipated to carry daily volumes greater than 1,500 vpd on the approach to the arterial roadway network. It is recommended that free flow two-way traffic be maintained on the approaches to the arterial.

6.3 Arterial/Collector and Arterial/Access Intersections

The recommended geometry and traffic control for the arterial/collector and arterial/access intersections were based on a review of the proposed arterial roadway cross-section, the projected AM and PM peak hour intersection turning movement volumes, and the review of v/c ratios, delays, LOS, and queue lengths at the intersections.

Traffic signals were assumed to be implemented when side street peak hour volumes were greater than a minimum of 300 vph. The City of Edmonton typically uses 400 vph as a threshold; however, unacceptable v/c ratios and delays for side street movements are often identified prior to reaching 400 vph on the side street. Where side street volumes are projected to be less than 300 vph, the intersections were initially assessed as unsignalized intersections, and the potential for future signalization was considered in the context of the overall network and other access opportunities. Where unsignalized operation continues to be recommended, high v/c ratios and long delays may be identified. It is also noted that in some instances Synchro reports “error” as a result for unsignalized intersections. This signifies that the results exceed the range of results that can be reported for a particular measure of effectiveness. While this is typically noted to reflect significant side street capacity issues, it does not in and of itself suggest signalization is warranted.

The results of the following arterial/collector intersections are included as part of the Neighbourhood Roadway Assessment:

23 Avenue Arterial/Collector Intersections

23 Avenue and 184 Street
23 Avenue and 187 Street
23 Avenue and 195 Street
23 Avenue and 196 Street
23 Avenue and 203 Street
23 Avenue and 212 Street

199 Street/Quadrant Avenue Arterial/Collector Intersections

Woodbend Wynd and 199 Street
27 Avenue and 199 Street
25 Avenue and 199 Street
24 Avenue and 199 Street
20 Avenue and 199 Street
18 Avenue and 199 Street
13 Avenue and 199 Street
10 Avenue and 199 Street
203 Street and Quadrant Avenue
209 Street and Quadrant Avenue
212 Street and Quadrant Avenue

215 Street Arterial/Collector and Arterial/Access Intersections

24 Avenue and 215 Street
20 Avenue and 215 Street
14 Avenue and 215 Street
10 Avenue and 215 Street
CSC2 Access and 215 Street

Riverview Way Arterial/Collector Intersections

Riverview Way and 20 Avenue
Riverview Way and 195 Street
Riverview Way and 196 Street
Riverview Way and 197 Street
Riverview Way and 203 Street
Riverview Way and 209 Street
Riverview Way and 212 Street

6.3.1 23 Avenue Collector Intersections

As per the arterial roadway assessment, 23 Avenue is assumed to be developed as a six-lane divided arterial roadway between Anthony Henday Drive and Riverview Way and could transition to a four-lane cross-section west of Riverview Way. The results of the 23 Avenue collector intersection assessments are summarized in **Table 6-1** on the following pages.

Table 6-1: 23 Avenue NW Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
1	23 Avenue NW and 184 Street - Protected SB Left Turns	**AM Peak Hour - 2044 Total - Pre-timed (140s cycle, Prot SB L, Pm+Pt EB L)**														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR			L/L/TR			55.1	E
		Volume (vph)	132	3985	29	29	1517	562	64	6	179	142	1	28		
		v/c Ratio	0.53	1.06	0.03	0.55	0.45	0.51	0.34	0.86		0.98	0.08			
		Delay (s)	15.1	74.6	4.8	59.8	15.7	3.2	60.2	92.6		135.4	15.2			
		LOS	B	E	A	E	B	A	E	F		F	B			
		95th Queue (m)	19	#438	5	#24	87	20	33	#97		#44	9			
		PM Peak Hour - 2044 Total - Pre-timed (140s cycle, Prot SB L, Pm+Pt WB L)														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR			L/L/TR			55.9	E
		Volume (vph)	43	2069	91	142	3508	202	65	2	53	518	5	124		
		v/c Ratio	0.81	0.74	0.12	0.63	1.00	0.21	0.38	0.21		1.57	0.30			
		Delay (s)	74.5	25.0	10.5	41.4	41.6	6.5	62.0	16.2		312.3	42.6			
		LOS	E	C	B	D	D	A	E	B		F	D			
		95th Queue (m)	m#19	m112	m11	47	#373	24	34	14		#143	49			
1	23 Avenue NW and 184 Street - Permitted SB Left Turns	**AM Peak Hour - 2044 Total - Pre-timed (120s cycle)**														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR			L/L/TR			22.2	C
		Volume (vph)	132	3985	29	29	1517	562	64	6	179	142	1	28		
		v/c Ratio	0.58	0.99	0.03	0.47	0.38	0.45	0.29	0.74		0.50	0.11			
		Delay (s)	20.2	27.7	2.6	36.4	6.4	1.6	48.4	66.2		52.7	16.4			
		LOS	C	C	A	D	A	A	D	E		D	B			
		95th Queue (m)	39	#331	3	#20	47	9	28	#78		27	9			
		PM Peak Hour - 2044 Total - Pre-timed (120s cycle, Pm+Pt WB L)														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR			L/L/TR			25.6	C
		Volume (vph)	43	2069	91	142	3508	202	65	2	53	518	5	124		
		v/c Ratio	0.69	0.66	0.10	0.64	0.92	0.19	0.27	0.15		0.96	0.41			
		Delay (s)	76.5	19.7	4.7	33.1	21.4	3.1	43.8	12.1		78.3	45.7			
		LOS	E	B	A	C	C	A	D	B		E	D			
		95th Queue (m)	#32	129	10	#38	248	14	28	12		#99	48			
2	23 Avenue NW and 187 Street - Protected SB Left Turns	**AM Peak Hour - 2044 Total – Pre-timed (140s cycle, Prot SB L)**														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR$^{(channelized)}$			L/L/TR			50.6	D
		Volume (vph)	184	3544	45	44	940	625	103	6	291	311	2	54		
		v/c Ratio	0.52	1.00	0.05	0.83	0.27	0.53	0.57	1.17		1.03	0.12			
		Delay (s)	20.0	57.2	6.1	102.2	5.8	5.0	69.7	156.6		120.4	10.9			
		LOS	B	E	A	F	A	A	E	F		F	B			
		95th Queue (m)	51	#377	7	#39	18	63	50	#161		#79	12			
		PM Peak Hour - 2044 Total – Pre-timed (140s cycle, Prot SB L, Pm+Pt EB & WB L)														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR$^{(channelized)}$			L/L/TR			66.2	E
		Volume (vph)	89	1518	144	224	3124	349	104	2	87	598	6	179		
		v/c Ratio	0.74	0.61	0.20	0.58	0.99	0.38	0.64	0.27		1.97	0.40			
		Delay (s)	57.1	30.9	9.2	35.4	19.8	2.1	75.9	12.6		>480	26.1			
		LOS	E	C	A	D	B	A	E	B		F	C			
		95th Queue (m)	#38	126	22	m33	m177	m4	#54	16		#173	48			

Table 6-1: 23 Avenue NW Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
2	23 Avenue NW and 187 Street - Permitted SB Left Turns	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR(channelized)			L/L/TR			19.7	B
		Volume (vph)	184	3544	45	44	940	625	103	6	291	311	2	54		
		v/c Ratio	0.45	0.90	0.04	0.71	0.24	0.50	0.44	0.92		0.63	0.18			
		Delay (s)	11.4	18.0	2.6	71.8	6.1	1.9	50.7	78.4		52.1	13.3			
		LOS	B	B	A	E	A	A	D	E		D	B			
		95th Queue (m)	33	231	4	#17	29	10	42	#124		51	12			
		PM Peak Hour - 2044 Total – Pre-timed (140s cycle, Pm+Pt EB, WB, & SB L)														
		Geometry	L/T/T/T/R			L/T/T/T/R			L/TR(channelized)			L/L/TR			37.4	D
		Volume (vph)	89	1518	144	224	3124	349	104	2	87	598	6	179		
		v/c Ratio	0.74	0.61	0.20	0.54	0.97	0.38	0.64	0.29		0.94	0.42			
		Delay (s)	57.8	30.9	9.2	23.4	38.4	9.6	75.9	12.6		73.2	27.9			
		LOS	E	C	A	C	D	A	E	B		E	C			
		95th Queue (m)	#38	126	22	57	#304	48	#54	16		#114	49			
3	23 Avenue NW and 195 Street	**AM Peak Hour - 2044 Total – Pre-timed (120 s cycle)**														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			18.2	B
		Volume (vph)	17	1650	15	36	809	42	41	8	198	282	11	43		
		v/c	0.05	0.78	0.02	0.46	0.38	0.05	0.10	0.40		0.85	0.10			
		Delay (s)	3.5	12.2	0.9	47.0	13.2	3.0	29.0	30.7		59.3	9.4			
		LOS	A	B	A	D	B	A	C	C		E	A			
		95th Queue (m)	m1	203	m0	#19	75	2	m15	57		#116	m9			
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			15.3	B
		Volume (vph)	48	1178	61	159	1755	213	41	19	70	75	16	32		
		v/c	0.64	0.63	0.08	0.61	0.79	0.23	0.11	0.17		0.20	0.10			
		Delay (s)	51.3	13.8	2.5	26.7	15.0	3.3	31.4	10.6		36.1	23.1			
		LOS	D	B	A	C	B	A	C	B		D	C			
		95th Queue (m)	#32	72	2	30	186	11	m14	m13		28	m15			
4	23 Avenue NW and 196 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T			T/T/R			-			L/R			13.8	B
		Volume (vph)	59	1553	-	-	799	95	-			129	-	41		
		v/c	0.16	0.70	-	-	0.36	0.10	-			0.24	-	0.09		
		Delay (s)	9.7	16.8	-	-	6.7	1.0	-			34.3	-	9.8		
		LOS	A	B	-	-	A	A	-			C	-	A		
		95th Queue (m)	m8	164	-	-	53	0	-			41	-	9		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle, Pm+Pt EB L)														
		Geometry	L/T/T			T/T/R			-			L/R			19.6	B
		Volume (vph)	135	1047	-	-	1541	288	-			241	-	167		
		v/c	0.84	0.47	-	-	0.81	0.34	-			0.45	-	0.31		
		Delay (s)	69.6	4.2	-	-	25.2	11.0	-			38.4	-	11.6		
		LOS	E	A	-	-	C	B	-			D	-	B		
		95th Queue (m)	m#29	m20	-	-	m119	m33	-			74	-	25		

Table 6-1: 23 Avenue NW Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
5	23 Avenue NW and 203 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			11.4	B
		Volume (vph)	56	531	42	102	681	111	52	19	189	150	13	49		
		v/c	0.14	0.25	0.05	0.22	0.32	0.12	0.12	0.33		0.46	0.11			
		Delay (s)	10.4	8.6	2.7	10.5	10.1	1.4	30.0	7.1		37.9	11.2			
		LOS	B	A	A	B	B	A	C	A		D	B			
		95th Queue (m)	11	31	2	13	31	3	19	21		51	13			
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			16.2	B
		Volume (vph)	161	628	124	299	585	326	113	51	243	259	45	142		
		v/c	0.41	0.32	0.14	0.79	0.30	0.34	0.28	0.41		0.83	0.28			
		Delay (s)	18.3	11.8	2.8	31.3	8.0	0.9	29.6	9.5		58.8	8.8			
		LOS	B	B	A	C	A	A	C	A		E	A			
		95th Queue (m)	62	63	11	m#58	20	m0	36	35		#108	24			
6	23 Avenue NW and 212 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T/R			L/T/T/R			L/TR			LTR			5.9	A
		Volume (vph)	6	382	16	96	670	17	41	3	172	75	4	19		
		v/c	0.01	0.17	0.02	0.16	0.30	0.02	0.11	0.32		0.31				
		Delay (s)	3.5	1.7	0.3	3.1	3.0	0.7	33.4	6.8		33.7				
		LOS	A	A	A	A	A	A	C	A		C				
		95th Queue (m)	m0	m4	m0	9	17	0	17	18		33				
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	L/T/T/R			L/T/T/R			L/TR			LTR			9.9	A
		Volume (vph)	17	673	63	238	533	69	42	7	205	35	6	11		
		v/c	0.03	0.30	0.07	0.56	0.24	0.07	0.12	0.37		0.14				
		Delay (s)	11.3	13.2	6.4	10.1	4.5	1.0	33.4	7.0		28.0				
		LOS	B	B	A	B	A	A	C	A		C				
		95th Queue (m)	m3	m44	m3	23	21	0	17	20		18				

23 Avenue and 184 Street

The 23 Avenue/184 Street intersection represents the first collector within Riverview west of Anthony Henday Drive and provides access to business employment and highway commercial land uses to the north and residential land uses to the south. Two southbound left turn bays were assumed to accommodate the projected 518 vph southbound left turn movement in the PM peak hour. The intersection was assessed with and without protected only phasing for the southbound left turn. Under both signal phasing scenarios it is anticipated that pedestrian movements would be actuated and that vehicle through movements along 23 Avenue would be given priority.

As shown in Table 6-1, the intersection is anticipated to be over-capacity during the peak hours based on the assumed geometry and traffic control. In the AM peak hour the eastbound through movement is projected to be over capacity. In the PM peak hour, the westbound through movement is projected to operate at capacity, while the southbound left is projected to be significantly over capacity. Based on a review of the traffic volumes by movement there is not a logical geometry improvement that would offset the impacts associated with protected only phasing.

If protected only phasing is not used, the intersection is projected to operate at acceptable levels of service in the AM and PM peak hours; although, the eastbound through movement is projected to approach capacity in the AM peak hour.

23 Avenue and 187 Street

The 23 Avenue/187 Street intersection provides access to residential land uses south of 23 Avenue and a combination of residential, business employment, and highway commercial land uses north of 23 Avenue. It is recommended that dual southbound left turns and a channelized northbound right turn be developed at the 23 Avenue/187 Street intersection.

The intersection assessments were completed assuming protected only phasing as well as permitted or permitted/protected phasing for the dual southbound left turn. Based on the assessments completed assuming protected only phasing for the dual southbound left turn movement, the eastbound through movement is projected to be at capacity in the AM peak hour and the westbound through movement is projected to be at capacity in the PM peak hour. As well, the southbound left turn movement is projected to be 3% to 97% over capacity in the AM and PM peak hours respectively, and the northbound right turn is projected to be 17% over capacity in the AM peak hour.

Based on the assessment assuming permitted and/or permitted/protected phasing, the intersection is projected to operate below capacity during the AM and PM peak hours.

Based on the assessments completed, the 23 Avenue/184 Street and 23 Avenue/187 Street intersections are anticipated to represent congestion points on the network. It is recommended that the signal timings prioritize 23 Avenue. As well, additional assessments could be completed when more information is available regarding the types and density of land uses that could be developed within the business

employment area. This assessment assumes a high percentage of highway commercial and office type land uses; however, light industrial or warehouse land uses may reduce the peak traffic activity at the intersections. As well, Travel Demand Management (TDM) programs that promote staggered start/end times, work at home, car-pooling, and transit usage should be promoted within the business employment area.

23 Avenue Between Riverview Way and 199 Street

The following remaining arterial/collector intersections are anticipated to operate well as signalized intersections within the 2047 horizon.

- 23 Avenue and 195 Street;
- 23 Avenue and 196 Street (T-intersection);
- 23 Avenue and 203 Street; and,
- 23 Avenue and 212 Street.

23 Avenue was assumed to be developed as a four-lane divided arterial west of Riverview Way, with left and right turn bays developed at the arterial/collector intersections. The majority of the side street approaches are assumed to be developed with two outbound lanes and one inbound lane. The outbound lanes are assumed to include a left turn bay and shared through/right lane, or left turn bay and right turn lane for T-intersections. The exception is the north approach of the 23 Avenue/212 Street intersection, which is assumed to include a shared left/through/right lane.

The assessments included a minimum north/south green time of 34 seconds, which is anticipated to exceed the potential minimum pedestrian requirements. Based on the assessments completed, pre-timed signal operations could be implemented at the above noted arterial/collector intersections to accommodate pedestrian movements across 23 Avenue.

6.3.2 199 Street/Quadrant Avenue Arterial/Collector Intersections

The majority of the collector intersections along 199 Street and Quadrant Avenue are anticipated to be signalized based on a review of the AM and PM peak hour side street volumes. The following exceptions were reviewed in more detail as the AM and PM peak hour side street volumes are projected to be less than 300 vph:

- Woodbend Wynd and 199 Street;
- 27 Avenue and 199 Street
- 25 Avenue and 199 Street;
- 18 Avenue and 199 Street;
- 10 Avenue and 199 Street; and,
- Quadrant Avenue and 203 Street.

The following summarizes the results of the assessments completed for the 199 Street/Quadrant Avenue arterial/collector intersections. Unless otherwise noted, minimum pedestrian times were accommodated for pedestrians crossing 199 Street/Quadrant Avenue. Detailed summaries are provided in **Table 6-2**.

Woodbend Wynd and 199 Street

The Woodbend Wynd/199 Street intersection is an existing unsignalized intersection that provides access to approximately 16 country residential lots. Based on the proposed NSP, there is the potential for a small pocket of redevelopment adjacent to 199 Street; however, the total number of lots accessed via Woodbend Wynd is not anticipated to generate sufficient traffic to warrant signalization. Additional pedestrian and bicycle access is provided to the south via parks, storm water management facilities, and the north/south utility right-of-way; however, vehicle access is anticipated to be limited to the 199 Street access. Based on the assessment of the intersection as an unsignalized intersection, side street movements are anticipated to experience long delays; although, the side street v/c ratios are projected to be 0.11 or less. Overall, the Woodbend Wynd/199 Street intersection is not anticipated to be a candidate for signalization in the future.

27 Avenue/199 Street

The 27 Avenue/199 Street intersection provides access to residential land uses east and west of 199 Street and also provides a secondary connection to the business employment land uses located north of 23 Avenue and west of Anthony Henday Drive. Based on a review of the projected peak hour volumes, the 27 Avenue/199 Street intersection is anticipated to be signalized. As shown in the attached tables, the intersection is anticipated to operate well as a signalized intersection in the 2047 horizon.

25 Avenue/199 Street

The total outbound volumes on the east and west approaches of the 25 Avenue/199 Street intersection are anticipated to be in the order of 254 vph in the AM peak hour and 158 vph in the PM peak hour. The eastbound and westbound left turn movements are projected to be over capacity in the PM peak hour with significant delay under stop control operation; however, the PM peak hour side street left turn volumes are 60 vph or less, which would not typically warrant signalization. Alternate access to the arterial roadway network is available via the internal collector roadways; therefore, the 25 Avenue/199 Street intersection is not anticipated to be a candidate for signalization in the 2047 horizon. However, if the intersection meets the City of Edmonton's traffic signal installation guidelines based on measured data in the future, it is appropriately spaced from 24 Avenue and 27 Avenue to allow for signalization.

Table 6-2: 199 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
7	Woodbend Wynd and 199 Street	**AM Peak Hour - 2044 Total - Unsignalized (WB Stop)**														
		Geometry	-			LR			T/TR			L/T/T			0.2	A
		Volume (vph)	-			7	-	3	-	1329	2	1	833	-		
		v/c Ratio	-			0.07			-	0.52	0.26	0.00	0.24	-		
		Delay (s)	-			33.3			-	0.0	0.0	10.9	0.0	-		
		LOS	-			D			-	A	A	B	A	-		
		95th Queue (m)	-			2			-	0	0	0	0	-		
		PM Peak Hour - 2044 Total - Unsignalized (WB Stop)														
		Geometry	-			LR			T/TR			L/T/T			0.2	A
		Volume (vph)	-			4	-	1	-	1305	7	3	1814	-		
		v/c Ratio	-			0.11			-	0.51	0.26	0.01	0.53	-		
		Delay (s)	-			96.2			-	0.0	0.0	11.5	0.0	-		
		LOS	-			F			-	A	A	B	A	-		
		95th Queue (m)	-			3			-	0	0	0	0	-		
8	27 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle, Pm+Pt SB L)**														
		Geometry	LTR			L/TR			L/T/T/R			L/T/T/R			18.6	B
		Volume (vph)	13	1	26	43	5*	129	7	1189	27	253	584	2		
		v/c Ratio	0.09			0.12	0.26		0.02	0.72	0.04	0.75	0.26	0.00		
		Delay (s)	16.8			33.4	7.5		13.7	16.4	5.8	50.8	11.4	6.5		
		LOS	B			C	A		B	B	A	D	B	A		
		95th Queue (m)	11			18	16		m2	61	m2	m70	m39	m0		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	LTR			L/TR			L/T/T/R			L/T/T/R			7.8	A
		Volume (vph)	4	5*	14	59	1	253	24	1055	66	154	1652	12		
		v/c Ratio	0.05			0.16	0.51		0.24	0.47	0.07	0.59	0.73	0.01		
		Delay (s)	19.2			34.1	24.5		11.4	7.0	0.5	8.3	4.9	0.3		
		LOS	B			C	C		B	A	A	A	A	A		
		95th Queue (m)	8			23	57		m2	29	m1	m6	m42	m0		
9	25 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			4.2	A
		Volume (vph)	56	5*	81	38	5*	79	22	1088	22	14	628	10		
		v/c	0.41	0.18		0.47	0.15		0.02	0.32	0.01	0.02	0.18	0.01		
		Delay (s)	49.4	14.5		84.5	12.7		9.0	0.0	0.0	10.1	0.0	0.0		
		LOS	E	B		F	B		A	A	A	A	A	A		
		95th Queue (m)	14	5		16	4		1	0	0	1	0	0		
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			>240	F
		Volume (vph)	18	5*	45	61	5*	24	77	1103	62	75	1597	53		
		v/c	>4.0	0.90		>10	0.77		0.20	0.32	0.04	0.12	0.47	0.03		
		Delay (s)	Error	209.1		Error	239.5		17.0	0.0	0.0	11.2	0.0	0.0		
		LOS	F	F		F	F		C	A	A	B	A	A		
		95th Queue (m)	Error	32		Error	23		6	0	0	3	0	0		

Table 6-2: 199 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
10	24 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle, Prot NB & SB L)**														
		Geometry	L/TR			L/TR			L/L/T/T/R			L/L/T/T/R			14.5	B
		Volume (vph)	126	3	77	56	5	80	111	926	88	94	531	123		
		v/c	0.34	0.16		0.15	0.17		0.31	0.54	0.12	0.29	0.32	0.16		
		Delay (s)	37.0	8.4		33.3	8.7		69.0	4.9	0.2	42.1	14.1	5.3		
		LOS	D	A		C	A		E	A	A	D	B	A		
		95th Queue (m)	43	13		22	13		m17	m21	m0	16	48	16		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle, Prot NB & SB L)														
		Geometry	L/TR			L/TR			L/L/T/T/R			L/L/T/T/R			29.0	C
		Volume (vph)	289	11	279	234	13	236	281	717	193	261	1051	391		
		v/c	0.76	0.38		0.68	0.33		0.79	0.58	0.31	0.63	0.80	0.56		
		Delay (s)	46.8	5.8		42.1	5.0		42.8	36.5	17.8	52.7	26.9	12.5		
		LOS	D	A		D	A		D	D	B	D	C	B		
		95th Queue (m)	#107	23		81	19		m#49	108	m41	43	127	73		
11	20 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			19.5	B
		Volume (vph)	75	6	40	40	9	217	80	1547	44	46	445	90		
		v/c	0.23	0.09		0.09	0.44		0.16	0.76	0.05	0.52	0.22	0.10		
		Delay (s)	28.1	9.5		25.1	27.6		12.8	21.3	5.2	41.0	12.3	2.7		
		LOS	C	A		C	C		B	C	A	D	B	A		
		95th Queue (m)	24	9		14	56		16	148	6	#25	31	7		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle, Pm+Pt NB & SB L)														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			22.4	C
		Volume (vph)	222	19	232	102	18	117	153	898	93	217	1561	279		
		v/c	0.54	0.42		0.35	0.23		0.89	0.52	0.12	0.67	0.90	0.36		
		Delay (s)	40.6	15.6		35.4	8.2		67.1	25.7	8.5	10.2	20.9	4.1		
		LOS	D	B		D	A		E	C	A	B	C	A		
		95th Queue (m)	73	43		36	18		#59	99	19	m72	m181	m17		
12	18 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	LTR			LTR			L/T/T/R			L/T/T/R			5.0	A
		Volume (vph)	114	5*	5	4	5*	105	4	1451	4	19	484	21		
		v/c	0.75			0.26			0.00	0.43	0.00	0.03	0.14	0.01		
		Delay (s)	72.0			16.3			8.5	0.0	0.0	11.7	0.0	0.0		
		LOS	F			C			A	A	A	B	A	A		
		95th Queue (m)	37			8			0	0	0	1	0	0		
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	LTR			LTR			L/T/T/R			L/T/T/R			2.5	A
		Volume (vph)	43	5*	6	6	5*	37	7	1064	7	93	1704	99		
		v/c	0.63			0.21			0.02	0.31	0.00	0.12	0.50	0.06		
		Delay (s)	101.3			25.0			14.2	0.0	0.0	10.5	0.0	0.0		
		LOS	F			D			B	A	A	B	A	A		
		95th Queue (m)	24			6			0	0	0	3	0	0		

Table 6-2: 199 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
13	13 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle, Pm+Pt SB L)**														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			26.1	C
		Volume (vph)	125	8	11	54	6	320	9	1616	98	82	485	22		
		v/c	0.69	0.04		0.14	0.63		0.02	0.84	0.12	0.53	0.21	0.02		
		Delay (s)	60.6	20.3		33.9	29.4		14.9	27.1	9.1	42.4	12.8	7.2		
		LOS	E	C		C	C		B	C	A	D	B	A		
		95th Queue (m)	#58	8		21	78		m2	148	m16	m21	26	m1		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle, Pm+Pt SB L)														
		Geometry	L/TR			L/TR			L/T/T/R			L/T/T/R			17.5	B
		Volume (vph)	42	14	14	143	12	165	16	1015	131	328	1661	107		
		v/c	0.14	0.06		0.38	0.32		0.16	0.68	0.20	0.76	0.73	0.11		
		Delay (s)	34.1	20.4		38.5	7.8		23.0	24.6	6.5	20.4	13.1	2.4		
		LOS	C	C		D	A		C	C	A	C	B	A		
		95th Queue (m)	18	10		49	20		m7	112	18	m47	169	m5		
14A	10 Avenue and 199 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	LTR			LTR			L/T/T/R			L/T/T/R			17.5	C
		Volume (vph)	64	5*	5*	5*	5*	126	5*	1533	5*	21	518	11		
		v/c	1.53			0.63			0.00	0.45	0.00	0.05	0.15	0.01		
		Delay (s)	>420			46.6			8.6	0.0	0.0	14.1	0.0	0.0		
		LOS	F			E			A	A	A	B	A	A		
		95th Queue (m)	57			30			0	0	0	1	0	0		
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	LTR			LTR			L/T/T/R			L/T/T/R			102.8	F
		Volume (vph)	19	5*	5*	5*	5*	38	5*	1106	5*	103	1661	53		
		v/c	>4			1.22			0.01	0.33	0.00	0.17	0.49	0.03		
		Delay (s)	Error			>360			14.1	0.0	0.0	12.1	0.0	0.0		
		LOS	F			F			B	A	A	B	A	A		
		95th Queue (m)	Error			39			0	0	0	5	0	0		
14B	Quadrant Avenue and 203 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	L/T/T/R			L/T/T/R			LTR			LTR			3.0	A
		Volume (vph)	5*	1441	4	7	491	20	5	5*	13	79	5*	5*		
		v/c	0.00	0.42	0.00	0.01	0.14	0.01	0.18			0.59				
		Delay (s)	8.5	0.0	0.0	12.4	0.0	0.0	40.0			57.6				
		LOS	A	A	A	B	A	A	E			F				
		95th Queue (m)	0	0	0	0	0	0	5			24				
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	L/T/T/R			L/T/T/R			LTR			LTR			23.6	C
		Volume (vph)	5*	1040	7	23	1557	80	6	5*	21	45	5*	5*		
		v/c	0.01	0.31	0.00	0.03	0.46	0.05	0.50			>2.5				
		Delay (s)	14.6	0.0	0.0	10.3	0.0	0.0	109.5			>1000				
		LOS	B	A	A	B	A	A	F			F				
		95th Queue (m)	0	0	0	1	0	0	16			57				

Table 6-2: 199 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
15	Quadrant Avenue and 209 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			15.7	B
		Volume (vph)	24	1043	17	46	412	37	50	2	233	169	1	118		
		v/c	0.04	0.46	0.02	0.17	0.18	0.04	0.14	0.46		0.67	0.23			
		Delay (s)	7.2	8.3	2.3	19.4	16.7	10.5	34.0	21.9		53.2	7.2			
		LOS	A	A	A	B	B	B	C	C		D	A			
		95th Queue (m)	4	40	m1	23	43	10	20	50		#66	15			
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			6.1	A
		Volume (vph)	105	866	51	213	1195	155	27	3	101	80	4	44		
		v/c	0.48	0.38	0.06	0.63	0.53	0.16	0.07	0.21		0.23	0.10			
		Delay (s)	18.8	5.5	0.7	9.9	2.8	0.3	32.7	7.8		36.0	11.8			
		LOS	B	A	A	A	A	A	C	A		D	B			
		95th Queue (m)	30	38	m1	7	15	m0	13	14		m29	m10			
16	Quadrant Avenue and 212 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			18.4	B
		Volume (vph)	8	803	45	122	369	88	197	9	205	83	10	5		
		v/c	0.01	0.39	0.05	0.38	0.18	0.10	0.44	0.35		0.25	0.03			
		Delay (s)	12.4	19.4	5.8	19.8	12.9	5.9	35.4	10.5		32.0	21.5			
		LOS	B	B	A	B	B	A	D	B		C	C			
		95th Queue (m)	m2	89	8	38	35	15	61	29		29	7			
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	L/T/T/R			L/T/T/R			L/TR			L/TR			15.0	B
		Volume (vph)	23	628	190	266	845	156	96	15	224	165	14	29		
		v/c	0.07	0.30	0.21	0.66	0.41	0.17	0.22	0.36		0.53	0.08			
		Delay (s)	18.4	20.2	6.7	20.0	9.6	1.4	30.8	6.4		40.0	13.9			
		LOS	B	C	A	B	A	A	C	A		D	B			
		95th Queue (m)	m8	59	21	59	31	2	31	21		57	11			

*Movement was projected to accommodate 0 vph; a nominal 5 vph was assumed in the assessment.

24 Avenue and 199 Street

The 24 Avenue/199 Street intersection provides access to the town centre sites north of 23 Avenue. The intersection is planned to include dual left turn bays and single right turn bays on the north and south approaches along 199 Street and one left turn bay and a shared through/right lane on the east and west approaches along 24 Avenue. The provision of dual left turn bays requires the use of protected only phasing and is not anticipated to significantly increase the capacity of these left turn movements; however, it is projected to reduce the queue lengths for the movements, reducing the potential for the queue to spill out of the left turn bays. Overall, the intersection is anticipated to operate well as a signalized intersection in the 2047 horizon.

20 Avenue and 199 Street

The 20 Avenue/199 Street intersection is anticipated to operate well as a signalized intersection assuming single left and right turn bays are developed along 199 Street and a left turn bay and shared through/right lane are developed along 20 Avenue.

18 Avenue and 199 Street

The 18 Avenue/199 Street intersection is proposed as a minor secondary access to NBHD 2 and NBHD 3. The daily volumes on the side streets are anticipated to be in the order of 1,350 to 1,650 vpd; however, the link is not anticipated to be required to provide transit access in this area. Secondary access to the collector roadway network is available in the vicinity of 18 Avenue; therefore, signalization is not anticipated to be warranted in the future. As shown in Table 6-2, the analysis assumed one shared left/through/right lane on the side streets, which are anticipated to operate at or below capacity during the AM and PM peak hours with long delays.

13 Avenue and 199 Street

The 13 Avenue/199 Street intersection is anticipated to operate at acceptable levels of service in the AM and PM peak hours as a signalized intersection under the 2047 total traffic scenario. The intersection is anticipated to include single left and right turn bays along 199 Street and a left turn bay and a shared through/right lane on the east and west approaches.

10 Avenue and 199 Street

10 Avenue is planned as a low volume collector road west of 199 Street and a potential local road east of 199 Street. Left and right turn bays are assumed to be developed along 199 Street, and the side street approaches are assumed to include one shared left/through/right lane. As shown in Table 6-2, the side street movements are projected to be over capacity with high delays in the peak hours under stop control. However, based on the magnitude of the side street volumes, and the alternate access options via the internal collector roadway network, signalization is not anticipated to be warranted.

Quadrant Avenue and 203 Street

The 203 Street link provides access to a small parcel of low density residential land uses that are bounded by a natural area and a school park site to the north and northwest. Based on daily volumes in the order of 1,320 vpd, the link is anticipated to be developed as a local roadway with a shared left/through/right lane on the approach to Quadrant Avenue.

As shown in the analysis of the intersection as an unsignalized intersection, side street capacity constraints and delays are noted; however, secondary access is available to 209 Street and signalization is not anticipated to be warranted at this location in the future.

Quadrant Avenue and 209 Street

The Quadrant Avenue/209 Street intersection is anticipated to operate at acceptable levels of service in the AM and PM peak hours as a signalized intersection under the 2047 total traffic scenario. The intersection is anticipated to include single left and right turn bays along Quadrant Avenue and a left turn bay and a shared through/right lane on the north and south approaches.

Quadrant Avenue and 212 Street

The Quadrant Avenue/212 Street intersection is anticipated to operate well as a signalized intersection in the AM and PM peak hours under the 2047 total traffic scenario. The intersection is anticipated to include single left and right turn bays along Quadrant Avenue and a left turn bay and a shared through/right lane on the north and south approaches.

6.3.3 215 Street Arterial/Collector and Arterial/Access Intersections

Based on the arterial roadway analysis, 215 Street is anticipated to be developed as a six-lane arterial from approximately 20 Avenue north to Wedgewood Creek. South of 20 Avenue, 215 Street is anticipated to be developed as standard four-lane divided arterial.

Traffic signals are anticipated to be warranted at the 20 Avenue/215 Street intersection and the CSC2 site access intersection. Detailed assessment summarizes are included in **Table 6-3**.

24 Avenue and 215 Street

The configuration of Wedgewood Creek is such that there is a small pocket of developable land located in the northeast corner of the 23 Avenue/215 Street intersection. Access to the parcel is proposed via an all-directional access to 215 Street approximately 185 metres north of 23 Avenue and a local road connection to the east that parallels 23 Avenue.

Table 6-3: 215 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
24	24 Avenue and 215 Street	**AM Peak Hour - 2044 Total - Unsignalized (WB Stop)**														
		Geometry	-			LR			T/T/TR			L/T/T/T			0.5	A
		Volume (vph)	-			4	-	87	-	2489	3	14	790	-		
		v/c Ratio	-			0.23			-	0.59	0.29	0.04	0.15	-		
		Delay (s)	-			16.6			-	0.0	0.0	16.9	0.0	-		
		LOS	-			C			-	A	A	C	A	-		
		95th Queue (m)	-			7			-	0	0	1	0	-		
		PM Peak Hour - 2044 Total - Unsignalized (WB Stop)														
		Geometry	-			LR			T/T/TR			L/T/T/T			0.5	A
		Volume (vph)	-			5	-	26	-	1528	5	75	2486	-		
		v/c Ratio	-			0.23			-	0.36	0.18	0.14	0.49	-		
		Delay (s)	-			38.9			-	0.0	0.0	13.0	0.0	-		
		LOS	-			E			-	A	A	B	A	-		
		95th Queue (m)	-			7			-	0	0	4	0	-		
25	20 Avenue and 215 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	-			L/R			T/T/R			L/T/T			11.7	B
		Volume (vph)	-			42	-	161	-	2136	79	52	455	-		
		v/c Ratio	-			0.09	-	0.42	-	0.90	0.08	0.84	0.19	-		
		Delay (s)	-			36.0	-	39.4	-	8.0	0.5	120.7	6.8	-		
		LOS	-			D	-	D	-	A	A	F	A	-		
		95th Queue (m)	-			18	-	53	-	35	m0	#39	18	-		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	-			L/R			T/T/R			L/T/T			13.8	B
		Volume (vph)	-			211	-	136	-	769	138	258	1839	-		
		v/c Ratio	-			0.42	-	0.26	-	0.34	0.14	0.68	0.81	-		
		Delay (s)	-			38.3	-	6.8	-	11.1	3.4	9.9	13.9	-		
		LOS	-			D	-	A	-	B	A	A	B	-		
		95th Queue (m)	-			66	-	15	-	63	10	m9	m67	-		
26	14 Avenue and 215 Street	**AM Peak Hour - 2044 Total – Unsignalized (WB Stop)**														
		Geometry	-			L/R			T/T/R			L/T/T			1.8	A
		Volume (vph)	-			12	-	93	-	1833	10	18	431	-		
		v/c	-			0.30	-	0.36	-	0.54	0.01	0.06	0.13	-		
		Delay (s)	-			127.6	-	26.4	-	0.0	0.0	17.1	0.0	-		
		LOS	-			F	-	D	-	A	A	C	A	-		
		95th Queue (m)	-			8	-	12	-	0	0	1	0	-		
		PM Peak Hour - 2044 Total – Unsignalized (WB Stop)														
		Geometry	-			L/R			T/T/R			L/T/T			1.0	A
		Volume (vph)	-			17	-	34	-	800	19	83	1717	-		
		v/c	-			0.29	-	0.06	-	0.24	0.01	0.11	0.51	-		
		Delay (s)	-			91.6	-	11.7	-	0.0	0.0	10.1	0.0	-		
		LOS	-			F	-	B	-	A	A	B	A	-		
		95th Queue (m)	-			8	-	2	-	0	0	3	0	-		

Table 6-3: 215 Street Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
27	10 Avenue and 215 Street	**AM Peak Hour - 2044 Total – Unsignalized (WB Stop)**														
		Geometry	-			L/R			T/T/R			L/T/T			0.9	A
		Volume (vph)	-			2	-	128	-	1716	2	27	417	-		
		v/c	-			0.03	-	0.19	-	0.50	0.00	0.06	0.12	-		
		Delay (s)	-			53.4	-	11.8	-	0.0	0.0	13.7	0.0	-		
		LOS	-			F	-	B	-	A	A	B	A	-		
		95th Queue (m)	-			1	-	6	-	0	0	2	0	-		
		PM Peak Hour - 2044 Total – Unsignalized (WB Stop)														
		Geometry	-			L/R			T/T/R			L/T/T			0.7	A
		Volume (vph)	-			3	-	51	-	767	3	118	1615	-		
		v/c	-			0.05	-	0.07	-	0.23	0.00	0.14	0.47	-		
		Delay (s)	-			67.9	-	10.5	-	0.0	0.0	9.8	0.0	-		
		LOS	-			F	-	B	-	A	A	A	A	-		
		95th Queue (m)	-			1	-	2	-	0	0	4	0	-		
28	CSC2 Access and 215 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	-			L/R			T/T/R			L/T/T			8.2	A
		Volume (vph)	-			32	-	60	-	1657	53	50	369	-		
		v/c	-			0.06	-	0.13	-	0.73	0.06	0.51	0.16	-		
		Delay (s)	-			32.3	-	20.8	-	7.6	1.4	33.7	4.5	-		
		LOS	-			C	-	C	-	A	A	C	A	-		
		95th Queue (m)	-			14	-	17	-	46	m1	#15	17	-		
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	-			L/R			T/T/R			L/T/T			7.9	A
		Volume (vph)	-			126	-	101	-	670	73	139	1480	-		
		v/c	-			0.24	-	0.20	-	0.30	0.08	0.32	0.65	-		
		Delay (s)	-			35.1	-	7.3	-	7.6	1.9	5.3	6.3	-		
		LOS	-			D	-	A	-	A	A	A	A	-		
		95th Queue (m)	-			41	-	14	-	33	m4	m14	102	-		

As shown in Table 6-3, the 24 Avenue/215 Street intersection is anticipated to operate at acceptable levels of service as an unsignalized intersection. The geometry assumed in the assessment included a southbound left turn bay but did not include a separate northbound right turn bay. 24 Avenue east of 215 Street is anticipated to include one shared left/right lane. The left out is anticipated to be difficult during the peak hours; therefore, consideration could be given to developing the access as a right in/right out/left in access. The low volume left out movement (4 to 5 vph) could be accommodated at the 23 Avenue/212 Street intersection.

20 Avenue and 215 Street

The 20 Avenue/215 Street intersection is assumed to be developed as a signalized T-intersection within the 2047 horizon.

Although a six-lane cross-section was assumed for the 23 Avenue/215 Street intersection, it is not anticipated to continue through the 20 Avenue intersection. As shown in Table 6-3, the 20 Avenue/215 Street intersection is anticipated to operate at acceptable levels of service in the AM and PM peak hours. The analysis assumed pre-timed operation with a minimum green time of 30 seconds for the westbound movements. It is anticipated that this would provide sufficient pedestrian crossing time for movements across 215 Street. It is also noted that the southbound left turn is projected to operate at LOS F in the AM peak hour; although, the v/c ratio is projected to be acceptable. A southbound permitted/protected phase was not included as the volume is less than 100 vph and the addition of the phase would significantly impact the high volume northbound through movement.

14 Avenue/215 Street and 10 Avenue/215 Street

The 14 Avenue/215 Street and 10 Avenue/215 Street intersections are anticipated to be developed as unsignalized T-intersections within the 2047 horizon. The east intersection approaches are anticipated to accommodate a left turn bay and a right turn lane, while northbound right turn bays and southbound left turn bays are anticipated at the intersections along 215 Street.

Based on the assessments completed, the westbound left turns from 14 Avenue and 10 Avenue to 215 Street southbound are anticipated to experience long delays, resulting in LOS F; however, the volumes for these movements are low and the v/c ratios are projected to be 0.30 or less. It is also noted that the left turn volumes are low, and the suggested westbound left turn bay does not need to be substantial. For example, it could be developed within a standard 11.5 metre collector through the implementation of a parking ban within the first 30 metres east of 215 Street.

CSC2 Access and 215 Street

The CSC2 Access/215 Street intersection is anticipated to be developed as a signalized T-intersection. The east approach is anticipated to include a left turn bay and a right turn lane and a southbound left turn bay and a northbound right turn bay are anticipated to be developed along 215 Street. Based on the

assessment completed, the CSC2 Access/215 Street intersection is anticipated to operate well as a signalized intersection in the AM and PM peak hours in the 2047 horizon.

6.3.4 Riverview Way Arterial/Collector Intersections

Based on the arterial roadway assessment and discussions with the client group, Riverview Way is anticipated to be developed as a four-lane arterial with a wide centre median (without left turn bays) between Riverview Way and 199 Street and a two-lane arterial between 199 Street and 215 Street.

Two intersections along Riverview Way are anticipated to be signalized in the 2047 horizon: Riverview Way and 20 Avenue and Riverview Way and 197 Street. The remaining intersections are anticipated to remain as unsignalized intersections based on the projected side street volumes. Detailed intersection summaries are provided in **Table 6-4**.

Riverview Way and 20 Avenue

The east approach of the Riverview Way/20 Avenue intersection is a collector roadway while the west approach is a local roadway. As such, the geometry assumed on the east approach includes a left turn bay and a shared through/right lane, while the geometry assumed on the west approach includes a shared left/through/right lane. The north and south approaches are assumed to include one shared left/through lane and one shared through/right lane.

Based on the assessments completed, the Riverview Way/20 Avenue intersection is anticipated to operate well as a signalized intersection in the AM and PM peak hours under the 2047 total traffic scenario.

Riverview Way and 195 Street

The Riverview Way/195 Street intersection is anticipated to remain an unsignalized intersection in the 2047 horizon. Although the intersection assessments identify that the side street movements could operate at LOS F during the peak hours, the side street v/c ratios are projected to be less than 1.0. The overall magnitude of side street traffic is not anticipated to warrant signalization, especially considering the alternate accesses available to this portion of the plan area.

Riverview Way and 196 Street

The Riverview Way/196 Street intersection is identified as one intersection on the traffic volume exhibits; however, it actually represents three local roadway intersections along Riverview Way between 195 Street and 197 Street that provide access to residential land uses located between the North Saskatchewan River Valley and Riverview Way. It is anticipated that the accesses will remain unsignalized and that the side street approaches would include one inbound and one outbound lane at the intersection. The local/arterial intersections are anticipated to operate with long delays during peak hours, although, the v/c ratios are projected to be less than 0.60.

Table 6-4: Riverview Way Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
17	Riverview Way and 20 Avenue	**AM Peak Hour - 2044 Total - Pre-timed (120s cycle)**														
		Geometry	LTR			L/TR			LT/TR			LT/TR			15.6	B
		Volume (vph)	13	4	2	72	5	362	1	1365	98	64	241	2		
		v/c Ratio	0.05			0.19	0.79		0.69			0.23				
		Delay (s)	29.9			34.7	47.9		7.3			11.0				
		LOS	C			C	D		A			B				
		95th Queue (m)	9			26	#121		41			23				
		PM Peak Hour - 2044 Total - Pre-timed (120s cycle)														
		Geometry	LTR			L/TR			LT/TR			LT/TR			14.3	B
		Volume (vph)	4	12	3	174	11	120	3	414	137	323	1057	10		
		v/c Ratio	0.05			0.54	0.29		0.25			0.83				
		Delay (s)	31.8			47.4	9.7		9.0			12.5				
		LOS	C			D	A		A			B				
		95th Queue (m)	10			62	18		22			203				
18	Riverview Way and 195 Street	**AM Peak Hour - 2044 Total – Unsignalized (N/S Stop)**														
		Geometry	LT/TR			LT/TR			LTR			LTR			9.0	A
		Volume (vph)	7	1245	16	32	276	7	23	3	188	32	2	8		
		v/c Ratio	0.38			0.09			0.81			0.50				
		Delay (s)	0.1			1.5			57.5			85.1				
		LOS	A			A			F			F				
		95th Queue (m)	0			2			50			17				
		PM Peak Hour - 2044 Total – Unsignalized (N/S Stop)														
		Geometry	LT/TR			LT/TR			LTR			LTR			7.4	A
		Volume (vph)	12	485	40	157	1049	28	40	6	56	13	6	13		
		v/c Ratio	0.17			0.33			0.74			0.47				
		Delay (s)	0.4			2.1			82.0			97.1				
		LOS	A			A			F			F				
		95th Queue (m)	1			4			35			15				
19	Riverview Way and 196 Street	**AM Peak Hour - 2044 Total – Unsignalized (N/S Stop)**														
		Geometry	LT/TR			LT/TR			LTR			LTR			5.3	A
		Volume (vph)	3	1116	15	16	282	9	33	5*	98	54	5*	4		
		v/c	0.34			0.09			0.59			0.43				
		Delay (s)	0.0			0.7			40.2			47.5				
		LOS	A			A			E			E				
		95th Queue (m)	0			1			27			16				
		PM Peak Hour - 2044 Total – Unsignalized (N/S Stop)														
		Geometry	LT/TR			LT/TR			LTR			LTR			3.1	A
		Volume (vph)	7	493	46	77	981	43	33	5*	29	16	5*	6		
		v/c	0.17			0.31			0.39			0.30				
		Delay (s)	0.2			1.0			38.1			60.4				
		LOS	A			A			E			F				
		95th Queue (m)	0			2			13			9				

Table 6-4: Riverview Way Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
20	Riverview Way and 197 Street	**AM Peak Hour - 2044 Total – Pre-timed (120s cycle)**														
		Geometry	LT/TR			LT/TR			L/TR			L/TR			11.7	B
		Volume (vph)	76	1024	65	27	270	22	42	4	17	92	6	56		
		v/c	0.58			0.18			0.12	0.05		0.24	0.13			
		Delay (s)	11.0			4.2			33.4	15.8		35.6	10.5			
		LOS	B			A			C	B		D	B			
		95th Queue (m)	88			7			17	7		33	12			
		PM Peak Hour - 2044 Total – Pre-timed (120s cycle)														
		Geometry	LT/TR			LT/TR			L/TR			L/TR			6.2	A
		Volume (vph)	95	462	123	50	866	104	86	9	35	50	12	120		
		v/c	0.48			0.52			0.25	0.06		0.14	0.25			
		Delay (s)	4.5			2.9			36.1	13.8		33.8	8.6			
		LOS	A			A			D	B		C	A			
		95th Queue (m)	14			13			31	11		20	18			
21	Riverview Way and 203 Street	**AM Peak Hour - 2044 Total – Unsignalized (N/S Stop)**														
		Geometry	LTR			LTR			LTR			LTR			6.9	A
		Volume (vph)	23	243	16	23	118	15	55	10	129	74	6	31		
		v/c	0.02			0.02			0.33			0.29				
		Delay (s)	0.8			1.3			13.9			18.2				
		LOS	A			A			B			C				
		95th Queue (m)	0			0			11			10				
		PM Peak Hour - 2044 Total – Unsignalized (N/S Stop)														
		Geometry	LTR			LTR			LTR			LTR			6.5	A
		Volume (vph)	56	213	58	111	270	64	31	22	45	31	21	46		
		v/c	0.05			0.09			0.33			0.33				
		Delay (s)	1.8			2.7			23.1			22.8				
		LOS	A			A			C			C				
		95th Queue (m)	1			2			11			11				

Table 6-4: Riverview Way Arterial/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
22	Riverview Way and 209 Street	**AM Peak Hour - 2044 Total – Unsignalized (NB Stop)**														
		Geometry	TR			LT			LR			-			8.0	A
		Volume (vph)	-	93	59	68	137	-	146	-	189	-				
		v/c	-	0.09		0.05		-	0.48			-				
		Delay (s)	-	0.0		2.8		-	14.7			-				
		LOS	-	A		A		-	B			-				
		95th Queue (m)	-	0		1		-	21			-				
		PM Peak Hour - 2044 Total – Unsignalized (NB Stop)														
		Geometry	TR			LT			LR			-			7.5	A
		Volume (vph)	-	193	149	201	147	-	91	-	135	-				
		v/c	-	0.20		0.17		-	0.51			-				
		Delay (s)	-	0.0		5.7		-	21.6			-				
		LOS		A		A		-	C			-				
		95th Queue (m)		0		5		-	23			-				
23	Riverview Way and 212 Street	**AM Peak Hour - 2044 Total – Unsignalized (SB Stop)**														
		Geometry	LT			TR			-			LR			4.6	A
		Volume (vph)	28	74	-	-	231	51	-			78	-	113		
		v/c	0.02		-	-	0.17		-			0.29				
		Delay (s)	2.3		-	-	0.0		-			12.6				
		LOS	A		-	-	A		-			B				
		95th Queue (m)	1		-	-	0		-			10				
		PM Peak Hour - 2044 Total – Unsignalized (SB Stop)														
		Geometry	LT			TR			-			LR			4.7	A
		Volume (vph)	106	243	-	-	124	114	-			99	-	50		
		v/c	0.08		-	-	0.14		-			0.32				
		Delay (s)	3.0		-	-	0.0		-			16.1				
		LOS	A		-	-	A		-			C				
		95th Queue (m)	2		-	-	0		-			11				

*Movement was projected to accommodate 0 vph; a nominal 5 vph was assumed in the assessment.

Riverview Way and 197 Street

The Riverview Way/197 Street intersection provides access to residential land uses and the transit supportive development north of Riverview Way and to the district park and high schools to the south of Riverview Way. The intersection is anticipated to operate well as a signalized intersection in the AM and PM peak hours.

Riverview Way Between 199 Street and 215 Street

The intersections along Riverview Way between 199 Street and 215 Street are anticipated to operate as unsignalized intersections with one shared left/through/right lane on all four approaches. Based on the assessments completed, the intersections are anticipated to operate at LOS C or better during the AM and PM peak hours under the 2047 total traffic scenario.

The recommended intersection geometry and traffic control for the arterial/arterial, arterial/collector, and arterial/access intersections within Riverview NBHDs 1, 2, and 3 are illustrated in **Exhibit 6-1**.

6.4 Collector/Collector and Collector/Access Intersections

The following collector/collector and collector/access intersections were analyzed to confirm the internal collector roadway requirements:

NBHD 1 Collector/Collector and Collector/Access Intersections

- 27 Avenue and 187 Street
- 27 Avenue and 195 Street
- 25 Avenue and 195 Street
- 24 Avenue and 196 Street
- 24 Avenue and TC2 Access
- 24 Avenue and TC1 Access
- 24 Avenue and 203 Street
- 24 Avenue and 212 Street

NBHD 2 Collector/Collector and Collector/Access Intersections

- TC3 Access and 203 Street
- 18 Avenue and 203 Street
- CSC1 Access and 212 Street
- 20 Avenue and 212 Street
- 18 Avenue and 212 Street
- 14 Avenue and 209 Street
- 10 Avenue and 209 Street
- CSC2 Access and 212 Street

NBHD 3 Collector/Collector Intersections

- 20 Avenue and 195 Street
- 20 Avenue and 197 Street

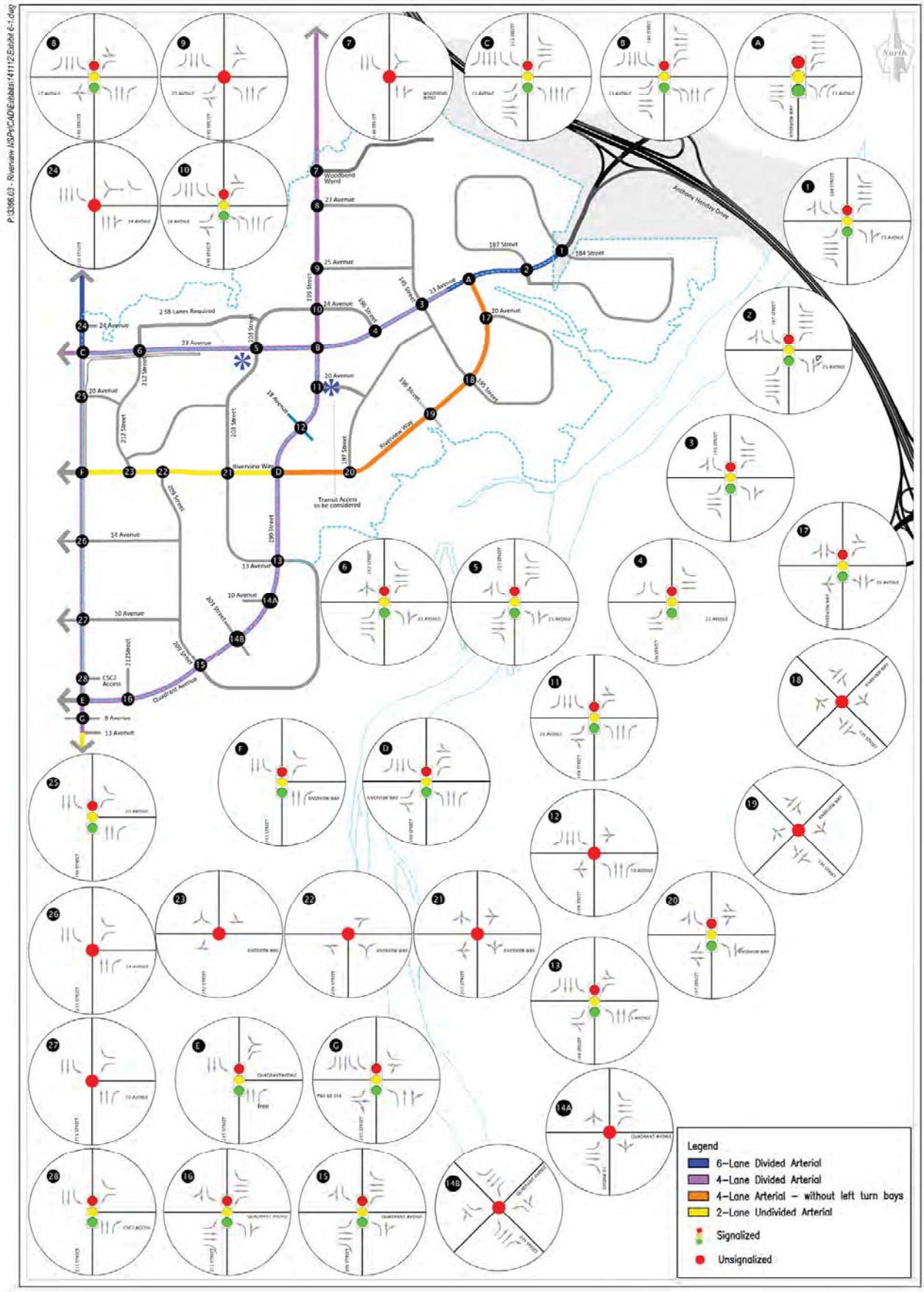

Exhibit 6-1

N.T.S.

Arterial/Arterial, Arterial/Collector, and Arterial/Access Recommended Intersection Geometry and Traffic Control

6.4.1 NBHD 1 Collector/Collector Intersections

The intersection assessments for NBHD 1 are summarized in **Table 6-5**. The majority of the intersections are anticipated to operate well as unsignalized intersections with one lane accommodating all movements on each approach.

The collector roadways around the town centre are anticipated to accommodate daily volumes greater than 10,000 vpd; therefore, a more detailed review of the potential collector/collector and collector/access intersections was completed.

TC1 Access

Access to TC1 is assumed to include the east approach of the 24 Avenue/203 Street intersection as well as at least one intersection along 24 Avenue between 199 Street and 203 Street.

- Based on available site plans, the 24 Avenue/203 Street intersection is proposed to be developed as a single lane roundabout. Based on the SIDRA Intersection 6.0 assessments, the intersection is anticipated to operate very well as a single lane roundabout in the AM and PM peak hours.
- The 24 Avenue/TC1 access is anticipated to operate well as an all-way stop controlled intersection with left turn bays on the east and north approaches and a right turn bay on the south approach. Alternatively, the 24 Avenue/TC1 Access could operate very well as a single lane roundabout.

TC2 Access

Access to TC2 is assumed to include the west leg of the 24 Avenue/196 Street intersection as well at least one additional all-directional access along 24 Avenue between 196 Street and 199 Street.

- The 24 Avenue/196 Street intersection is currently proposed to be developed as single lane roundabout. Based on the SIDRA Intersection 6.0 assessments, the intersection is anticipated to operate very well as a single lane roundabout.
- The 24 Avenue/TC2 access is anticipated to operate well as an all-way stop controlled intersection with left turn bays on all four approaches. Alternatively, the intersection could operate very well as a single lane roundabout in the AM and PM peak hours.

Based on the above a two-lane cross-section with left turn bays is recommended along 24 Avenue between 196 Street and 203 Street to provide access opportunities to TC2. If roundabouts are implemented at the TC1 and TC2 site accesses, a single lane would be appropriate along 24 Avenue.

Table 6-5: Neighbourhood 1 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
31	24 Avenue and TC1 Access	**AM Peak Hour - 2044 Total – Unsignalized (All-Way Stop)**														
		Geometry	LTR			L/TR			LT/R			L/TR			7.9	A
		Volume (vph)	2	41	2	123	7	109	1	1	70	96	2	5		
		v/c	0.07			0.19	0.14		0.00		0.09	0.16	0.01			
		Delay (s)	8.6			8.6	6.9		7.5		7.0	8.7	6.7			
		LOS	A			A	A		A		A	A	A			
		95th Queue (m)	15			18	15		3		14	17	8			
		PM Peak Hour - 2044 Total – Unsignalized (All-Way Stop)														
		Geometry	LTR			L/TR			LT/R			L/TR			17.3	C
		Volume (vph)	7	13	4	337	38	311	3	3	302	265	4	6		
		v/c	0.05			0.65	0.56		0.01		0.53	0.55	0.02			
		Delay (s)	10.9			20.8	14.9		9.2		15.1	18.3	8.5			
		LOS	B			C	B		A		C	C	A			
		95th Queue (m)	13			44	36		6		28	33	8			
31	24 Avenue and TC1 Access	**AM Peak Hour - 2044 Total – Roundabout**														
		Geometry	LTR			LTR			LTR			LTR			5.3	A
		Volume (vph)	2	41	2	123	7	109	1	1	70	96	2	5		
		v/c	0.05			0.16			0.07			0.10				
		Delay (s)	4.2			4.9			3.7			7.8				
		LOS	A			A			A			A				
		95th Queue (m)	2			6			2			3				
		PM Peak Hour - 2044 Total – Roundabout														
		Geometry	LTR			LTR			LTR			LTR			6.1	A
		Volume (vph)	7	13	4	337	38	311	3	3	302	265	4	6		
		v/c	0.04			0.46			0.35			0.33				
		Delay (s)	8.0			4.8			5.1			10.1				
		LOS	A			A			A			B				
		95th Queue (m)	1			27			16			14				
32	24 Avenue and TC2 Access	**AM Peak Hour - 2044 Total – Unsignalized (All-Way Stop)**														
		Geometry	L/TR			L/TR			L/TR			L/TR			7.6	A
		Volume (vph)	96	5	84	5*	9	77	55	5*	5*	73	5*	77		
		v/c	0.15	0.11		0.01	0.11		0.09	0.01		0.12	0.11			
		Delay (s)	8.5	6.9		7.6	7.1		8.2	6.9		8.4	7.0			
		LOS	A	A		A	A		A	A		A	A			
		95th Queue (m)	19	17		6	16		14	10		14	16			
		PM Peak Hour - 2044 Total – Unsignalized (All-Way Stop)														
		Geometry	L/TR			L/TR			L/TR			L/TR			14.5	B
		Volume (vph)	243	15	207	5*	15	205	219	5*	5*	206	5*	249		
		v/c	0.51	0.39		0.01	0.42		0.48	0.02		0.43	0.45			
		Delay (s)	17.0	12.3		9.9	13.4		16.7	9.0		15.0	13.3			
		LOS	C	B		A	B		C	A		B	B			
		95th Queue (m)	47	35		7	25		24	9		24	28			

Table 6-5: Neighbourhood 1 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
32	24 Avenue and TC2 Access	**AM Peak Hour - 2044 Total – Roundabout**														
		Geometry		LTR			LTR			LTR			LTR		5.5	A
		Volume (vph)	96	5	84	5*	9	77	55	5*	5*	73	5*	77		
		v/c		0.16			0.09			0.07			0.14			
		Delay (s)		5.7			3.7			7.6			5.5			
		LOS		A			A			A			A			
		95th Queue (m)		6			3			2			5			
		PM Peak Hour - 2044 Total – Roundabout														
		Geometry		LTR			LTR			LTR			LTR		7.5	A
		Volume (vph)	243	15	207	5*	15	205	219	5*	5*	206	5*	249		
		v/c		0.48			0.30			0.30			0.49			
		Delay (s)		7.0			6.2			10.6			6.9			
		LOS		A			A			B			A			
		95th Queue (m)		26			13			13			26			
34A	27 Avenue and 187 Street	**AM Peak Hour - 2044 Total - Unsignalized (EB Stop)**														
		Geometry		LR			-			LT			TR		7.8	A
		Volume (vph)	137	-	260		-		32	269	-	-	40	17		
		v/c Ratio		0.50			-			0.02	-	-	0.03			
		Delay (s)		14.1			-			1.0	-	-	0.0			
		LOS		B			-			A	-	-	A			
		95th Queue (m)		23			-			1	-	-	0			
		PM Peak Hour - 2044 Total - Unsignalized (EB Stop)														
		Geometry		LR			-			LT			TR		4.8	A
		Volume (vph)	39	-	59		-		217	52	-	-	242	130		
		v/c Ratio		0.22			-			0.19	-	-	0.22			
		Delay (s)		15.6			-			7.4	-	-	0.0			
		LOS		C			-			A	-	-	A			
		95th Queue (m)		7			-			6	-	-	0			
34B	27 Avenue and 195 Street	**AM Peak Hour - 2044 Total – Unsignalized (NB Stop)**														
		Geometry		TR			LT			LR			-		0.7	A
		Volume (vph)	-	249	71	11	82	-	10	-	8	-	-	-		
		v/c Ratio	-	0.19		0.01		-		0.03			-			
		Delay (s)	-	0.0		1.0		-		10.6			-			
		LOS	-	A		A		-		B			-			
		95th Queue (m)	-	0		0		-		1			-			
		PM Peak Hour - 2044 Total – Unsignalized (NB Stop)														
		Geometry		TR			LT			LR			-		1.8	A
		Volume (vph)	-	110	18	10	242	-	53	-	10	-	-	-		
		v/c Ratio	-	0.08		0.01		-		0.10			-			
		Delay (s)	-	0.0		0.4		-		11.1			-			
		LOS	-	A		A		-		B			-			
		95th Queue (m)	-	0		0				3			-			

Table 6-5: Neighbourhood 1 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
34C	25 Avenue and 195 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry	LR			-			LT			TR			2.5	A
		Volume (vph)	9	-	57	-			13	30	-	-	150	40		
		v/c	0.08			-			0.01		-	-	0.11			
		Delay (s)	9.8			-			2.4		-	-	0.0			
		LOS	A			-			A		-	-	A			
		95th Queue (m)	2			-			0		-	-	0			
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry	LR			-			LT			TR			3.2	A
		Volume (vph)	39	-	21	-			43	126	-	-	58	19		
		v/c	0.08			-			0.03		-	-	0.05			
		Delay (s)	10.3			-			2.1		-	-	0.0			
		LOS	B			-			A		-	-	A			
		95th Queue (m)	2			-			1		-	-	0			
33	24 Avenue and 196 Street	**AM Peak Hour - 2044 Total – Roundabout**														
		Geometry	LTR			LTR			LTR			LTR			4.8	A
		Volume (vph)	5*	4	48	49	7	9	69	77	8	5	73	5*		
		v/c	0.06			0.06			0.11			0.08				
		Delay (s)	3.9			6.8			4.9			3.8				
		LOS	A			A			A			A				
		95th Queue (m)	2			2			4			3				
		PM Peak Hour - 2044 Total – Roundabout														
		Geometry	LTR			LTR			LTR			LTR			4.6	A
		Volume (vph)	5*	16	187	15	15	15	178	205	39	15	206	5*		
		v/c	0.23			0.06			0.32			0.24				
		Delay (s)	4.6			6.3			4.9			4.6				
		LOS	A			A			A			A				
		95th Queue (m)	9			2			15			9				

Table 6-5: Neighbourhood 1 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
30	24 Avenue and 203 Street	**AM Peak Hour - 2044 Total – Roundabout**														
		Geometry	LTR			LTR			LTR			LTR			4.8	A
		Volume (vph)	42	5	114	93	2	5*	25	2	158	5*	5	8		
		v/c Ratio	0.15			0.09			0.15			0.02				
		Delay (s)	4.6			7.1			3.7			4.7				
		LOS	A			A			A			A				
		95th Queue (m)	6			3			6			1				
		PM Peak Hour - 2044 Total – Roundabout														
		Geometry	LTR			LTR			LTR			LTR			5.6	A
		Volume (vph)	17	12	51	389	10	5*	98	7	432	5*	6	41		
		v/c Ratio	0.10			0.36			0.40			0.07				
		Delay (s)	6.3			7.7			3.9			6.4				
		LOS	A			A			A			A				
		95th Queue (m)	4			17			22			3				
29	24 Avenue and 212 Street	**AM Peak Hour - 2044 Total - Unsignalized (NB Stop)**														
		Geometry	TR			LT			LR			-			6.6	A
		Volume (vph)	-	1	15	82	3	-	3	-	23	-				
		v/c Ratio	-	0.01		0.05		-	0.03			-				
		Delay (s)	-	0.0		7.2		-	8.8			-				
		LOS	-	A		A		-	A			-				
		95th Queue (m)	-	0		1		-	1			-				
		PM Peak Hour - 2044 Total - Unsignalized (NB Stop)														
		Geometry	TR			LT			LR			-			7.5	A
		Volume (vph)	-	6	4	48	7	-	12	-	81	-				
		v/c Ratio	-	0.01		0.03		-	0.09			-				
		Delay (s)	-	0.0		6.4		-	9.0			-				
		LOS	-	A		A		-	A			-				
		95th Queue (m)	-	0		1		-	3			-				

*Movement was projected to accommodate 0 vph; a nominal 5 vph was assumed in the assessment.

6.4.2 NBHD 2 Collector/Collector Intersections

The intersection assessments for the NBHD 2 are summarized in **Table 6-6**. All of the intersections are anticipated to operate well as unsignalized intersections with one lane accommodating all movements on each approach.

6.4.3 NBHD 3 Collector/Collector Intersections

As shown in **Table 6-7**, the NBHD 3 collector/collector intersections are anticipated to operate at acceptable levels of service as unsignalized intersections within one lane accommodating all movements on each approach.

The recommended collector roadway geometry and traffic control within Riverview NBHDs 1, 2, and 3 are illustrated on **Exhibit 6-2**.

6.5 Complete Streets

The City of Edmonton recently developed guidelines for the implementation of complete streets in Edmonton. The Complete Streets Guidelines (May 2013) provide design guidance for the implementation of cross-sections for all modes (pedestrians, bicycles, transit, vehicles) for new and rehabilitated transportation projects. The guidelines are intended to allow for flexibility in the planning and design of roadways based on the site context and the prioritization of modes.

Although typical City of Edmonton roadways standards can still be utilized, there is the potential for a greater mix of cross-sections throughout Riverview NBHDs 1, 2, and 3. Where a standard City of Edmonton collector cross-section was identified (e.g. 11.5 metre collector), a minimum of two travel lanes should be provided. Additional roadway elements such as on-street parking, active modes elements (e.g. sidewalks, bike facilities), and boulevard treatments should be designed to reflect the adjacent land uses, the overall active modes network, and vehicle access requirements (e.g. transit or truck traffic).

At this time alternate cross-sections have not be developed for specific roadways within the plan; however, it is anticipated that Riverview Way and the roadways within and surrounding the town centre will implement alternate cross-sections that reflect the Complete Streets guidelines.

As well, there are a number of active modes connections identified along local and collector roadway segments in Section 3.4 that require the development of bicycle facilities to ensure the continuity of the overall active modes network. These roadway segments will be developed using the Complete Streets guidelines, in consultation with Sustainable Transportation.

Table 6-6: Neighbourhood 2 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
38	TC3 Access and 203 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry		LTR			LTR			LTR			LTR		4.7	A
		Volume (vph)	5*	5*	5*	11	5*	78	5*	181	18	116	41	5*		
		v/c		0.03			0.13			0.00			0.09			
		Delay (s)		12.8			10.9			0.2			5.9			
		LOS		B			B			A			A			
		95th Queue (m)		1			4			0			2			
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry		LTR			LTR			LTR			LTR		9.6	A
		Volume (vph)	5*	5*	5*	39	5*	301	5*	105	36	286	182	5*		
		v/c		0.09			0.56			0.00			0.20			
		Delay (s)		29.5			17.9			0.3			5.7			
		LOS		D			C			A			A			
		95th Queue (m)		2			28			0			6			
39	18 Avenue and 203 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry		LR			-			LT			TR		7.1	A
		Volume (vph)	176	-	6		-		5	23	-	-	13	39		
		v/c		0.20			-			0.00	-	-	0.03			
		Delay (s)		10.0			-			1.3	-	-	0.0			
		LOS		B			-			A	-	-	A			
		95th Queue (m)		6			-			0	-	-	0			
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry		LR			-			LT			TR		2.9	A
		Volume (vph)	89	-	9		-		10	53	-	-	51	171		
		v/c		0.13			-			0.01	-	-	0.13			
		Delay (s)		10.5			-			1.3	-	-	0.0			
		LOS		B			-			A	-	-	A			
		95th Queue (m)		4			-			0	-	-	0			
35	CSC1 Access and 212 Street	**AM Peak Hour - 2044 Total - Unsignalized (EB Stop)**														
		Geometry		LR			-			LT			TR		2.5	A
		Volume (vph)	59	-	12		-		19	156	-	-	29	87		
		v/c Ratio		0.10			-			0.01	-	-	0.07			
		Delay (s)		10.6			-			0.9	-	-	0.0			
		LOS		B			-			A	-	-	A			
		95th Queue (m)		3			-			0	-	-	0			
		PM Peak Hour - 2044 Total - Unsignalized (EB Stop)														
		Geometry		LR			-			LT			TR		5.0	A
		Volume (vph)	185	-	34		-		32	69	-	-	131	177		
		v/c Ratio		0.39			-			0.03	-	-	0.18			
		Delay (s)		15.3			-			1.5	-	-	0.0			
		LOS		C			-			A	-	-	A			
		95th Queue (m)		15			-			1	-	-	0			

Table 6-6: Neighbourhood 2 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
36	20 Avenue and 212 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	LTR			LTR			LTR			LTR			7.0	A
		Volume (vph)	94	4	29	4	24	22	32	59	3	4	21	16		
		v/c Ratio	0.18			0.06			0.02			0.00				
		Delay (s)	11.0			9.9			2.6			0.7				
		LOS	B			A			A			A				
		95th Queue (m)	5			2			1			0				
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	LTR			LTR			LTR			LTR			5.4	A
		Volume (vph)	41	20	62	6	9	10	61	50	6	18	70	78		
		v/c Ratio	0.18			0.04			0.04			0.01				
		Delay (s)	11.5			11.1			4.2			0.9				
		LOS	B			B			A			A				
		95th Queue (m)	5			1			1			0				
37	18 Avenue and 212 Street	**AM Peak Hour - 2044 Total – Unsignalized (E/W Stop)**														
		Geometry	LTR			LTR			LTR			LTR			6.7	A
		Volume (vph)	41	1	46	106	1	6	11	46	22	6	39	9		
		v/c	0.10			0.16			0.01			0.00				
		Delay (s)	9.6			11.1			1.1			0.9				
		LOS	A			B			A			A				
		95th Queue (m)	3			5			0			0				
		PM Peak Hour - 2044 Total – Unsignalized (E/W Stop)														
		Geometry	LTR			LTR			LTR			LTR			3.6	A
		Volume (vph)	19	2	21	42	2	14	44	84	92	14	86	37		
		v/c	0.06			0.10			0.03			0.01				
		Delay (s)	10.8			12.0			1.7			0.9				
		LOS	B			B			A			A				
		95th Queue (m)	2			3			1			0				
40	14 Avenue and 209 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry	LR			-			LT			TR			8.5	A
		Volume (vph)	269	-	2	-			1	5	-	-	3	54		
		v/c	0.29			-			0.00		-	-	0.03			
		Delay (s)	10.4			-			1.2		-	-	0.0			
		LOS	B			-			A		-	-	A			
		95th Queue (m)	10			-			0		-	-	0			
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry	LR			-			LT			TR			3.2	A
		Volume (vph)	111	-	3	-			3	8	-	-	9	240		
		v/c	0.14			-			0.00		-	-	0.15			
		Delay (s)	10.2			-			2.1		-	-	0.0			
		LOS	B			-			A		-	-	A			
		95th Queue (m)	4			-			0		-	-	0			

Table 6-6: Neighbourhood 2 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
41	10 Avenue and 209 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry	LR			-			LT			TR			7.7	A
		Volume (vph)	1	-	80	-			15	5	-	-	5	1		
		v/c	0.08			-			0.01		-	-	0.00			
		Delay (s)	8.8			-			5.5		-	-	0.0			
		LOS	A			-			A		-	-	A			
		95th Queue (m)	2			-			0		-	-	0			
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry	LR			-			LT			TR			6.4	A
		Volume (vph)	2	-	27	-			66	9	-	-	10	2		
		v/c	0.03			-			0.04		-	-	0.01			
		Delay (s)	8.7			-			6.5		-	-	0.0			
		LOS	A			-			A		-	-	A			
		95th Queue (m)	1			-			1		-	-	0			
42	CSC2 Access and 212 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry	LR			-			LT			TR			7.0	A
		Volume (vph)	5	-	83	-	-	-	94	11	-	-	15	5		
		v/c	0.09			-			0.06			0.01				
		Delay (s)	9.0			-			6.7			0.0				
		LOS	A			-			A			A				
		95th Queue (m)	2			-			2			0				
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry	LR			-			LT			TR			7.4	A
		Volume (vph)	9	-	180	-	-	-	164	30	-	-	29	8		
		v/c	0.20			-			0.11			0.02				
		Delay (s)	9.7			-			6.6			0.0				
		LOS	A			-			A			A				
		95th Queue (m)	6			-			3			0				

*Movement was projected to accommodate 0 vph; a nominal 5 vph was assumed in the assessment.

Table 6-7: Neighbourhood 3 Collector/Collector Intersection Summaries

Intersection Number	Intersection	Approach	Eastbound			Westbound			Northbound			Southbound			Overall	
		Movement	L	T	R	L	T	R	L	T	R	L	T	R	Delay	LOS
43	20 Avenue and 195 Street	**AM Peak Hour - 2044 Total - Unsignalized (E/W Stop)**														
		Geometry	LTR			LTR			LTR			LTR			8.1	A
		Volume (vph)	99	5*	3	5*	5*	122	4	27	5*	21	16	25		
		v/c Ratio	0.18			0.14			0.00			0.01				
		Delay (s)	12.3			9.3			0.8			2.6				
		LOS	B			A			A			A				
		95th Queue (m)	5			4			0			0				
		PM Peak Hour - 2044 Total - Unsignalized (E/W Stop)														
		Geometry	LTR			LTR			LTR			LTR			5.4	A
		Volume (vph)	51	5*	9	5*	5*	36	8	42	5*	101	48	88		
		v/c Ratio	0.12			0.06			0.01			0.07				
		Delay (s)	12.8			9.7			1.1			3.5				
		LOS	B			A			A			A				
		95th Queue (m)	3			1			0			2				
44	20 Avenue and 197 Street	**AM Peak Hour - 2044 Total – Unsignalized (EB Stop)**														
		Geometry	LR			-			LT			TR			7.2	A
		Volume (vph)	99	-	23	-	-	-	44	8	-	-	18	25		
		v/c Ratio	0.15			-			0.03			0.03				
		Delay (s)	10.0			-			6.3			0.0				
		LOS	B			-			A			A				
		95th Queue (m)	4			-			1			0				
		PM Peak Hour - 2044 Total – Unsignalized (EB Stop)														
		Geometry	LR			-			LT			TR			5.3	A
		Volume (vph)	56	-	68	-	-	-	50	23	-	-	14	94		
		v/c Ratio	0.15			-			0.03			0.06				
		Delay (s)	10.0			-			5.3			0.0				
		LOS	B			-			A			A				
		95th Queue (m)	4			-			1			0				

*Movement was projected to accommodate 0 vph; a nominal 5 vph was assumed in the assessment.

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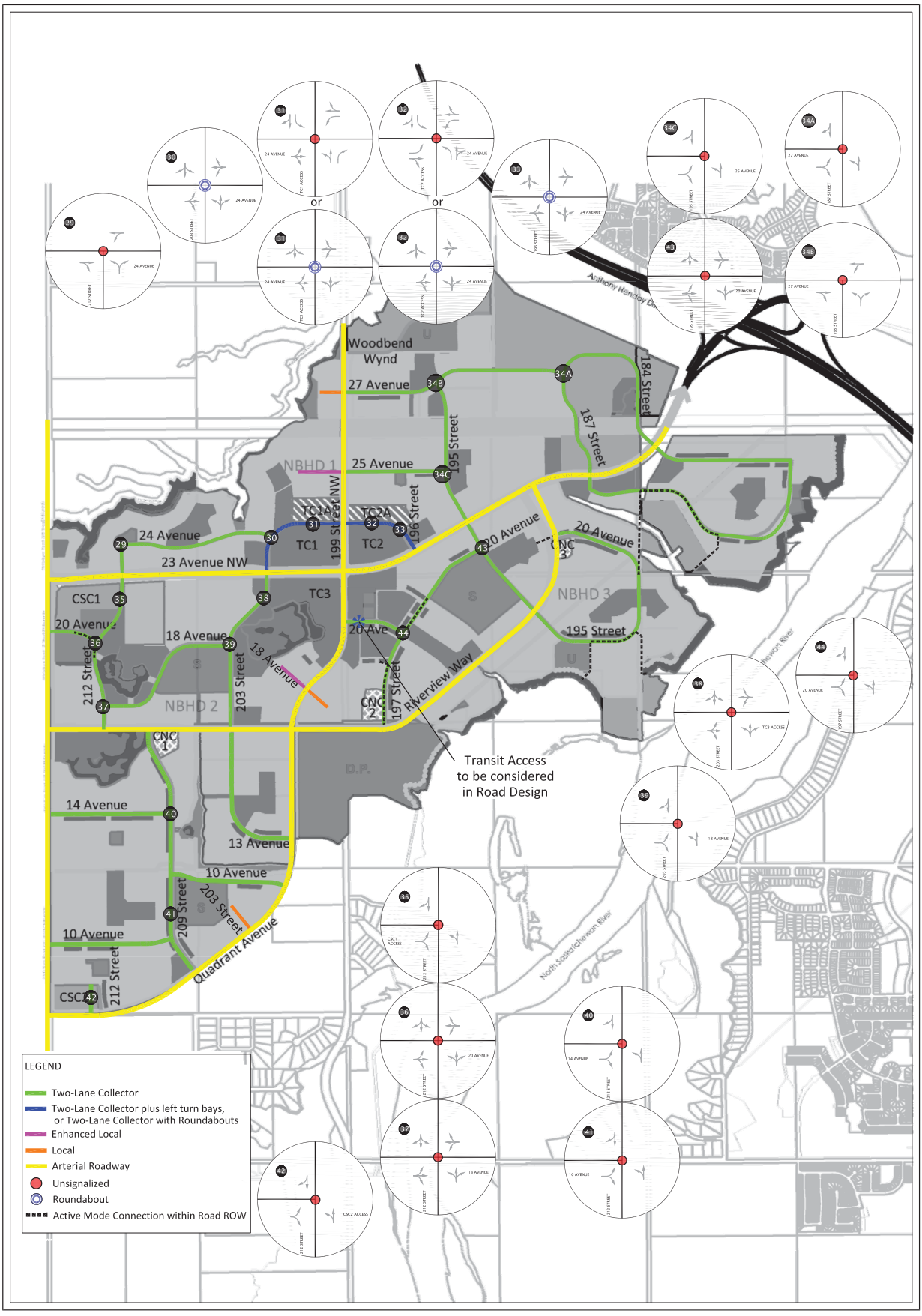

Exhibit 6-2

N.T.S.

Riverview NBHDs 1, 2, and 3 Recommended Collector Roadway Geometry and Traffic Control

6.6 Transit

Transit routing within Riverview NBHDs 1, 2, and 3 can be accommodated on all arterial and collector roadways. Based on the proposed roadway networks, transit access will be provided within 400 metres of the majority of new residential units.

It is noted that roadway upgrades are not proposed within the existing country residential subdivisions; therefore, opportunities to expand transit service into these area are limited. However, it is noted that the provision of transit along the new collector roadways will bring transit closer to the existing country residential land uses than currently provided.

6.7 District Park and School Sites

Vehicle access to the district park site is anticipated to be provided as the south approach of the Riverview Way/197 Street intersection and via 13 Avenue east of 199 Street. Access spacing along 199 Street is sufficient to accommodate a direct site access between 13 Avenue and Riverview Way; however, the vehicle access should coincide with the midblock pedestrian crossing.

The school sites have been located adjacent to collector roadways to facilitate vehicle, transit, school bus, and active modes access. It is recommended that pick up/drop off access and school bus activity be incorporated on-site to minimize congestion along the collector roadway network. As well, school site accesses should be aligned with opposing local road intersections and meet minimum collector roadway intersection spacing guidelines.

It is also suggested that the development of residential land uses with front drive access across from the school sites be limited to reduce the impact on adjacent residents.

The development of access to the school sites should consider best practices for school design. Available information regarding transportation facilities for schools can be found in such documents as the Institute of Transportation Engineer's *School Site Planning, Design, and Transportation* and the *Survey of Practice for Signing and Markings Near Schools*.

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7. TRANSPORTATION NETWORK STAGING

7.1 Short Term Development

The short term horizon selected for review generally reflects the development potential in Riverview prior to the extension of the South Edmonton Sanitary Sewer line across the North Saskatchewan River from Windermere. Based on preliminary engineering completed for Riverview NBHDs 1, 2, and 3, it is anticipated that approximately 2,900 dwelling units could be developed using an interim servicing strategy. Based on a development rate of 500 units/year, this reflects a short term development horizon of 2021 assuming a 2015 start date.

7.1.1 Short Term Assumed Roadway Network

The following arterial roadways are assumed to be developed by 2021 in conjunction with residential development in Riverview:

- 23 Avenue is assumed to be upgraded to a two-lane urban arterial from the Anthony Henday Drive/Cameron Heights interchange to the first collector (203 Street) west of 199 Street;
- 199 Street is assumed to be upgraded to a two-lane urban arterial from Wedgewood Creek to 18 Avenue; and,
- Riverview Way is assumed to be constructed as a two-lane urban arterial between 23 Avenue and 20 Avenue.

7.1.2 Short Term Background Traffic Volumes

Background volumes used in the assessment are based on a 2014 City of Edmonton intersection turning movement count at the 23 Avenue/199 Street intersection and AT's 2013 projections at the Anthony Henday Drive/Cameron Heights interchange. The Anthony Henday Drive/Cameron Heights interchange was under construction during AT's most recent count, and the extension of 23 Avenue into the Riverview ASP area did not exist. Therefore, traffic volumes measured on the east approach of the 23 Avenue/199 Street intersection were carried to the interchange and assigned to Anthony Henday Drive based on the existing distribution of traffic associated with the Cameron Heights neighbourhood.

For the purposes of this assessment, daily traffic volumes were estimated by multiply the sum of the AM peak hour and PM peak hour traffic volumes by six. However, daily volumes to/from the Cameron Heights neighbourhood at the Anthony Henday Drive/Cameron Heights interchange were based on AT's 2013 AADT estimates.

To account for growth in Parkland County and the surrounding areas, traffic volumes at the 23 Avenue/199 Street intersection and the Anthony Henday Drive/Cameron Heights interchange were increased at a rate of 2% per year.

7.1.3 Short Term Land Use Assumptions

Development within Riverview could progress in a number of different locations within NBHDs 1, 2, and 3 over the next five years. For the purposes of this assessment, the development has been assumed to be located centrally within the plan area, generally within the four quadrants of the 23 Avenue/199 Street intersection as illustrated in **Exhibit 7-1**. Only low density residential land uses were assumed within the short term. The shaded area on Exhibit 7-1 generally corresponds to the potential land area that could encompass 2,900 low density residential dwelling units. Although medium density and commercial sites may be created through subdivisions within these areas, they are not anticipated to be developed within the short term horizon.

The areas shown on Exhibit 7-1 were identified for analysis purposes only and do not reflect specific development stages. Other parcels within Riverview NBHDs 1, 2, and 3 may be developed in the short term; although, additional or different arterial roadway connections may be required.

7.1.4 Short Term Trip Generation

The City of Edmonton's low density residential rate was used for the short term analysis; however, no mode split adjustment was assumed. **Table 7-1** summarizes the short term trip generation.

Table 7-1: Short Term Trip Generation

Land Use/ Intensity	AM Peak Hour		PM Peak Hour		Daily	
	In	Out	In	Out	In	Out
Low Density Residential/ 2,900 du	380	1,621	1,535	756	11,484	11,484
Total Two-Way	**2,001**		**2,291**		**22,968**	

7.1.5 Trip Distribution and Assignment

The City of Edmonton's 2019 origin-destination car driver trip tables were used for external residential trips within the assessment. Trips were assigned to the roadway network based on the assumed development patterns and collector roadway connections.

7.1.6 Short Term Roadway Assessment

The assessment of the short term roadway network includes the review of daily volumes on the key roadway segments impacted by the first stage development traffic, as well as a review of potential intersection operations at the 23 Avenue/199 Street intersection and Anthony Henday Drive/Cameron Heights interchange.

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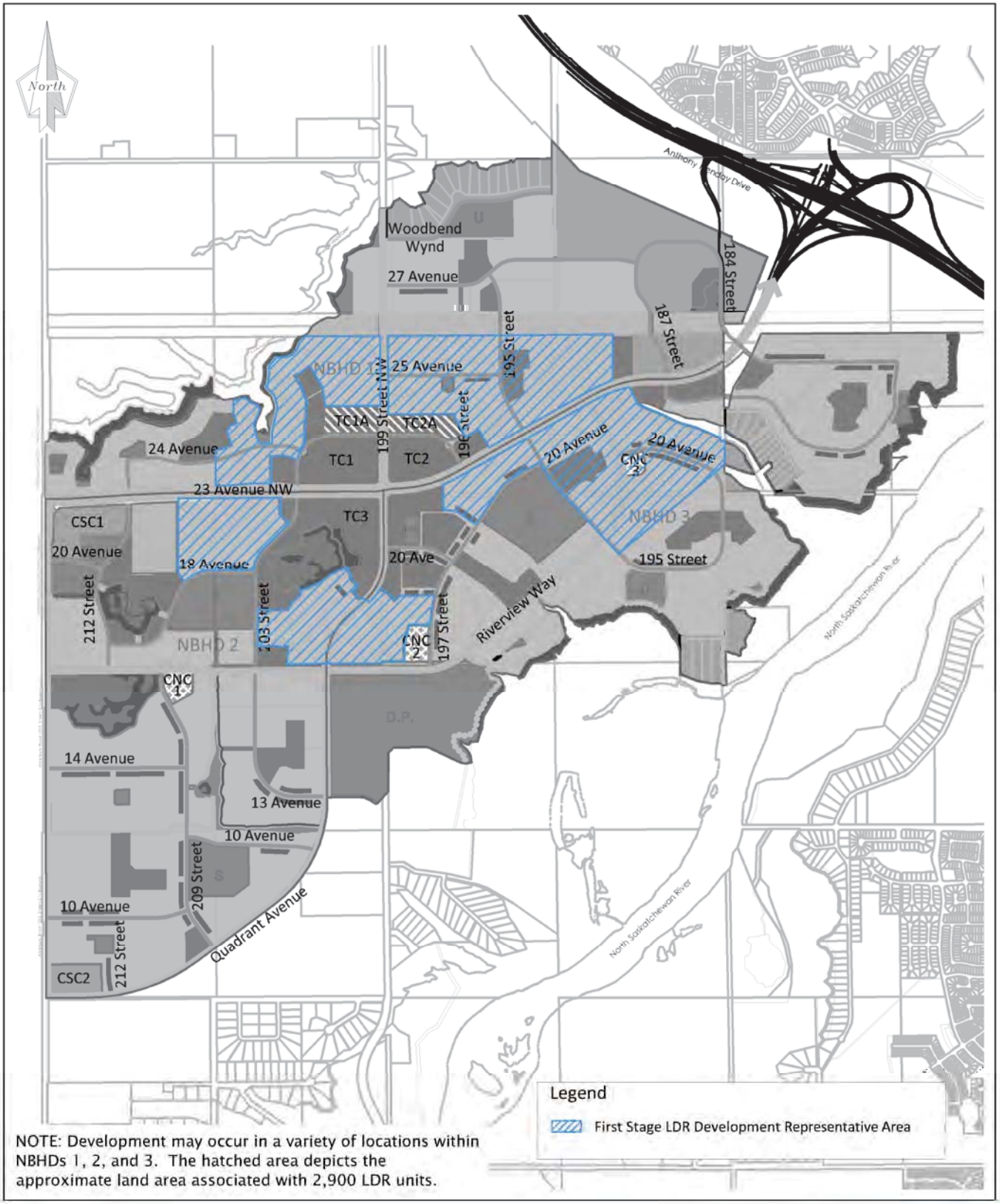


Exhibit 7-1

N.T.S.

Riverview NBHDs 1, 2 and 3
Assumed Short Term Development Area

Total Short Term Volumes

The site generated volumes were added to the background volumes to determine the total volumes for use in the assessment. The total daily volumes are summarized in **Table 7-2**.

Table 7-2: Short Term Daily Traffic Volumes

Roadway Link	From	To	Stage 1 Site Volumes	Background Volumes	Stage 1 Total Daily Volumes
23 Avenue	215 Street	203 Street	720 vpd	7,520 vpd	8,240 vpd
23 Avenue	203 Street	199 Street	4,750 vpd	7,520 vpd	12,270 vpd
23 Avenue	199 Street	Riverview Way	9,250 vpd	4,300 vpd	10,550 vpd
23 Avenue	Riverview Way	Anthony Henday Drive	13,160 vpd	4,300 vpd	17,460 vpd
199 Street	20 Avenue	23 Avenue	3,560 vpd	910 vpd	4,470 vpd
199 Street	23 Avenue	25 Avenue	5,590 vpd	4,100 vpd	9,690 vpd
199 Street	25 Avenue	Wedgewood Creek	9,080 vpd	4,100 vpd	13,180 vpd

The AM and PM peak hour volumes used in the assessment of the 23 Avenue/199 Street intersection are illustrated in **Figure 7-1**, while the peak hour volumes used in the assessment of the Anthony Henday Drive/Cameron Heights interchange are illustrated in **Figure 7-2**.

Figure 7-1: 23 Avenue/199 Street Total Short Term Volumes – AM (PM) Peak Hours

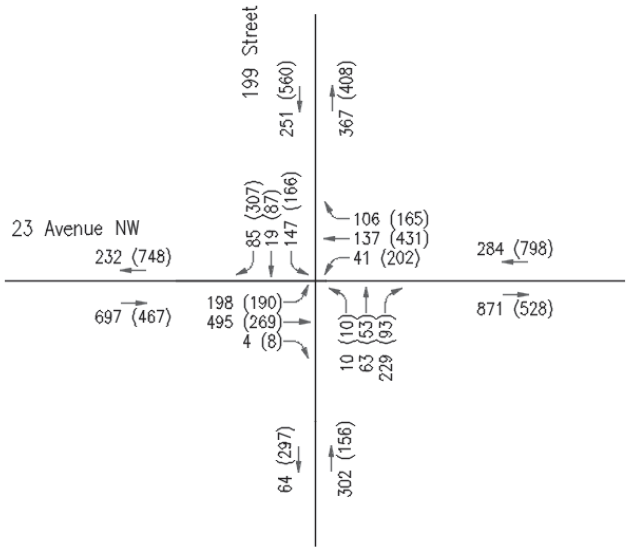
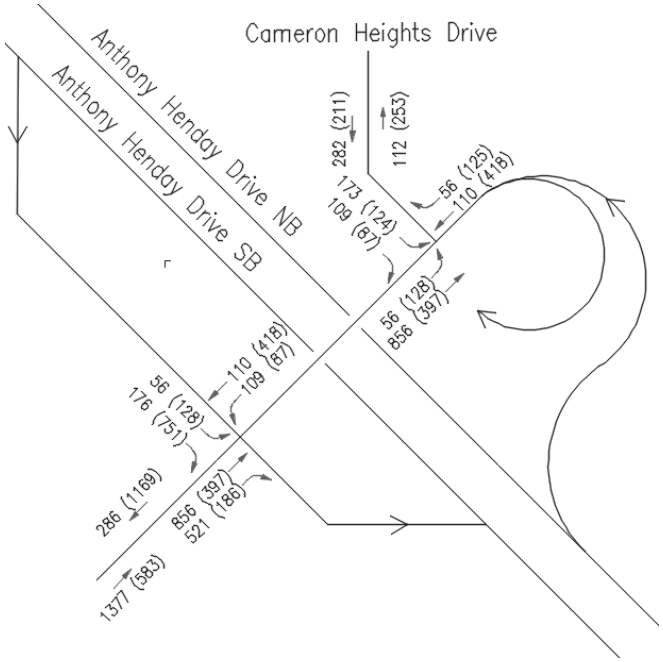


Figure 7-2: Anthony Henday Drive/Cameron Heights Interchange Total Short Term Volumes – AM (PM) Peak Hours



7.1.7 Short Term Arterial Roadway Assessment

Arterial Roadway Requirements

As shown in Table 7-2, 23 Avenue is anticipated to accommodate approximately 17,460 vpd between Anthony Henday Drive and Riverview Way, which exceeds the typical upper threshold for a two-lane arterial. Therefore, it is anticipated that 23 Avenue would require upgrading to a four-lane divided arterial between Anthony Henday Drive and Riverview Way within the 2021 horizon based on the assumed short term development intensity.

23 Avenue west of Riverview Way is anticipated to accommodate in the order of 8,240 vpd to 12,270 vpd within the 2021 horizon, which are within the upper thresholds for a two-lane divided arterial. It is anticipated that left turn bays will be developed at arterial/arterial and arterial/collector intersections as part of the construction of the first two urban arterial lanes; therefore, no additional widening is anticipated to be required along 23 Avenue within the 2021 horizon.

Daily volumes along 199 Street between 20 Avenue and 25 Avenue are in the range of 4,470 vpd to 9,690 vpd, which can be accommodated within a two-lane urban arterial. North of 25 Avenue, daily volumes are anticipated to approach 13,180 vpd. It is anticipated that these daily volumes can be accommodated along the first two urban arterial lanes, with the development of left turn bays at the arterial/collector intersections. However, upgrading to the ultimate four-lane divided cross-section is anticipated to be required shortly after 2021 if the pace of development assumed in this assessment is maintained.

23 Avenue/199 Street Intersection Assessment

The assessment assumes that the 23 Avenue/199 Street intersection would be signalized in the 2021 horizon. **Table 7-3** summarizes the results of the analysis assuming 23 Avenue is constructed as a two-lane undivided arterial with left turn bays on each approach.

Table 7-3: 23 Avenue and 199 Street

	Eastbound			Westbound			Northbound			Southbound		
Movement	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
AM Peak Hour – Pre-timed (90s cycle)												
Geometry	L/TR			L/TR			L/TR			L/TR		
Volume (vph)	198	495	4	41	137	106	10	63	229	147	19	85
v/c	0.38	0.56		0.13	0.29		0.02	0.40		0.43	0.16	
Delay (s)	17.4	19.5		14.4	11.5		18.2	7.0		26.1	6.8	
LOS	B	B		B	B		B	A		C	A	
95th Queue (m)	39	92		12	48		5	26		38	13	
Intersection Delay						**15.2**	**Intersection LOS**					**B**
PM Peak Hour – Pre-timed (90s cycle)												
Geometry	L/TR			L/TR			L/TR			L/TR		
Volume (vph)	190	269	8	202	431	165	10	53	93	166	87	307
v/c	0.57	0.27		0.34	0.60		0.06	0.27		0.47	0.65	
Delay (s)	21.0	10.9		6.0	7.4		24.3	11.5		31.3	19.0	
LOS	C	B		A	A		C	B		C	B	
95th Queue (m)	45	38		m13	54		5	21		45	63	
Intersection Delay						**13.8**	**Intersection LOS**					**B**

As shown in Table 7-3, the 23 Avenue/199 Street intersection could operate at acceptable levels of service in the 2021 horizon based on the assumed development scenario, intersection geometry and traffic, control.

Anthony Henday Drive/Cameron Heights Interchange

The assessment assumes that the existing geometry and traffic control at the Anthony Henday Drive/Cameron Heights interchange remains in the 2021 horizon. **Table 7-4** summarizes the capacity analyses at the north ramp intersection, while **Table 7-5** summarizes the results of the capacity analyses at the south ramp intersection.

Table 7-4: Anthony Henday Drive and Cameron Heights Interchange North Ramp Intersection

	Eastbound		Northbound		Southbound	
Movement	**L**	**R**	**L**	**T**	**T**	**R**
AM Peak Hour – Pre-timed (90s cycle)						
Geometry	L/R		L/T/T		T/T/R	
Volume (vph)	173	109	56	856	110	56
v/c	0.28	0.18	0.09	0.45	0.06	0.06
Delay (s)	23.2	5.2	3.6	5.0	11.0	3.4
LOS	C	A	A	A	B	A
95th Queue (m)	39	11	m2	25	9	6
Intersection Delay			**7.7**	**Intersection LOS**		**A**
PM Peak Hour – Pre-timed (90s cycle)						
Geometry	L/R		L/T/T		T/T/R	
Volume (vph)	124	87	128	397	418	125
v/c	0.20	0.15	0.26	0.21	0.22	0.13
Delay (s)	22.2	5.6	7.8	6.6	12.2	2.5
LOS	C	A	A	A	B	A
95th Queue (m)	29	10	m10	13	28	8
Intersection Delay			**9.6**	**Intersection LOS**		**A**

Table 7-5: Anthony Henday Drive and Cameron Heights Interchange South Ramp Intersection

	Eastbound			Northbound		Southbound	
Movement	**L**	**T**	**R**	**T**	**R**	**L**	**T**
AM Peak Hour – Pre-timed (90s cycle)							
Geometry	L/LT/R			T/R		L/T/T	
Volume (vph)	56	10*	176	856	521	109	110
v/c	0.08		0.32	0.74	0.51	0.47	0.05
Delay (s)	28.1		6.5	11.5	8.4	16.6	5.7
LOS	C		A	B	A	B	A
95th Queue (m)	12		16	m87	m46	19	4
Intersection Delay			**10.7**	**Intersection LOS**			**B**
PM Peak Hour – Pre-timed (90s cycle)							
Geometry	L/LT/R			T/R		L/T/T	
Volume (vph)	128	10*	751	397	186	87	418
v/c	0.07		0.74	0.61	0.34	0.38	0.32
Delay (s)	11.8		17.5	21.3	16.3	18.9	13.8
LOS	B		B	C	B	B	B
95th Queue (m)	13		122	82	31	11	19
Intersection Delay			**17.0**	**Intersection LOS**			**B**

*Movement was projected to accommodate 0 vph; a nominal 10 vph was assumed in the assessment.

As shown in Tables 7-4 and 7-5, the Anthony Henday Drive/Cameron Heights interchange is anticipated to operate at acceptable levels of service based on existing geometry and traffic control. No improvements to the interchange are projected within the 2021 horizon.

7.2 Staging of the Anthony Henday Drive and Cameron Heights Interchange Upgrades

The assessments completed for the Anthony Henday Drive/Cameron Heights interchange identified capacity constraints at the interchange upon full build out of the Riverview ASP area. Based on the assessments, it was recommended that an updated functional planning study be undertaken to confirm the ultimate design for the interchange; however, in the medium term the interchange as currently constructed can accommodate development in Riverview.

As shown in the short term staging assessment, the existing interchange can accommodate the initial 2,900 dwelling units at acceptable levels of service. Based on the assessments completed for the build out of the Riverview ASP area, the South Ramp intersection, the northbound on-ramp, the southbound on-ramp, and the southbound off-ramp are anticipated to require upgrades in order accommodate the projected 2047 total traffic volumes.

Based on a review of the capacity constraints noted above, and the review of the external traffic anticipated to be generated by development within Riverview NBHDs 1, 2, and 3, it is estimated that 70% of the residential lands, 45% of the total assumed build out commercial GFA, and 64% of the business employment lands within Riverview NBHDs 1, 2, and 3 could be developed prior to improvements being required at the Anthony Henday Drive/Cameron Heights interchange. In conjunction with this level of development, it is assumed that the district park/high school site and three elementary/junior high schools could also be developed.

The above noted limits represent a high level estimate of potential future traffic activity at the Anthony Henday Drive/Cameron Heights interchange based on the trip distribution and assignment assumptions used in the preparation of the build out scenario. It is noted that while capacity constraints may be noted at the Anthony Henday Drive/Cameron Heights interchange at this level of development, spare capacity is anticipated to be available on 199 Street and 215 Street.

As there are an infinite number of potential development scenarios that could occur in Riverview over the next 15 to 20 years, the medium term development scenario identified above is intended to provide a high level staging review, and is not intended to be used to set development thresholds on the neighbourhood. Traffic volumes and development activity within Riverview should be reviewed on an approximate five year basis to help identify timing for interchange improvements.

8. STUDY SYNOPSIS

This report provides an update to the Riverview ASP TIA based on the most current low density trip generation rates and the latest Riverview ASP land use development concept. The report also provides additional neighbourhood level information for Riverview NBHDs 1, 2, and 3.

8.1 Development Concept

The development of the ASP and NSP transportation networks was based on the following land use assumptions:

- The Riverview ASP area is focused around town centre and transit supportive land uses on the four corners of the 23 Avenue/199 Street intersection.
- Three CSC sites have been identified along 215 Street: on the southeast corner of the 23 Avenue/215 Street intersection, on the northeast corner of the Quadrant Avenue/215 Street intersection, and on the southeast corner of the Quadrant Avenue/215 Street intersection.
- Five CNC sites have been scattered throughout Riverview to provide convenience commercial land uses in close proximity to residential land uses.
- Business employment land uses located north of 23 Avenue and west of the TUC are proposed to include a mix of highway commercial and office land uses.
- Low density residential, row housing, low-rise apartments, and mixed use residential units are proposed within the plan area. A total of 20,781 dwelling units accommodating a population of 52,889 people are assumed to be developed in Riverview.
- Recreational land uses, schools, and park sites have been identified within the plan area to complement the residential, business employment, and commercial land uses resulting in a complete community.

8.2 Proposed Arterial Roadway Network

The proposed arterial roadway network is consistent with the network identified in the original Riverview ASP with the exception of Riverview Way, which was re-aligned along a straight east-west alignment to allow for the sustained retention of a natural/wetland area.

The proposed collector roadway network within Riverview NBHDs 1, 2, and 3 has also been refined to reflect the most current information regarding retained natural areas within the plan area and to create opportunities for a modified grid of local roadways within the residential areas. Transit connectivity within Riverview NBHDs 1, 2, and 3 and future connections to NBHD 4 were considered as the collector network was revised.

8.3 Active Modes Network

In addition to the standard road based transportation network within Riverview, which includes shared-use paths and sidewalks along arterial roads, sidewalks along collector and local roads, and on-street bicycle access on collector and local roadways, additional facilities are proposed to promote the use of active modes to travel within and through the neighbourhoods. The proposed network includes commuter and recreational routes providing connections to destinations within and external to the plan area.

8.4 Traffic Generation

The study area is projected to generate a total of 18,448 two-way gross AM peak hour trips, 26,647 two-way gross PM peak hour trips, and 293,504 two-way daily trips. Based on the pass-by trip assumptions for commercial land uses, an assumed 5% mode split to transit and active modes for residential and business employment land uses, and internal trip assumptions, the plan area is anticipated to generate in the order of 12,528 external two-way vehicle trips in the AM peak hour, 14,110 external two-way vehicle trips in the PM peak hour, and 148,824 external two-way vehicle trips on a typical weekday.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The updates to the low density residential trip rates and the overall land use concept information for Riverview resulted in total trip generation estimates that are 13% to 22% lower than the trip generation estimates included in the Riverview ASP TIA. As a result, there are fewer potential congestion points along the network.

The updated land use concept for Riverview NBHDs 1, 2, and 3 also allowed for a more detailed review of the potential active modes network within the neighbourhoods. The combination of utility rights-of-way, natural areas, top-of-bank locations, stormwater management facilities, and the overall roadway network provides the opportunity to develop multiple facilities for short and longer distance trips to be made via active modes.

Overall, it is anticipated that the proposed transportation network provides an appropriate level of access to and within Riverview, consistent with the goals and objectives outlined in the Transportation Master Plan: The Way We Move.

9.2 Recommendations

Table 9-1 summarizes the recommended arterial roadway cross-sections within the plan area based on the traffic assessment completed.

Table 9-1: Recommended Arterial Roadway Network Cross-Sections

Arterial Roadway	From	To	Proposed Cross-Section
23 Avenue	Anthony Henday Drive	Riverview Way	6-Ln Divided Arterial
23 Avenue	Riverview Way	215 Street	4-Ln Divided Arterial
199 Street/Quadrant Avenue	Wedgewood Creek	215 Street	4-Ln Divided Arterial
215 Street	Wedgewood Creek	20 Avenue	6-Ln Divided Arterial
215 Street	20 Avenue	13 Avenue SW	4-Ln Divided Arterial
215 Street	13 Avenue SW	South City Limits	2-Ln Undivided Arterial
Riverview Way	23 Avenue	199 Street	4-Ln Arterial without left turn bays
Riverview Way	199 Street	215 Street	2-Ln Undivided Arterial

In addition to the recommended arterial cross-sections noted in Table 9-1, the following recommendations are advanced as a result of the intersection assessments completed for Riverview NBHDs 1, 2, and 3.

- An updated functional planning study should be completed for the Anthony Henday Drive/Cameron Heights interchange based on the 2047 total traffic volumes identified in this TIA;
- In consideration of the overall network implications, it is recommended that 23 Avenue and Riverview Way be developed as an all-directional T-intersection;
- Although the intersection analyses identified that single left turn bays would be appropriate on the north, south, west approaches of the 23 Avenue/199 Street intersection, it is recommended that sufficient right-of-way be protected to allow for the construction of two left turn bays on all four approaches in the future;
- The majority of the collector roadways within NBHDs 1, 2, and 3 can be developed as standard collector roadways that accommodate a minimum of two-travel lanes (one in each direction). On high volume collector roadways, additional capacity is recommended on the approach to the arterial roadways and can generally be provided through the development of appropriate channelization at the arterial/collector intersections;
- Additional analysis should be completed for the roadways surrounding the town centre land uses north of 23 Avenue (196 Street, 24 Avenue, 203 Street) to ensure appropriate capacity and access opportunities are provided. Based on the assessment completed, a three-lane cross-section is recommended for 24 Avenue (one lane in each direction plus left turn bays at accesses) if traditional stop controlled access points are developed. If roundabouts are developed along the corridor, a standard two-lane collector is anticipated to be appropriate;
- The design of 20 Avenue east of 199 Street should consider transit turning movements at the transit access;
- 25 Avenue west of 199 Street and 18 Avenue west of 199 Street should be developed as enhanced local roadways to accommodate free flow two-way traffic on the approaches to 199 Street; and,
- If ETS does not require the use of 212 Street north of 23 Avenue or 24 Avenue east of 212 Street for transit routing, these roadways can be constructed as local roadways.

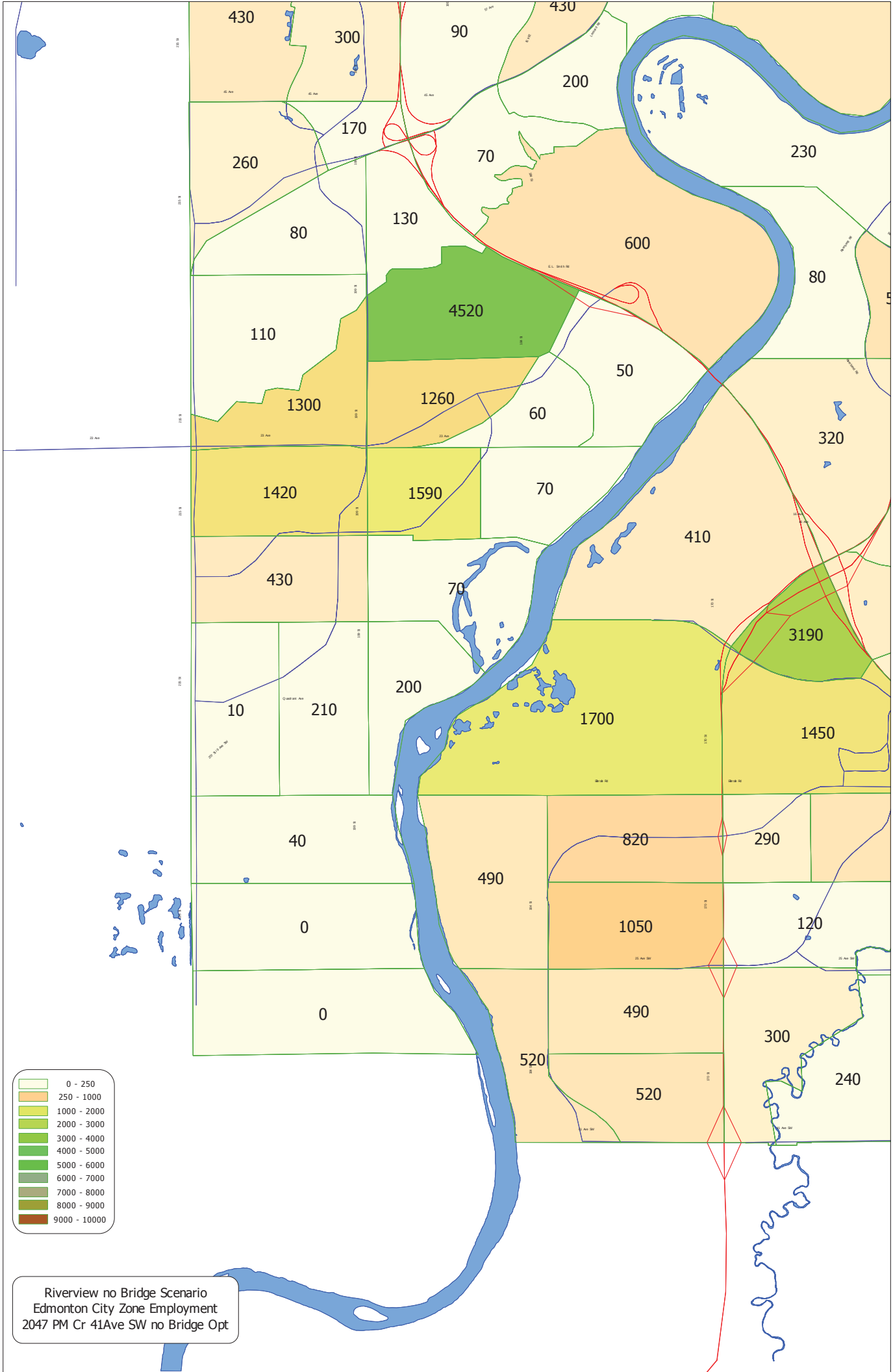
In addition to the above, the following general recommendations are advanced:

- The City of Edmonton's Complete Streets Guidelines should be used in the identification or cross-sections for roadways within the town centre, around the transit centre, and along roadway segments that correspond with the active modes network;

- Traffic volumes and development activity within Riverview should be reviewed on an approximate five year basis to help identify timing for improvements at the Anthony Henday Drive/Cameron Heights interchange.
- TIAs should be completed for school sites at the development permit stage to ensure that sufficient access capacity and on-site parent drop off and bus circulation space is provided to minimize congestion along the adjacent roadway network;
- School site accesses should be aligned at intersections, meet minimum intersection spacing guidelines, and should consider best practices for school site design;
- The development of residential land uses with front drive access across from the school site drop off areas should be limited to reduce the impact on adjacent residents;
- Opportunities to enhance transit connectivity and promote ridership with initial development stages should be explored;
- Frequent and reliable transit service, including midday service, that connects the residential, commercial, and employment land uses within Riverview ASP should be provided; and,
- Strategies to implement TDM programs at future employment and intuitional developments should be explored.

APPENDIX A

City of Edmonton 2047 Model Package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1050
120
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490
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0 - 250
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2000 - 3000
3000 - 4000
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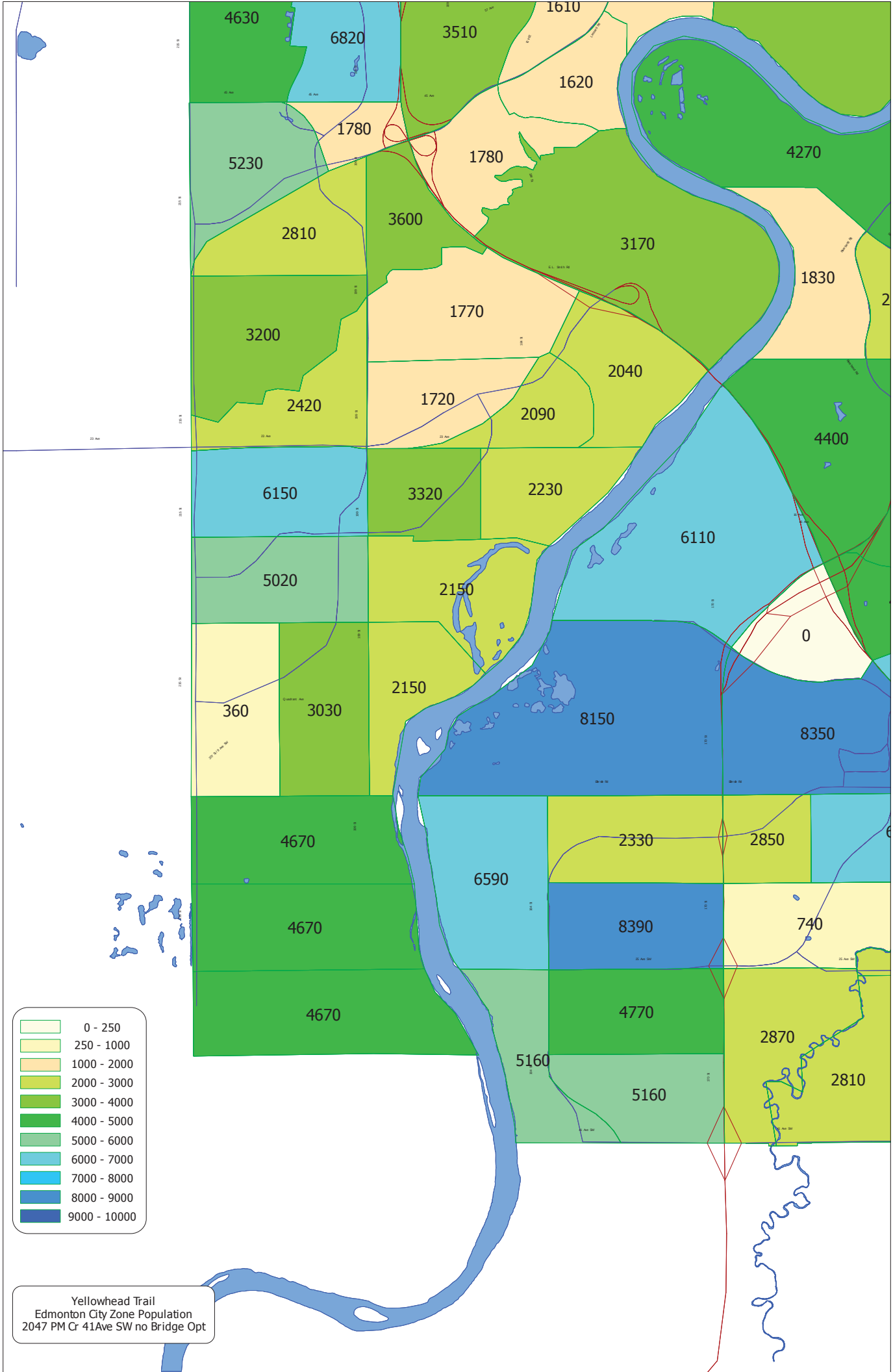
Riverview no Bridge Scenario
Edmonton City Zone Employment
2047 PM Cr 41Ave SW no Bridge Opt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2420
1720
2090
4400
6150
3320
2230
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5020
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360
3030
8150
8350
4670
2330
2850
6590
4670
8390
740
4670
4770
2870
5160
2810
5160
0 - 250
250 - 1000
1000 - 2000
2000 - 3000
3000 - 4000
4000 - 5000
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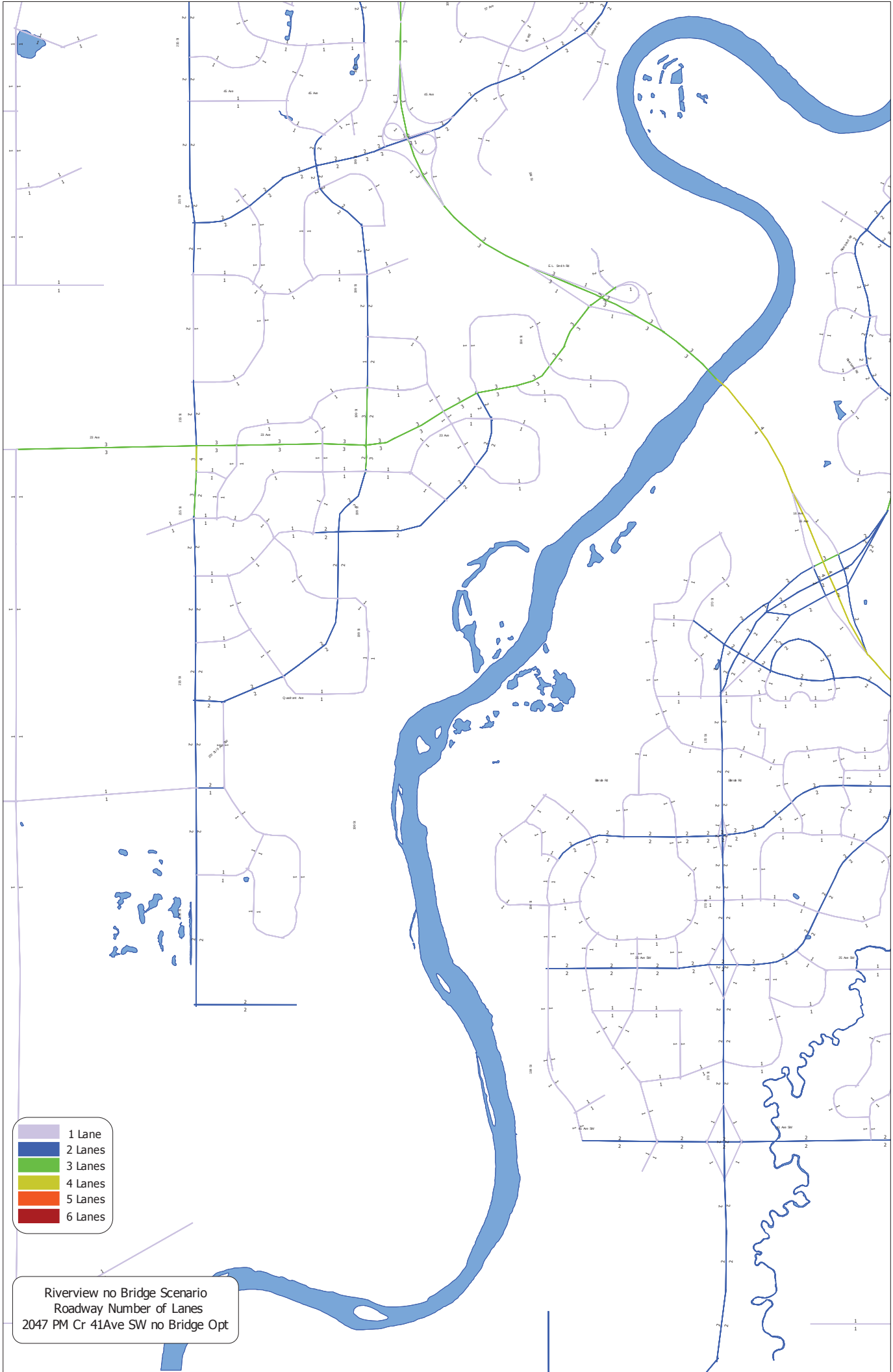
6000 - 7000
7000 - 8000
8000 - 9000
9000 - 10000
Yellowhead Trail
Edmonton City Zone Population
2047 PM Cr 41Ave SW no Bridge Opt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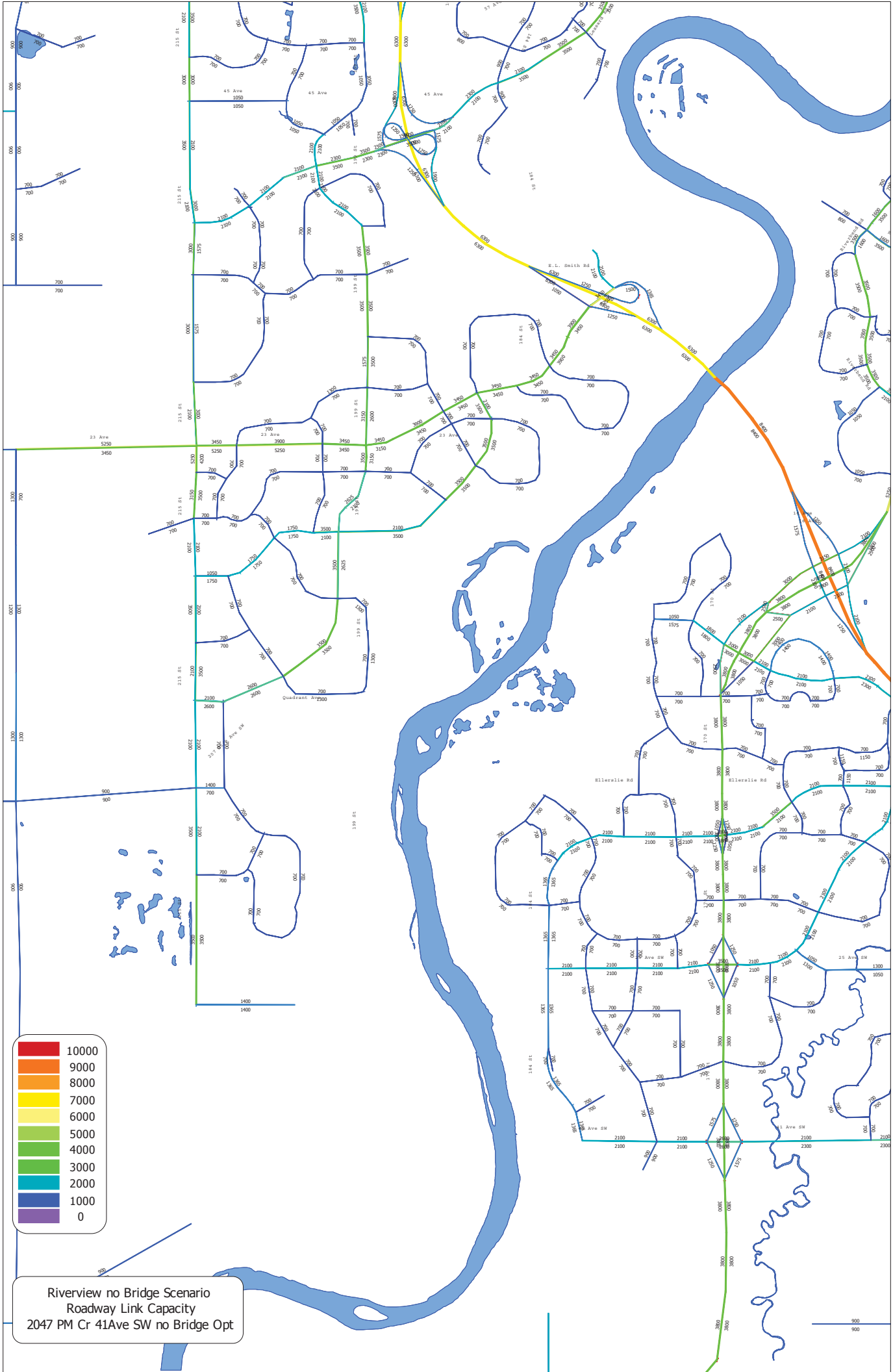
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Roadway Link Capacity
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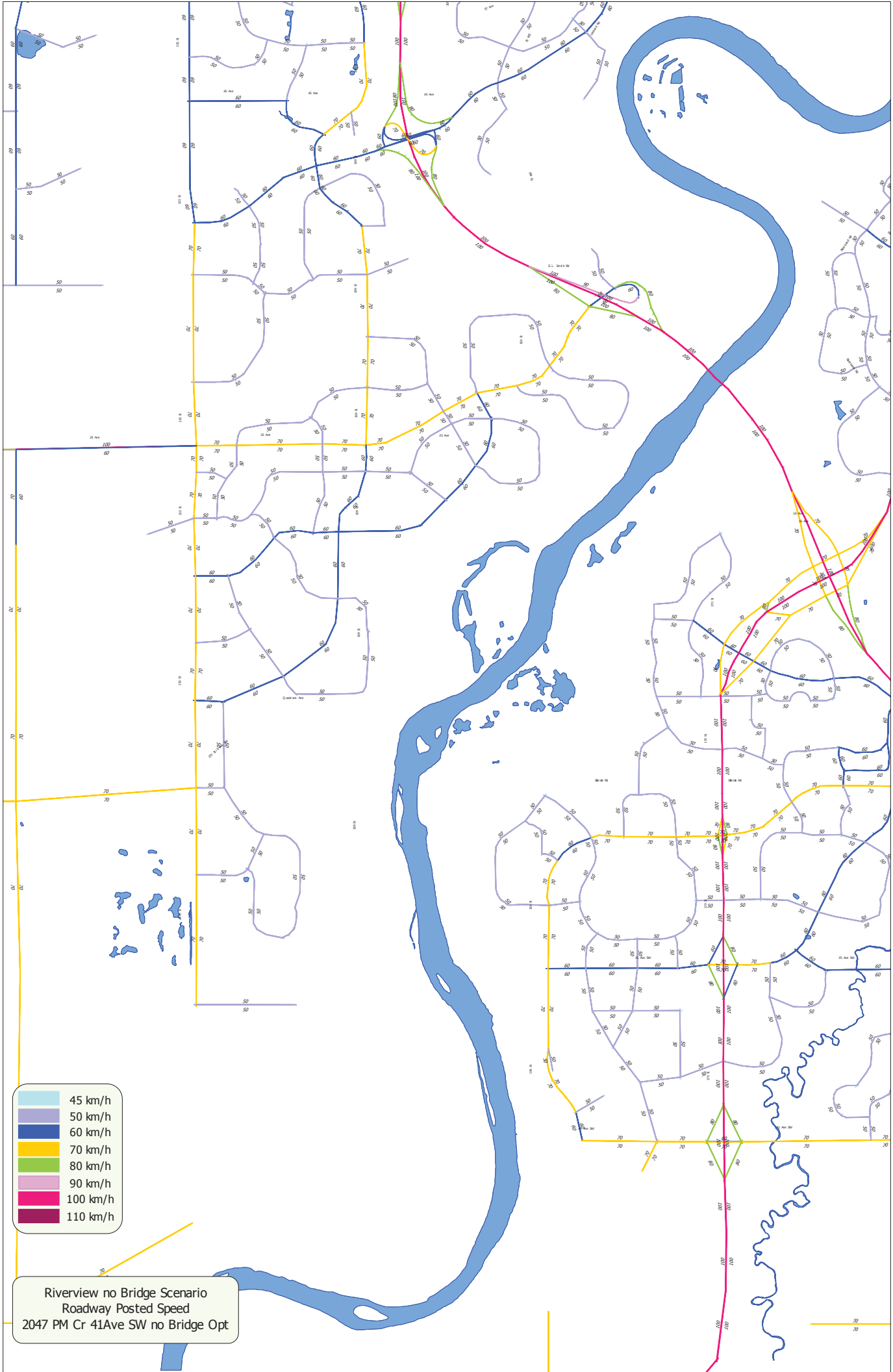
45 km/h
50 km/h
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100 km/h
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Roadway Posted Speed
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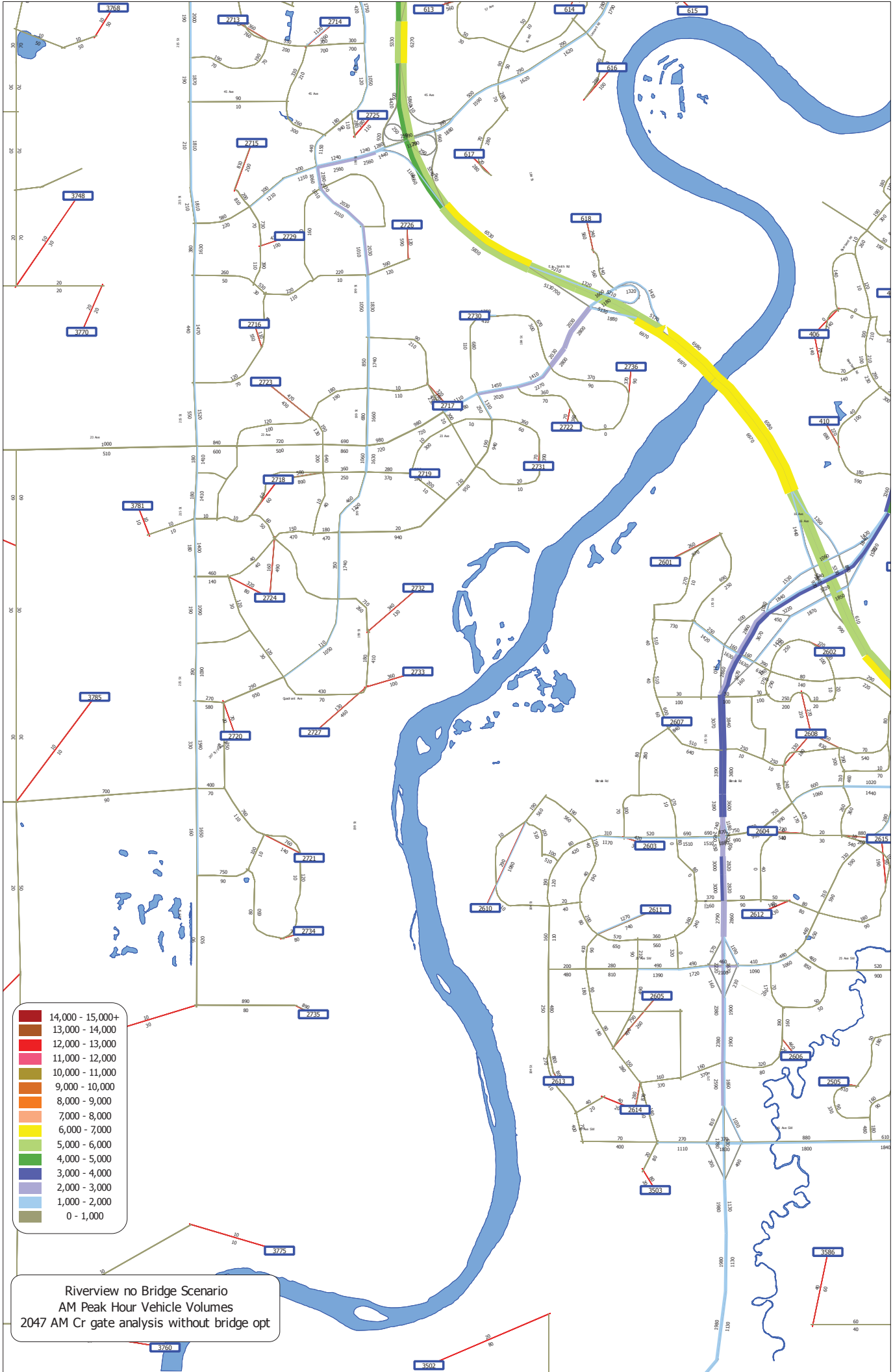
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11,000 - 12,000
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7,000 - 8,000
6,000 - 7,000
5,000 - 6,000
4,000 - 5,000
3,000 - 4,000
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1,000 - 2,000
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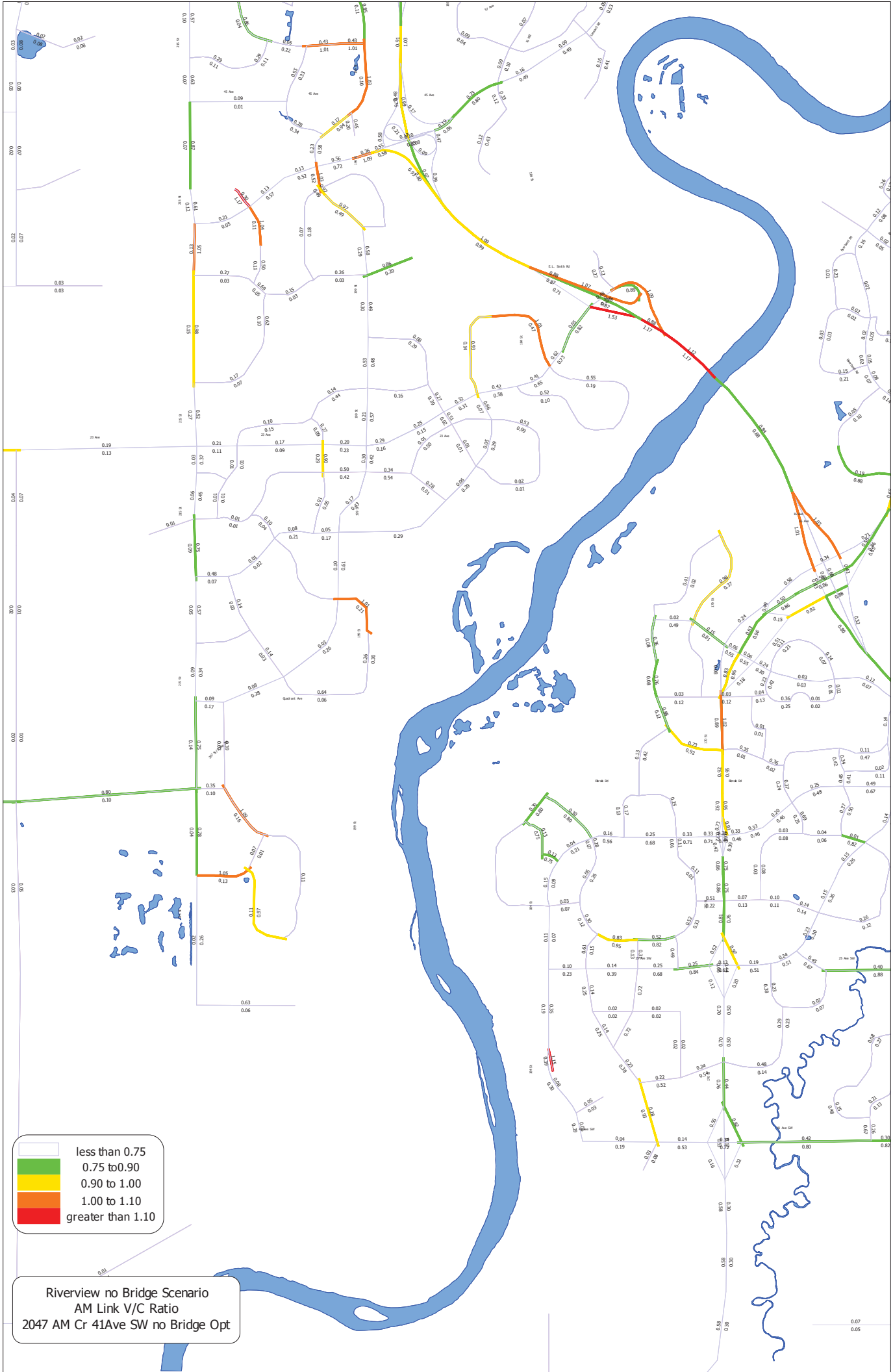
Riverview no Bridge Scenario
AM Peak Hour Vehicle Volumes
2047 AM Cr gate analysis without bridge opt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0.90 to 1.00
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Riverview no Bridge Scenario
AM Link V/C Ratio
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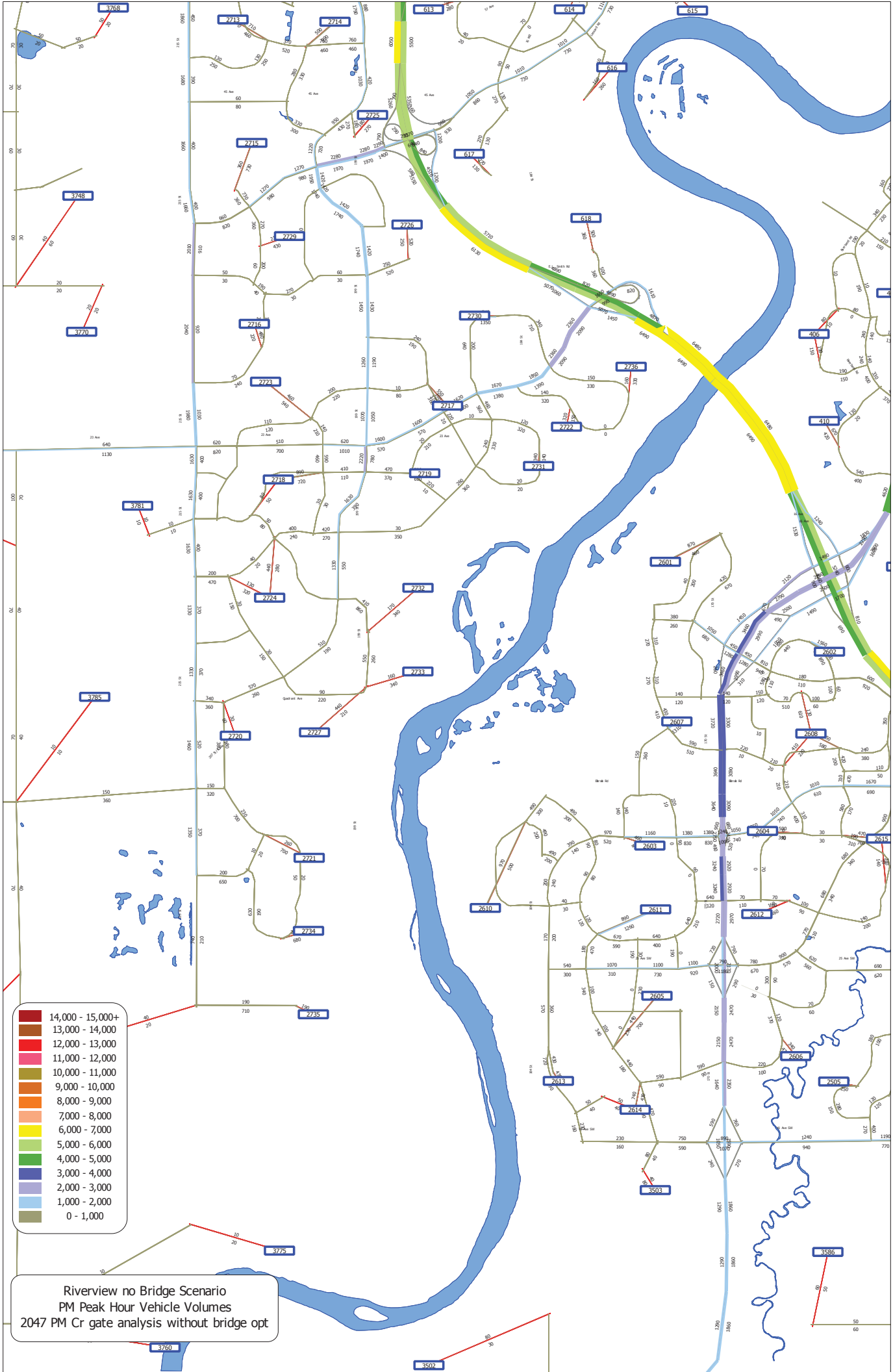
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7,000 - 8,000
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4,000 - 5,000
3,000 - 4,000
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1,000 - 2,000
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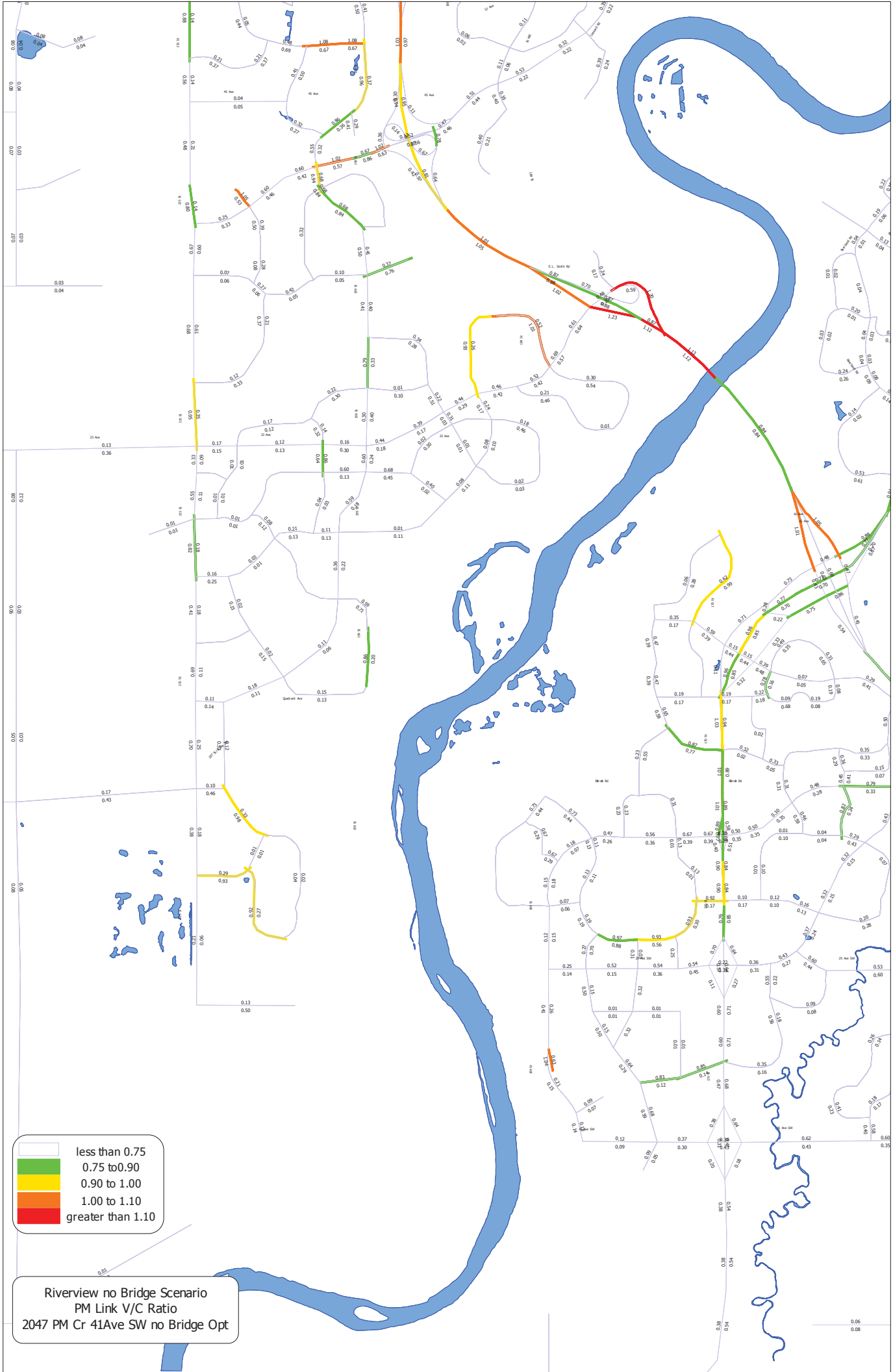
Riverview no Bridge Scenario
PM Peak Hour Vehicle Volumes
2047 PM Cr gate analysis without bridge opt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0.75 to0.90
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1.00 to 1.10
greater than 1.10
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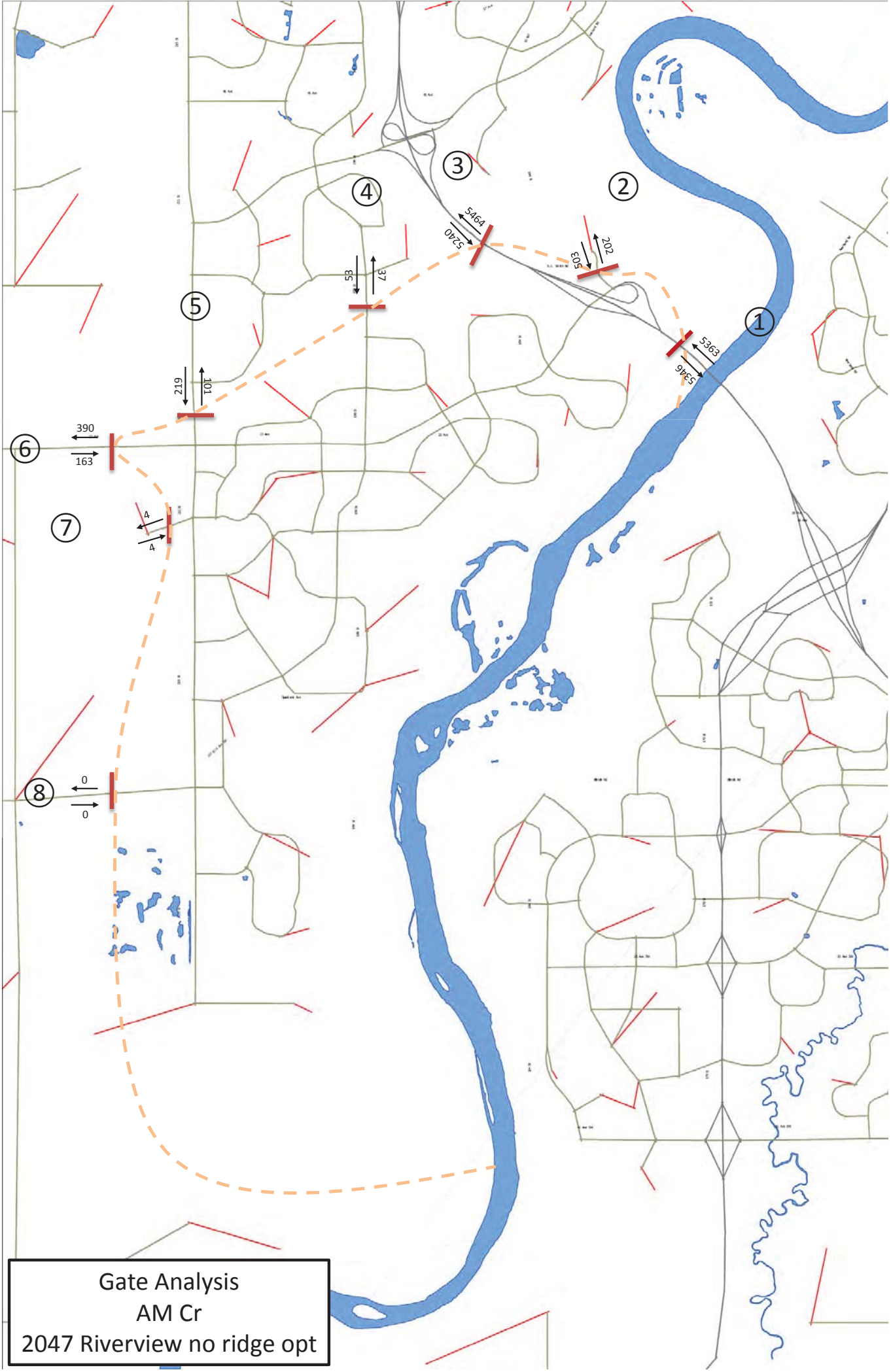
PM Link V/C Ratio
2047 PM Cr 41Ave SW no Bridge Opt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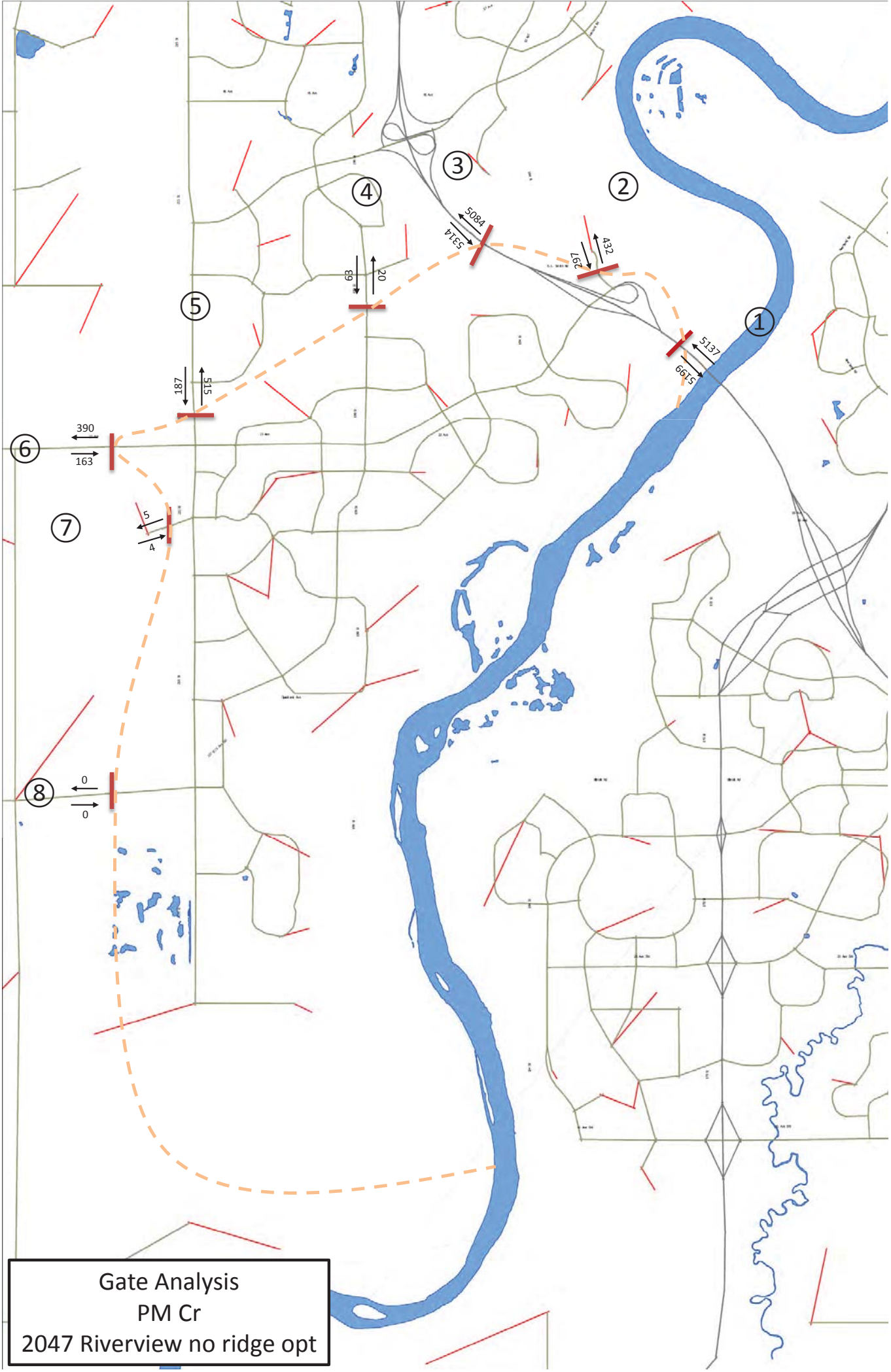
Gate Analysis
AM Cr
2047 Riverview no ridge opt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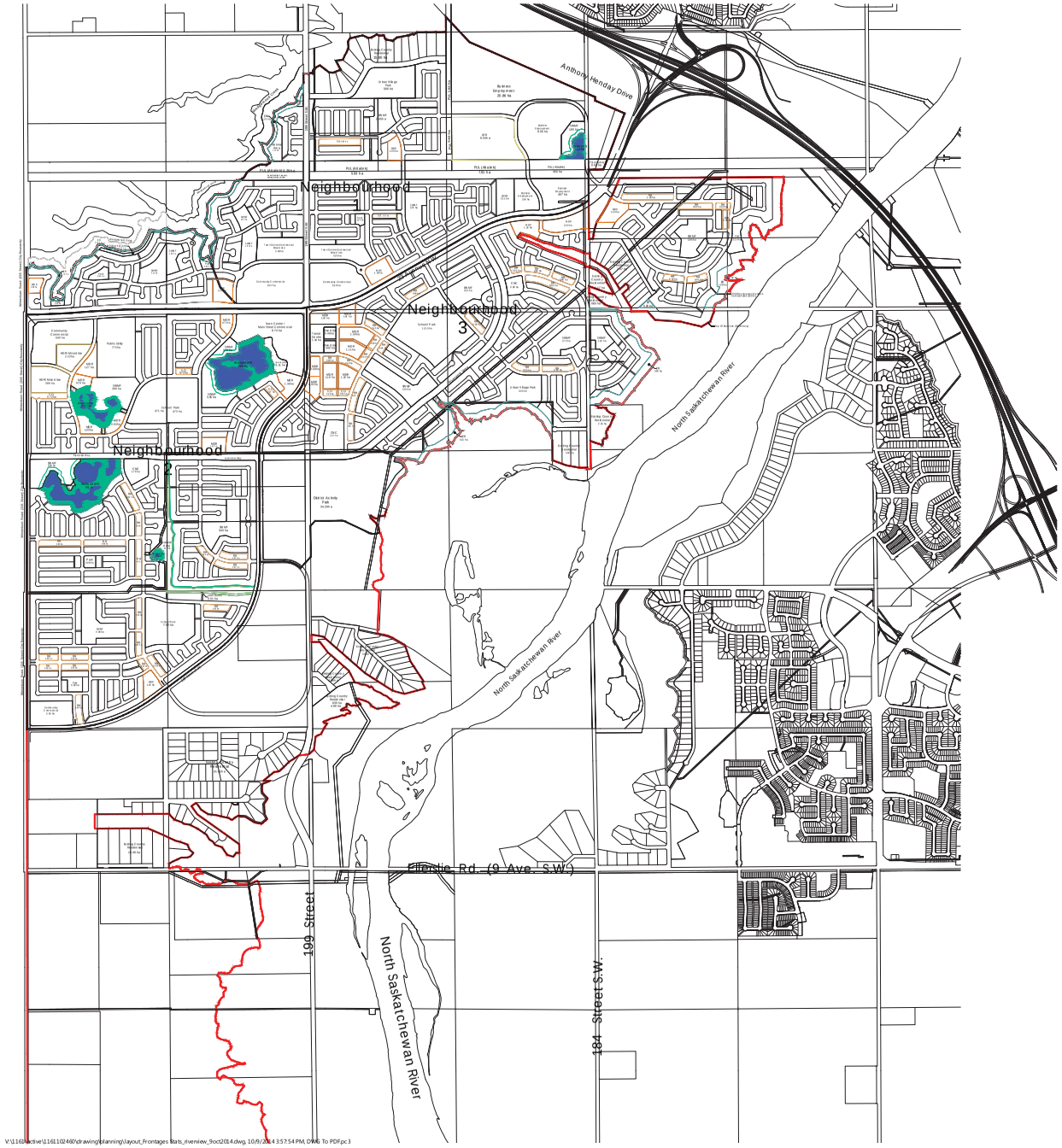
Gate Analysis
PM Cr
2047 Riverview no ridge opt

APPENDIX B

ASP and NSP Land Use Concepts and Statistics



Riverview NBHD 1 (October 9, 2014)

Gross Area (NSP Boundary)	283.85 ha
Arterial Roadway	15.05 ha
Altalink (Powerline R/W)	21.37 ha
PUL	2.28 ha
Environmental Reserve TOB	4.49 ha
Environmental Reserve (Wetland)	1.14 ha
Existing Country Residential	15.60 ha
Gross Developable Area (GDA)	223.92 ha
Municipal Reserve 9.24 ha (4.12 % of GDA)	
Natural Area (MR Credit)	1.11 ha
Urban Village Park	5.66 ha
Pocket Park	1.77 ha
Back of lots MR	0.57 ha
Greenway	0.13 ha
Storm Water Management Facility	14.79 ha
Circulation (20%)	44.78 ha
Land Uses	
Single/Semi-detached	86.14 ha
Street Orientated	1.23 ha
Low-rise / Medium Density Housing	4.65 ha
Business Employment	41.72 ha
Town Centre/ Mixed Use	6.74 ha
Community Commercial	14.63 ha

Riverview NBHD 2 (October 9, 2014)

Gross Area (NSP Boundary)	315.08 ha
Arterial Roadway	21.90 ha
PUL	2.41 ha
PUL - Transmission Facility	7.72 ha
Environmental Reserve (Wetland)	20.14 ha
Gross Developable Area (GDA)	262.91 ha
Municipal Reserve 24.10 ha (9.16 % of GDA)	
Natural Area (MR Credit)	4.81 ha
Upland (MR)	1.23 ha
School/Park	16.44 ha
Pocket Park	1.30 ha
Greenway	0.32 ha
Storm Water Management Facility	19.13 ha
Circulation (20%)	52.58 ha
Land Uses	
Single/Semi-detached	121.65 ha
Row Housing	11.29 ha
Low-rise / Medium Density Housing	8.42 ha
HDR/Mixed Uses	5.30 ha
CNC	1.76 ha
Town Centre/ Main Street Commercial	8.74 ha
Community Commercial	9.94 ha

Riverview NBHD 3 (October 9, 2014)

Gross Area (NSP Boundary)	314.90 ha
Arterial Roadway	15.92 ha
PUL	3.16 ha
Environmental Reserve TOB	10.30 ha
Existing Country Residential	15.83 ha
Gross Developable Area (GDA)	269.69 ha
Municipal Reserve 51.70 ha (19.17 % of GDA)	
District Activity Park	34.29 ha
Urban Village Park	3.35 ha
School / Park	12.10 ha
Pocket Park	1.96 ha
Storm Water Management Facility	14.34 ha
Circulation (20%)	53.94 ha
Land Uses	
Single/Semi-detached	118.85 ha
Row Housing	11.33 ha
Low-rise / Medium Density Housing	14.17 ha
Mixed Uses	0.97 ha
CNC	2.95 ha
Transit Centre	1.44 ha

Riverview ASP Update stats based on Oct 9, 2014

	NBHD 1	NBHD 2	NBHD 3	NBHD 4	NBHD 5	Total
Gross Area	**283.85**	**315.08**	**314.90**	**187.70**	**331.20**	**1,432.73**
Natural Area	5.63	20.14	10.30	-	-	36.07
Pipeline & Utility ROW	2.28	2.41	3.16	-	-	7.85
Altalink Power Corridor	21.37	-	-	-	-	21.37
Public Utility - Comunications Facility	-	7.72	-	-	-	7.72
Arterial Road ROW	15.05	21.90	15.92	5.30	4.00	62.17
Existing Land Uses						-
Residential	15.60	-	15.83	66.40	18.60	116.43
Urban Village Park	-	-	-	-	-	-
Natural Area	-	-	-	-	20.40	20.40
Gross Developable Area	**223.92**	**262.91**	**269.69**	**116.00**	**288.20**	**1,160.72**
Commercial						
Town Centre Commercial	6.74	8.74	-	-	-	15.48
Community Commercial	14.63	9.94	-	4.00	-	28.57
Mixed Use		-	0.49			
Neighbourhood Commercial	-	1.76	2.95	1.00	1.00	6.71
Business Employment	41.72	-	-	-	-	41.72
Parkland, Recreation, School (Municipal Reserve)						-
District Park	-	-	34.29	-	-	34.29
School/Park	-	16.44	12.10	-	9.50	38.04
Urban Village Park/Pocket Park/Greenway	8.13	1.62	5.31	3.90	6.10	25.06
Natural Area	1.11	6.04	-	4.80	12.00	23.95
Transportation	44.78	52.58	53.94	23.20	57.60	232.10
Transit Centre	-	-	1.44	-	-	1.44
Stormwater Management	14.79	19.13	14.34	8.90	22.20	79.36
Total Non-Residential Area	**131.90**	**116.25**	**124.86**	**45.80**	**108.40**	**526.72**
Net Residential Area (NRA)	**92.02**	**146.66**	**144.83**	**70.20**	**179.80**	**634.00**
Residential Land Use						
Single/Semi Detached	86.14	121.65	118.85	60.20	163.80	550.64
Row Housing	1.23	11.29	11.33	6.00	6.00	35.85
Low-rise/Multi/Medium Units	4.65	8.42	14.17	4.00	9.00	40.24
Residential Mixed Use	0.00	5.30	0.48	0.00	0.00	5.78
High Density	0.00	0.00	0.00	0.00	1.00	1.00
Total	**92.02**	**146.66**	**144.83**	**70.20**	**179.80**	**633.51**
Residential Dwelling Units						
Existing Residential						180
Single/Semi Detached (@25 du/ha)	2154	3041	2971	1505	4095	13766
Row Housing (@45 du/ha)	55	508	510	270	270	1613
Low-rise/Multi/Medium Units (@ 90 du/ha)	419	758	1275	360	810	3622
Residential Mixed Use (@ 90 du/ha or 150 du/ha)	304	874	197	0	0	1375
High Density (@ 225 du/ha)	0	0	0	0	225	225
Total	**2932**	**5181**	**4953**	**2135**	**5400**	**20781**
Residential Population						
Existing Residential						496
Single/Semi Detached (@2.8 people/du)	6031	8515	8319	4214	11466	38545
Row Housing (@ 2.8 people/du)	154	1422	1428	756	756	4516
Low-rise/Multi/Medium Units (@ 1.8 people/du)	754	1364	2295	648	1458	6519
Residential Mixed Use (@ 1.8 du/ha)	547	1573	355	0	0	2475
High Density (@ 1.5 people/du)	0	0	0	0	338	338
Total	**7486**	**12874**	**12397**	**5618**	**14018**	**52889**

Town Centre, Commercial, and Mixed Use Site Areas

Retail Commercial Land Use Assumptions	Area (ha)	% of Site	FAR	Estimated GFA (SF)
Town Centre West (TC1)	8.47	100%	0.25	227,900
Town Centre Mixed Use West (TC1A)	3.48	100%	0.5	187,300
Town Centre East (TC2)	6.16	100%	0.25	165,800
Town Centre Mixed Use East (TC2A)	3.26	100%	0.5	175,500
Town Centre South (TC3)	7.74	100%	0.25	208,300
Town Centre South (TC3) Main Street	1.00	100%	1	107,600
Transit Centre Mixed Use 1 (NBHD 3) (50% Retail/50% Residential)	0.49	100%	1	52,700
CSC 1 (NBHD 2)	6.40	100%	0.25	172,200
CSC 2(NBHD 2)	3.54	100%	0.25	95,300
CSC 3 (NBHD 4)	4.00	100%	0.25	107,600
CNC 1 (NBHD 2) (Mixed Use 50% Retail/50% Residential)	1.76	50%	0.25	23,700
CNC 2 (NBHD 3) (Mixed Use 50% Retail/50% Residential)	1.97	50%	0.25	26,500
CNC 3 (NBHD 3)	0.98	100%	0.25	26,400
CNC 4 (NBHD 4)	1.00	100%	0.25	26,900
CNC 5 (NBHD 5)	1.00	100%	0.25	26,900
Total Assumed Retail Commercial GFA	51.25			**1,630,600**

APPENDIX C

Trip Generation

3366.03 - Riverview NBHDs 1-3 NSPs
09-Oct-14
Statistics Source: Stantec - October 9, 2014 Plan

			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Residential - Existing & Single Unit	13,946	units	0.69	19%	1,828	81%	7,794	0.79	67%	7,382	33%	3,636	7.92	50%	55,226	50%	55,226
Residential - Townhouse	1,613	units	0.46	21%	156	79%	586	0.58	65%	608	35%	327	6.59	50%	5,315	50%	5,315
Residential - Low-Rise Apartment	3,622	units	0.34	17%	209	83%	1,022	0.40	63%	913	37%	536	5.81	50%	10,522	50%	10,522
Residential - Mixed Use	1,375	units	0.34	17%	79	83%	388	0.40	63%	347	37%	204	5.81	50%	3,994	50%	3,994
Residential - HDR	225	units	0.34	17%	13	83%	63	0.40	63%	57	37%	33	5.81	50%	654	50%	654
				2,285		9,853			9,307		4,736			75,711		75,711	
Total Residential	**20,781**			12,138					14,043					151,422			
Town Centre West (TC1 & TC1A)	415,200	SF			389		224			1,066		956			10,414		10,414
Town Centre East (TC2 & TC2A)	341,300	SF			322		215			808		853			9,976		9,976
Town Centre South (TC3)	315,900	SF			312		209			772		814			9,576		9,576
CSC 1 (NBHD 2)	172,200	SF			242		167			543		565			6,971		6,971
CSC 2 (NBHD 2)	95,300	SF	4.02	53%	203	47%	180	8.38	48%	383	52%	415	69.06	50%	3,291	50%	3,291
CSC 3 (NBHD 4)	107,600	SF	4.02	53%	229	47%	203	7.90	48%	408	52%	442	66.19	50%	3,561	50%	3,561
Transit Centre Mixed Use (NBHD 3)	52,700	SF	4.02	53%	112	47%	100	10.38	48%	263	52%	284	84.98	50%	2,239	50%	2,239
CNC 1 (NBHD 2)	23,700	SF	5.62	55%	73	45%	60	8.72	48%	99	52%	107	112.40	50%	1,332	50%	1,332
CNC 2 (NBHD 3)	26,500	SF	5.62	55%	82	45%	67	9.59	48%	122	52%	132	108.09	50%	1,432	50%	1,432
CNC 3 (NBHD 2)	26,400	SF	5.62	55%	82	45%	67	9.57	48%	121	52%	131	108.24	50%	1,429	50%	1,429
CNC 4 (NBHD 4)	26,900	SF	5.62	55%	83	45%	68	9.69	48%	125	52%	136	107.53	50%	1,446	50%	1,446
CNC 5 (NBHD 5)	26,900	SF	5.62	55%	83	45%	68	9.69	48%	125	52%	136	107.53	50%	1,446	50%	1,446
Business Employment	3,200	employees	0.48	88%	1,352	12%	184	0.46	17%	250	83%	1,222	3.32	50%	5,312	50%	5,312
Highway Commercial	675,000	SF			451		235			387		457			5,487		5,487
District Park	163,000	SF			150		98			284		198			2,382		2,382
High School	2,350	students			0		0			0		0	1.71	50%	2,009	50%	2,009
Elementary/Jr High	3,750	students			0		0			0		0	1.46	50%	2,738	50%	2,738
				4,165		2,145			5,756		6,848			71,041		71,041	
Total Commercial / Hotel				6,310					12,604					142,082			
				6,450		11,998			15,063		11,584			146,752		146,752	
Total Area				18,448					26,647					293,504			

Non-Residential Assumptions	Area (ha)	FAR	Estimated GFA (SF)		
Business Employment	29.72	0.4	1279600	3200 Employees	710 - General Office Building
Highway Commercial	12.0				
Assume 250 rooms/hotel	4.5	3.0	750	525000	
Assume 30,000 SF Car Dealership	12.5	5.0	150000		
Schools					
High Schools - Assumed	1550 students public, 800 cat		2350		530 - High School
Elementary/Jr Highs - Assumed 5	750 students per school		3750		Average of 520 - Elementary and 522 - Middle/Jr High

District Activity Park assumed to include a 100,000 SF recreation centre, twin ice arenas, and 7 playing fields

Town Centre West (TC1 &TC1A)			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Discount Superstore (City Superstore/813)	150,000	SF	1.86	69%	193	31%	86	6.52	58%	567	42%	411	50.75	50%	3806	50%	3806
Fast Food (City/934)	5,000	SF	20.27	51%	52	49%	50	13.89	45%	31	55%	38	496.12	50%	1240	50%	1240
CRU 820 Fitted Curve	260,200	SF	0.89	62%	144	38%	88	3.75	48%	468	52%	507	41.26	50%	5368	50%	5368
				63%	389	37%	224		53%	1,066	47%	956		50%	10,414	50%	10,414
Total Commercial	**415,200**	**SF**	1.48	613				4.87	2,022				50.16	20,828			

Town Centre East (TC2)			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Grocery Store 850	45,000	SF	3.40	62%	95	38%	58	9.48	51%	218	49%	209	102.24	50%	2300	50%	2300
Fast Food (City/934)	5,000	SF	20.27	51%	52	49%	50	13.89	45%	31	55%	38	496.12	50%	1240	50%	1240
CRU 820 Fitted Curve	291,300	SF	0.97	62%	175	38%	107	4	48%	559	52%	606	44.19	50%	6436	50%	6436
				60%	322	40%	215		49%	808	51%	853		50%	9,976	50%	9,976
Total Commercial	**341,300**	**SF**	1.57	537				4.87	1,661				58.46	19,952			

Town Centre South (TC3)			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Grocery Store 850	45,000	SF	3.40	62%	95	38%	58	9.48	51%	218	49%	209	102.24	50%	2300	50%	2300
Fast Food (City/934)	5,000	SF	20.27	51%	52	49%	50	13.89	45%	31	55%	38	496.12	50%	1240	50%	1240
CRU 820 Fitted Curve	265,900	SF	1.00	62%	165	38%	101	4.1	48%	523	52%	567	45.4	50%	6036	50%	6036
				60%	312	40%	209		49%	772	51%	814		50%	9,576	50%	9,576
Total Commercial	**315,900**	**SF**	1.65	521				5.02	1,586				60.63	19,152			

CSC 1 (NBHD 2)			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Grocery Store 850	45,000	SF	3.40	62%	95	38%	58	9.48	51%	218	49%	209	102.24	50%	2300	50%	2300
Fast Food (City/934)	5,000	SF	20.27	51%	52	49%	50	13.89	45%	31	55%	38	496.12	50%	1240	50%	1240
CRU 820 Fitted Curve	122,200	SF	1.26	62%	95	38%	59	5.01	48%	294	52%	318	56.15	50%	3431	50%	3431
				59%	242	41%	167		49%	543	51%	565		50%	6,971	50%	6,971
Total Commercial	**172,200**	**SF**	2.38	409				6.43	1,108				80.96	13,942			

Highway Commercial			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Hotel (LUC 310)	750	rooms	0.53	59%	235	41%	163	0.60	51%	230	49%	221	8.17	50%	3064	50%	3064
Car Dealership (LUC 841)	150,000	SF	1.92	75%	216	25%	72	2.62	40%	157	60%	236	32.3	50%	2423	50%	2423
				66%	451	34%	235		46%	387	54%	457		50%	5,487	50%	5,487
Total Commercial	**525,000**	**SF**	1.31	686				1.61	844				20.90	10,974			

District Park			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Rec Centre (LUC 495)	100,000	SF	2.05	66%	135	34%	70	2.74	49%	134	51%	140	33.82	50%	1691	50%	1691
Hockey Arena (LUC 465)	700	seats	0.05	30%	11	70%	25	0.12	80%	67	20%	17	1.26	50%	441	50%	441
Playing Fields (LUC 488)	7	fields	1.12	57%	4	43%	3	17.7	67%	83	33%	41	71.33	50%	250	50%	250
				60%	150	40%	98		59%	284	41%	198		50%	2,382	50%	2,382
Total Commercial	**163,000**	**SF**	1.52	248				2.96	482				29.23	4,764			

School			AM Peak Hour					PM Peak Hour					Daily				
Land Use	**Units**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**		**Rate**	**In**		**Out**	
Elementary School	750	students											1.29	50%	484	50%	484
Middle School/Jr High School	750	students											1.62	50%	608	50%	608
														50%	1,091	50%	1,091
Average School Rates	**1500**												1.455	2,183			

APPENDIX D

Catchment Areas

Riverview **Commercial Distribution**
Project #3366.03

West Suburb Neighbourhoods

Neighbourhoods	Population	Source	% of Total	% of 7km Radius	Riverview, Edgemont, Cameron Heights, & Parkland County
Callingwood North	2375	Census	1%	2%	
Callingwood South	5590	Census	3%	4%	
Cameron Heights	4490	NSP	2%	3%	6%
Dechene	1720	Census	1%	1%	
Donsdale	1310	Census	1%	1%	
Edgemont	14836	NSP	7%	11%	20%
Gariepy	1890	Census	1%	1%	
Glastonbury	7780	NSP	4%	6%	
Granville	5820	NSP	3%	4%	
Jamieson Place	3920	Census	2%	3%	
La Perle	5212	Census	3%		
Lymburn	5930	Census	3%	4%	
Oleskiw	2995	Census	1%	2%	
Ormsby Place	5325	Census	3%	4%	
Riverview	52889	ASP	26%	39%	70%
The Hamptons	13588	NSP	7%	10%	
Wedgewood Heights	1470	Census	1%	1%	
Westridge	1325	Census	1%	1%	
Parkland County (Estimate west to Hwy 60	3225		2%	2%	4%
Total	205791	152902	100%	100%	100%
Within ~ 7 km radius	136478			61%	
Riverview, Edgemont, Cameron Heights, P	75440				30%

APPENDIX E

Net Trip Generation

			PASS-BY		
Pass-by and Internal Trips	Mode Split	Internal Trips	AM	PM	Daily
Town Centre West (TC1 & TC1A)	0%	40%	20%	20%	20%
Town Centre East (TC2 & TC2A)	0%	40%	20%	25%	25%
Town Centre South (TC3)	0%	40%	20%	30%	25%
CSC 1 (NBHD 2)	0%	70%	20%	35%	25%
CSC 2 (NBHD 2)	0%	70%	20%	40%	30%
CSC 3 (NBHD 4)	0%	70%	20%	40%	30%
Transit Centre Mixed Use (NBHD 3)	50%	100%	10%	10%	10%
CNC 1 (NBHD 2)	0%	100%	50%	25%	25%
CNC 2 (NBHD 3)	0%	100%	50%	50%	50%
CNC 3 (NBHD 2)	0%	100%	50%	50%	50%
CNC 4 (NBHD 4)	0%	100%	50%	50%	50%
CNC 5 (NBHD 5)	0%	100%	50%	50%	50%
Business Employment	5%	10%	0%	0%	0%
Highway Commercial	0%	10%	0%	0%	0%
District Park	0%	70%	0%	0%	0%
High School	0%	40%	0%	0%	0%
Elementary/Jr High	0%	70%	0%	0%	0%

Non-Residential Trip Generation

Land Use (ITE LUC)	Intensity	AM Peak Hour		PM Peak Hour		Daily	
		In	Out	In	Out	In	Out
Town Centre West (TC1 & TC1A)	415,200	389	224	1,066	956	10,414	10,414
Mode Split		0	0	0	0	0	0
Pass-by Trips		45	45	191	191	2,083	2,083
Internal NBHD Trips		138	72	350	306	3,332	3,332
Net External Trips		**207**	**108**	**525**	**459**	**4,999**	**4,999**
Town Centre East (TC2 & TC2A)	341,300	322	215	808	853	9,976	9,976
Mode Split		0	0	0	0	0	0
Pass-by Trips		43	43	202	202	2,494	2,494
Internal NBHD Trips		112	69	242	260	2,993	2,993
Net External Trips		**167**	**103**	**364**	**391**	**4,489**	**4,489**
Town Centre South (TC3)	315,900	312	209	772	814	9,576	9,576
Mode Split		0	0	0	0	0	0
Pass-by Trips		42	42	232	232	2,394	2,394
Internal NBHD Trips		108	67	216	233	2,873	2,873
Net External Trips		**162**	**100**	**324**	**349**	**4,309**	**4,309**
CSC 1 (NBHD 2)	172,200	242	167	543	565	6,971	6,971
Mode Split		0	0	0	0	0	0
Pass-by Trips		33	33	190	190	1,743	1,743
Internal NBHD Trips		146	94	247	262	3,660	3,660
Net External Trips		**63**	**40**	**106**	**112**	**1,568**	**1,568**
CSC 2 (NBHD 2)	95,300	203	180	383	415	3,291	3,291
Mode Split		0	0	0	0	0	0
Pass-by Trips		36	36	153	153	987	987
Internal NBHD Trips		117	101	161	183	1,613	1,613
Net External Trips		**50**	**43**	**69**	**79**	**691**	**691**
CSC 3 (NBHD 4)	107,600	229	203	408	442	3,561	3,561
Mode Split		0	0	0	0	0	0
Pass-by Trips		41	41	163	163	1,068	1,068
Internal NBHD Trips		132	114	171	195	1,745	1,745
Net External Trips		**57**	**49**	**73**	**84**	**748**	**748**
Transit Centre Mixed Use (NBHD 3)	52,700	112	100	263	284	2,239	2,239
Mode Split		56	50	132	142	1,120	1,120
Pass-by Trips		5	5	13	13	112	112
Internal NBHD Trips		51	45	118	129	1,008	1,008
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**
CNC 1 (NBHD 2)	23,700	73	60	99	107	1,332	1,332
Mode Split		0	0	0	0	0	0
Pass-by Trips		30	30	25	25	333	333
Internal NBHD Trips		43	30	74	82	999	999
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**
CNC 2 (NBHD 3)	26,500	82	67	122	132	1,432	1,432
Mode Split		0	0	0	0	0	0
Pass-by Trips		34	34	61	61	716	716
Internal NBHD Trips		49	34	61	71	716	716
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**
CNC 3 (NBHD 2)	26,400	82	67	121	131	1,429	1,429
Mode Split		0	0	0	0	0	0
Pass-by Trips		34	34	61	61	715	715
Internal NBHD Trips		49	34	61	71	715	715
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**
CNC 4 (NBHD 4)	26,900	83	68	125	136	1,446	1,446
Mode Split		0	0	0	0	0	0
Pass-by Trips		34	34	63	63	723	723
Internal NBHD Trips		49	34	63	74	723	723
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**

CNC 5 (NBHD 5)	26,900	83	68	125	136	1,446	1,446
Mode Split		0	0	0	0	0	0
Pass-by Trips		34	34	63	63	723	723
Internal NBHD Trips		49	34	63	74	723	723
Net External Trips		**0**	**0**	**0**	**0**	**0**	**0**
Business Employment	3,200	1,352	184	250	1,222	5,312	5,312
Mode Split		68	9	13	61	266	266
Pass-by Trips		0	0	0	0	0	0
Internal NBHD Trips		128	17	24	116	505	505
Net External Trips		**1,156**	**157**	**214**	**1,045**	**4,542**	**4,542**
Highway Commercial	675,000	451	235	387	457	5,487	5,487
Mode Split		0	0	0	0	0	0
Pass-by Trips		0	0	0	0	0	0
Internal NBHD Trips		45	24	39	46	549	549
Net External Trips		**406**	**212**	**348**	**411**	**4,938**	**4,938**
District Park	163,000	150	98	284	198	2,382	2,382
Mode Split		0	0	0	0	0	0
Pass-by Trips		0	0	0	0	0	0
Internal NBHD Trips		105	69	199	139	1,667	1,667
Net External Trips		**45**	**29**	**85**	**59**	**715**	**715**
High School	2,350	0	0	0	0	2,009	2,009
Mode Split		0	0	0	0	0	0
Pass-by Trips		0	0	0	0	0	0
Internal NBHD Trips		0	0	0	0	804	804
Net External Trips		**0**	**0**	**0**	**0**	**1,205**	**1,205**
Elementary/Jr High	3,750	0	0	0	0	2,738	2,738
Mode Split		0	0	0	0	0	0
Pass-by Trips		0	0	0	0	0	0
Internal NBHD Trips		0	0	0	0	1,917	1,917
Net External Trips		**0**	**0**	**0**	**0**	**821**	**821**
Total Gross Trips		**4,165**	**2,145**	**5,756**	**6,848**	**71,041**	**71,041**
Total Mode Split		**124**	**59**	**144**	**203**	**1,385**	**1,385**
Total Pass-by Trips		**410**	**410**	**1,416**	**1,416**	**14,091**	**14,091**
Total Internal NBHD Trips		**1,320**	**835**	**2,088**	**2,240**	**26,539**	**26,539**
Total External NBHD Trips		**2,312**	**841**	**2,108**	**2,989**	**29,026**	**29,026**

Discrepancies between the totals noted above and totals summarized in Table 4-6 reflect rounding differences.

Residential Trip Generation

Land Use (ITE LUC)	Intensity	AM Peak Hour		PM Peak Hour		Daily	
		In	Out	In	Out	In	Out
Residential - Existing & Single Unit	13,946	1,828	7,794	7,382	3,636	55,226	55,226
Mode Split	5%	91	390	369	182	2,761	2,761
Internal NBHD Trips		668	1,044	1,777	1,603	19,359	19,359
Net External Trips		**1,069**	**6,360**	**5,236**	**1,851**	**33,106**	**33,106**
Residential - Townhouse	1,613	156	586	608	327	5,315	5,315
Mode Split	5%	8	29	30	16	266	266
Internal NBHD Trips		57	78	146	144	1,863	1,863
Net External Trips		**91**	**478**	**431**	**166**	**3,186**	**3,186**
Residential - Low-Rise Apartment	3,622	209	1,022	913	536	10,522	10,522
Mode Split	5%	10	51	46	27	526	526
Internal NBHD Trips		76	137	220	236	3,688	3,688
Net External Trips		**122**	**834**	**648**	**273**	**6,308**	**6,308**
Residential - Mixed Use	1,375	79	388	347	204	3,994	3,994
Mode Split	5%	4	19	17	10	200	200
Internal NBHD Trips		29	52	84	90	1,400	1,400
Net External Trips		**46**	**317**	**246**	**104**	**2,394**	**2,394**
Residential - HDR	225	13	63	57	33	654	654
Mode Split	5%	1	3	3	2	33	33
Internal NBHD Trips		5	8	14	15	229	229
Net External Trips		**8**	**51**	**40**	**17**	**392**	**392**
Total Gross Trips		**2,285**	**9,853**	**9,307**	**4,736**	**75,711**	**75,711**
Total Mode Split		**114**	**493**	**465**	**237**	**3,786**	**3,786**
Total Internal NBHD Trips		**835**	**1,320**	**2,240**	**2,088**	**26,539**	**26,539**
Total External NBHD Trips		**1,336**	**8,041**	**6,601**	**2,411**	**45,386**	**45,386**
% Internal Trips By Direction		**37%**	**13%**	**24%**	**44%**	**35%**	**35%**
% Total Internal Trips		**18%**		**31%**		**35%**	

Total Gross Trips		**6,450**	**11,998**	**15,063**	**11,584**	**146,752**	**146,752**
Total Mode Split		**238**	**552**	**609**	**440**	**5,171**	**5,171**
Total Pass-by		**410**	**410**	**1,416**	**1,416**	**14,091**	**14,091**
Total Internal NBHD Trips		**2,155**	**2,155**	**4,328**	**4,328**	**53,079**	**53,079**
		3,648	**8,882**	**8,710**	**5,400**	**74,412**	**74,412**
Total External NBHD Trips		**12,530**		**14,110**		**148,824**	

Discrepancies between the totals noted above and totals summarized in Table 4-7 reflect rounding differences.

APPENDIX F

City Of Edmonton 2013 Origin-Destination Tables

Table P9: 2044 AM Peak Period (Percentage for Origin Trips)

		DESTINATION SECTOR																		
ORIGIN SECTOR		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County	Sum
Sector 1	CBD	14.4%	4.6%	15.7%	7.3%	6.8%	7.0%	5.9%	4.7%	8.5%	3.0%	9.8%	3.0%	2.7%	2.6%	1.6%	0.5%	1.0%	0.6%	0.5%	100.0%
Sector 2	University	6.9%	14.4%	7.6%	4.8%	3.4%	7.3%	12.2%	4.5%	8.5%	1.8%	13.6%	6.1%	3.4%	1.7%	1.3%	0.3%	1.2%	0.7%	0.4%	100.0%
Sector 3	CBD Fringe	9.8%	3.6%	17.3%	10.3%	7.0%	5.1%	3.8%	4.7%	14.5%	3.2%	9.2%	2.4%	2.2%	1.8%	1.8%	0.6%	1.1%	0.8%	0.7%	100.0%
Sector 4	NW Inner	7.3%	4.6%	9.9%	16.2%	8.0%	4.1%	2.3%	4.3%	18.6%	5.3%	8.8%	1.5%	1.9%	1.6%	2.5%	0.7%	0.7%	0.9%	1.0%	100.0%
Sector 5	NE Inner	5.6%	2.3%	6.1%	8.8%	19.1%	5.2%	2.1%	2.1%	12.4%	13.4%	10.3%	1.4%	1.2%	2.7%	1.8%	1.1%	0.8%	0.7%	2.9%	100.0%
Sector 6	SE Inner	9.6%	6.1%	5.5%	3.7%	5.5%	19.3%	4.2%	2.0%	5.5%	2.8%	24.5%	2.3%	1.2%	2.9%	0.8%	0.6%	2.6%	0.4%	0.4%	100.0%
Sector 7	SW Inner	7.7%	10.9%	5.0%	2.8%	2.0%	3.9%	20.1%	2.4%	6.9%	1.3%	18.0%	10.7%	1.8%	1.8%	0.9%	0.5%	2.2%	0.8%	0.3%	100.0%
Sector 8	West Inner	7.8%	5.1%	6.8%	5.5%	2.5%	2.4%	3.1%	20.0%	17.2%	1.8%	8.1%	3.3%	9.8%	1.0%	2.1%	0.4%	1.2%	1.2%	0.6%	100.0%
Sector 9	NW Suburb	4.4%	3.5%	5.7%	9.6%	6.2%	3.0%	1.7%	4.3%	31.2%	6.3%	7.2%	1.7%	3.4%	1.6%	5.0%	0.9%	0.8%	1.9%	1.8%	100.0%
Sector 10	NE Suburb	3.3%	1.5%	3.6%	6.1%	13.3%	3.8%	1.4%	1.6%	12.2%	27.2%	9.7%	1.3%	1.1%	3.1%	2.2%	1.9%	1.0%	0.7%	4.8%	100.0%
Sector 11	SE Suburb	3.9%	3.3%	2.1%	1.5%	1.8%	6.5%	3.9%	1.4%	3.5%	1.9%	52.5%	5.5%	1.3%	2.6%	0.5%	0.7%	6.2%	0.5%	0.4%	100.0%
Sector 12	SW Suburb	5.4%	6.4%	3.5%	2.1%	1.3%	2.3%	9.5%	2.4%	7.6%	1.4%	16.2%	30.7%	2.1%	1.5%	1.1%	0.5%	4.6%	1.0%	0.5%	100.0%
Sector 13	West Suburb	4.8%	3.8%	4.0%	3.3%	1.8%	2.0%	3.1%	11.0%	15.7%	1.9%	9.6%	5.0%	25.7%	0.9%	2.2%	0.5%	1.9%	2.3%	0.7%	100.0%
Sector 14	Sherwood Park	5.4%	1.9%	3.5%	2.8%	3.3%	3.9%	1.9%	1.2%	5.7%	5.8%	13.4%	1.9%	0.8%	36.9%	1.0%	7.4%	1.4%	0.5%	1.0%	100.0%
Sector 15	St. Albert	6.2%	1.8%	3.8%	4.1%	2.4%	1.5%	1.2%	2.6%	22.6%	3.7%	4.7%	1.7%	2.5%	1.0%	34.7%	0.8%	0.9%	1.4%	2.4%	100.0%
Sector 16	Strathcona County	2.5%	1.1%	1.6%	2.0%	2.1%	1.9%	1.0%	0.6%	2.9%	9.4%	7.4%	1.1%	0.4%	13.4%	0.8%	49.4%	0.7%	0.2%	1.7%	100.0%
Sector 17	Leduc County	2.0%	1.4%	1.6%	0.8%	0.7%	1.5%	2.2%	1.0%	2.6%	0.8%	16.3%	7.1%	1.2%	1.2%	0.4%	0.3%	58.0%	0.8%	0.2%	100.0%
Sector 18	Parkland County	3.2%	2.1%	3.1%	3.2%	1.6%	1.2%	1.8%	1.9%	15.8%	1.8%	5.4%	2.9%	3.0%	0.6%	2.6%	0.3%	1.5%	47.3%	0.6%	100.0%
Sector 19	Sturgeon County	2.4%	1.2%	2.8%	4.1%	3.2%	1.1%	0.7%	1.4%	13.4%	11.2%	2.8%	0.8%	1.3%	1.7%	8.9%	2.8%	0.3%	1.2%	38.6%	100.0%

Table P11: 2044 PM Peak Period (Percentage for Origin Trips)

		DESTINATION SECTOR																		
ORIGIN SECTOR		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County	Sum
Sector 1	CBD	8.5%	2.3%	10.3%	7.4%	6.5%	7.2%	6.5%	5.7%	5.0%	4.3%	8.1%	8.1%	6.4%	5.0%	4.5%	1.2%	1.0%	1.4%	0.8%	100.0%
Sector 2	University	2.9%	7.5%	4.2%	5.4%	3.4%	6.7%	14.5%	4.9%	5.4%	2.7%	9.8%	15.9%	6.9%	2.6%	2.0%	0.7%	1.6%	2.1%	0.7%	100.0%
Sector 3	CBD Fringe	5.5%	2.1%	19.3%	11.1%	8.6%	5.0%	4.0%	5.3%	6.6%	5.5%	5.1%	4.7%	4.9%	3.2%	3.2%	0.9%	1.1%	2.2%	1.4%	100.0%
Sector 4	NW Inner	2.9%	1.2%	7.3%	22.1%	11.2%	3.3%	2.0%	4.2%	14.1%	8.3%	3.8%	2.8%	4.0%	2.9%	3.8%	1.0%	0.6%	2.4%	2.1%	100.0%
Sector 5	NE Inner	2.1%	1.1%	4.2%	9.3%	27.5%	4.0%	1.5%	1.6%	8.1%	21.3%	3.9%	1.7%	2.1%	3.6%	2.4%	1.4%	0.6%	1.2%	2.3%	100.0%
Sector 6	SE Inner	2.9%	2.6%	4.3%	4.6%	7.3%	23.0%	5.0%	2.0%	3.7%	5.9%	19.7%	4.4%	2.7%	5.8%	1.4%	1.3%	1.7%	1.1%	0.7%	100.0%
Sector 7	SW Inner	2.0%	3.7%	3.0%	2.2%	2.2%	4.5%	27.4%	2.4%	2.2%	1.8%	16.1%	19.2%	4.1%	2.7%	1.1%	0.7%	2.6%	1.5%	0.4%	100.0%
Sector 8	West Inner	2.3%	1.2%	4.6%	5.5%	2.7%	1.7%	2.9%	24.1%	8.8%	2.5%	3.7%	5.3%	23.5%	1.4%	3.7%	0.4%	1.2%	3.4%	1.0%	100.0%
Sector 9	NW Suburb	1.1%	0.8%	3.0%	8.9%	6.0%	2.0%	1.7%	5.2%	23.9%	7.2%	4.0%	4.6%	9.0%	2.4%	9.0%	0.8%	0.9%	5.7%	3.7%	100.0%
Sector 10	NE Suburb	0.8%	0.5%	1.7%	4.7%	15.5%	1.8%	0.8%	0.9%	6.8%	42.1%	3.1%	1.4%	1.7%	4.4%	2.8%	4.1%	0.5%	1.2%	5.1%	100.0%
Sector 11	SE Suburb	0.8%	1.1%	1.4%	2.0%	2.6%	5.8%	5.6%	1.5%	2.1%	3.2%	47.5%	9.6%	3.2%	4.3%	1.0%	1.3%	5.4%	1.2%	0.5%	100.0%
Sector 12	SW Suburb	0.8%	1.4%	1.2%	1.0%	0.8%	1.4%	10.5%	1.8%	1.7%	0.9%	13.5%	51.5%	4.4%	1.4%	0.9%	0.4%	4.6%	1.4%	0.3%	100.0%
Sector 13	West Suburb	1.1%	0.7%	1.9%	2.4%	1.5%	0.9%	2.3%	11.4%	7.4%	1.7%	3.4%	4.9%	49.2%	0.9%	3.1%	0.3%	1.3%	4.6%	0.9%	100.0%
Sector 14	Sherwood Park	0.6%	0.3%	1.1%	1.5%	2.9%	2.8%	1.4%	0.6%	1.7%	4.6%	6.6%	2.0%	1.0%	60.6%	0.8%	9.5%	1.0%	0.4%	0.6%	100.0%
Sector 15	St. Albert	0.4%	0.3%	1.3%	3.1%	2.1%	0.7%	0.7%	1.9%	9.1%	3.4%	1.3%	1.8%	4.1%	0.9%	59.2%	0.5%	0.4%	2.4%	6.3%	100.0%
Sector 16	Strathcona County	0.4%	0.2%	0.5%	0.8%	1.5%	0.7%	0.5%	0.3%	1.3%	4.2%	2.4%	0.9%	0.7%	13.1%	0.9%	69.1%	0.5%	0.3%	1.8%	100.0%
Sector 17	Leduc County	0.6%	0.4%	0.7%	0.5%	0.6%	0.9%	1.9%	0.8%	0.9%	0.9%	9.8%	7.3%	2.0%	1.2%	0.6%	0.4%	68.8%	1.3%	0.2%	100.0%
Sector 18	Parkland County	0.5%	0.3%	0.7%	1.0%	0.8%	0.4%	0.8%	1.2%	2.9%	0.9%	1.4%	1.8%	4.1%	0.4%	1.5%	0.1%	0.9%	79.6%	0.7%	100.0%
Sector 19	Sturgeon County	0.5%	0.2%	1.0%	1.9%	5.2%	0.6%	0.5%	0.8%	4.5%	12.5%	1.4%	1.2%	1.9%	2.4%	9.7%	3.1%	0.3%	1.3%	51.3%	100.0%

Table P10: 2044 AM Peak Period (Percentage for Destination Trips)

		DESTINATION SECTOR																	
ORIGIN SECTOR		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County
Sector 1	CBD	3.4%	1.6%	4.2%	1.9%	1.8%	2.2%	1.9%	1.7%	0.9%	0.6%	0.8%	0.6%	0.9%	0.7%	0.5%	0.2%	0.2%	0.2%	0.2%
Sector 2	University	1.1%	3.5%	1.4%	0.9%	0.6%	1.6%	2.7%	1.1%	0.6%	0.3%	0.7%	0.8%	0.8%	0.3%	0.3%	0.1%	0.2%	0.2%	0.1%
Sector 3	CBD Fringe	5.7%	3.1%	11.3%	6.6%	4.5%	3.9%	3.0%	4.1%	3.8%	1.7%	1.7%	1.1%	1.8%	1.1%	1.4%	0.5%	0.6%	0.6%	0.8%
Sector 4	NW Inner	6.4%	5.8%	9.8%	15.9%	7.8%	4.7%	2.7%	5.7%	7.2%	4.1%	2.5%	1.1%	2.3%	1.6%	3.0%	0.9%	0.6%	1.1%	1.8%
Sector 5	NE Inner	5.9%	3.5%	7.3%	10.3%	22.5%	7.3%	3.0%	3.4%	5.9%	12.5%	3.5%	1.2%	1.8%	3.2%	2.6%	1.8%	0.8%	1.0%	6.2%
Sector 6	SE Inner	6.6%	6.1%	4.3%	2.8%	4.2%	17.5%	3.9%	2.0%	1.7%	1.7%	5.5%	1.3%	1.2%	2.2%	0.8%	0.6%	1.6%	0.4%	0.6%
Sector 7	SW Inner	5.2%	10.6%	3.8%	2.1%	1.5%	3.5%	18.1%	2.4%	2.1%	0.8%	3.9%	6.0%	1.8%	1.4%	0.8%	0.5%	1.4%	0.7%	0.5%
Sector 8	West Inner	5.3%	5.0%	5.2%	4.2%	1.9%	2.1%	2.8%	20.6%	5.2%	1.1%	1.8%	1.9%	9.4%	0.8%	1.9%	0.4%	0.8%	1.2%	0.8%
Sector 9	NW Suburb	5.0%	5.8%	7.2%	12.0%	7.7%	4.5%	2.5%	7.3%	15.7%	6.3%	2.7%	1.6%	5.3%	2.0%	7.6%	1.6%	0.8%	3.0%	4.2%
Sector 10	NE Suburb	5.1%	3.3%	6.2%	10.4%	22.6%	7.6%	3.0%	3.7%	8.3%	36.5%	4.8%	1.6%	2.3%	5.4%	4.6%	4.7%	1.3%	1.5%	14.9%
Sector 11	SE Suburb	9.0%	10.9%	5.4%	3.9%	4.5%	19.5%	12.0%	4.8%	3.6%	3.7%	39.0%	10.5%	4.1%	6.8%	1.7%	2.4%	13.2%	1.6%	1.7%
Sector 12	SW Suburb	11.1%	18.9%	8.2%	4.8%	2.9%	6.2%	26.0%	7.3%	6.9%	2.5%	10.8%	52.2%	6.1%	3.4%	3.0%	1.7%	8.7%	2.9%	1.9%
Sector 13	West Suburb	6.4%	7.3%	5.9%	4.9%	2.6%	3.4%	5.5%	22.0%	9.2%	2.2%	4.2%	5.5%	48.1%	1.4%	4.0%	1.0%	2.3%	4.2%	1.9%
Sector 14	Sherwood Park	7.0%	3.5%	5.1%	4.1%	4.6%	6.6%	3.3%	2.3%	3.2%	6.5%	5.6%	2.1%	1.5%	52.8%	1.8%	15.1%	1.7%	0.9%	2.6%
Sector 15	St. Albert	7.0%	2.9%	4.8%	5.1%	3.0%	2.2%	1.8%	4.4%	11.2%	3.7%	1.7%	1.6%	3.9%	1.3%	52.6%	1.4%	1.0%	2.1%	5.5%
Sector 16	Strathcona County	2.0%	1.2%	1.5%	1.7%	1.9%	2.0%	1.1%	0.7%	1.0%	6.6%	1.9%	0.7%	0.5%	12.0%	0.8%	63.1%	0.5%	0.2%	2.7%
Sector 17	Leduc County	2.3%	2.4%	2.1%	1.1%	0.9%	2.2%	3.4%	1.7%	1.3%	0.8%	6.2%	6.9%	1.9%	1.6%	0.6%	0.6%	62.5%	1.3%	0.4%
Sector 18	Parkland County	3.7%	3.6%	4.1%	4.2%	2.1%	1.8%	2.8%	3.3%	8.2%	1.9%	2.1%	2.8%	4.9%	0.8%	4.1%	0.5%	1.6%	75.8%	1.4%
Sector 19	Sturgeon County	1.6%	1.2%	2.1%	3.0%	2.4%	0.9%	0.6%	1.4%	4.0%	6.6%	0.6%	0.4%	1.2%	1.3%	8.0%	3.0%	0.2%	1.1%	51.8%

Table P12: 2044 PM Peak Period (Percentage for Destination Trips)

		DESTINATION SECTOR																	
ORIGIN SECTOR		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County
Sector 1	CBD	18.5%	6.3%	11.2%	5.4%	4.0%	6.8%	4.8%	5.6%	2.6%	2.1%	2.2%	3.1%	3.1%	2.8%	2.8%	1.1%	0.6%	0.8%	0.9%
Sector 2	University	4.4%	14.4%	3.2%	2.7%	1.5%	4.4%	7.5%	3.3%	2.0%	0.9%	1.9%	4.3%	2.3%	1.0%	0.8%	0.5%	0.7%	0.9%	0.6%
Sector 3	CBD Fringe	12.7%	6.1%	22.3%	8.6%	5.7%	5.1%	3.2%	5.4%	3.7%	2.8%	1.5%	1.9%	2.5%	1.9%	2.1%	0.9%	0.8%	1.5%	1.8%
Sector 4	NW Inner	8.2%	4.5%	10.3%	21.0%	9.1%	4.1%	2.0%	5.3%	9.6%	5.2%	1.4%	1.4%	2.6%	2.2%	3.1%	1.1%	0.5%	1.9%	3.3%
Sector 5	NE Inner	6.5%	4.3%	6.5%	9.6%	24.3%	5.4%	1.6%	2.2%	6.0%	14.5%	1.5%	0.9%	1.5%	2.9%	2.1%	1.8%	0.5%	1.1%	3.9%
Sector 6	SE Inner	6.5%	7.5%	4.8%	3.4%	4.7%	22.6%	3.8%	2.0%	2.0%	2.9%	5.6%	1.8%	1.4%	3.4%	0.9%	1.2%	1.2%	0.7%	0.8%
Sector 7	SW Inner	5.7%	13.6%	4.4%	2.1%	1.8%	5.7%	27.2%	3.1%	1.5%	1.1%	5.9%	9.9%	2.7%	2.0%	1.0%	0.9%	2.2%	1.2%	0.6%
Sector 8	West Inner	4.8%	3.1%	4.7%	3.7%	1.6%	1.5%	2.1%	22.0%	4.4%	1.1%	1.0%	1.9%	10.7%	0.7%	2.2%	0.4%	0.7%	2.0%	1.2%
Sector 9	NW Suburb	7.0%	6.5%	9.4%	18.5%	10.7%	5.4%	3.7%	14.3%	35.6%	9.8%	3.1%	5.1%	12.4%	3.8%	16.0%	2.0%	1.7%	9.9%	12.7%
Sector 10	NE Suburb	3.3%	2.8%	3.4%	6.4%	18.1%	3.3%	1.1%	1.6%	6.7%	37.8%	1.6%	1.0%	1.5%	4.7%	3.3%	7.0%	0.6%	1.3%	11.5%
Sector 11	SE Suburb	7.0%	13.1%	6.5%	6.3%	6.9%	23.9%	18.0%	6.1%	4.6%	6.6%	56.2%	16.0%	6.7%	10.3%	2.8%	5.1%	14.7%	3.2%	2.3%
Sector 12	SW Suburb	3.5%	8.1%	2.8%	1.6%	1.0%	2.8%	16.3%	3.6%	1.9%	0.9%	7.7%	41.4%	4.4%	1.7%	1.2%	0.8%	6.1%	1.7%	0.7%
Sector 13	West Suburb	4.0%	3.4%	3.5%	3.0%	1.6%	1.5%	2.9%	18.6%	6.5%	1.4%	1.6%	3.2%	39.8%	0.8%	3.3%	0.5%	1.4%	4.7%	1.8%
Sector 14	Sherwood Park	1.8%	1.4%	1.8%	1.7%	2.8%	4.0%	1.6%	0.9%	1.3%	3.3%	2.8%	1.2%	0.7%	51.9%	0.8%	13.2%	1.0%	0.4%	1.1%
Sector 15	St. Albert	1.3%	1.2%	2.0%	3.1%	1.8%	0.9%	0.7%	2.6%	6.6%	2.3%	0.5%	1.0%	2.7%	0.7%	51.2%	0.6%	0.3%	2.1%	10.5%
Sector 16	Strathcona County	0.7%	0.4%	0.5%	0.6%	0.9%	0.6%	0.4%	0.3%	0.7%	1.9%	0.6%	0.3%	0.3%	7.1%	0.5%	60.3%	0.3%	0.2%	2.1%
Sector 17	Leduc County	2.0%	1.7%	1.1%	0.6%	0.6%	1.3%	2.1%	1.1%	0.7%	0.7%	4.0%	4.3%	1.5%	1.0%	0.6%	0.6%	65.9%	1.2%	0.3%
Sector 18	Parkland County	1.4%	1.1%	1.0%	1.0%	0.6%	0.5%	0.8%	1.5%	2.1%	0.6%	0.5%	0.9%	2.6%	0.3%	1.2%	0.1%	0.8%	64.7%	1.2%
Sector 19	Sturgeon County	0.8%	0.5%	0.7%	0.9%	2.3%	0.4%	0.2%	0.5%	1.6%	4.1%	0.3%	0.3%	0.6%	0.9%	4.2%	2.0%	0.1%	0.5%	42.7%

Table S5: 2044 Daily (Percentage for Origin Trips)

ORIGIN SECTOR		DESTINATION SECTOR																		
		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County	Sum
Sector 1	CBD	10.4%	2.9%	13.6%	8.7%	7.3%	7.5%	7.0%	5.2%	5.9%	3.9%	8.0%	5.1%	5.4%	3.6%	2.7%	0.6%	0.7%	0.8%	0.6%	100.0%
Sector 2	University	3.5%	9.0%	5.0%	5.0%	3.6%	7.6%	16.2%	4.7%	5.7%	2.5%	11.2%	12.0%	6.2%	2.2%	1.8%	0.5%	1.3%	1.5%	0.6%	100.0%
Sector 3	CBD Fringe	6.3%	2.3%	22.1%	12.1%	8.6%	5.2%	4.5%	5.3%	8.0%	4.6%	5.5%	3.4%	4.5%	2.1%	2.4%	0.5%	0.7%	1.1%	0.8%	100.0%
Sector 4	NW Inner	3.7%	1.8%	7.8%	23.6%	11.0%	3.3%	2.2%	4.2%	16.6%	7.2%	4.1%	1.9%	3.5%	2.1%	3.3%	0.6%	0.4%	1.3%	1.4%	100.0%
Sector 5	NE Inner	2.7%	1.3%	4.7%	9.8%	27.9%	4.3%	1.7%	1.7%	9.2%	20.5%	4.7%	1.2%	1.8%	2.8%	1.9%	0.9%	0.4%	0.6%	1.9%	100.0%
Sector 6	SE Inner	4.2%	3.4%	4.7%	4.2%	6.8%	25.0%	5.6%	2.0%	3.5%	4.5%	21.7%	3.3%	2.3%	4.6%	1.0%	0.7%	1.4%	0.5%	0.4%	100.0%
Sector 7	SW Inner	2.7%	4.6%	3.2%	2.3%	1.9%	4.5%	30.0%	2.2%	2.8%	1.2%	17.3%	18.0%	3.4%	2.0%	0.7%	0.4%	1.7%	0.8%	0.2%	100.0%
Sector 8	West Inner	3.3%	2.0%	5.1%	5.7%	2.4%	1.9%	3.2%	24.5%	11.6%	1.7%	4.4%	4.2%	22.8%	0.9%	2.9%	0.3%	0.8%	1.8%	0.6%	100.0%
Sector 9	NW Suburb	1.6%	1.2%	3.3%	10.3%	6.4%	1.9%	1.6%	5.3%	31.2%	6.7%	3.4%	2.7%	8.5%	1.7%	7.4%	0.5%	0.5%	3.3%	2.5%	100.0%
Sector 10	NE Suburb	1.4%	0.8%	2.2%	5.4%	16.6%	2.4%	0.9%	1.0%	8.3%	42.1%	4.1%	0.8%	1.3%	3.3%	2.2%	2.3%	0.4%	0.6%	3.9%	100.0%
Sector 11	SE Suburb	1.2%	1.4%	1.3%	1.5%	2.0%	6.1%	6.2%	1.2%	1.7%	2.0%	54.8%	8.3%	2.3%	3.3%	0.5%	0.8%	4.5%	0.6%	0.2%	100.0%
Sector 12	SW Suburb	1.8%	2.7%	1.8%	1.3%	0.8%	1.6%	11.7%	1.9%	3.0%	0.7%	15.1%	47.2%	3.7%	1.1%	0.7%	0.3%	3.6%	0.8%	0.2%	100.0%
Sector 13	West Suburb	1.8%	1.4%	2.3%	2.6%	1.3%	1.2%	2.6%	11.5%	9.8%	1.3%	4.6%	4.6%	47.4%	0.6%	2.5%	0.2%	1.0%	2.8%	0.6%	100.0%
Sector 14	Sherwood Park	1.4%	0.6%	1.4%	1.6%	2.6%	2.9%	1.4%	0.6%	2.1%	4.0%	7.2%	1.2%	0.8%	62.9%	0.6%	7.1%	0.7%	0.2%	0.5%	100.0%
Sector 15	St. Albert	1.5%	0.6%	1.7%	3.2%	1.9%	0.8%	0.7%	2.0%	11.6%	2.7%	1.5%	1.1%	3.5%	0.6%	60.5%	0.3%	0.3%	1.3%	4.2%	100.0%
Sector 16	Strathcona County	0.7%	0.3%	0.7%	0.9%	1.4%	0.9%	0.7%	0.3%	1.4%	4.9%	3.4%	0.7%	0.5%	13.4%	0.6%	67.5%	0.4%	0.1%	1.3%	100.0%
Sector 17	Leduc County	0.8%	0.6%	0.8%	0.5%	0.5%	1.0%	2.1%	0.7%	1.1%	0.6%	12.2%	6.4%	1.6%	0.9%	0.3%	0.3%	68.8%	0.8%	0.1%	100.0%
Sector 18	Parkland County	0.9%	0.6%	1.1%	1.3%	0.8%	0.5%	1.0%	1.3%	5.5%	0.8%	2.0%	1.6%	4.0%	0.3%	1.5%	0.1%	0.8%	75.6%	0.5%	100.0%
Sector 19	Sturgeon County	1.0%	0.5%	1.5%	2.6%	4.0%	0.7%	0.5%	1.0%	7.3%	10.6%	1.4%	0.7%	1.8%	1.8%	11.6%	2.8%	0.2%	1.0%	49.0%	100.0%

Table S6: 2044 Daily (Percentage for Destination Trips)

ORIGIN SECTOR		DESTINATION SECTOR																	
		Sector 1 CBD	Sector 2 University	Sector 3 CBD Fringe	Sector 4 NW Inner	Sector 5 NE Inner	Sector 6 SE Inner	Sector 7 SW Inner	Sector 8 West Inner	Sector 9 NW Suburb	Sector 10 NE Suburb	Sector 11 SE Suburb	Sector 12 SW Suburb	Sector 13 West Suburb	Sector 14 *Sherwood Park*	Sector 15 St. Albert	Sector 16 Strathcona County	Sector 17 Leduc County	Sector 18 Parkland County	Sector 19 Sturgeon County
Sector 1	CBD	11.9%	4.3%	9.8%	4.5%	3.4%	5.1%	3.6%	3.7%	1.9%	1.5%	1.5%	1.6%	2.0%	1.5%	1.3%	0.5%	0.4%	0.4%	0.6%
Sector 2	University	2.9%	9.7%	2.6%	1.8%	1.2%	3.7%	5.9%	2.4%	1.3%	0.7%	1.5%	2.7%	1.7%	0.6%	0.6%	0.3%	0.5%	0.5%	0.4%
Sector 3	CBD Fringe	9.7%	4.7%	21.6%	8.5%	5.4%	4.8%	3.1%	5.1%	3.5%	2.4%	1.4%	1.5%	2.3%	1.2%	1.5%	0.5%	0.5%	0.7%	1.2%
Sector 4	NW Inner	7.7%	5.1%	10.4%	22.4%	9.5%	4.1%	2.0%	5.6%	9.7%	5.1%	1.4%	1.1%	2.4%	1.6%	2.8%	0.8%	0.4%	1.2%	2.7%
Sector 5	NE Inner	6.5%	4.0%	7.0%	10.5%	26.9%	6.0%	1.8%	2.5%	6.1%	16.2%	1.8%	0.8%	1.4%	2.4%	1.9%	1.4%	0.4%	0.7%	4.2%
Sector 6	SE Inner	6.8%	7.1%	4.8%	3.0%	4.5%	23.9%	4.0%	2.0%	1.6%	2.4%	5.7%	1.5%	1.2%	2.7%	0.7%	0.7%	1.0%	0.4%	0.6%
Sector 7	SW Inner	5.6%	12.8%	4.2%	2.1%	1.7%	5.6%	27.9%	2.9%	1.6%	0.8%	5.9%	10.5%	2.3%	1.5%	0.6%	0.6%	1.6%	0.8%	0.4%
Sector 8	West Inner	5.2%	4.1%	5.0%	4.0%	1.5%	1.7%	2.2%	24.0%	5.0%	0.9%	1.1%	1.9%	11.7%	0.5%	1.8%	0.3%	0.6%	1.2%	0.9%
Sector 9	NW Suburb	5.8%	5.7%	7.4%	16.7%	9.3%	4.0%	2.5%	11.8%	31.3%	8.1%	2.0%	2.7%	10.1%	2.2%	10.7%	1.3%	0.8%	5.3%	8.4%
Sector 10	NE Suburb	4.3%	3.0%	4.1%	7.2%	20.3%	4.2%	1.2%	1.9%	7.0%	42.2%	2.0%	0.7%	1.3%	3.6%	2.7%	4.6%	0.5%	0.8%	11.0%
Sector 11	SE Suburb	7.4%	11.4%	5.1%	4.0%	4.8%	21.8%	16.5%	4.5%	2.9%	4.1%	53.9%	14.0%	4.6%	7.3%	1.3%	3.0%	12.1%	1.5%	1.4%
Sector 12	SW Suburb	7.0%	13.3%	4.2%	2.2%	1.2%	3.7%	19.5%	4.4%	3.2%	0.9%	9.3%	49.7%	4.6%	1.5%	1.1%	0.7%	6.1%	1.4%	0.7%
Sector 13	West Suburb	5.2%	5.4%	4.2%	3.4%	1.5%	2.0%	3.4%	21.1%	8.0%	1.2%	2.2%	3.7%	45.5%	0.7%	3.0%	0.4%	1.3%	3.6%	1.6%
Sector 14	Sherwood Park	3.9%	2.3%	2.5%	2.0%	2.9%	4.8%	1.8%	1.0%	1.7%	3.7%	3.3%	1.0%	0.7%	63.0%	0.6%	12.9%	0.9%	0.3%	1.2%
Sector 15	St. Albert	3.7%	1.9%	2.8%	3.7%	2.0%	1.1%	0.8%	3.2%	8.2%	2.3%	0.6%	0.8%	2.9%	0.5%	62.1%	0.6%	0.3%	1.5%	9.9%
Sector 16	Strathcona County	1.2%	0.7%	0.7%	0.6%	0.9%	0.8%	0.5%	0.3%	0.6%	2.5%	0.8%	0.3%	0.2%	7.5%	0.4%	68.7%	0.3%	0.1%	1.9%
Sector 17	Leduc County	1.9%	1.8%	1.2%	0.5%	0.4%	1.4%	2.2%	1.0%	0.7%	0.4%	4.6%	4.1%	1.2%	0.8%	0.3%	0.4%	71.3%	0.9%	0.2%
Sector 18	Parkland County	2.2%	2.0%	1.6%	1.4%	0.7%	0.7%	1.0%	1.9%	3.6%	0.6%	0.8%	1.0%	3.1%	0.3%	1.4%	0.1%	0.8%	78.3%	1.1%
Sector 19	Sturgeon County	1.1%	0.7%	1.0%	1.3%	1.8%	0.4%	0.2%	0.7%	2.3%	3.9%	0.3%	0.2%	0.7%	0.7%	5.2%	2.1%	0.1%	0.5%	51.4%

APPENDIX H

Utility Plans

PLOTTED: 2/20/2015 $TIME$

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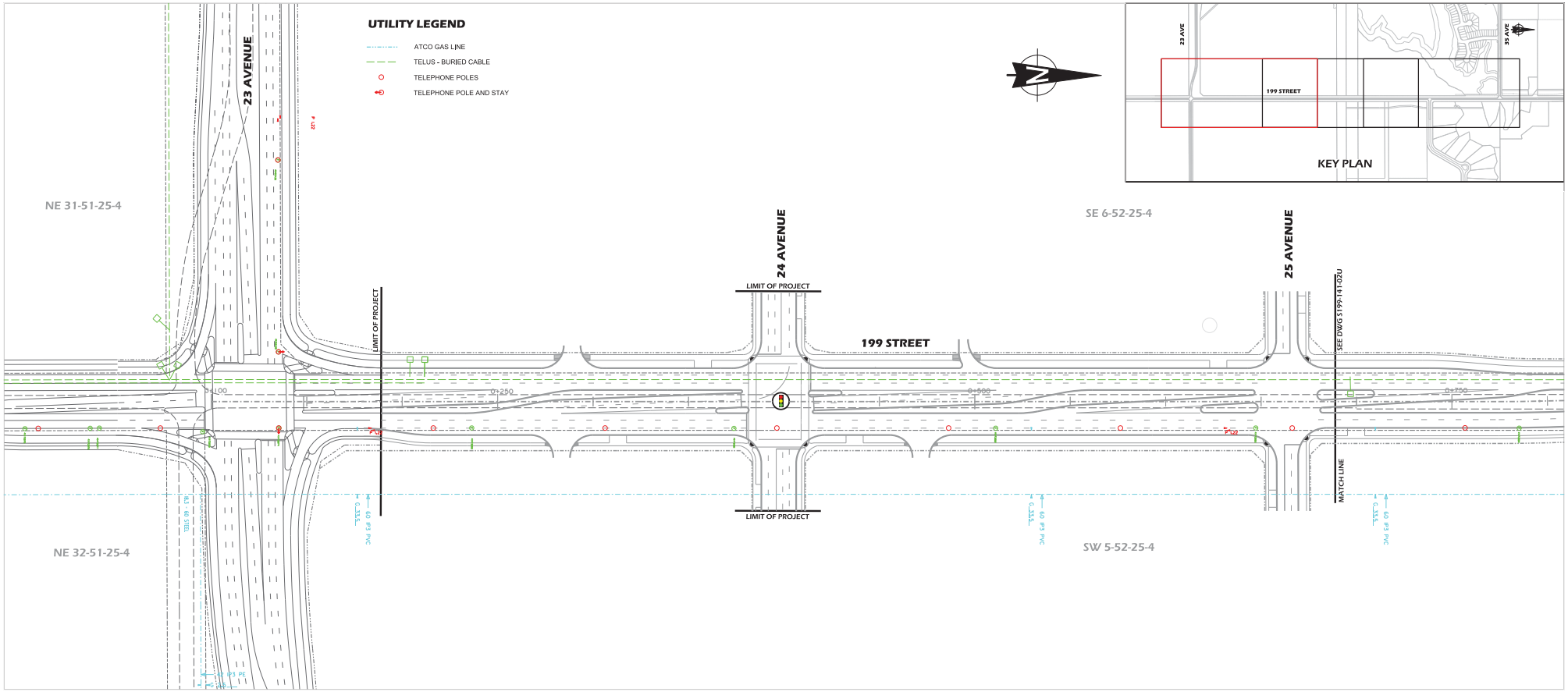

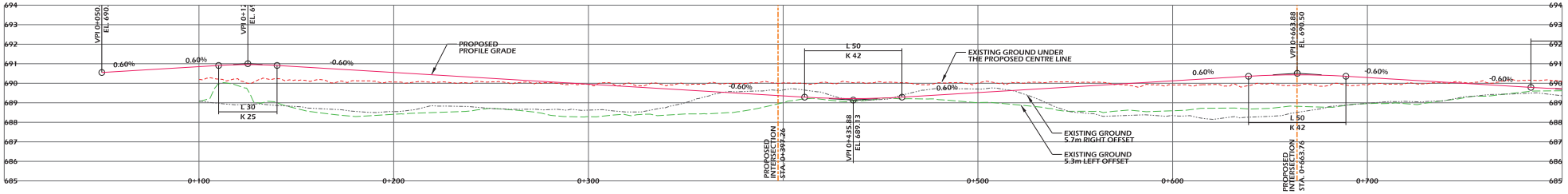

CIMA

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VERTICAL 0 2.5 5.0m

DESIGN SPEED = 70 km/h
POSTED SPEED =60 km/h

PERMIT TO PRACTICE P8204

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
23 AVENUE TO 25 AVENUE

The City of Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-01U

PLOTTED: 2/20/2015 $TIME$

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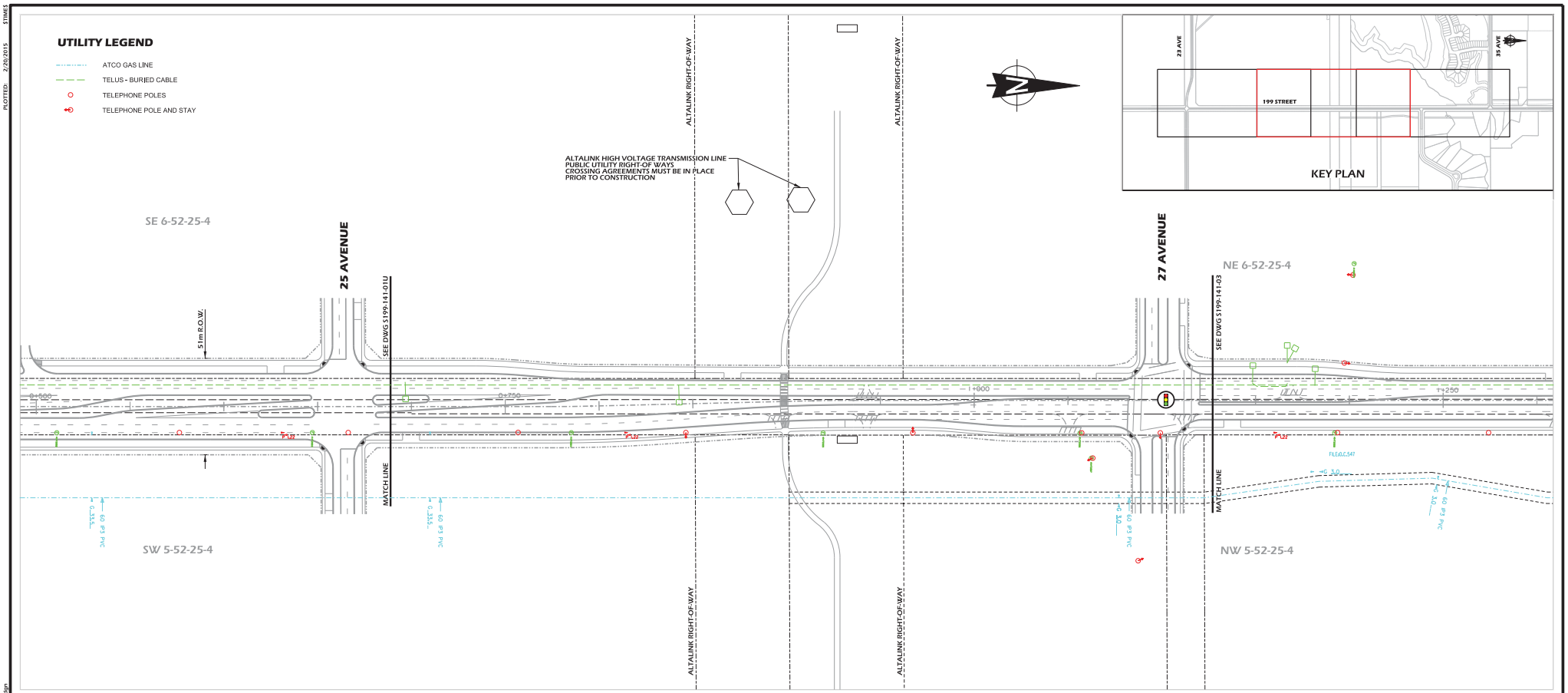

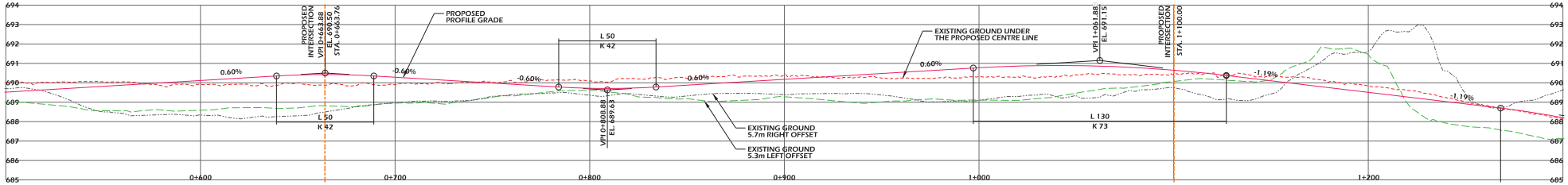

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POSTED SPEED =60 km/h

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
25 AVENUE TO 27 AVENUE

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

PERMIT TO PRACTICE P8204

City of Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-02U

PLOTTED: 2/20/2015 $TIME$

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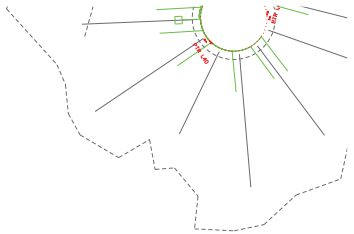
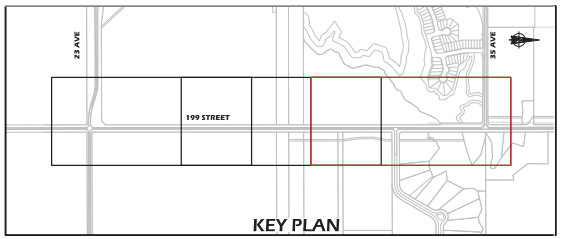
UTILITY LEGEND

- ATCO GAS LINE
- TELUS - BURIED CABLE
- TELEPHONE POLES
- TELEPHONE POLE AND STAY





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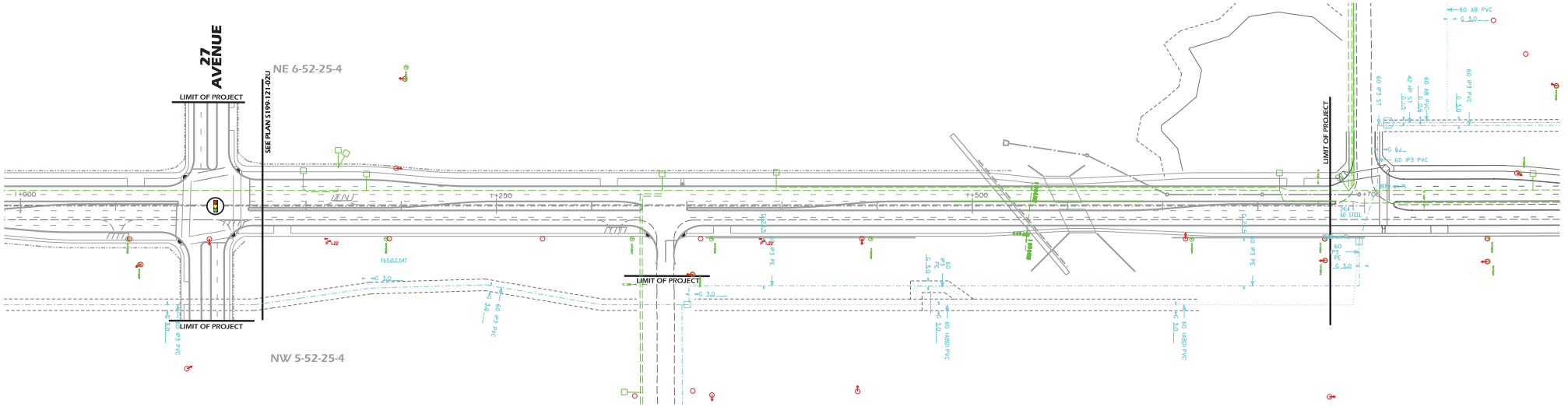

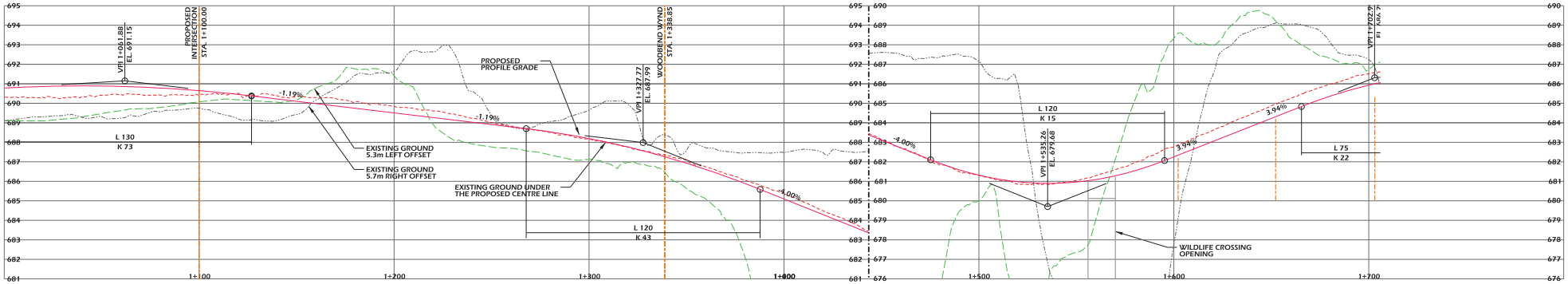

HORIZONTAL 0 25 50m
VERTICAL 0 2.5 5.0m

DESIGN SPEED = 70 km/h
POSTED SPEED =60 km/h

CONCEPT - SUBJECT TO PRELIMINARY SURVEY AND DESIGN

199 STREET
27 AVENUE TO 35 AVENUE

Manager, Transportation Planning Branch

Director, Facility & Capital Planning

Director, Development Planning & Engineering

PERMIT TO PRACTICE P8204

CIMA

City of Edmonton TRANSPORTATION SERVICES

DRAWN: BC
REVIEWED: TW
DATE: FEB 2015

PLAN NO. S199-141-03U

APPENDIX I

Environmental Noise Impact Assessment

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Edmonton, Alberta, Canada T6M 0A8
Phone: (780) 414-6373
www.aciacoustical.com

Environmental Noise Impact Assessment
For The

Riverview Developments
In
Southwest Edmonton

Prepared for:
Riverview Ownership Group
c/o Qualico Communities

INSERT STAMP HERE

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aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGGA Permit to Practice #P7735

aci Project #: 14-049
July 24, 2014

Executive Summary

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Riverview Ownership Group to conduct an environmental noise impact assessment (NIA) for the Riverview Residential Development Neighbourhoods 1, 2 & 3 (the Developments) in southwest Edmonton. The purpose of the work was to generate a computer noise model of the Developments with the use of elevation contours, road alignments, and future traffic data to determine the noise levels for residential receptors most impacted by Anthony Henday Drive (AHD), 23 Avenue NW, 199 Street NW, Riverview Way, Quadrant Avenue & 215 Street NW. This was then used to determine the noise attenuation measures required to meet the criteria of the City of Edmonton Urban Traffic Noise Policy (UTNP), C506A.

The results of the Future Case modeling for Neighbourhood 1 indicated noise levels ranging from 61.7 - 70.8 dBA $L_{eq}24$[1]. Neighbourhood 2 indicated noise levels ranging from 57.6 – 67.8 dBA $L_{eq}24$ while Neighbourhood 3 indicated noise levels ranging from 54.6 – 69.8 dBA $L_{eq}24$. As a result, noise mitigation measures were investigated for residential receptor locations above 65 dBA $L_{eq}24$ to lower the noise levels to below the requirements the UTNP C506A criteria.

The results of the Future Case noise modeling *with* mitigation for all 3 neighbourhoods (for residential backyard spaces that initially exceeded 65 dBA) indicated noise levels below the UTNP C506A criteria of 65 dBA $L_{eq}24$. A variety of barrier heights were implemented within the model to achieve the projected noise levels.

[1] The term L_{eq} represents the energy equivalent sound level. This is a measure of the equivalent sound level for a specified period of time accounting for fluctuations.

Table of Contents

List of Tables

List of Figures

1.0 Introduction

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Riverview Ownership Group to conduct an environmental noise impact assessment (NIA) for the Riverview Residential Development Neighbourhoods 1, 2 & 3 (the Developments) in southwest Edmonton. The purpose of the work was to generate a computer noise model of the Developments with the use of elevation contours, road alignments, and future traffic data to determine the noise levels for residential receptors most impacted by Anthony Henday Drive (AHD), 23 Avenue NW, 199 Street NW, Riverview Way, Quadrant Avenue & 215 Street NW. This was then used to determine the noise attenuation measures required to meet the criteria of the City of Edmonton Urban Traffic Noise Policy (UTNP), C506A.

2.0 Location Description

The proposed Developments are located in the Riverview area in southwest Edmonton. The residential developments included in this study are Neighbourhoods 1, 2 & 3 as shown in Figure 1. The land uses within the Developments will vary from single and multi-family dwellings to community commercial, schools/parks, Storm Water Management Facilities (SWMF), etc.

Neighbourhood 1 (NBHD 1) is bounded on the west by 215 Street NW, on the north by Wedgewood Creek, on the northeast & east by AHD and on the south by 23 Avenue NW. The most impacted residents within this neighborhood are those directly backing onto 23 Avenue NW, 199 Street NW and 215 Street NW. Neighbourhood 2 (NBHD 2) is bounded on the west by 215 Street NW, on the north by 23 Avenue NW, on the east by 199 Street NW and on the south by 199 Street NW/Quadrant Avenue. The most impacted residents within this neighbourhood are those adjacent to the major arterial roadways. Neighbourhood 3 (NBHD 3) is bounded on the west by 199 Street NW, on the north by 23 Avenue NW and AHD, on the east by AHD and the North Saskatchewan River Valley (NSRV) and on the south by future residential developments and the NSRV. The most impacted residents within this neighborhood are those adjacent to the major arterial roadways and backing onto AHD.

Topographically the land in the Riverview area is relatively flat with a gentle slope from the southwest to the north towards the Wedgewood Creek Ravine, to the northeast towards AHD, to the east and south to the NSRV. Presently, the land is not covered with any type of significant vegetation and, once the development is in place, much of the land will be comprised of roads, structures, etc.

3.0 Modeling Methods

3.1. Computer Noise Modeling

The computer noise modeling was conducted using the CADNA/A (version 4.4.145) software package. CADNA/A allows for the modeling of various noise sources such as road, rail, and various stationary sources. In addition, topographical features such as land contours, vegetation, and bodies of water can be included. Finally, meteorological conditions such as temperature, relative humidity, wind-speed and wind-direction can be included in the calculations.

The calculation method used for noise propagation follows the ISO standard 9613-2. All receiver locations were assumed as being downwind from the source(s). In particular, as stated in Section 5 of the ISO document:

> *"Downwind propagation conditions for the method specified in this part of IS0 9613 are as specified in 5.4.3.3 of IS0 1996-2:1987, namely*
>
> - *wind direction within an angle of ± 45^0 of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from source to receiver, and*
> - *wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground.*
>
> *The equations for calculating the average downwind sound pressure level LAT(DW) in this part of IS0 9613, including the equations for attenuation given in clause 7, are the average for meteorological conditions within these limits. The term average here means the average over a short time interval, as defined in 3.1.*
>
> *These equations also hold, equivalently, for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights".*

Due to the relatively short distances from the roads to the nearest residential structures and the minimal amount of vegetation, vegetative sound absorption was not included within the Developments. Field grasses were added outside of the Developments where appropriate to match existing conditions. Therefore, all sound level propagation calculations are considered conservatively representative of summertime conditions for all surrounding residents.

Buildings were included in the model, however, only the first rows of perimeter houses were considered. In general, these houses have the highest potential for providing shielding for the remainder of the

houses further in. The exact dimensions and locations of these future structures were not known, so approximate dimensions were used.

Receptors were placed in areas indicated as Single/Semi-Detached or Low Rise / Medium Density Housing as these areas are most likely to have private backyard spaces. However, unlike the Single/Semi-Detached lots, buildings were not included for the Low Rise / Medium Density areas due to their various potential configurations. This results in conservative noise estimates.

Digital topographical information representing existing elevation contours for the Developments was provided by Keltek for use in the noise model while the proposed elevation contours for AHD were provided by Alberta Transportation.

Traffic data for the Developments was taken from the report entitled, "*Riverview Neighbourhoods 1, 2 &3 Neighbourhood Structure Plans Transportation Impact Assessment*, prepared by Bunt & Associates (May 30, 2014)[1]". Traffic data for AHD was obtained from the report entitled, "*Environmental Noise Study for Southwest Anthony Henday Drive in Edmonton, AB,* Prepared for AECOM, by aci Acoustical Consultants Inc., December 2013".

As part of the study, two noise modeling scenarios were conducted, including:

1) Future Case: This included the future conditions with the proposed Developments and future traffic volumes (representative of year 2047[2]) along 23 Avenue NW, 199 Street NW, 215 Street NW, Quadrant Avenue and Riverview Way in addition to the other internal collector roads. Traffic volumes for AHD were representative of year 2024[3].
2) Future Case With Mitigation: This included all conditions associated with the Future Case along with the mitigation required to achieve the maximum noise levels of 65 dBA $L_{eq}24$, as specified in the UTNP C506A.

[1] To be referenced in this report as TIA.
[2] Traffic data provided by Bunt & Associates in the report. The timeframe of 2047 exceeds the 20 year horizon as per UTNP C506A, resulting in a slightly more conservative estimate.
[3] 10 year data for AHD was the only available data by Alberta Transportation.

The computer noise modeling results were calculated in two ways. First, sound levels were calculated at specific receptor locations (i.e. typical residential outdoor amenity spaces). This was done at a height of 1.5 m (from the ground) and at an offset from the back property line of 5 m for all locations. The projected noise levels at the receptor locations provide a more representative indication of the typical noise levels experienced by residents in their private backyard spaces (i.e. not directly adjacent to the rear property line). In addition, the use of specific receptor locations allows for a better evaluation of the anticipated performance of any noise mitigation measures (i.e. the reduction in noise levels).

Secondly, color noise contours were calculated using a 5 m x 5 m grid over the entire study area at a height of 1.5 m. The color noise contours are used to determine if and where noise mitigation is required as they illustrate the projected noise levels within the entire residential private back yard spaces. They are then used once mitigation is in place in order to ensure that all areas within the residential private back yard spaces are below the applicable criteria.

Refer to Appendix I for a list of the noise modeling parameters.

3.2. Modeling Confidence

The algorithms used for the noise modeling follow the ISO 9613 standard. The published accuracy for this standard is ±3 dBA between 100 m – 1,000 m. Accuracy levels beyond 1,000 m are not published. Experience based on similar noise models conducted over large distances shows that, as expected, as the distance increases, the associated accuracy in prediction decreases. Experience has shown that environmental factors such as wind, temperature inversions, topography and ground cover all have increasing effects over distances larger than approximately 1,500 m. As such, since all receptors are within approximately 1,500 m of the various noise sources, the prediction confidence is considered high.

4.0 Permissible Sound Levels

Environmental noise levels from roads are commonly described in terms of equivalent sound levels or L_{eq}. This is the level of a steady sound having the same acoustic energy, over a given time period, as the fluctuating sound. In addition, this energy averaged level is A–weighted to account for the reduced sensitivity of average human hearing to low frequency sounds. These L_{eq} in dBA, which are the most common environmental noise measure, are often given for day-time (07:00 to 22:00) L_{eq}Day and night-time (22:00 to 07:00) L_{eq}Night while other criteria use the entire 24-hour period as L_{eq}24. Refer to Appendix II for a description of the acoustical terminology and Appendix III for a list of common noise sources.

The criteria used to evaluate the road noise in the study area include the City of Edmonton Urban Traffic Noise Policy (UTNP), C506A. The UTNP is applicable to residential land use adjacent to major transportation facilities such as arterial roadways, light rail transit and future high speed transit facilities. The UTNP accounts for "background" transportation noise only and does not deal with non-typical events such as loud mufflers, stereos, etc. These are dealt with under the City of Edmonton Community Standards Bylaw C14600. The following is taken directly from the UTNP:

1) A 20-year[1] time horizon for traffic volume projections (AAWDT volumes) is used to predict future noise levels adjacent to new developments and new or upgraded transportation facilities.

2) The City of Edmonton will seek to ensure that no new residential development less than three storeys will be allowed adjacent to transportation facilities (arterial roadways, light rail transit) unless the developer proves to the satisfaction of the City that the projected noise level in the private back yards of residences abutting the transportation facility will not exceed 65 dBA Leq24. Construction of any noise attenuation measures necessary to achieve this threshold will be funded and undertaken by the developer of the adjacent property, unless specific site characteristics, such as topography or existing land uses, necessitate the consideration of relief from the requirement. Under these circumstances, the attenuated noise level in the abutting private back yards should be the lowest level technically and economically practicable.

In summary, the UTNP requires a maximum sound level of 65 dBA L_{eq}24 in the private back yards of residences abutting transportation facilities. As such, the **permissible sound level (PSL) for the area is 65 dBA L_{eq}24.**

[1] 33 year data was used for traffic volumes within the Developments which resulted in conservative estimates. Again, 10 year data for AHD was the only available data by Alberta Transportation.

5.0 Results and Discussion

5.1. Future Case

The results of the Future Case noise modeling at the various private residential backyard spaces within the Developments are shown in Tables 1a – 1e and illustrated in Figures 2a – 2g. As mentioned previously, the noise mitigation requirements were based on the color noise contours provided in Figures 2a – 2g and not on the values found within the tables. Therefore, noise mitigation could still potentially be recommended for areas in which the $L_{eq}24$ values found within the tables are below 65 dBA $L_{eq}24$.

5.1.1. Neighbourhood 1 Residential Development

The results of the Future Case modeling for NBHD 1 indicate noise levels ranging from 61.7 – 70.8 dBA $L_{eq}24$, as indicated in Table 1a. As a results noise mitigation will be required for certain residents within NBHD 1 to reduce the noise levels to below the requirements of the City of Edmonton UTNP C506A.

Table 1a. Future Case Noise Modeling Results (Neighbourhood 1)

Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N1-001	69.1	70.7	63.4	N1-033	67.0	68.5	61.2
N1-002	70.6	72.2	64.8	N1-034	65.5	67.1	59.8
N1-003	70.7	72.3	64.9	N1-035	66.2	67.8	60.5
N1-004	70.8	72.4	65.1	N1-036	65.5	67.1	59.8
N1-005	70.8	72.4	65.0	N1-037	66.4	68.0	60.7
N1-006	64.8	66.4	58.8	N1-038	66.1	67.7	60.4
N1-007	62.5	64.1	56.4	N1-039	66.8	68.4	61.0
N1-008	62.8	64.5	56.7	N1-040	66.2	67.8	60.5
N1-009	63.2	64.8	57.1	N1-041	66.6	68.2	60.9
N1-010	63.7	65.3	57.6	N1-042	66.3	67.9	60.6
N1-011	63.8	65.5	57.7	N1-043	67.1	68.7	61.3
N1-012	64.0	65.6	57.9	N1-044	66.8	68.4	61.1
N1-013	63.9	65.6	57.8	N1-045	67.2	68.8	61.5
N1-014	64.0	65.6	57.8	N1-046	67.4	69.0	61.7
N1-015	63.8	65.4	57.7	N1-047	67.4	69.0	61.7
N1-016	63.9	65.6	57.8	N1-048	66.6	68.2	60.9
N1-017	63.9	65.5	57.8	N1-049	66.7	68.3	61.0
N1-018	63.6	65.2	57.4	N1-050	66.6	68.2	60.8
N1-019	62.3	64.0	56.2	N1-051	66.8	68.3	61.0
N1-020	61.7	63.3	55.6	N1-052	66.5	68.1	60.8
N1-021	61.9	63.5	55.8	N1-053	66.8	68.4	61.1
N1-022	62.4	64.0	56.3	N1-054	66.7	68.3	61.0
N1-023	65.7	67.3	59.7	N1-055	67.9	69.5	61.8
N1-024	65.9	67.5	60.2	N1-056	68.0	69.7	61.9
N1-025	65.5	67.0	59.7	N1-057	67.9	69.5	61.8
N1-026	66.2	67.8	60.4	N1-058	68.1	69.7	62.0
N1-027	65.2	66.8	59.5	N1-059	68.1	69.7	62.0
N1-028	65.9	67.5	60.1	N1-060	68.4	70.0	62.3
N1-029	65.2	66.8	59.5	N1-061	69.2	70.8	63.1
N1-030	66.8	68.4	61.1	N1-062	68.5	70.2	62.4
N1-031	65.3	66.9	59.6	N1-063	68.8	70.4	62.7
N1-032	65.9	67.5	60.1				

5.1.1.1. 215 Street NW, north of 23 Avenue NW (N1-001 to N1-005)

The noise levels are relatively consistent for all residents backing directly onto 215 Street NW range from 69.1 – 70.8 dBA. The noise levels for these receptors are the highest for NBHD 1 which was anticipated due to the traffic volumes along this road and due to expanding it to a six-lane divided arterial truck route in the future. Based on the results of the noise model, noise mitigation will be required for *all* receptors within this area.

5.1.1.2. 23 Avenue NW, between 215 Street NW and 199 Street NW (N1-006 to N1-023)

The noise levels for receptor locations backing onto 23 Avenue NW between 215 Street NW and 199 Street NW vary more significantly than other areas within NBHD 1 and range from 61.7 - 65.7 dBA. The variance in noise levels can be attributed to the distance between the residential back yards and 23 Avenue NW in addition to variances in traffic volumes along 23 Avenue NW. Based on the results of the noise model, noise mitigation will be required for *certain* receptors within this area.

5.1.1.3. 199 Street NW, north of 23 Avenue NW (N1-024 to N1-054)

The noise levels for receptor locations adjacent to 199 Street north of 23 Avenue NW are relatively consistent and range from 65.2 – 67.4 dBA. Based on the results of the noise model, noise mitigation will be required for *all* receptors within this area.

5.1.1.4. 23 Avenue NW, between 199 Street NW and AHD (N1-055 to N1-063)

The noise levels for receptor locations backing onto 23 Avenue NW between 199 Street NW and AHD are relatively consistent and range from 67.9 – 69.2 dBA. Based on the results of the noise model, noise mitigation will be required for *all* receptors within this area.

5.1.2. Neighbourhood 2 Residential Development

The results of the Future Case modeling for NBHD 2 indicate noise levels ranging from 57.6 – 67.8 dBA $L_{eq}24$, as indicated in Tables 1b & 1c. As a results noise mitigation will be required for certain residents within NBHD 2 to reduce the noise levels to below the requirements of the City of Edmonton UTNP C506A.

Table 1b. Future Case Noise Modeling Results (Neighbourhood 2)

Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N2-001	59.8	61.4	53.7	N2-030	65.3	66.8	59.5
N2-002	59.5	61.2	53.4	N2-031	65.2	66.8	59.5
N2-003	59.1	60.7	53.0	N2-032	65.3	66.8	59.5
N2-004	64.3	65.9	58.2	N2-033	64.8	66.4	59.1
N2-005	64.2	65.8	58.1	N2-034	64.9	66.5	59.2
N2-006	64.3	65.9	58.1	N2-035	65.1	66.7	59.4
N2-007	64.4	66.0	58.3	N2-036	65.1	66.7	59.3
N2-008	64.3	66.0	58.2	N2-037	65.2	66.8	59.5
N2-009	64.6	66.2	58.5	N2-038	65.1	66.7	59.4
N2-010	67.0	68.6	61.0	N2-039	65.2	66.8	59.4
N2-011	65.1	66.7	59.3	N2-040	65.0	66.6	59.3
N2-012	64.8	66.4	59.1	N2-041	65.1	66.7	59.4
N2-013	64.7	66.3	59.0	N2-042	65.0	66.6	59.3
N2-014	64.9	66.5	59.2	N2-043	65.1	66.7	59.3
N2-015	64.8	66.4	59.1	N2-044	66.0	67.6	60.3
N2-016	64.9	66.5	59.2	N2-045	65.3	66.8	59.5
N2-017	65.5	67.1	59.8	N2-046	63.9	65.4	58.1
N2-018	66.2	67.8	60.4	N2-047	64.0	65.6	58.3
N2-019	66.0	67.6	60.3	N2-048	64.0	65.6	58.2
N2-020	65.8	67.4	60.0	N2-049	64.1	65.7	58.3
N2-021	65.6	67.1	59.8	N2-050	64.0	65.6	58.3
N2-022	65.7	67.3	60.0	N2-051	64.0	65.6	58.3
N2-023	65.6	67.2	59.8	N2-052	63.9	65.5	58.2
N2-024	65.3	66.9	59.6	N2-053	64.1	65.7	58.4
N2-025	65.4	67.0	59.7	N2-054	64.2	65.7	58.4
N2-026	65.6	67.2	59.8	N2-055	64.2	65.8	58.4
N2-027	66.2	67.8	60.4	N2-056	66.4	68.0	60.7
N2-028	65.9	67.5	60.2	N2-057	66.6	68.2	60.9
N2-029	65.4	67.0	59.7	N2-058	66.8	68.4	61.0

Table 1c. Future Case Noise Modeling Results (Neighbourhood 2 cont.)

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N2-059	67.0	68.6	61.2		N2-088	60.1	61.6	54.3
N2-060	66.3	67.9	60.6		N2-089	60.7	62.3	55.0
N2-061	66.4	68.0	60.7		N2-090	60.5	62.1	54.8
N2-062	67.5	69.1	61.8		N2-091	60.3	61.9	54.5
N2-063	67.8	69.4	62.1		N2-092	60.5	62.0	54.7
N2-064	66.6	68.1	60.8		N2-093	60.5	62.1	54.8
N2-065	66.7	68.3	61.0		N2-094	60.7	62.3	55.0
N2-066	66.5	68.1	60.8		N2-095	60.1	61.6	54.3
N2-067	66.7	68.2	60.9		N2-096	60.8	62.3	55.0
N2-068	66.6	68.2	60.9		N2-097	58.5	60.1	52.7
N2-069	66.3	67.8	60.5		N2-098	60.7	62.3	55.0
N2-070	66.2	67.8	60.5		N2-099	57.8	59.3	52.0
N2-071	66.3	67.9	60.6		N2-100	61.2	62.8	55.5
N2-072	66.7	68.2	60.9		N2-101	57.6	59.2	51.9
N2-073	66.9	68.5	61.2		N2-102	61.4	63.0	55.7
N2-074	66.7	68.2	60.9		N2-103	58.0	59.5	52.2
N2-075	66.7	68.3	60.9		N2-104	61.5	63.1	55.7
N2-076	66.2	67.7	60.4		N2-105	63.2	64.8	57.5
N2-077	65.7	67.3	59.9		N2-106	63.9	65.5	58.2
N2-078	65.1	66.7	59.4		N2-107	63.6	65.2	57.8
N2-079	65.5	67.0	59.7		N2-108	63.0	64.6	57.3
N2-080	65.3	66.9	59.6		N2-109	58.8	60.4	53.0
N2-081	65.1	66.7	59.3		N2-110	61.9	63.5	56.2
N2-082	65.1	66.7	59.4		N2-111	58.5	60.0	52.7
N2-083	65.2	66.7	59.4		N2-112	60.6	62.2	54.9
N2-084	61.9	63.5	56.1		N2-113	58.5	60.1	52.8
N2-085	60.4	62.0	54.7		N2-114	60.4	62.0	54.7
N2-086	60.0	61.6	54.3		N2-115	59.6	61.2	53.9
N2-087	59.9	61.5	54.2		N2-116	61.6	63.2	55.9

5.1.2.1. 23 Avenue NW, between 215 Street NW and 199 Street NW (N2-001 to N2-010)

The noise levels for receptor locations backing onto 23 Avenue NW between 215 Street NW and 199 Street NW vary more significantly than other areas within NBHD 2 and range from 59.1 - 67.0 dBA. The variance in noise levels can be attributed to the distance between the residential back yards and 23 Avenue NW in addition to variances in traffic volumes along 23 Avenue NW. Based on the results of the noise model, noise mitigation will be required for *certain* residential receptors within this area.

5.1.2.2. 199 Street NW, south of 23 Avenue NW (N2-011 to N2-055)

The noise levels for receptor locations backing onto 199 Street south of 23 Avenue NW and terminating at 215 Street NW, are relatively consistent and range from 63.9 – 66.2 dBA. Based on the results of the noise model, noise mitigation will be required for *all* residential receptors within this area.

5.1.2.3. 215 Street NW, north of Quadrant Avenue (N2-056 to N2-083)

The noise levels are relatively consistent for all residents backing directly onto 215 Street NW and range from 65.1 – 67.8 dBA. The noise levels for these receptors are the highest for NBHD 2 which was anticipated due to the traffic volumes along this road and due to expanding it to a six-lane divided arterial truck route in the future. Based on the results of the noise model, noise mitigation will be required for *all* residential within this area.

5.1.2.4. Riverview Way, between 215 Street NW and 199 Street NW (N2-084 to N2-116)

The noise levels for receptor locations backing onto Riverview Way between 215 Street NW and 199 Street NW vary significantly and range from 57.6 – 63.9 dBA. The variance in noise levels can be primarily attributed to the varying distances between the residential back yards and Riverview Way. Based on the results of the noise model, noise mitigation will *not be required* for the residential receptor locations within this area.

5.1.3. Neighbourhood 3 Residential Development

The results of the Future Case modeling for NBHD 3 indicate noise levels ranging from 54.6 – 69.8 dBA $L_{eq}24$, as indicated in Tables 1d & 1e. As a results noise mitigation will be required for certain residents within NBHD 3 to reduce the noise levels to below the requirements of the City of Edmonton UTNP C506A.

Table 1d. Future Case Noise Modeling Results (Neighbourhood 3)

Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N3-001	66.5	68.1	60.7	N3-034	64.6	66.2	58.6
N3-002	68.1	69.7	62.1	N3-035	64.9	66.5	58.9
N3-003	68.9	70.6	62.8	N3-036	60.1	61.7	54.4
N3-004	68.5	70.1	62.4	N3-037	58.2	59.8	52.8
N3-005	68.5	70.1	62.4	N3-038	57.1	58.6	51.9
N3-006	68.5	70.1	62.3	N3-039	56.5	58.0	51.5
N3-007	68.5	70.1	62.4	N3-040	56.2	57.6	51.2
N3-008	68.6	70.2	62.4	N3-041	55.9	57.4	51.1
N3-009	69.0	70.6	62.8	N3-042	55.8	57.3	51.1
N3-010	68.3	70.0	62.2	N3-043	55.7	57.1	51.1
N3-011	68.9	70.5	62.8	N3-044	55.6	57.0	51.0
N3-012	68.8	70.5	62.7	N3-045	55.6	57.1	51.1
N3-013	68.9	70.5	62.8	N3-046	55.7	57.2	51.2
N3-014	68.7	70.3	62.6	N3-047	55.9	57.3	51.4
N3-015	69.3	70.9	63.2	N3-048	56.2	57.6	51.7
N3-016	69.3	70.9	63.2	N3-049	56.6	58.0	52.2
N3-017	69.1	70.7	63.0	N3-050	57.7	59.1	53.3
N3-018	68.7	70.4	62.6	N3-051	58.5	59.9	54.1
N3-019	69.0	70.6	62.9	N3-052	57.3	58.7	52.9
N3-020	68.9	70.5	62.7	N3-053	55.3	56.7	50.9
N3-021	68.9	70.5	62.8	N3-054	54.6	56.0	50.2
N3-022	68.0	69.6	62.0	N3-055	64.9	66.5	59.1
N3-023	69.8	71.4	63.7	N3-056	64.1	65.7	58.3
N3-024	69.7	71.3	63.6	N3-057	63.9	65.5	58.1
N3-025	69.5	71.1	63.4	N3-058	64.0	65.5	58.2
N3-026	69.0	70.7	62.9	N3-059	63.3	64.9	57.6
N3-027	68.5	70.2	62.4	N3-060	63.8	65.4	58.0
N3-028	69.2	70.8	63.1	N3-061	63.5	65.1	57.7
N3-029	69.3	70.9	63.2	N3-062	64.1	65.6	58.3
N3-030	69.4	71.0	63.3	N3-063	64.9	66.5	59.2
N3-031	69.6	71.3	63.5	N3-064	63.9	65.5	58.2
N3-032	63.1	64.7	57.1	N3-065	63.7	65.3	57.9
N3-033	63.9	65.5	57.8	N3-066	63.3	64.9	57.5

Table 1e. Future Case Noise Modeling Results (Neighbourhood 3 cont.)

Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N3-067	63.5	65.0	57.7	N3-099	63.0	64.6	57.2
N3-068	63.0	64.6	57.3	N3-100	62.8	64.4	57.1
N3-069	63.5	65.1	57.8	N3-101	63.1	64.7	57.3
N3-070	63.1	64.7	57.4	N3-102	63.1	64.7	57.4
N3-071	63.4	65.0	57.7	N3-103	62.8	64.4	57.0
N3-072	63.1	64.7	57.3	N3-104	63.1	64.7	57.4
N3-073	63.5	65.1	57.7	N3-105	62.9	64.5	57.2
N3-074	63.0	64.6	57.3	N3-106	62.8	64.4	57.1
N3-075	63.5	65.0	57.7	N3-107	63.1	64.6	57.3
N3-076	63.1	64.7	57.4	N3-108	62.9	64.5	57.2
N3-077	64.6	66.2	58.9	N3-109	63.2	64.8	57.5
N3-078	64.5	66.1	58.8	N3-110	63.2	64.8	57.5
N3-079	64.7	66.3	59.0	N3-111	65.2	66.8	59.4
N3-080	64.3	65.8	58.5	N3-112	59.5	61.1	53.8
N3-081	63.5	65.1	57.8	N3-113	59.4	61.0	53.7
N3-082	63.3	64.9	57.6	N3-114	61.1	62.7	55.4
N3-083	63.3	64.8	57.5	N3-115	61.3	62.8	55.5
N3-084	63.2	64.8	57.5	N3-116	61.5	63.1	55.8
N3-085	63.0	64.5	57.2	N3-117	62.4	64.0	56.6
N3-086	63.2	64.8	57.4	N3-118	66.1	67.7	60.4
N3-087	63.6	65.2	57.8	N3-119	65.3	66.9	59.5
N3-088	63.2	64.8	57.5	N3-120	65.2	66.8	59.5
N3-089	63.4	64.9	57.6	N3-121	65.4	67.0	59.6
N3-090	63.1	64.7	57.3	N3-122	65.2	66.8	59.5
N3-091	64.9	66.4	59.1	N3-123	65.1	66.6	59.3
N3-092	63.3	64.9	57.6	N3-124	64.9	66.5	59.2
N3-093	62.8	64.4	57.0	N3-125	65.3	66.8	59.5
N3-094	62.5	64.1	56.8	N3-126	65.0	66.5	59.2
N3-095	63.2	64.8	57.4	N3-127	64.9	66.5	59.2
N3-096	63.1	64.7	57.4	N3-128	65.4	66.9	59.6
N3-097	63.2	64.7	57.4	N3-129	65.1	66.7	59.4
N3-098	63.0	64.6	57.3	N3-130	66.1	67.7	60.3

5.1.3.1. 23 Avenue NW, between 199 Street NW and AHD (N3-001 to N3-035)

The noise levels for receptor locations backing onto 23 Avenue NW between 199 Street NW and AHD range from 63.1 – 69.8 dBA. The variance in noise levels can be attributed to the distance between the residential back yards and 23 Avenue NW in addition to variances in traffic volumes along 23 Avenue NW. Based on the results of the noise model, noise mitigation will be required for *certain* residential receptors within this area.

5.1.3.2. Anthony Henday Drive, (N3-036 to N3-054)

The noise levels for receptor locations backing onto Anthony Henday Drive vary from 54.6 – 60.1 dBA. Based on the results of the noise model, noise mitigation will *not be required* for the residential receptor locations within this area.

5.1.3.3. Riverview Way, between 23 Avenue NW and 199 Street NW (N3-055 to N3-117)

The noise levels for receptor locations backing onto Riverview Way between 23 Avenue NW and 199 Street NW vary significantly and range from 57.5 – 65.2 dBA. The variance in noise levels can be primarily attributed to the distance between the residential back yards and Riverview Way. Based on the results of the noise model, noise mitigation will be required *for a majority* of residential receptors within this area.

5.1.3.4. 199 Street NW, north of 23 Avenue NW (N3-118 to N3-130)

The noise levels for receptor locations backing onto 199 Street between 23 Avenue NW and Riverview Way, are relatively consistent and range from 64.9 – 66.1 dBA. Based on the results of the noise model, noise mitigation will be required for *all* residential receptors within this area.

5.2. Future Case *With* Mitigation

The results of the Future Case noise modeling *with* mitigation at the various private residential backyard spaces within the Developments are shown in Table 2a – 2e, and illustrated in Figures 3a -3g .

5.2.1. Neighbourhood 1 Residential Development

The results of the Future Case modeling *with* mitigation for NBHD 1 indicate noise levels ranging from 59.7 – 63.3 dBA $L_{eq}24$ as presented in Table 2a. Since all residential receptor $L_{eq}24$ noise levels are below 65 dBA, no further mitigation will be required to meet the requirements of the City of Edmonton UTNP C506A.

Table 2a. Future Case *With* Mitigation Noise Modeling Results (Neighbourhood 1)

Receptor	$L_{eq}24$ (dBA)	Difference Relative to Future Case Leq24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	Difference Relative to Future Case Leq24 (dBA)	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N1-001	59.8	-9.3	61.4	54.0	N1-033	62.3	-4.7	63.9	56.6
N1-002	60.2	-10.4	61.8	54.4	N1-034	61.8	-3.7	63.3	56.0
N1-003	60.8	-9.9	62.4	55.1	N1-035	62.2	-4.0	63.8	56.5
N1-004	60.8	-10.0	62.4	55.0	N1-036	61.7	-3.8	63.2	55.9
N1-005	61.4	-9.4	63.0	55.5	N1-037	62.8	-3.6	64.4	57.0
N1-006	62.3	-2.5	63.9	56.3	N1-038	62.5	-3.6	64.1	56.8
N1-007	62.5	0.0	64.1	56.4	N1-039	63.1	-3.7	64.7	57.4
N1-008	62.8	0.0	64.5	56.7	N1-040	62.9	-3.3	64.5	57.2
N1-009	63.2	0.0	64.8	57.1	N1-041	63.1	-3.5	64.6	57.3
N1-010	59.9	-3.8	61.5	53.9	N1-042	63.0	-3.3	64.5	57.2
N1-011	60.3	-3.5	61.9	54.2	N1-043	62.9	-4.2	64.5	57.2
N1-012	60.4	-3.6	62.1	54.3	N1-044	63.1	-3.7	64.7	57.3
N1-013	60.4	-3.5	62.0	54.3	N1-045	63.0	-4.2	64.5	57.2
N1-014	60.4	-3.6	62.0	54.3	N1-046	62.9	-4.5	64.5	57.1
N1-015	60.4	-3.4	62.0	54.2	N1-047	62.8	-4.6	64.4	57.1
N1-016	60.4	-3.5	62.0	54.3	N1-048	63.0	-3.6	64.6	57.2
N1-017	60.4	-3.5	62.1	54.3	N1-049	63.0	-3.7	64.5	57.2
N1-018	60.3	-3.3	61.9	54.2	N1-050	63.2	-3.4	64.8	57.4
N1-019	59.7	-2.6	61.4	53.6	N1-051	63.2	-3.6	64.8	57.5
N1-020	59.7	-2.0	61.4	53.6	N1-052	63.2	-3.3	64.8	57.4
N1-021	60.3	-1.6	61.9	54.2	N1-053	63.3	-3.5	64.8	57.5
N1-022	62.3	-0.1	63.9	56.2	N1-054	63.3	-3.4	64.9	57.5
N1-023	62.4	-3.3	64.1	56.4	N1-055	60.1	-7.8	61.8	54.0
N1-024	62.7	-3.2	64.3	57.0	N1-056	60.6	-7.4	62.2	54.4
N1-025	62.6	-2.9	64.1	56.9	N1-057	60.6	-7.3	62.2	54.5
N1-026	62.8	-3.4	64.3	57.0	N1-058	60.6	-7.5	62.2	54.5
N1-027	61.5	-3.7	63.1	55.8	N1-059	60.7	-7.4	62.3	54.5
N1-028	61.9	-4.0	63.5	56.2	N1-060	60.9	-7.5	62.5	54.8
N1-029	61.9	-3.3	63.4	56.1	N1-061	61.4	-7.8	63.0	55.3
N1-030	62.5	-4.3	64.1	56.8	N1-062	61.6	-6.9	63.2	55.5
N1-031	61.9	-3.4	63.5	56.2	N1-063	60.9	-7.9	62.5	54.8
N1-032	62.2	-3.7	63.7	56.4					

5.2.1.1. 215 Street NW, north of 23 Avenue NW (N1-001 to N1-005)

All $L_{eq}24$ noise levels for residential receptors backing on 215 Street are projected to be below 65 dBA and range from 59.8 – 62.3 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -9.4 to -10.4 dBA which is a significant decrease in noise level.

5.2.1.2. 23 Avenue NW, between 215 Street NW and 199 Street NW (N1-006 to N1-023)

The noise levels for receptor locations backing onto 23 Avenue NW between 215 Street NW and 199 Street NW are projected to be below 65 dBA and range from 59.7 – 63.2 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from 0.0 to -3.8 dBA.

5.2.1.3. 199 Street NW, north of 23 Avenue NW (N1-024 to N1-054)

The noise levels for receptor locations backing onto 199 Street NW between north of 23 Avenue NW are projected to be below 65 dBA and range from 61.5 – 63.3 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -2.9 to -4.7 dBA.

5.2.1.4. 23 Avenue NW, between 199 Street NW and AHD (N1-055 to N1-063)

The noise levels for receptor locations backing onto 23 Avenue NW between 199 Street NW and AHD are projected to be below 65 dBA and range from 60.1 – 61.6 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from -6.9 to -7.9 dBA.

5.2.2. Neighbourhood 2 Residential Development

The results of the Future Case modeling *with* mitigation for NBHD 2 indicate noise levels ranging from 56.3 – 63.9 dBA $L_{eq}24$ as presented in Table 2b & Table 2c. Since all residential receptor $L_{eq}24$ noise levels are below 65 dBA, no further mitigation will be required to meet the requirements of the City of Edmonton UTNP C506A.

Table 2b. Future Case *With* Mitigation Noise Modeling Results (Neighbourhood 2)

Receptor	$L_{eq}24$ (dBA)	Difference Relative to Future Case Leq24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	Difference Relative to Future Case Leq24 (dBA)	$L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N2-001	59.8	0.0	61.4	53.7	N2-030	61.5	-3.8	63.0	55.7
N2-002	59.5	0.0	61.1	53.4	N2-031	61.0	-4.2	62.5	55.2
N2-003	58.8	-0.3	60.4	52.7	N2-032	61.0	-4.3	62.6	55.3
N2-004	60.6	-3.7	62.2	54.5	N2-033	60.6	-4.2	62.2	54.9
N2-005	60.6	-3.6	62.3	54.5	N2-034	60.9	-4.0	62.4	55.1
N2-006	60.7	-3.6	62.3	54.6	N2-035	60.9	-4.2	62.4	55.1
N2-007	60.7	-3.7	62.3	54.6	N2-036	61.1	-4.0	62.7	55.3
N2-008	60.4	-3.9	62.1	54.3	N2-037	61.1	-4.1	62.7	55.4
N2-009	61.2	-3.4	62.8	55.1	N2-038	61.1	-4.0	62.7	55.4
N2-010	62.7	-4.3	64.3	56.7	N2-039	61.1	-4.1	62.7	55.4
N2-011	61.0	-4.1	62.6	55.3	N2-040	61.2	-3.8	62.8	55.4
N2-012	60.9	-3.9	62.4	55.1	N2-041	61.0	-4.1	62.6	55.3
N2-013	60.9	-3.8	62.4	55.1	N2-042	61.2	-3.8	62.8	55.4
N2-014	61.1	-3.8	62.7	55.3	N2-043	61.1	-4.0	62.7	55.4
N2-015	60.7	-4.1	62.2	54.9	N2-044	61.7	-4.3	63.3	56.0
N2-016	61.2	-3.7	62.8	55.5	N2-045	60.8	-4.5	62.4	55.1
N2-017	62.0	-3.5	63.6	56.3	N2-046	60.1	-3.8	61.7	54.4
N2-018	62.7	-3.5	64.3	56.9	N2-047	60.2	-3.8	61.8	54.5
N2-019	61.9	-4.1	63.5	56.2	N2-048	60.0	-4.0	61.6	54.3
N2-020	61.7	-4.1	63.3	56.0	N2-049	60.2	-3.9	61.8	54.4
N2-021	61.6	-4.0	63.2	55.8	N2-050	60.1	-3.9	61.7	54.3
N2-022	61.7	-4.0	63.3	56.0	N2-051	60.1	-3.9	61.7	54.3
N2-023	61.7	-3.9	63.3	56.0	N2-052	59.9	-4.0	61.4	54.1
N2-024	61.4	-3.9	62.9	55.6	N2-053	60.2	-3.9	61.8	54.4
N2-025	61.5	-3.9	63.0	55.7	N2-054	60.3	-3.9	61.9	54.6
N2-026	61.7	-3.9	63.3	56.0	N2-055	60.4	-3.8	62.0	54.7
N2-027	61.7	-4.5	63.3	56.0	N2-056	57.1	-9.3	58.7	51.3
N2-028	61.6	-4.3	63.2	55.9	N2-057	58.3	-8.3	59.9	52.5
N2-029	61.4	-4.0	63.0	55.6	N2-058	58.1	-8.7	59.7	52.4

Table 2c. Future Case *With* Mitigation Noise Modeling Results (Neighbourhood 2 cont.)

Receptor	L_{eq}24 (dBA)	Difference Relative to Future Case Leq24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	Difference Relative to Future Case Leq24 (dBA)	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
N2-059	58.3	-8.7	59.9	52.6	N2-088	60.1	0.0	61.6	54.3
N2-060	57.8	-8.5	59.4	52.0	N2-089	60.7	0.0	62.3	55.0
N2-061	57.8	-8.6	59.4	52.0	N2-090	60.5	0.0	62.1	54.8
N2-062	57.0	-10.5	58.6	51.3	N2-091	60.3	0.0	61.9	54.5
N2-063	57.1	-10.7	58.7	51.4	N2-092	60.5	0.0	62.0	54.7
N2-064	57.8	-8.8	59.4	52.1	N2-093	60.5	0.0	62.1	54.8
N2-065	57.7	-9.0	59.3	51.9	N2-094	60.7	0.0	62.3	55.0
N2-066	57.7	-8.8	59.3	52.0	N2-095	60.1	0.0	61.6	54.3
N2-067	57.7	-9.0	59.2	51.9	N2-096	60.7	-0.1	62.3	55.0
N2-068	57.8	-8.8	59.4	52.0	N2-097	58.5	0.0	60.1	52.7
N2-069	57.4	-8.9	59.0	51.6	N2-098	60.7	0.0	62.3	55.0
N2-070	57.9	-8.3	59.4	52.1	N2-099	57.7	-0.1	59.3	52.0
N2-071	57.1	-9.2	58.7	51.4	N2-100	61.2	0.0	62.8	55.5
N2-072	57.2	-9.5	58.8	51.4	N2-101	57.6	0.0	59.2	51.9
N2-073	58.1	-8.8	59.7	52.4	N2-102	61.4	0.0	63.0	55.7
N2-074	58.2	-8.5	59.8	52.4	N2-103	57.9	-0.1	59.5	52.2
N2-075	58.0	-8.7	59.6	52.3	N2-104	61.5	0.0	63.0	55.7
N2-076	56.6	-9.6	58.2	50.9	N2-105	63.2	0.0	64.8	57.5
N2-077	58.7	-7.0	60.3	53.0	N2-106	63.9	0.0	65.5	58.2
N2-078	58.2	-6.9	59.8	52.4	N2-107	63.6	0.0	65.2	57.8
N2-079	58.3	-7.2	59.9	52.5	N2-108	63.0	0.0	64.6	57.3
N2-080	58.5	-6.8	60.1	52.8	N2-109	58.8	0.0	60.3	53.0
N2-081	58.3	-6.8	59.9	52.5	N2-110	61.9	0.0	63.5	56.2
N2-082	58.1	-7.0	59.7	52.4	N2-111	58.4	-0.1	60.0	52.7
N2-083	56.3	-8.9	57.9	50.6	N2-112	60.6	0.0	62.2	54.8
N2-084	61.2	-0.7	62.8	55.5	N2-113	58.4	-0.1	60.0	52.7
N2-085	60.4	0.0	61.9	54.6	N2-114	60.4	0.0	61.9	54.6
N2-086	60.0	0.0	61.6	54.3	N2-115	59.4	-0.2	61.0	53.6
N2-087	59.9	0.0	61.5	54.1	N2-116	61.4	-0.2	63.0	55.6

5.2.2.1. 23 Avenue NW, between 215 Street NW and 199 Street NW (N2-001 to N2-010)

The noise levels for receptor locations backing onto 23 Avenue NW between 215 Street NW and 199 Street NW are projected to be below 65 dBA and range from 58.8 – 62.7 dBA. The relative difference in noise levels from the Future case *with* and *without* mitigation ranges from 0.0 to -4.3 dBA.