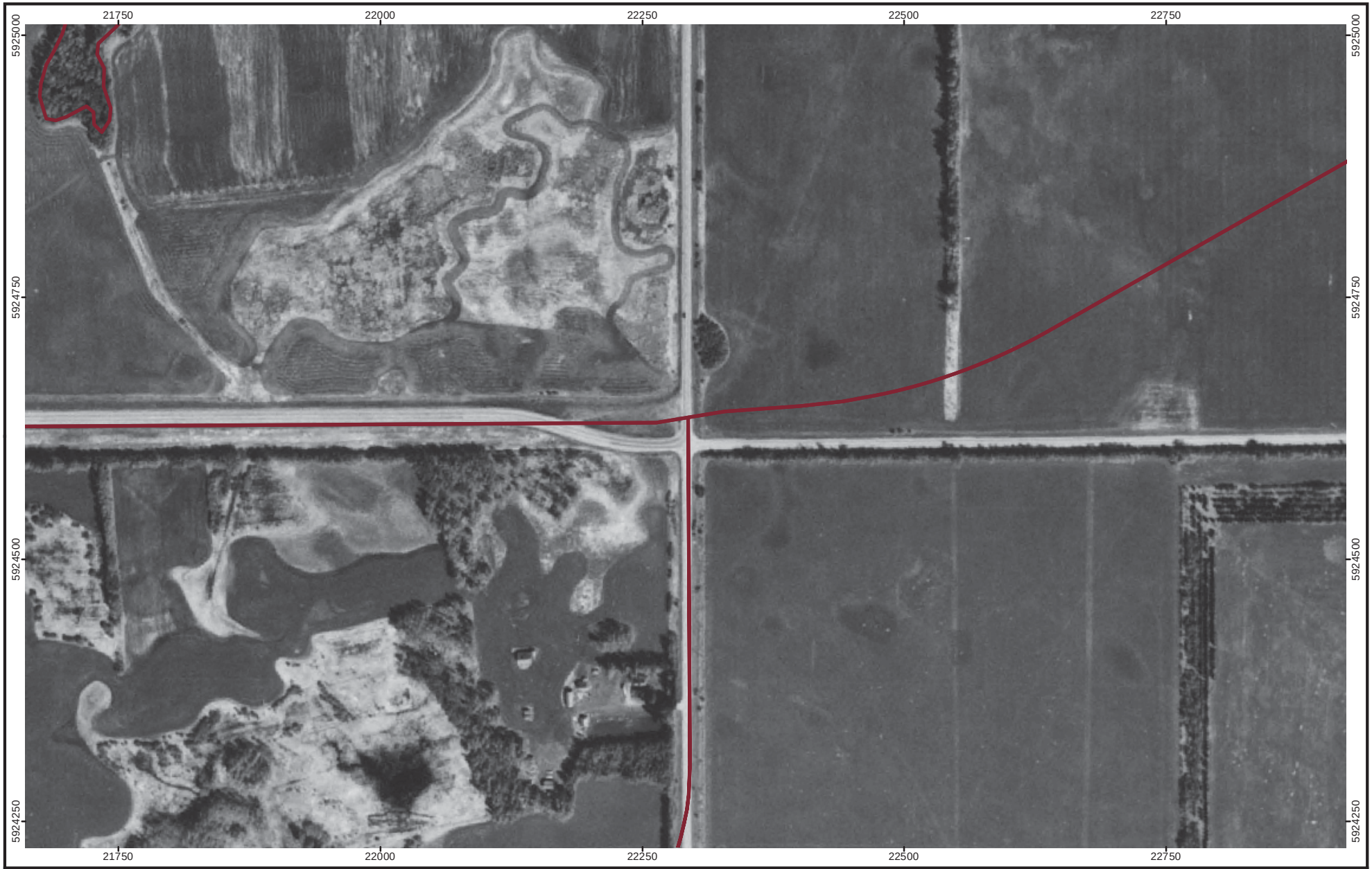
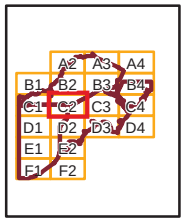


Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 1993



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Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
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PREPARED BY: Stantec

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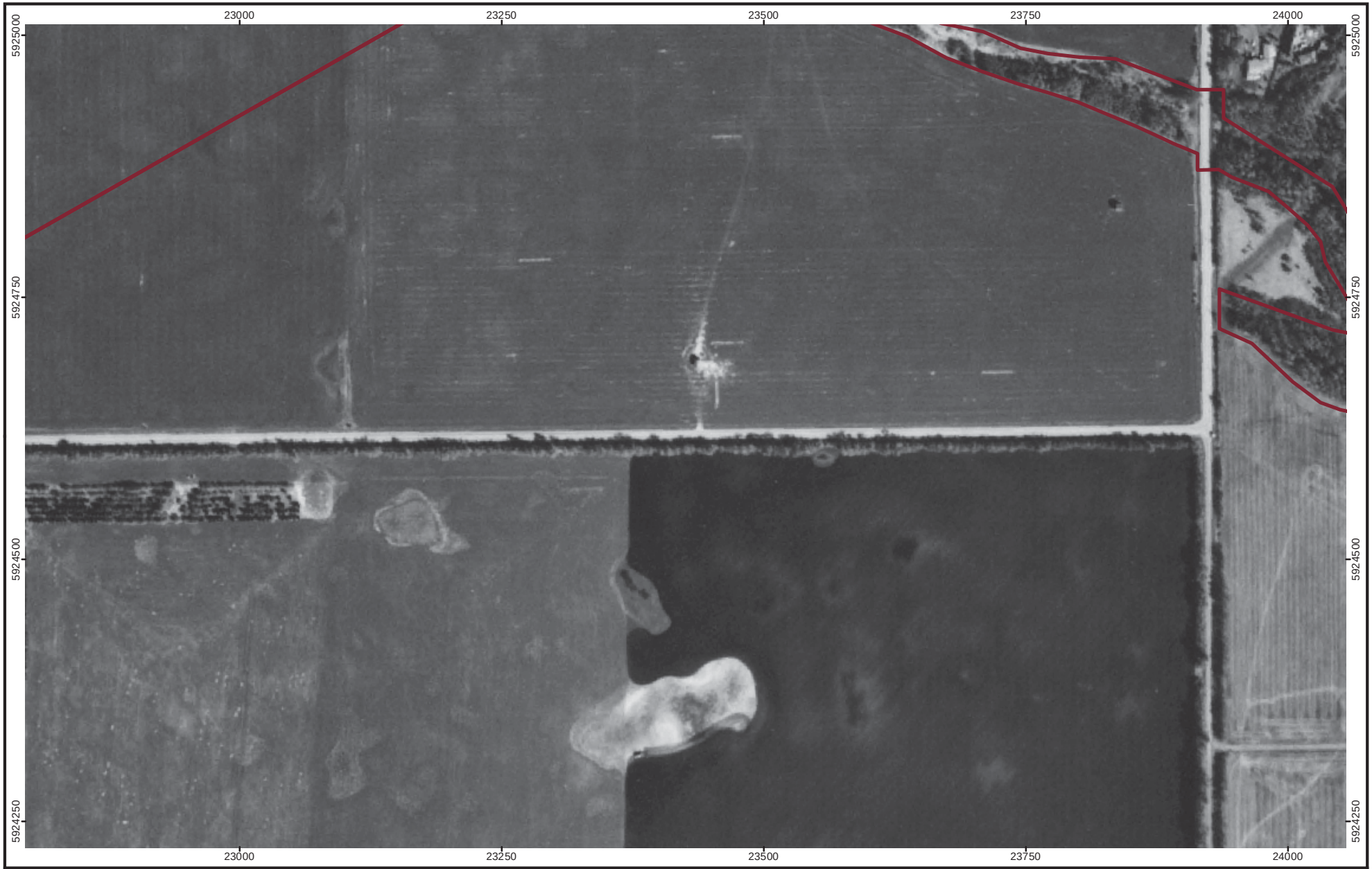

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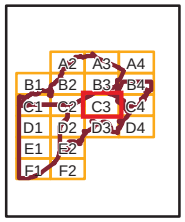
Historical Aerial Review
1993



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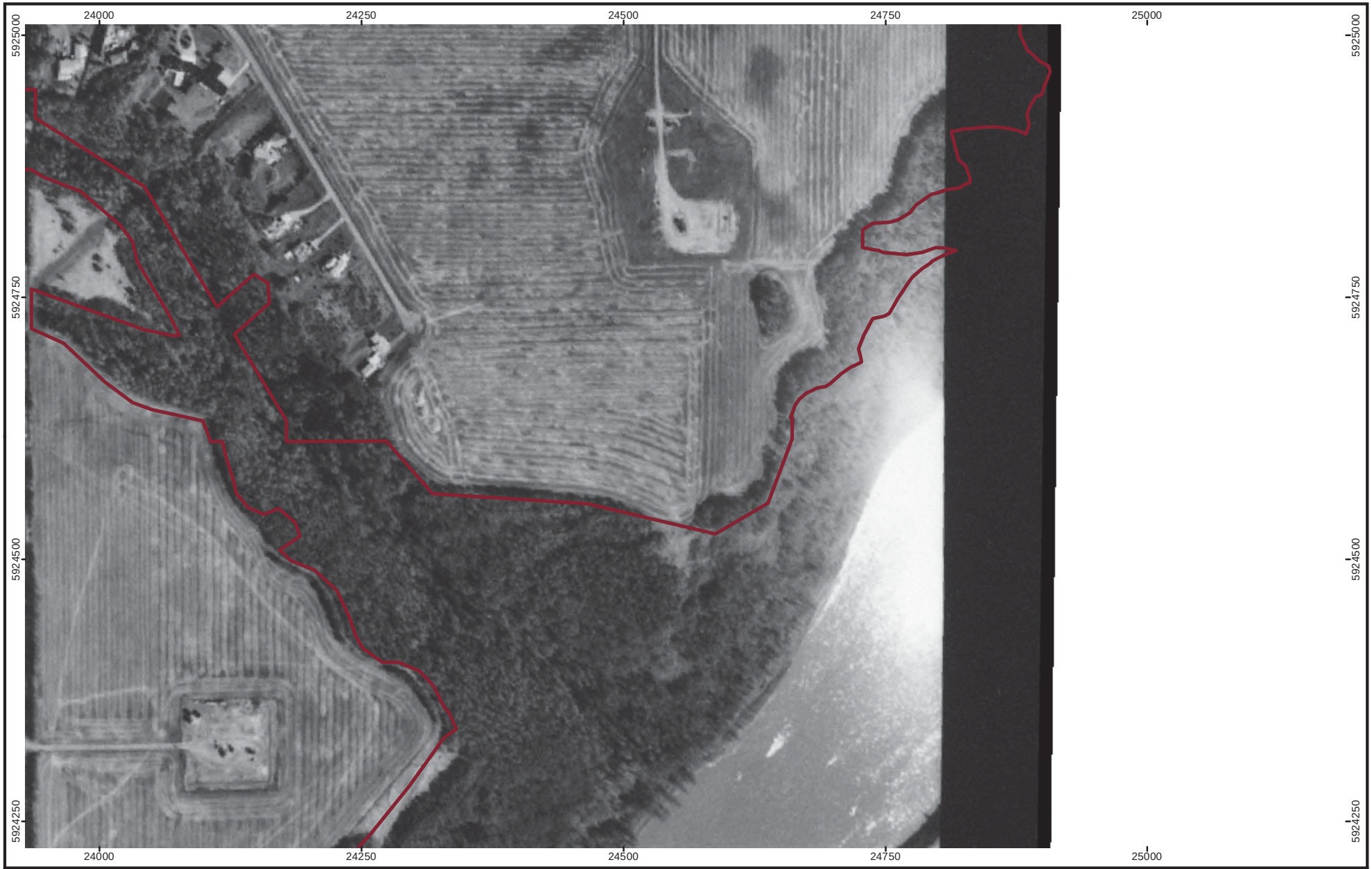

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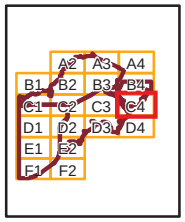
1993



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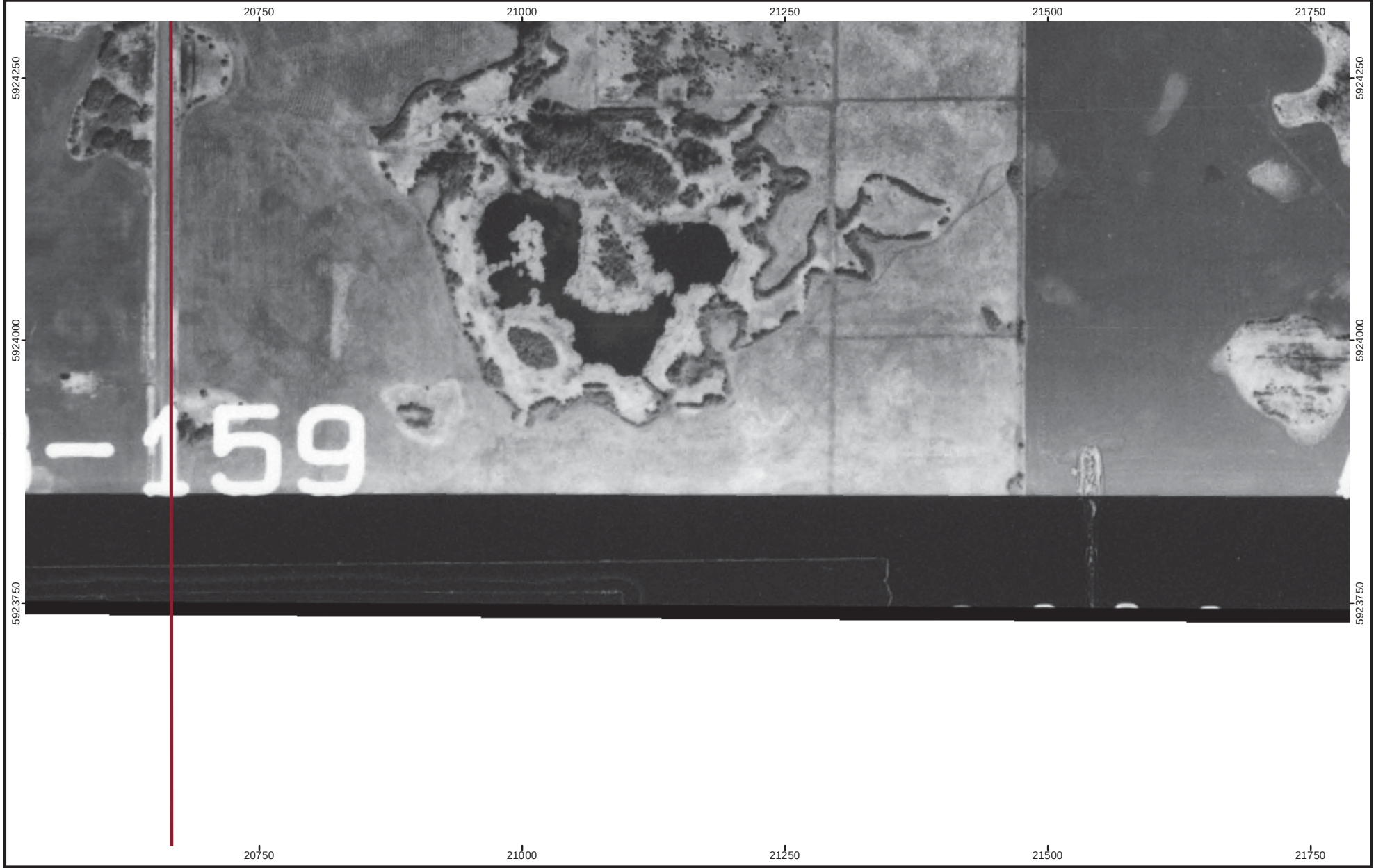

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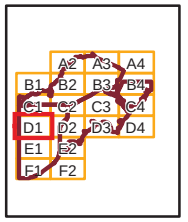
Historical Aerial Review
1993



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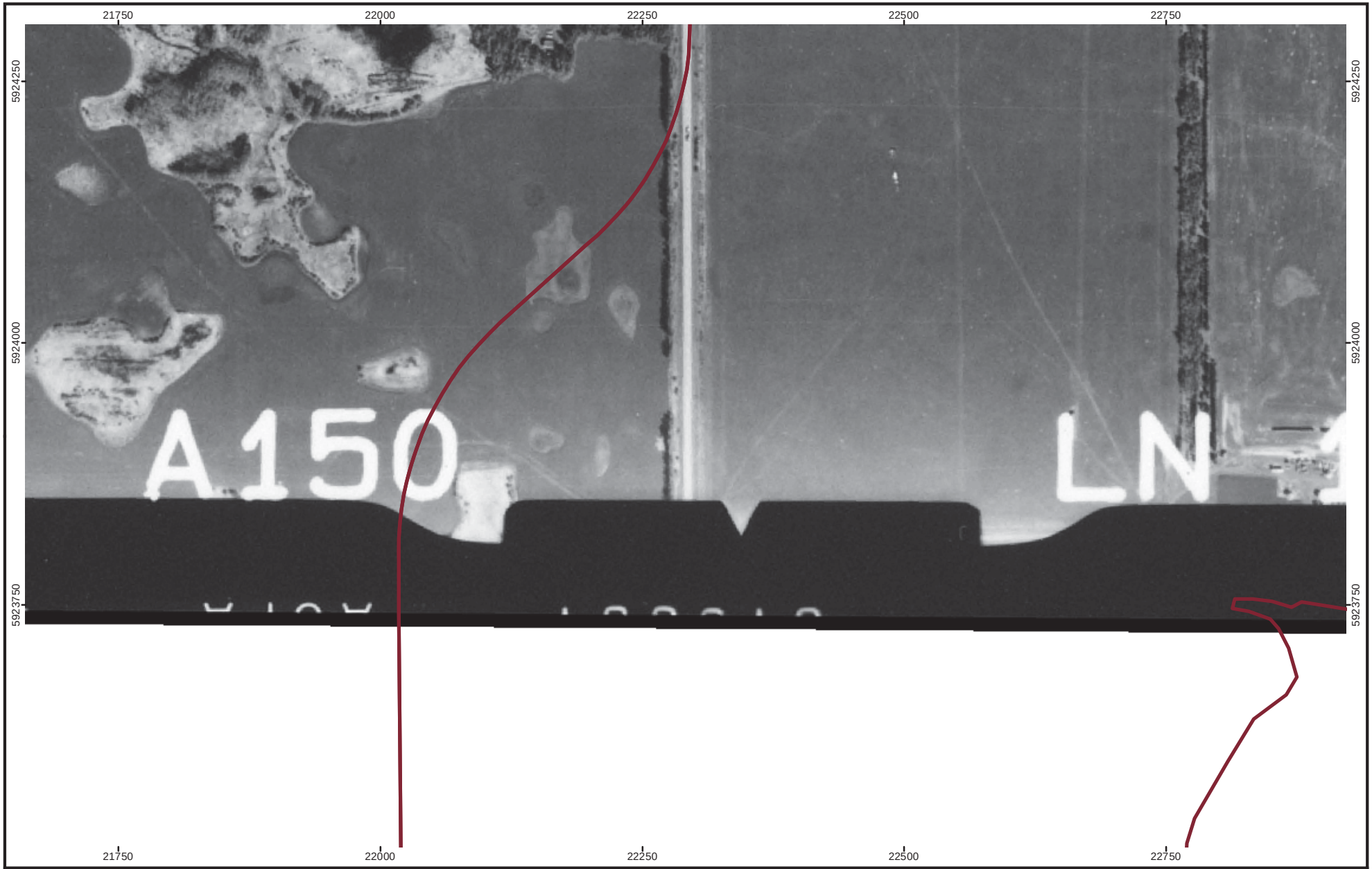

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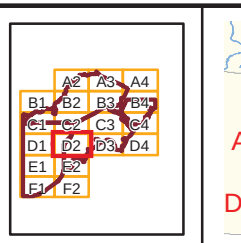
1993



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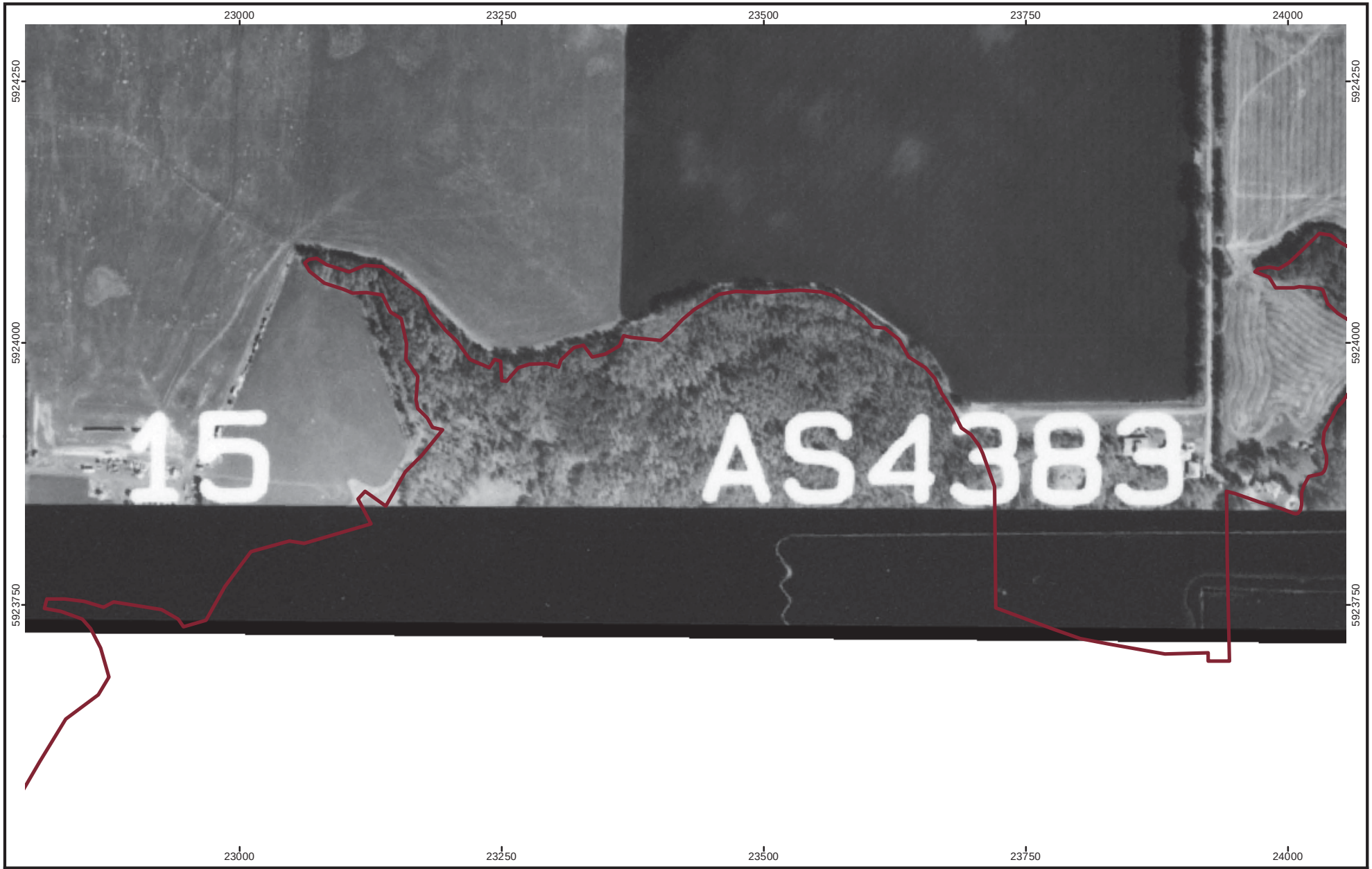

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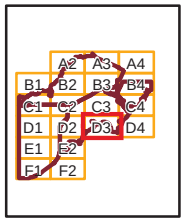
Historical Aerial Review
1993



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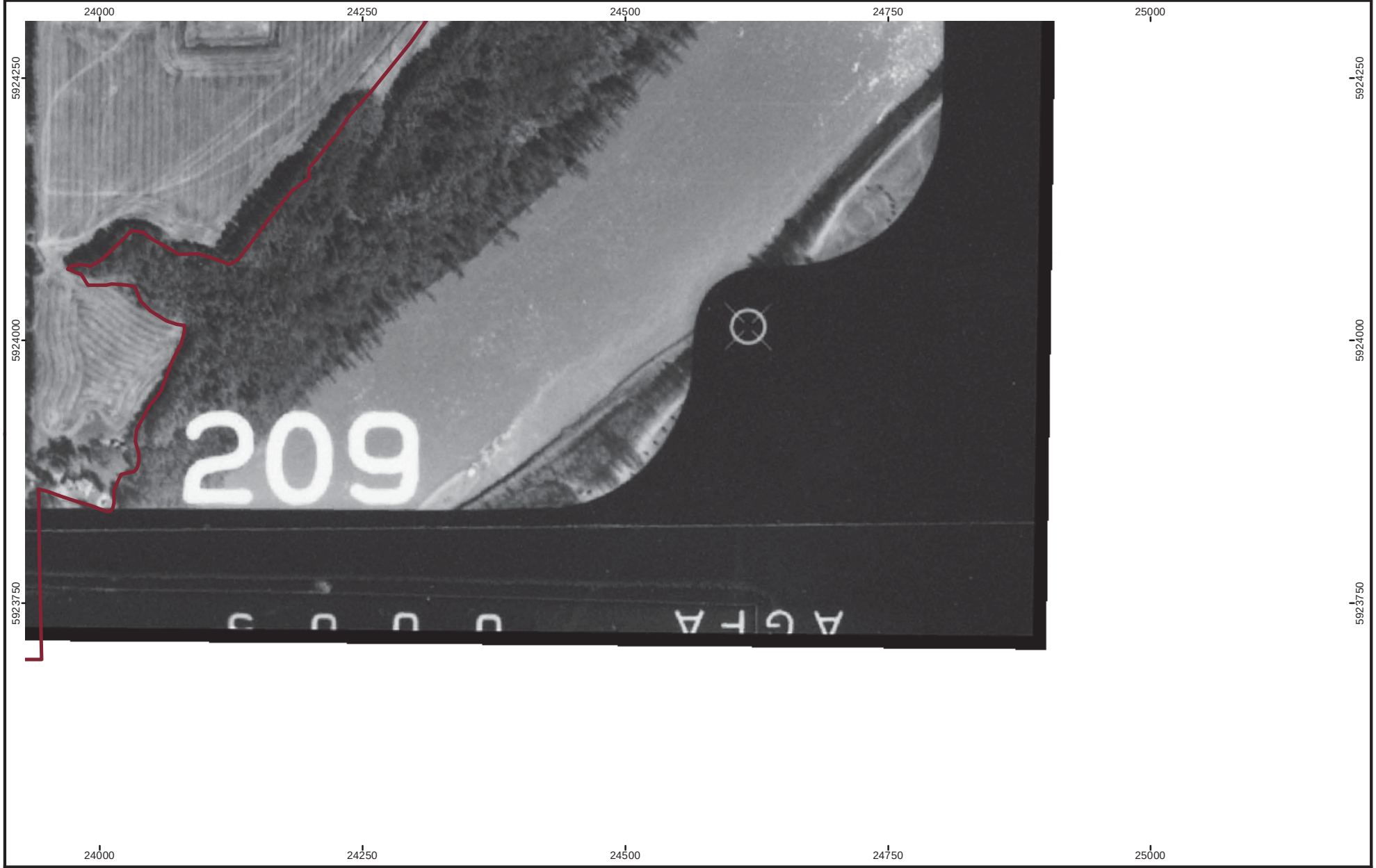

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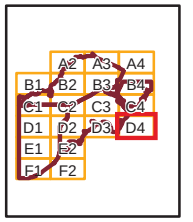
Historical Aerial Review
1993



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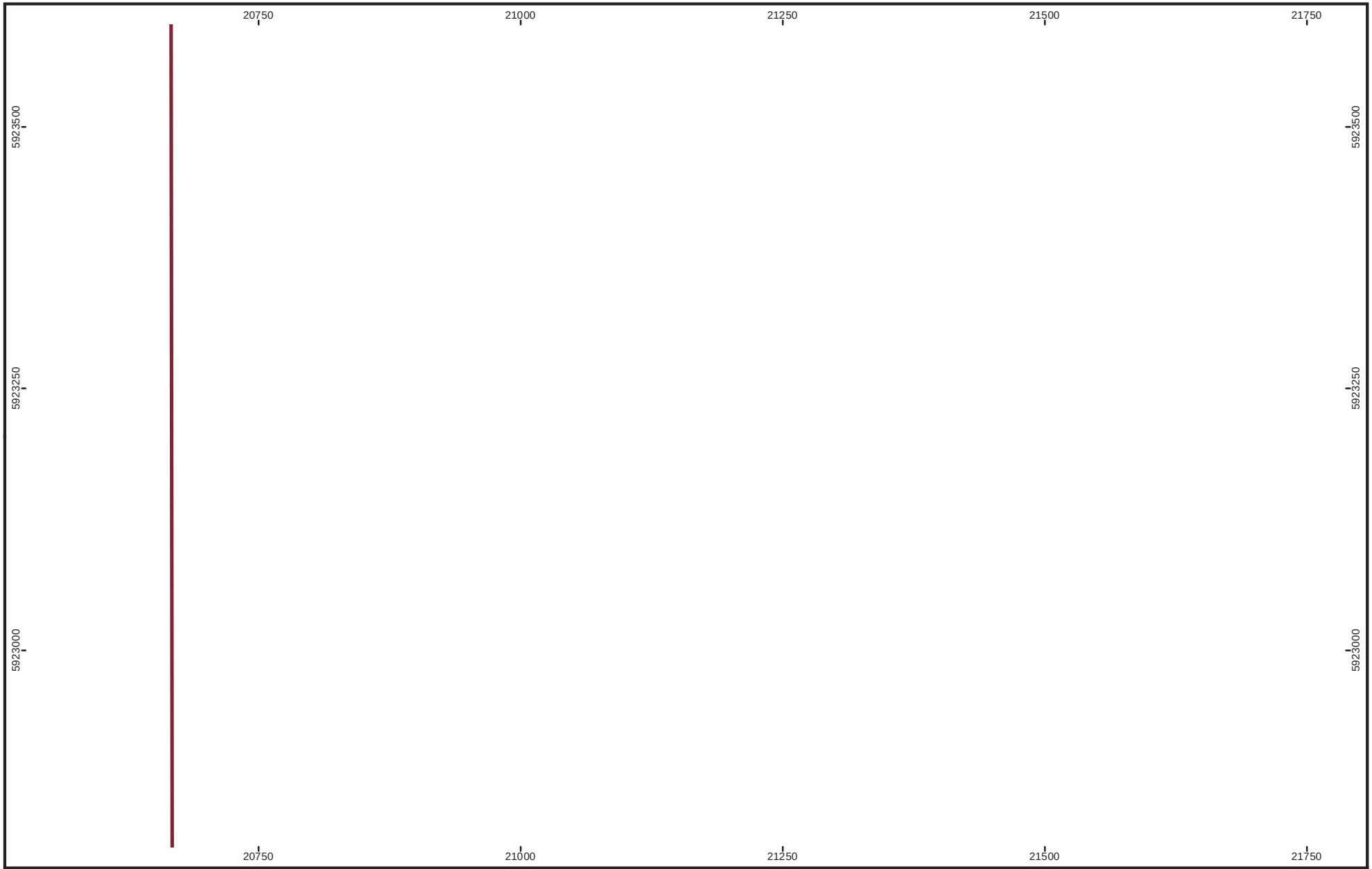

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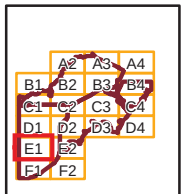
1993



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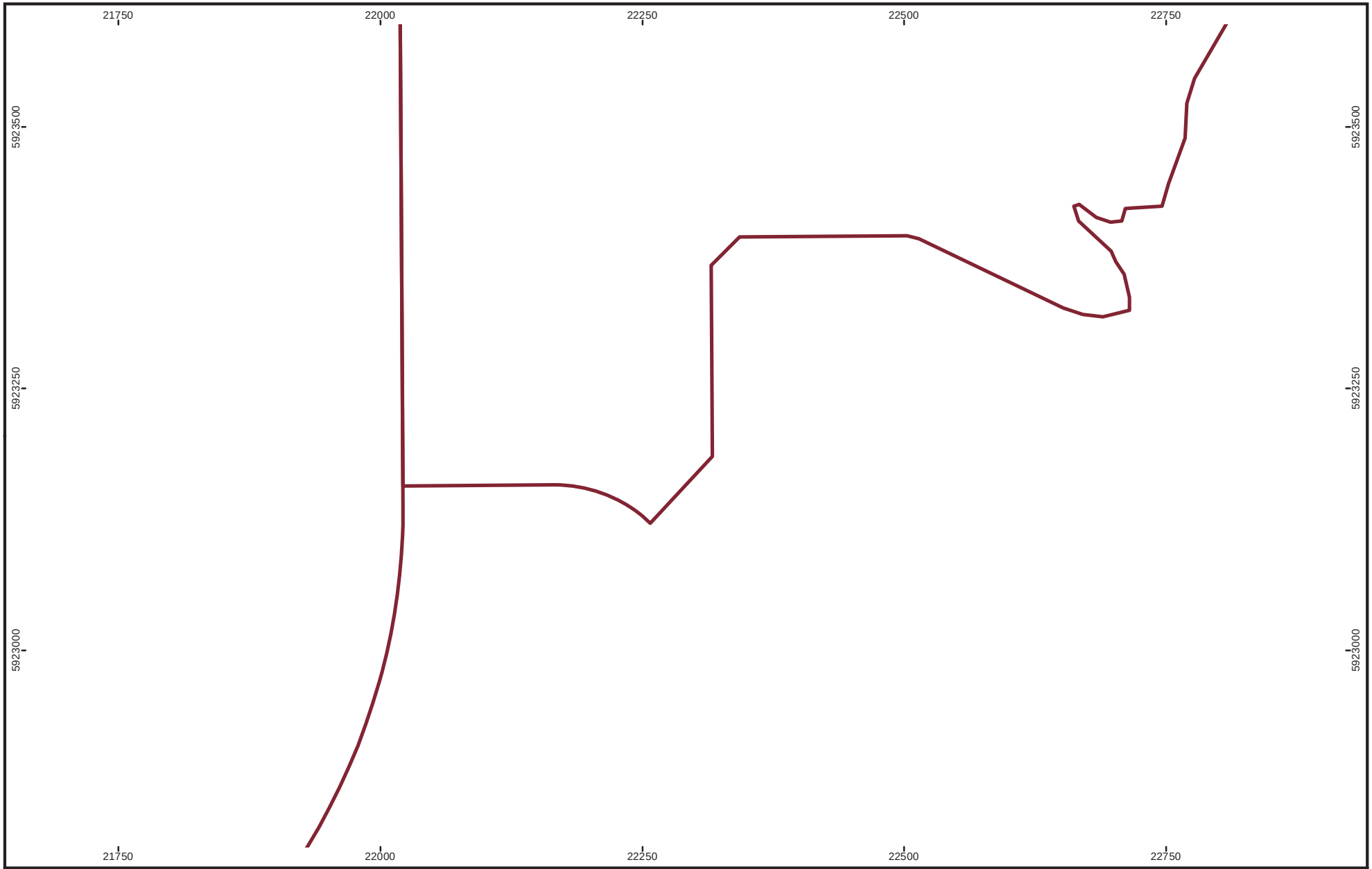

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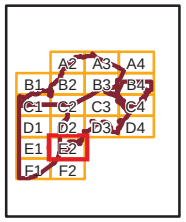
Historical Aerial Review
1993



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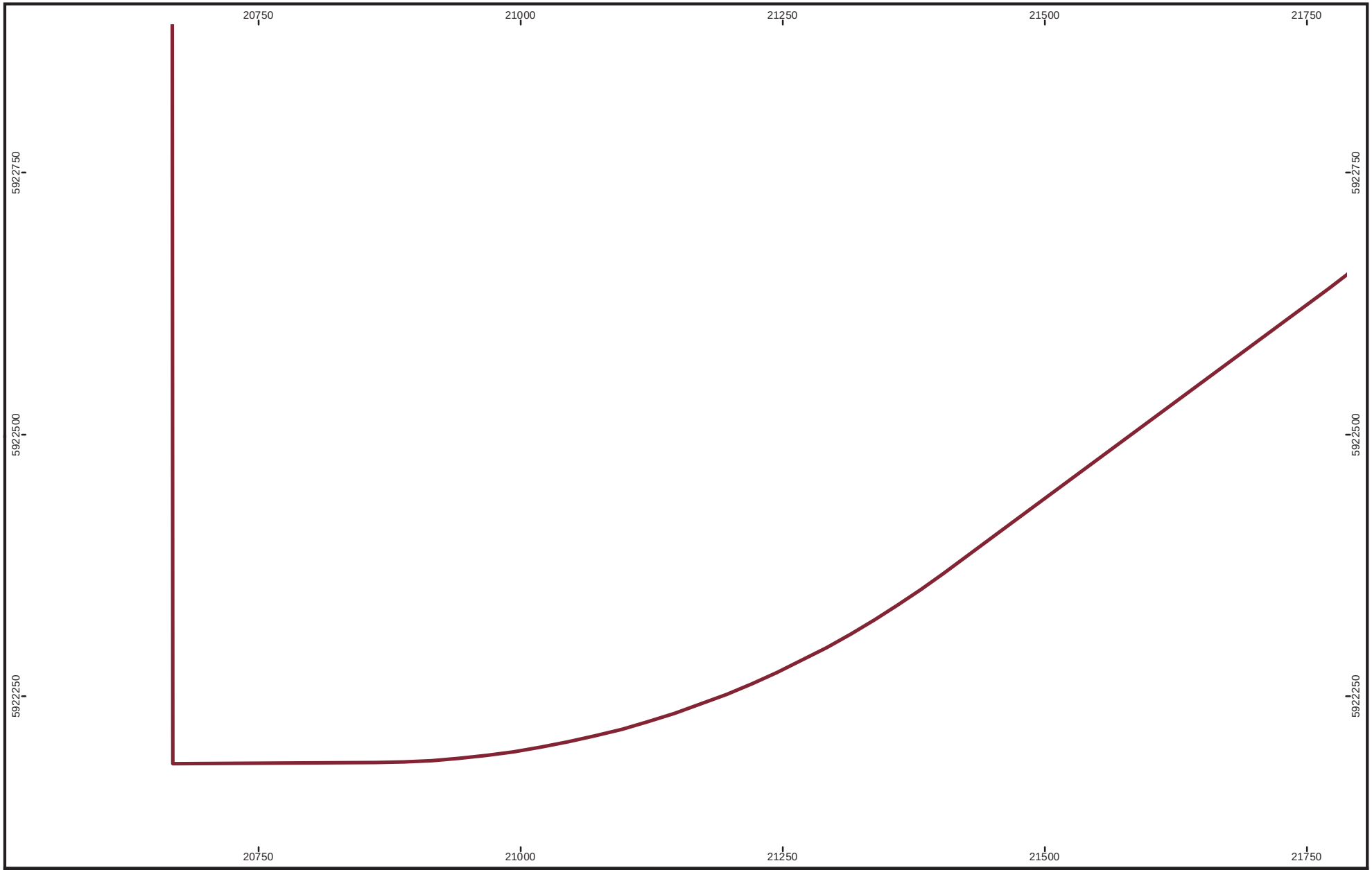
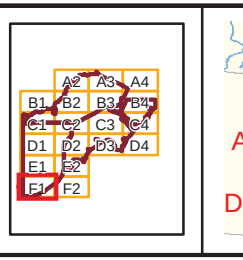


Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review
1993



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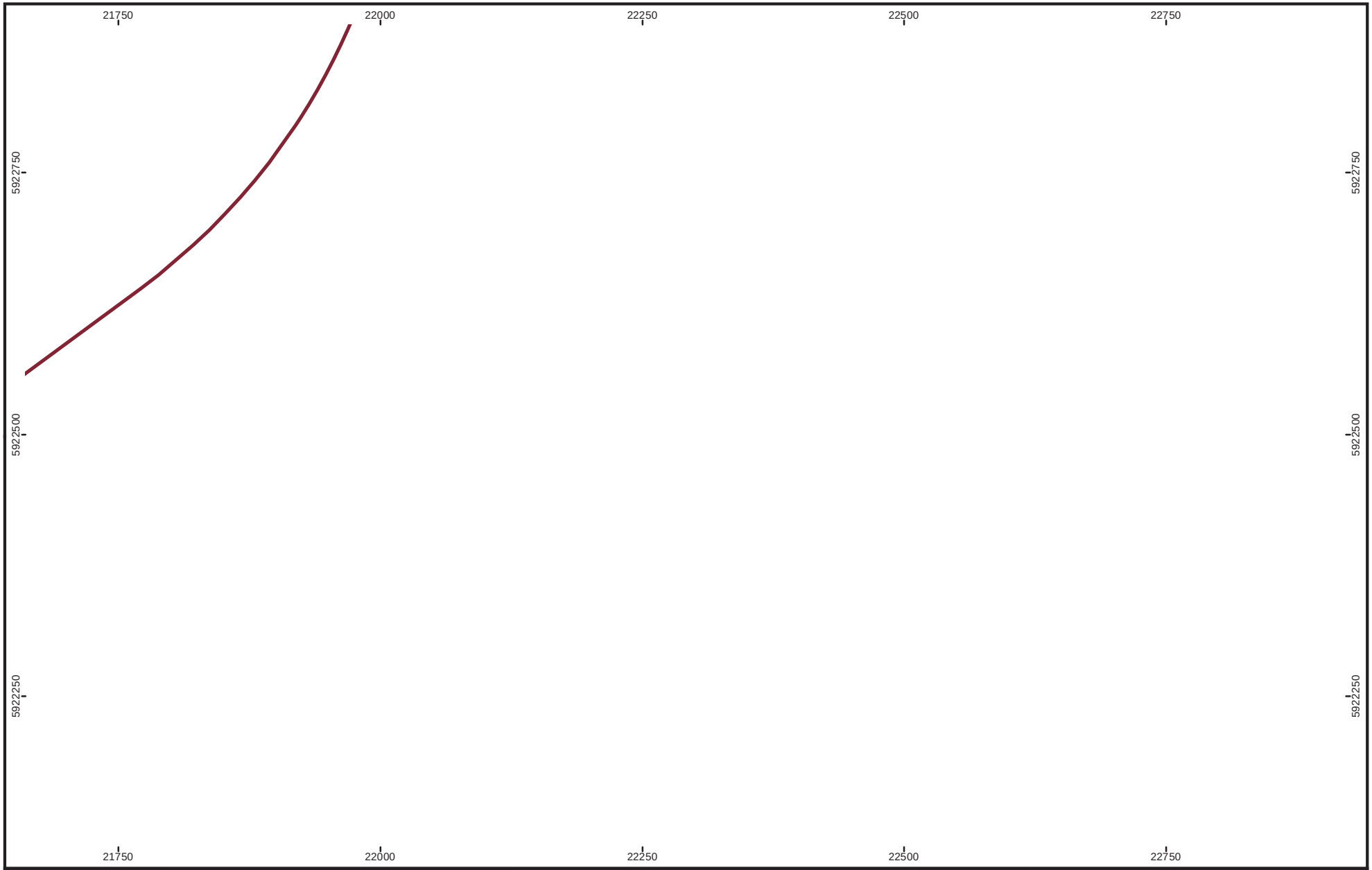
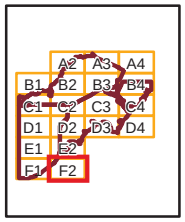


Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review
1993



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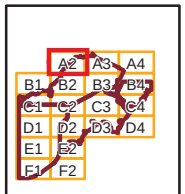
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2001



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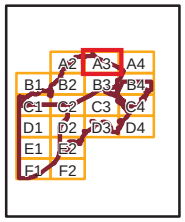
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2001



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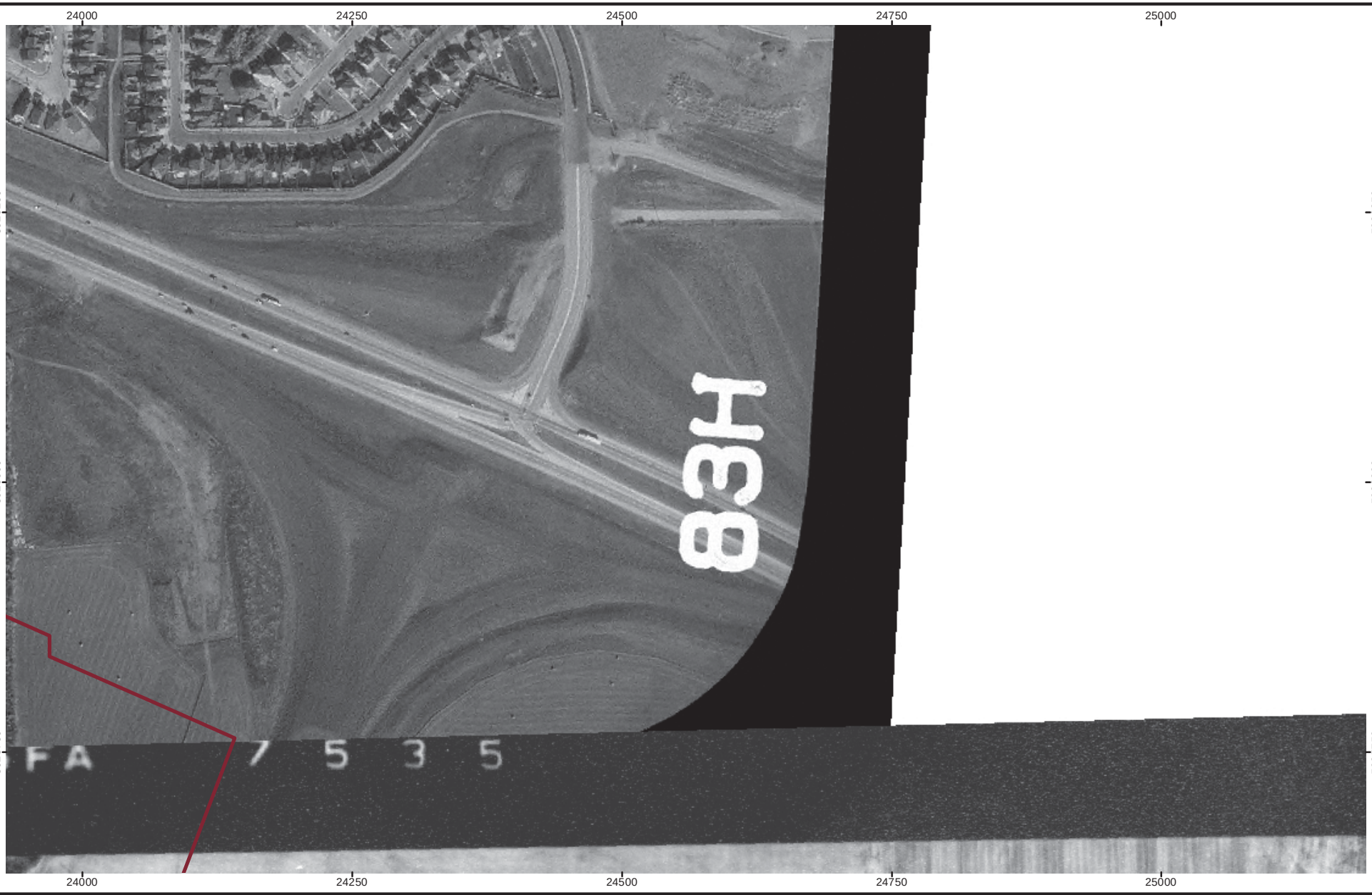

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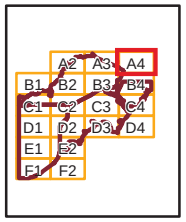

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FIGURE NO. 2001

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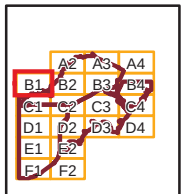

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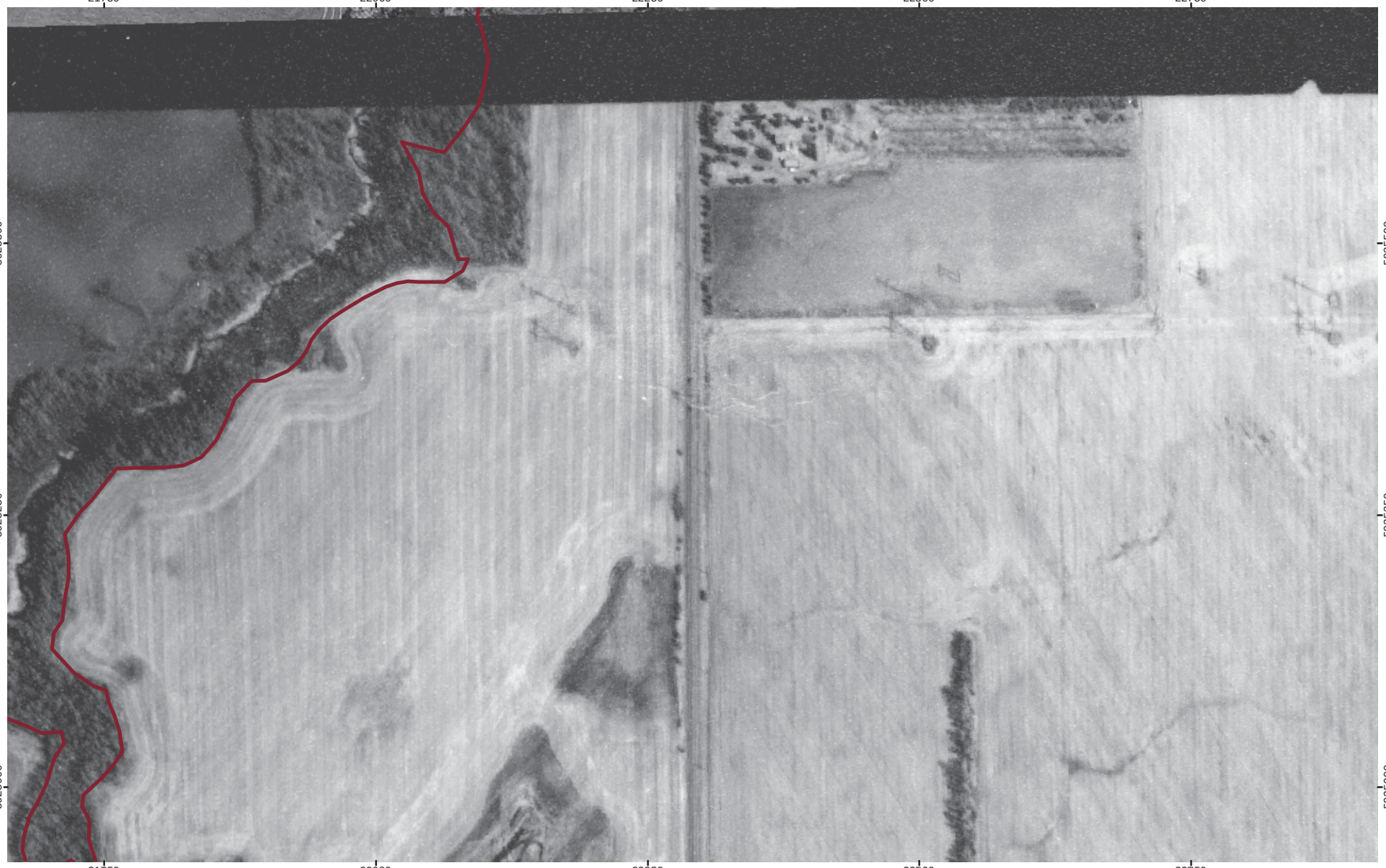

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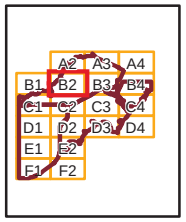
Historical Aerial Review 2001



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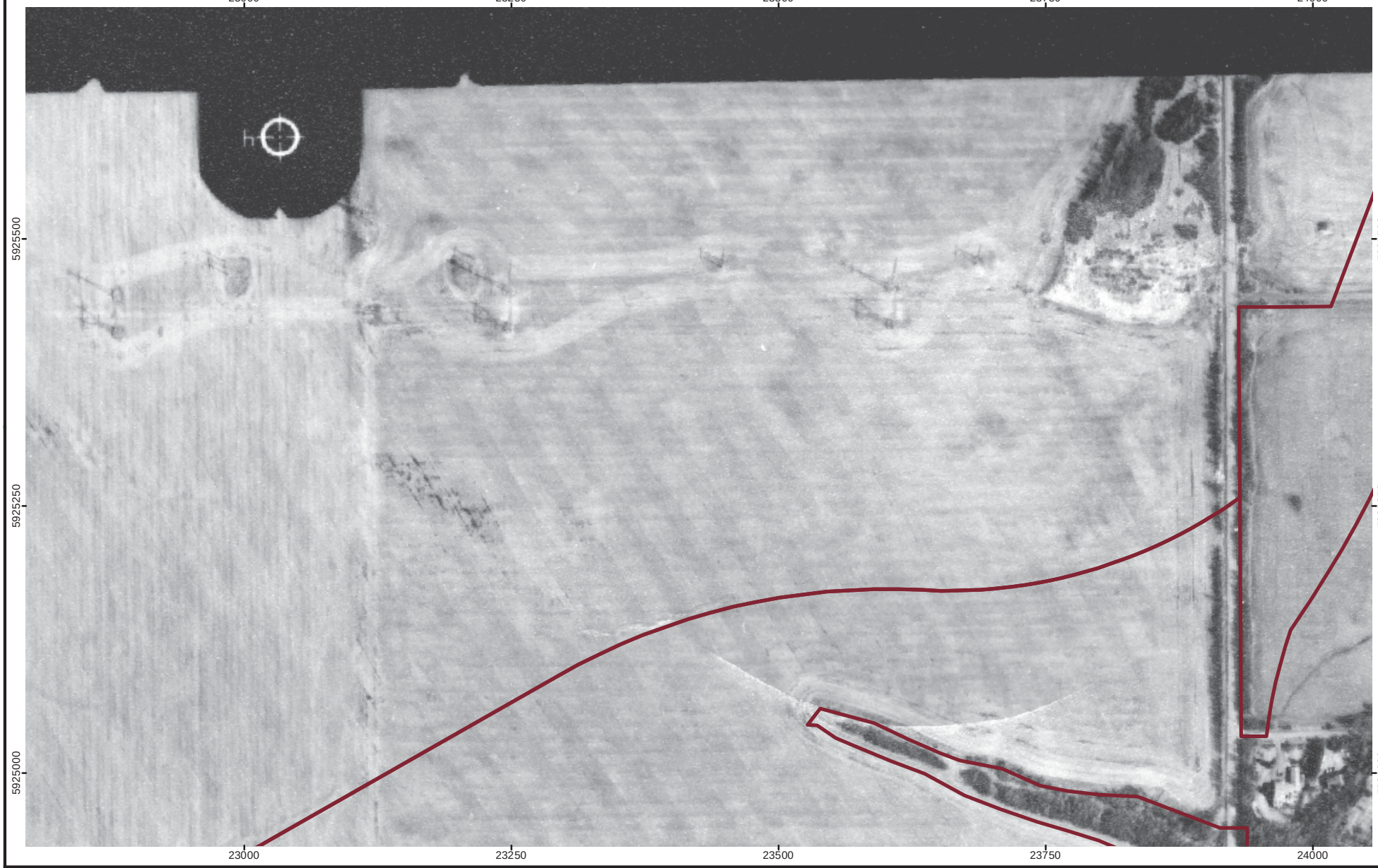

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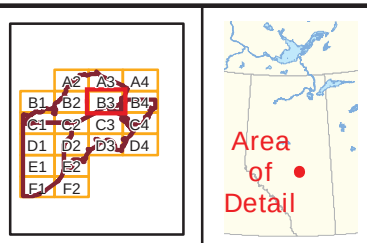

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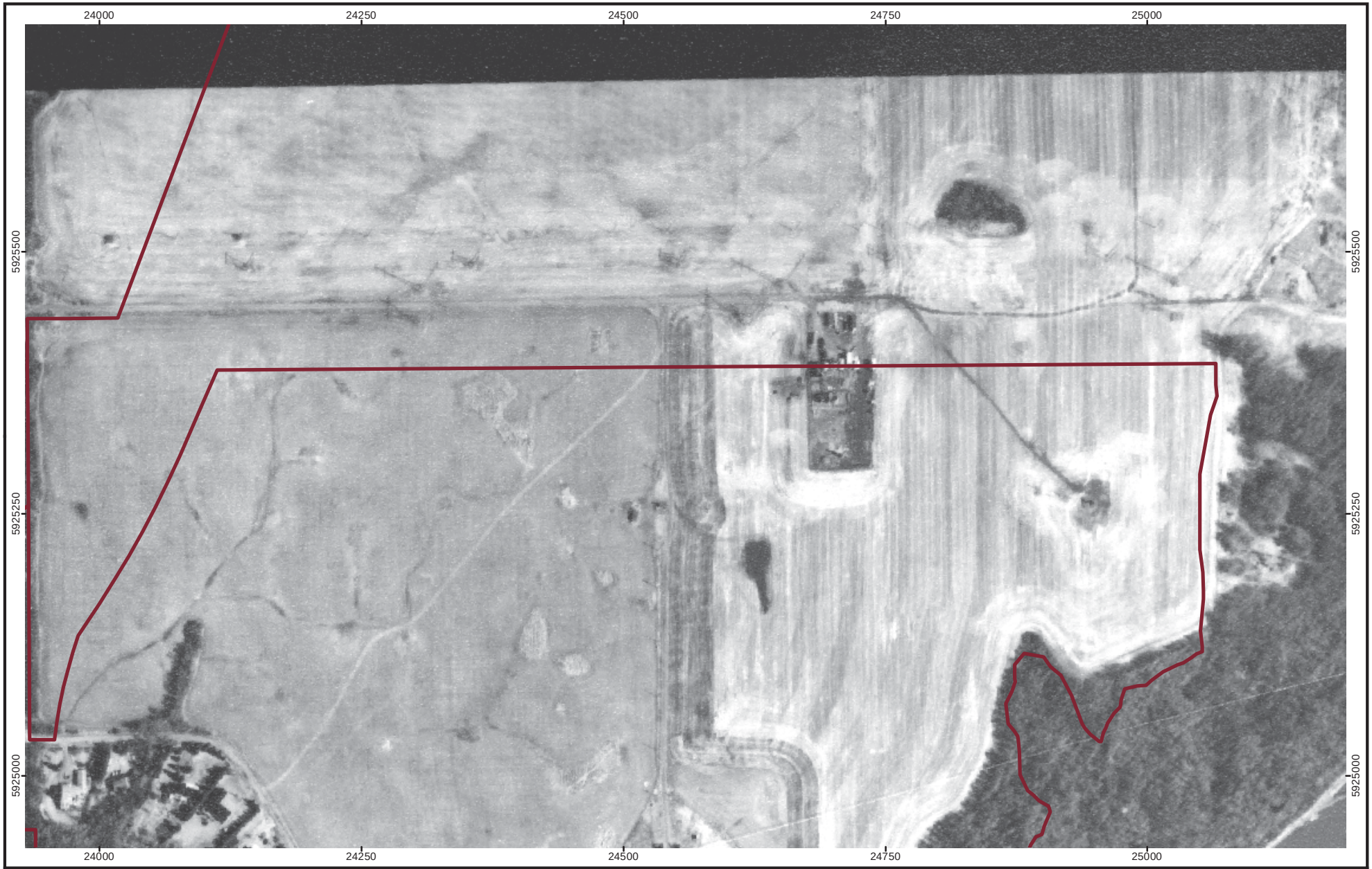

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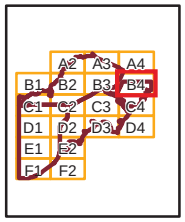

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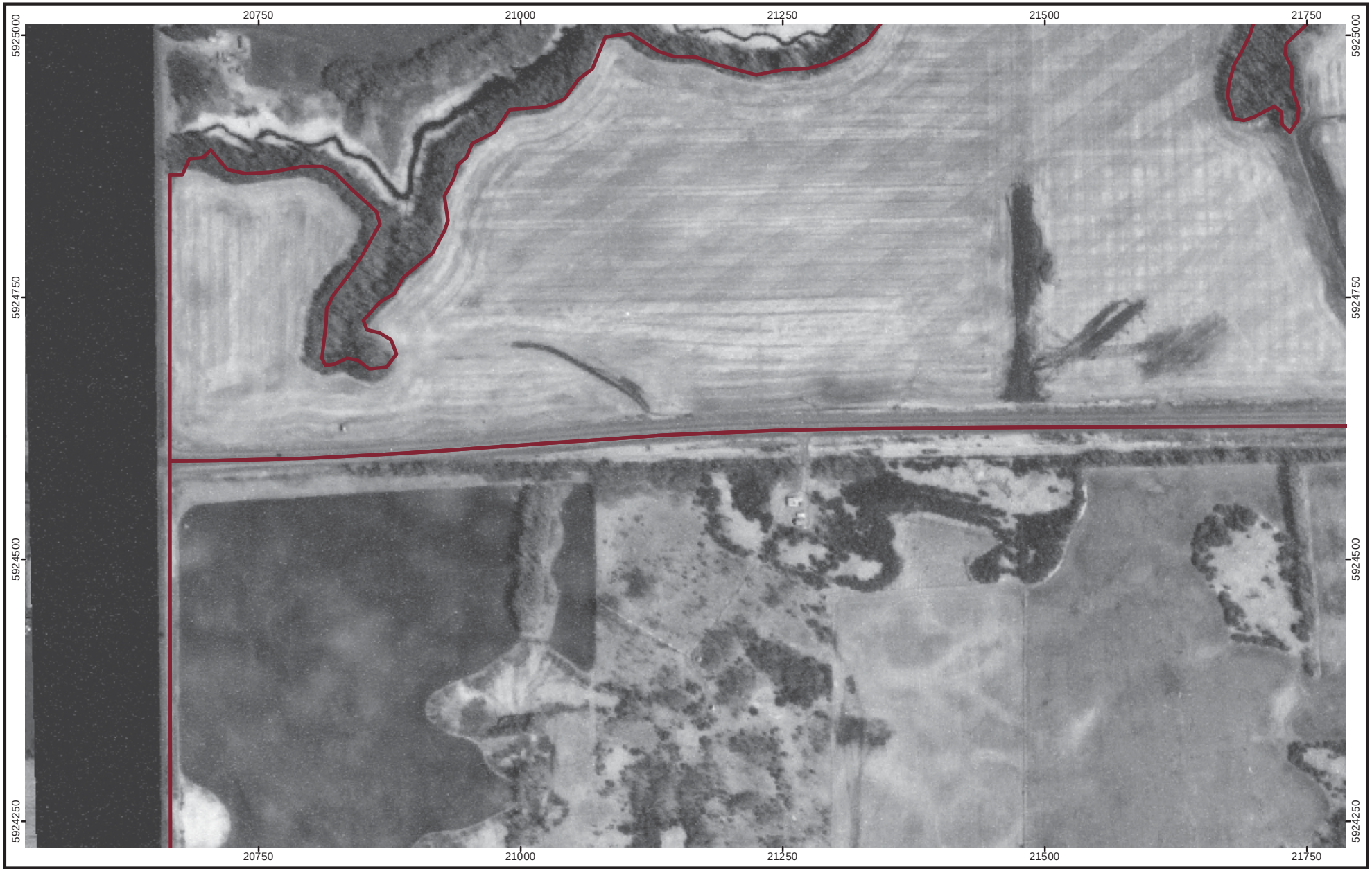

Study Area

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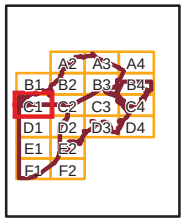
Historical Aerial Review 2001



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Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
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PREPARED BY: Stantec

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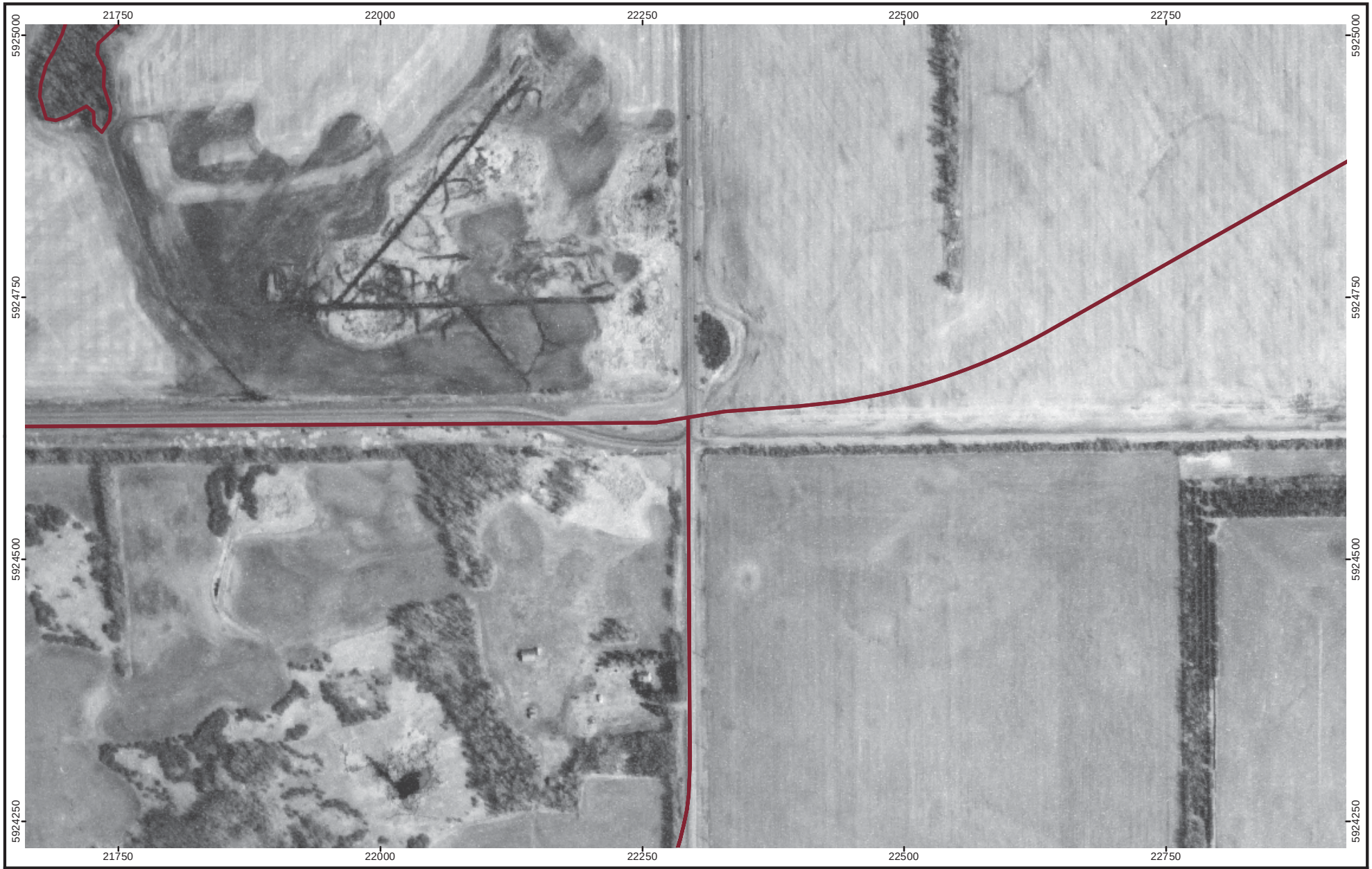

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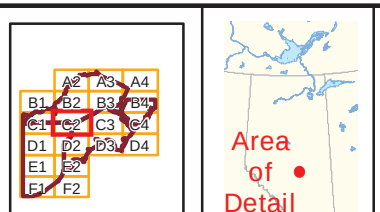

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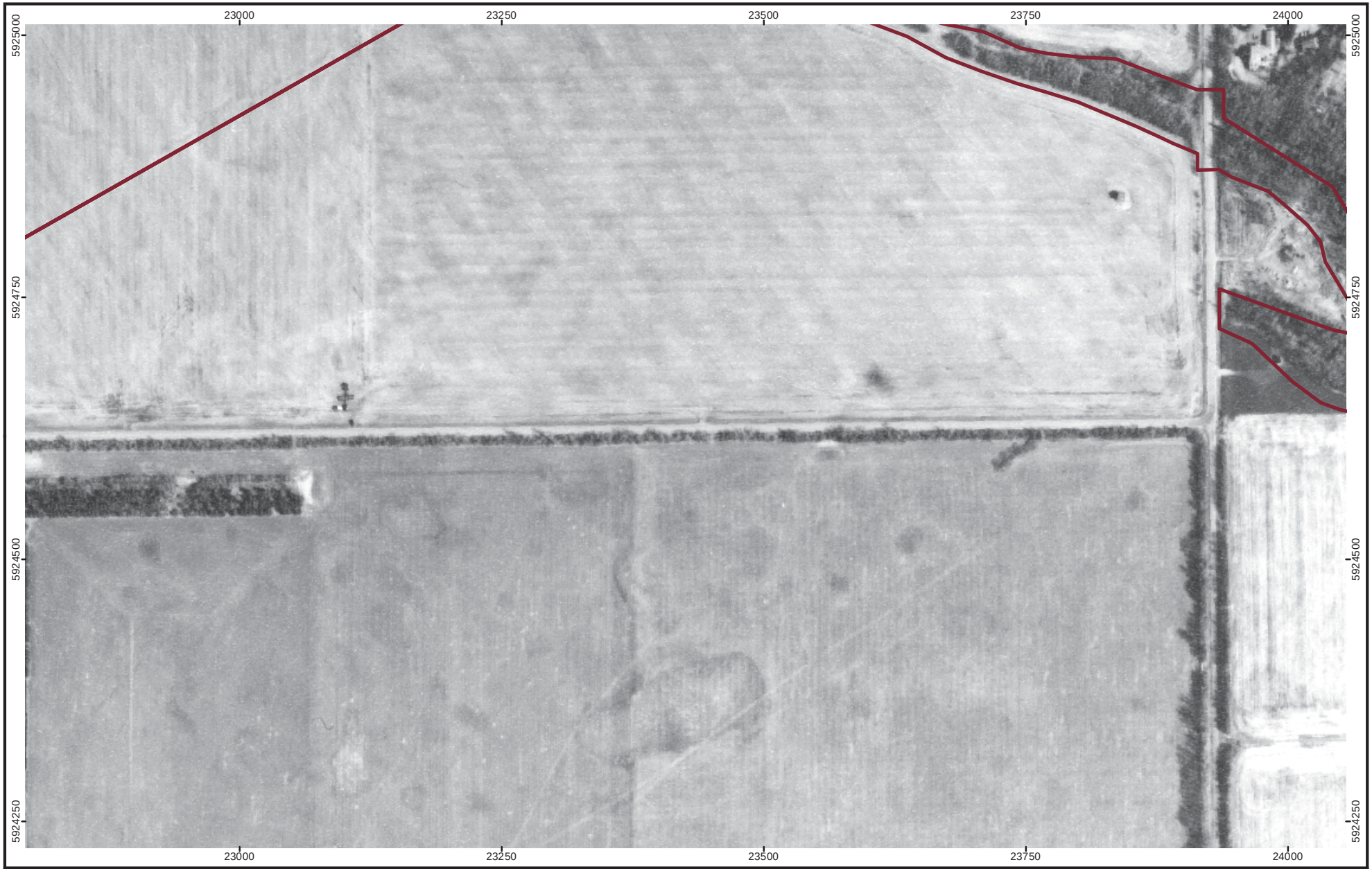

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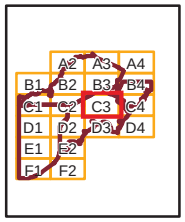

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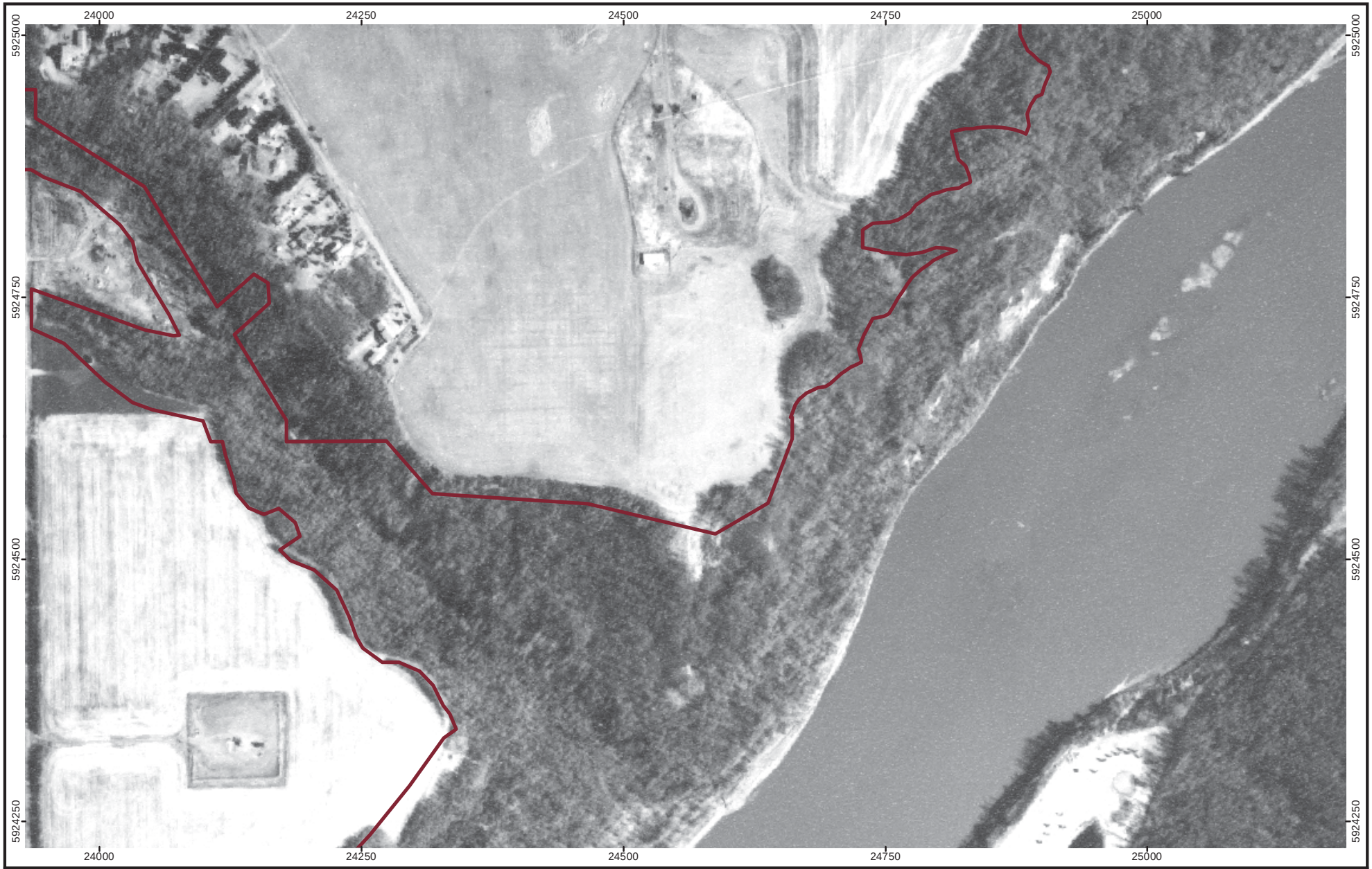

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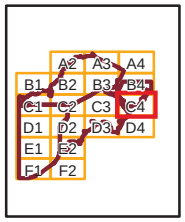

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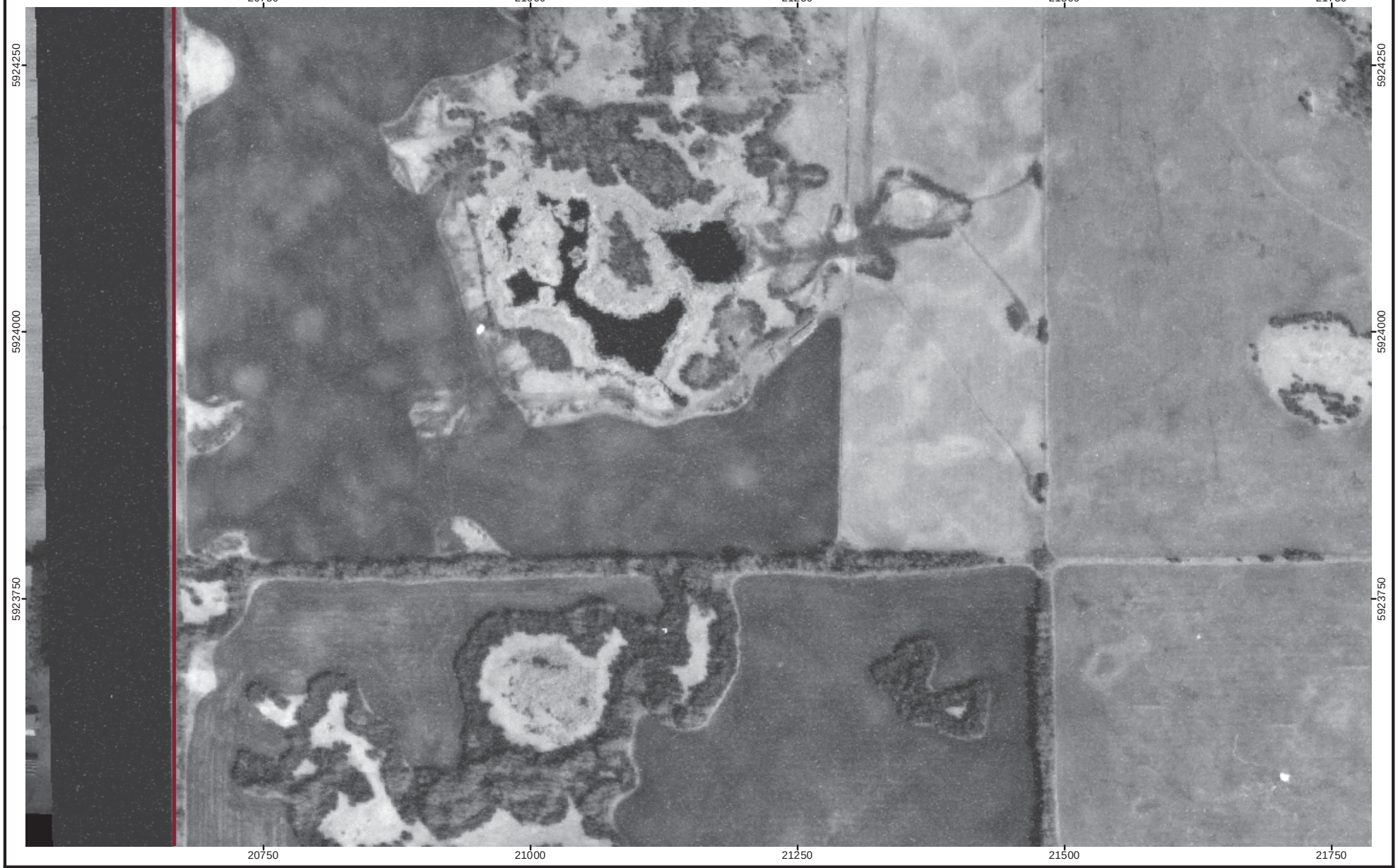

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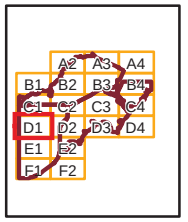

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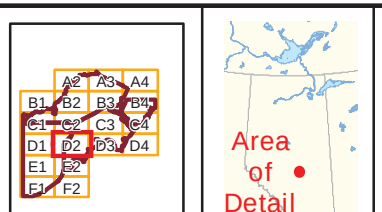

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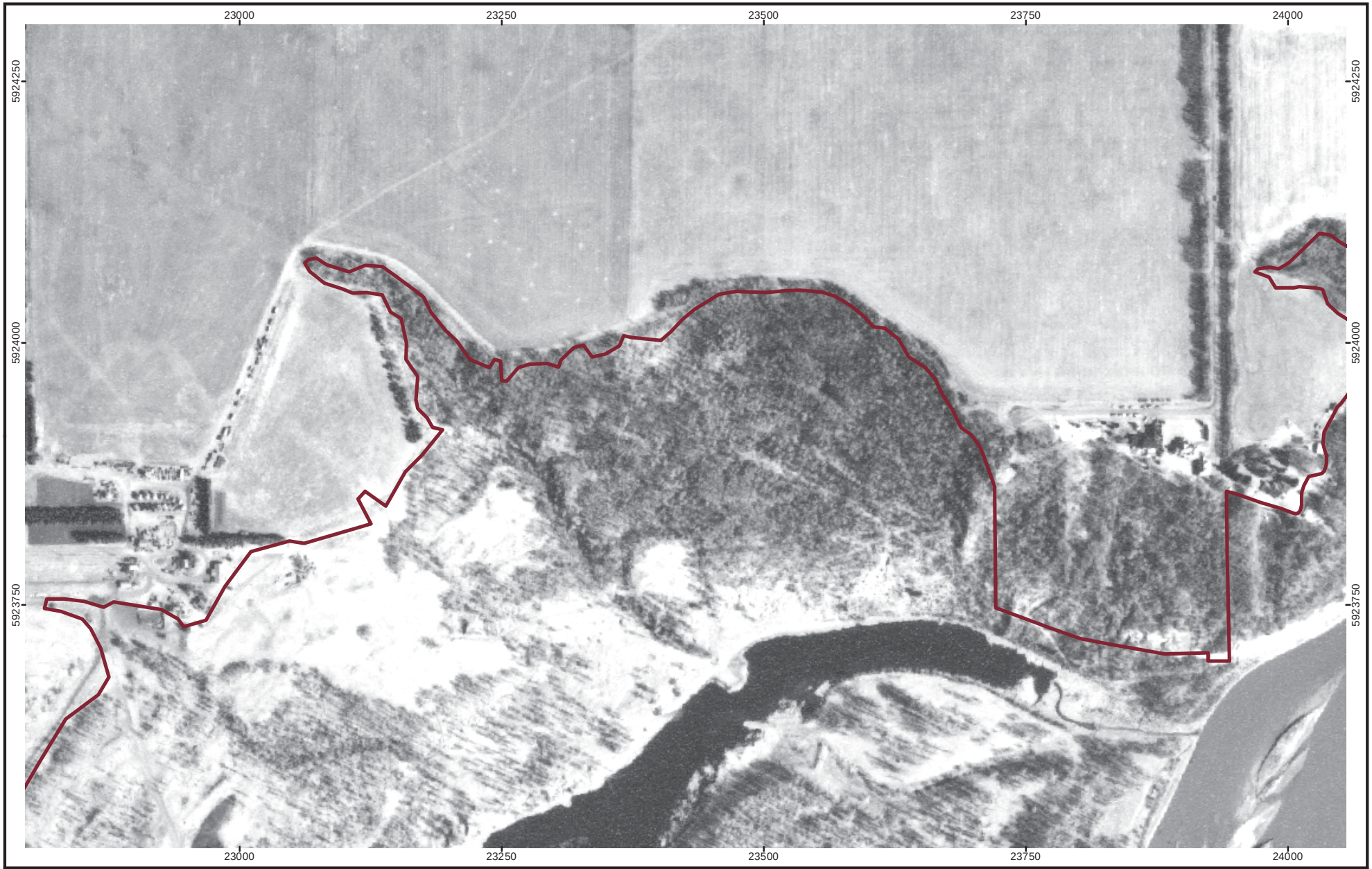

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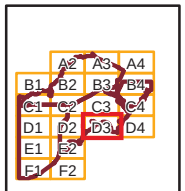

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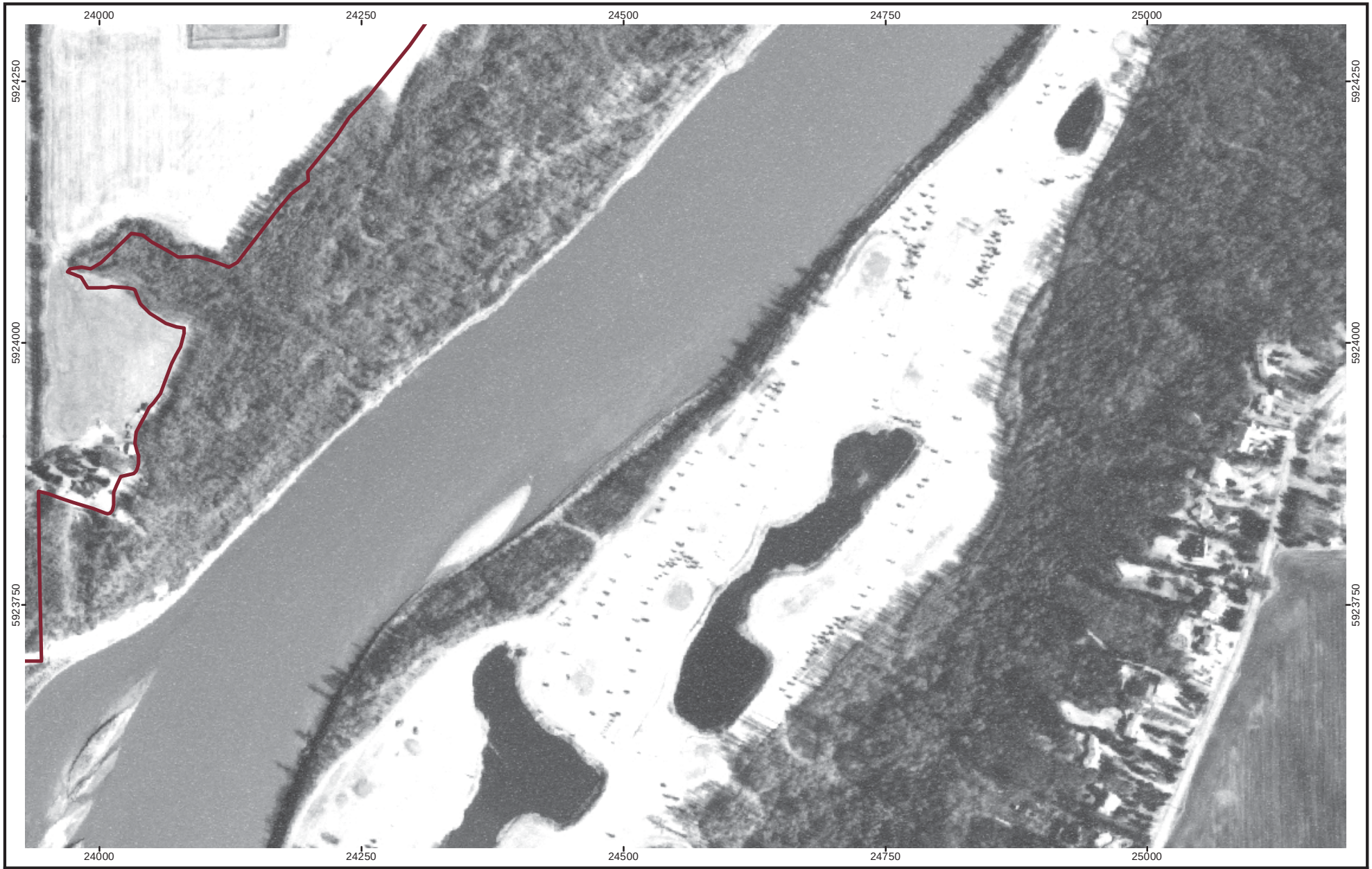

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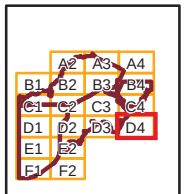

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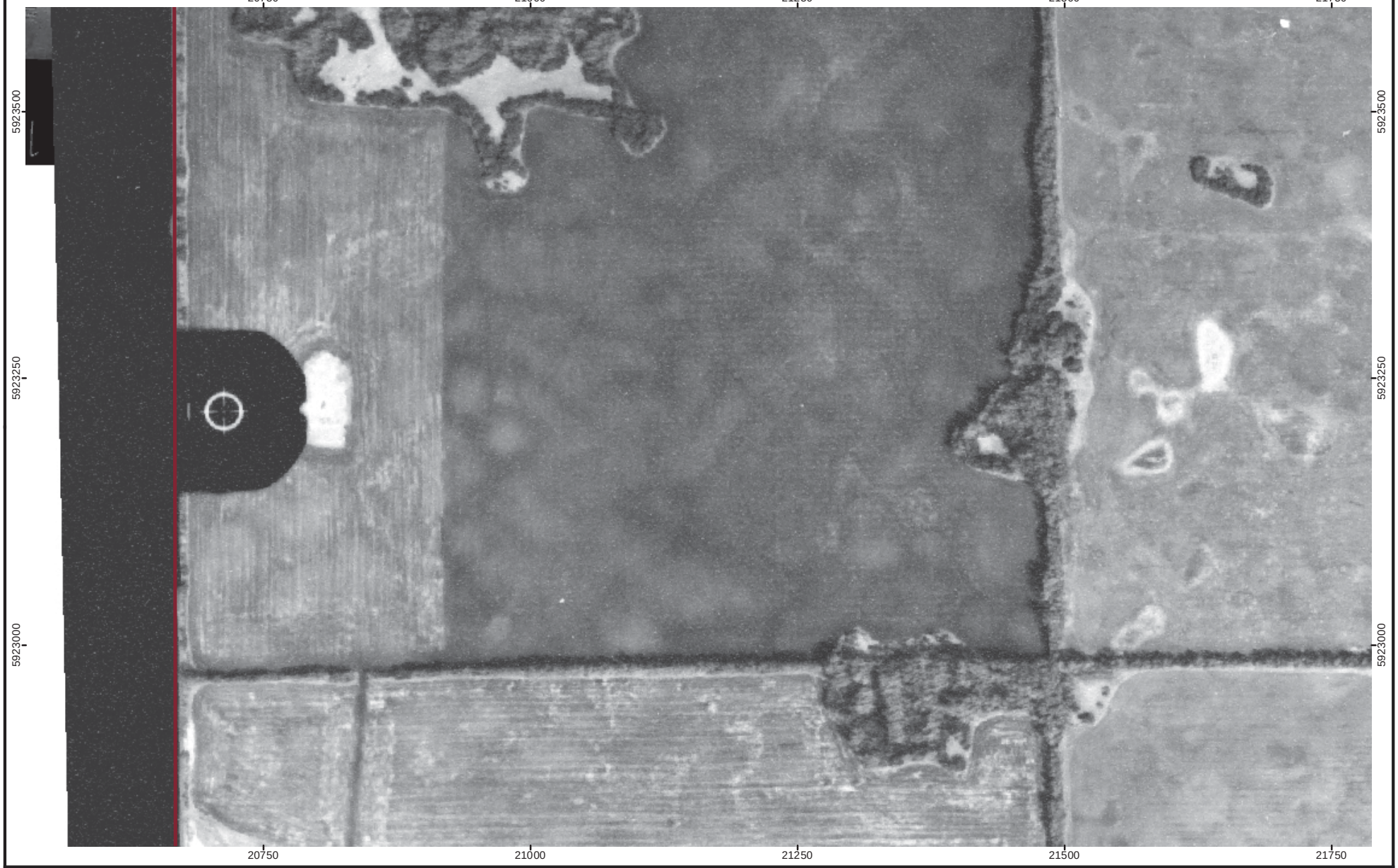

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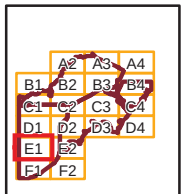

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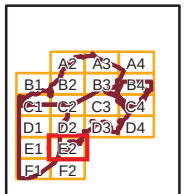

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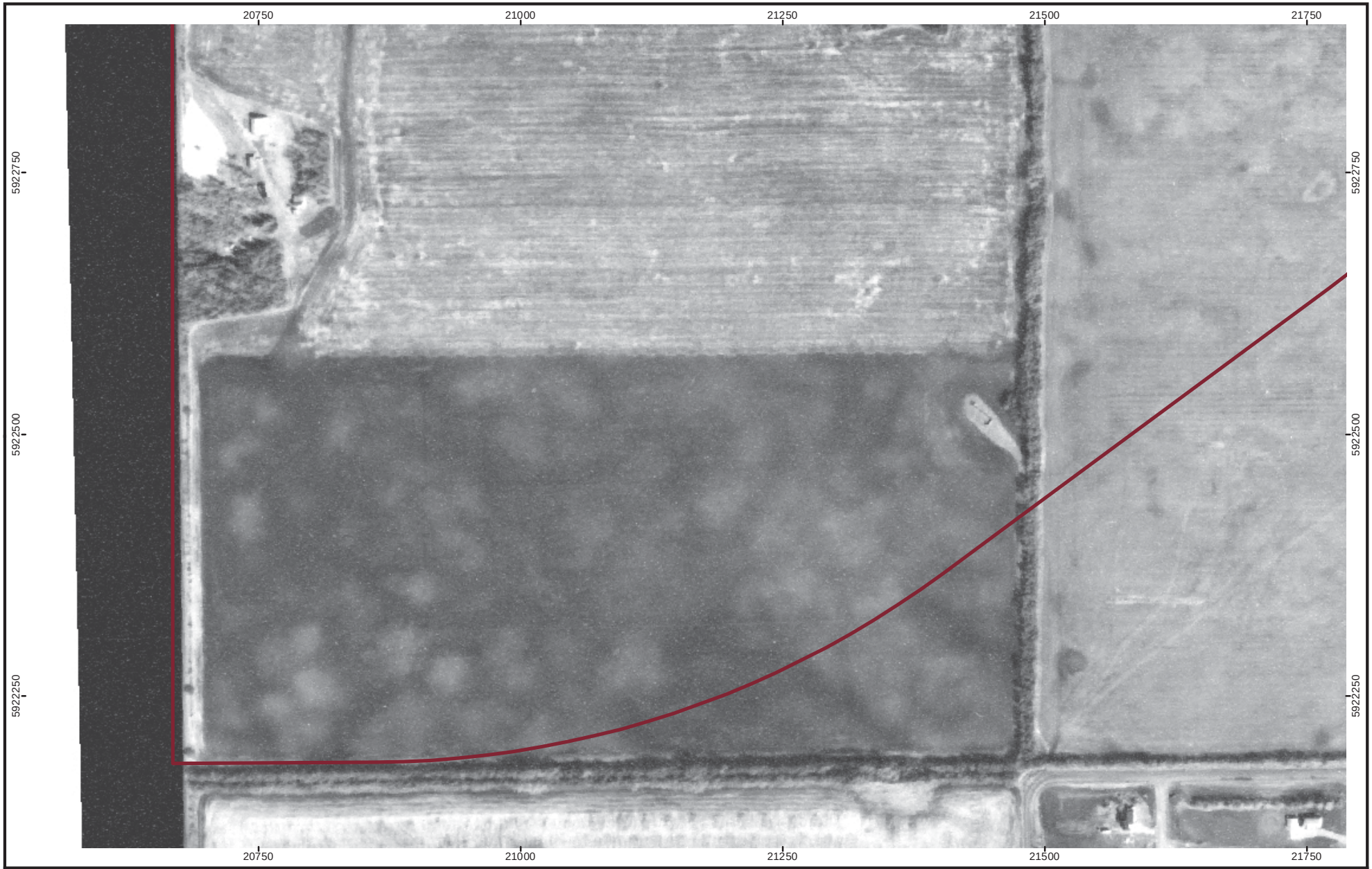

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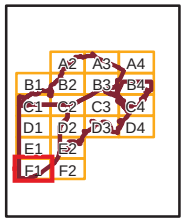

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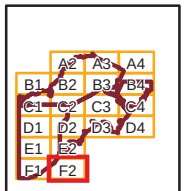

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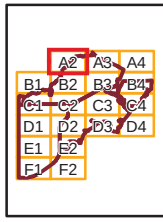

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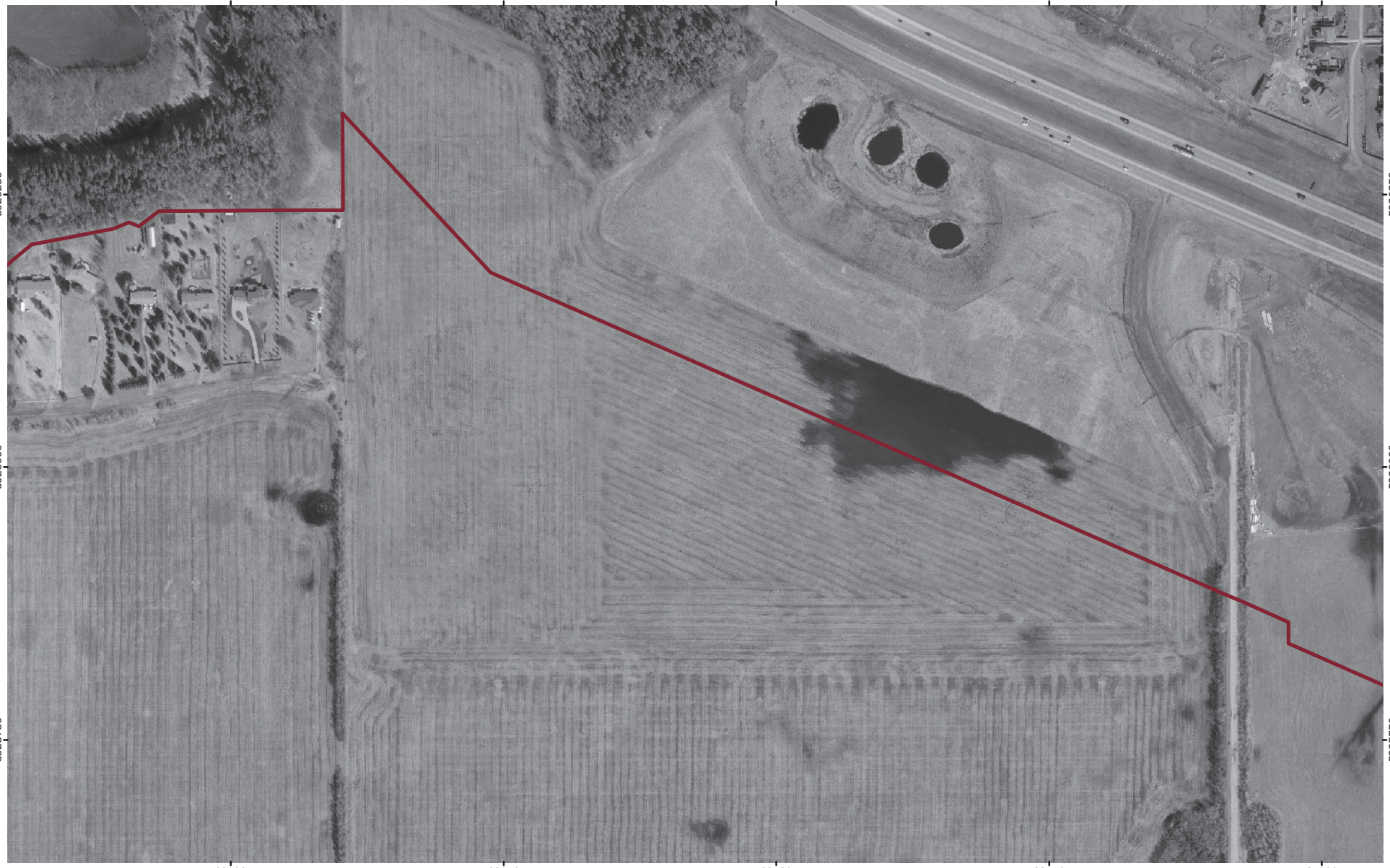

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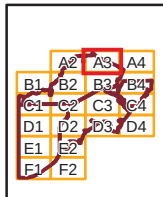

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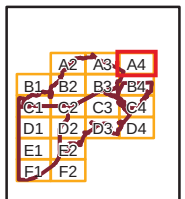

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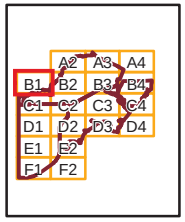

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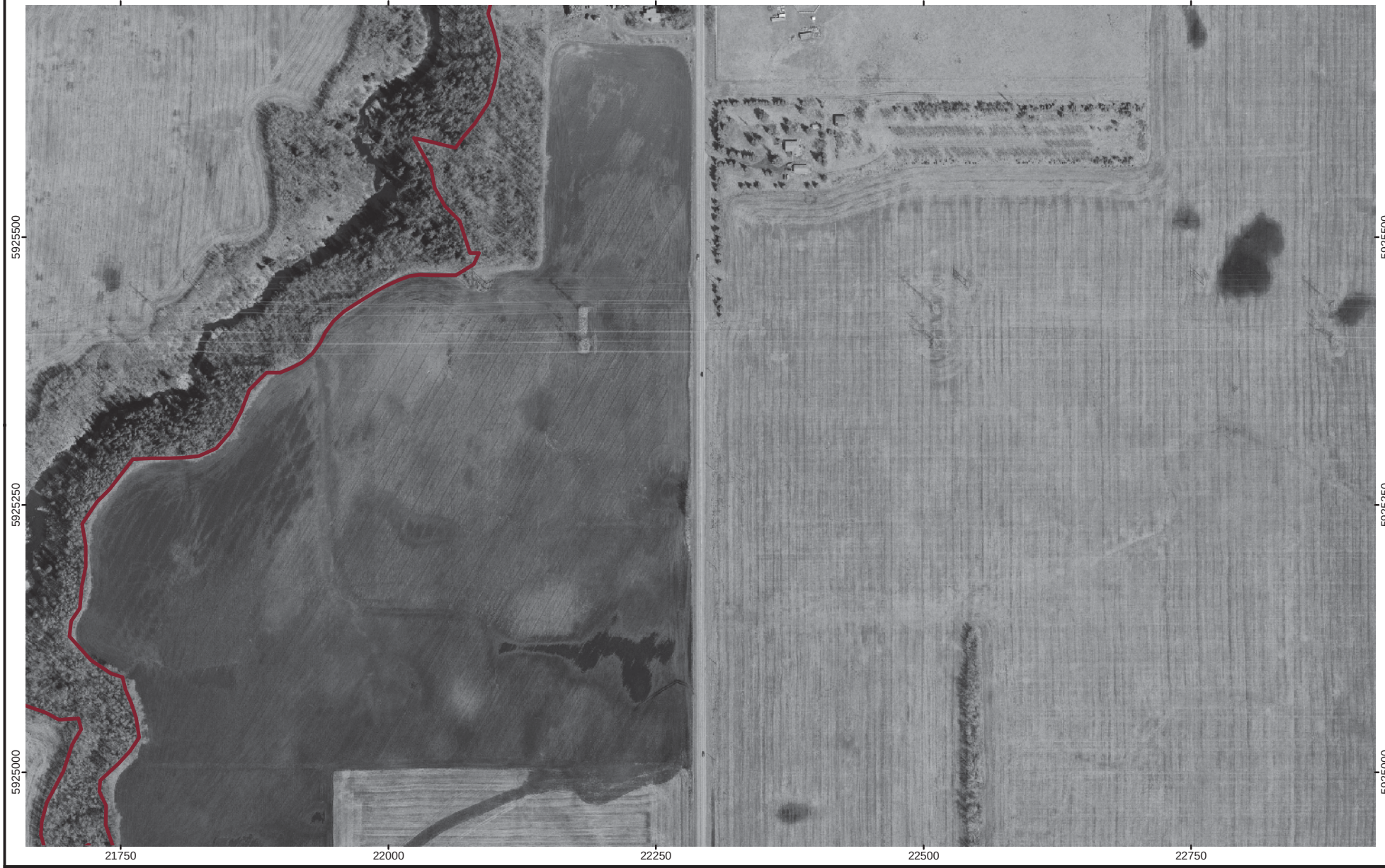

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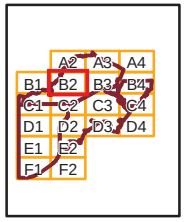

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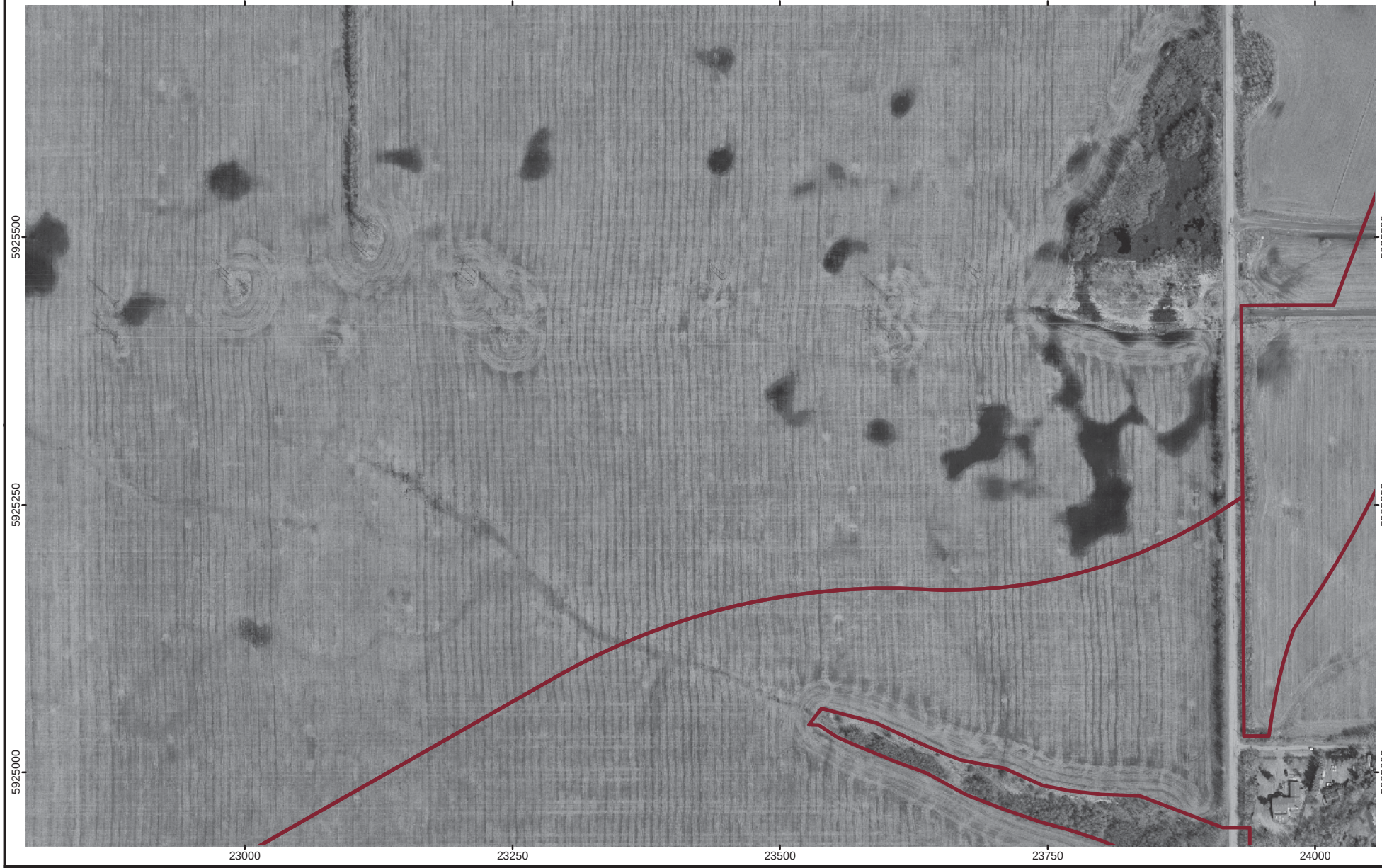

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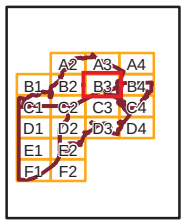

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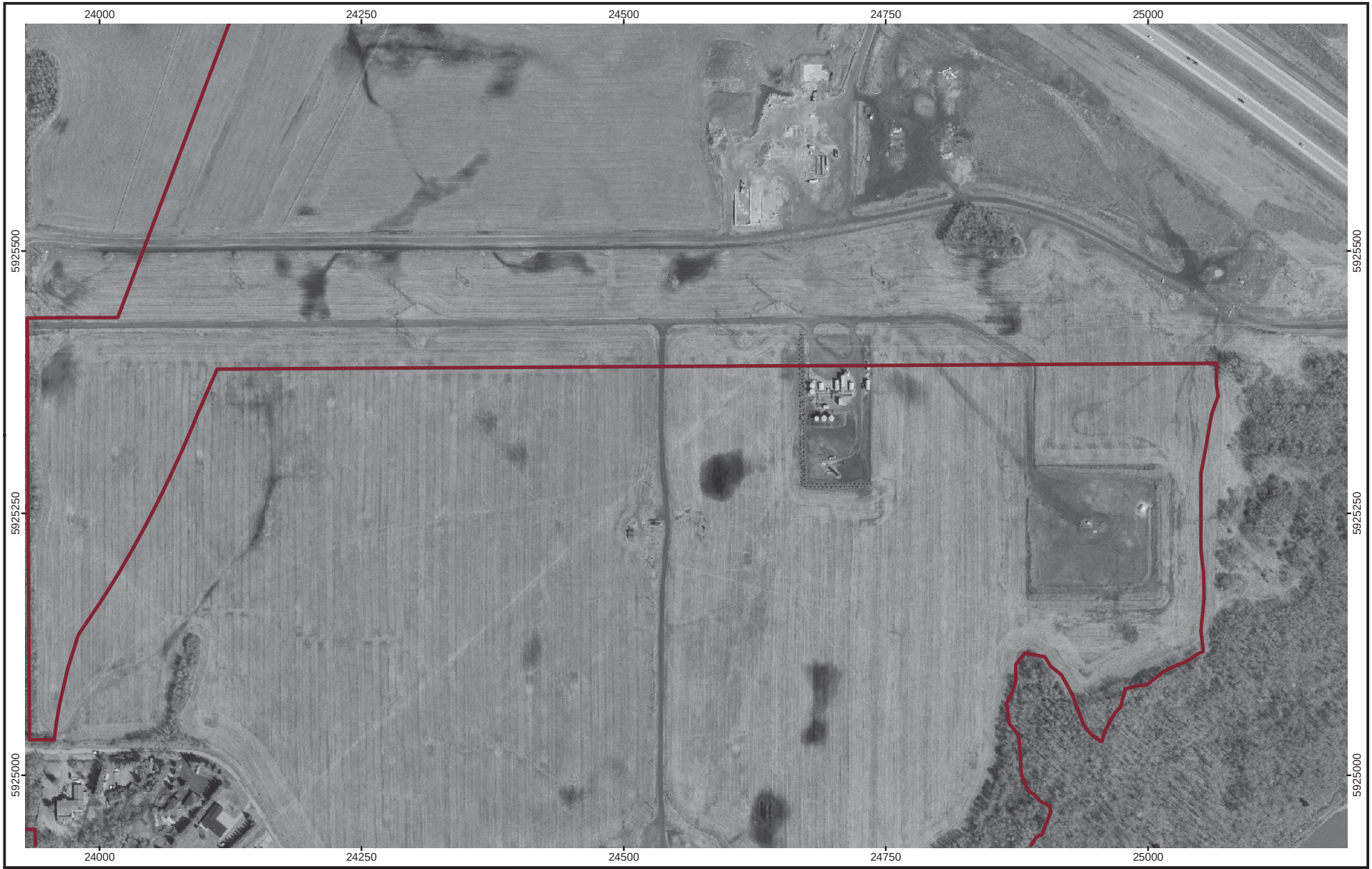

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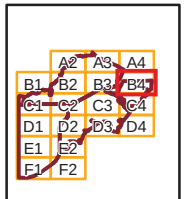

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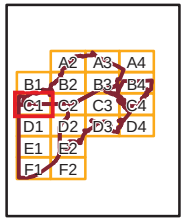

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DRAFT DATE December 12, 2012				SCALE 1:5,000	
REVISION DATE May 23, 2014				PROJECT 110218864	FIGURE NO. 2007
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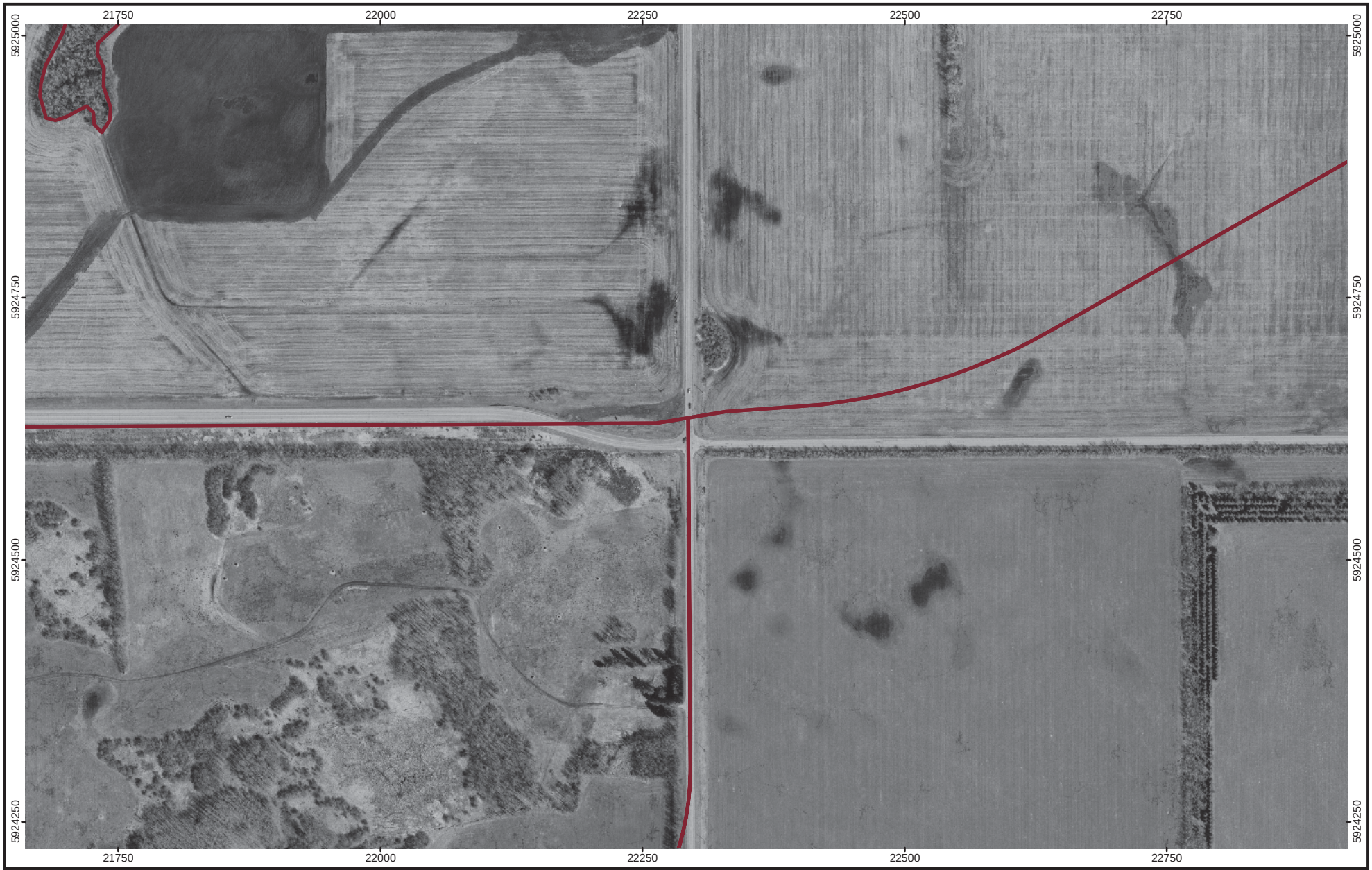
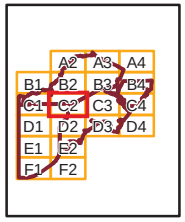


Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2007



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Meters

Projection: 3TM CM:114° Datum: NAD 83

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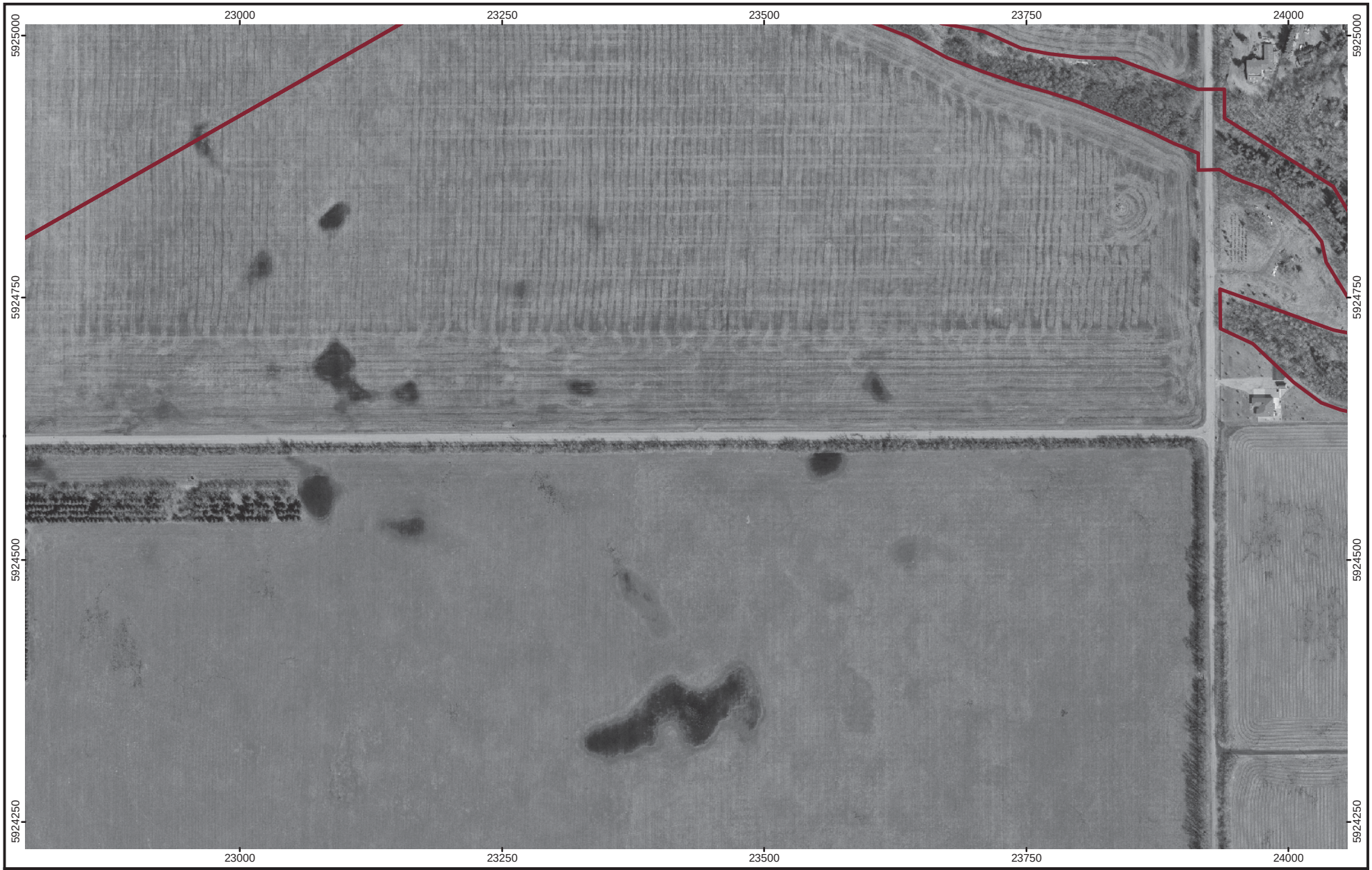

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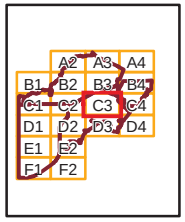

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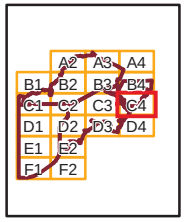

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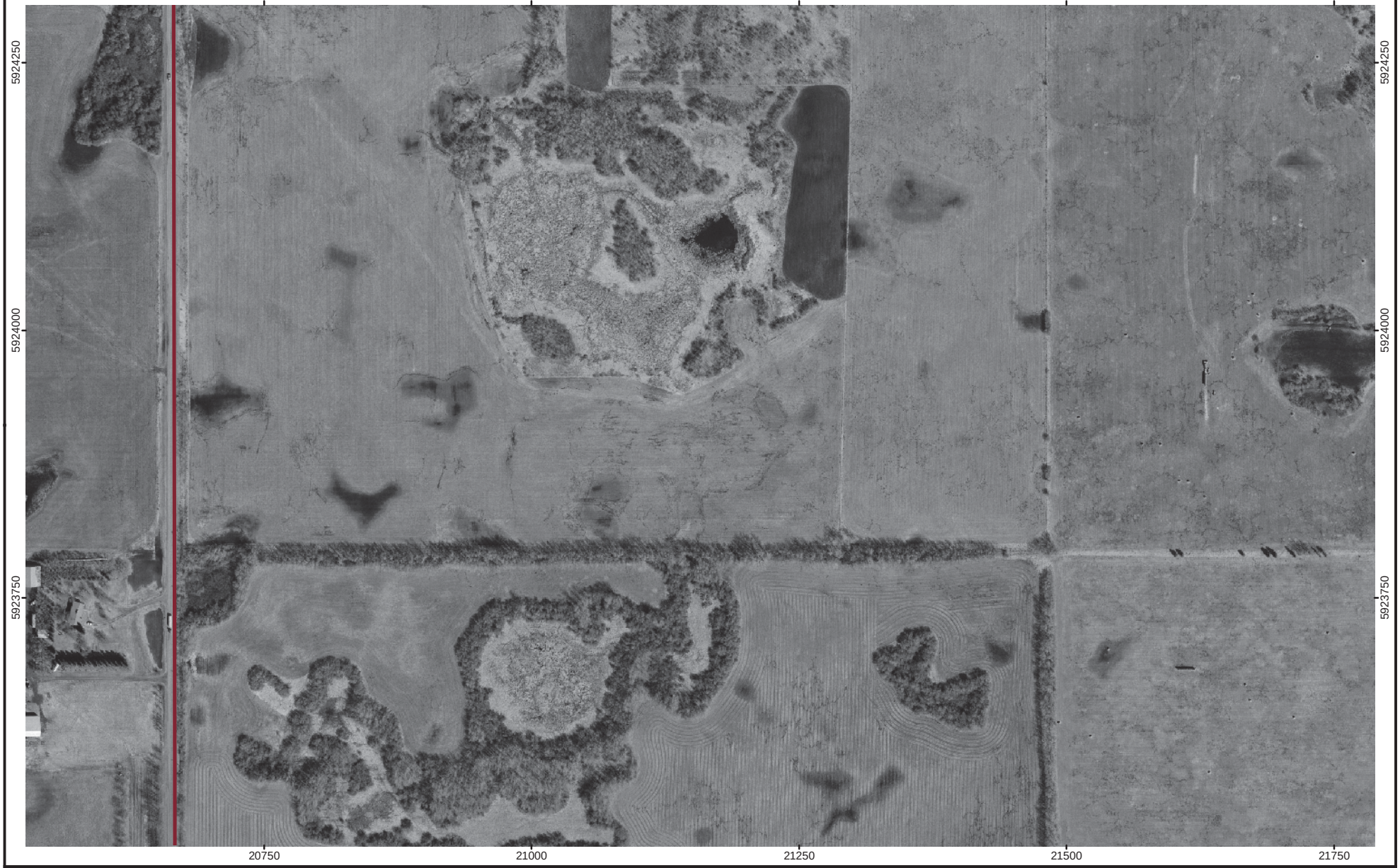

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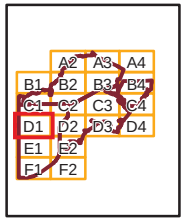

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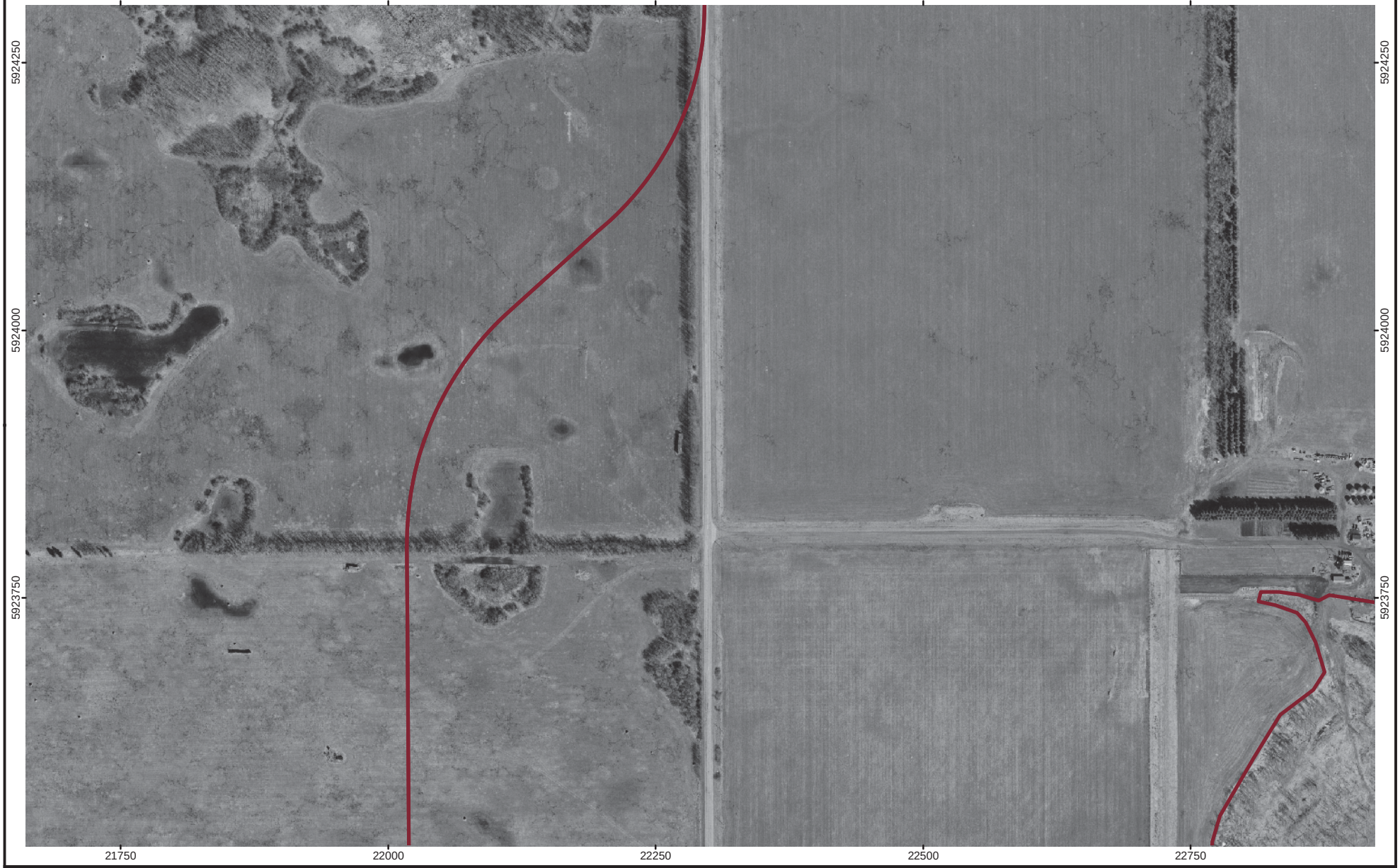

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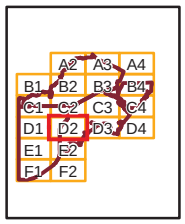

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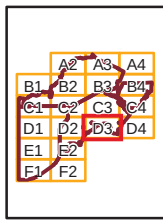

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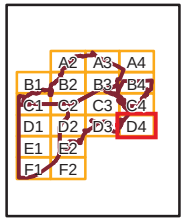

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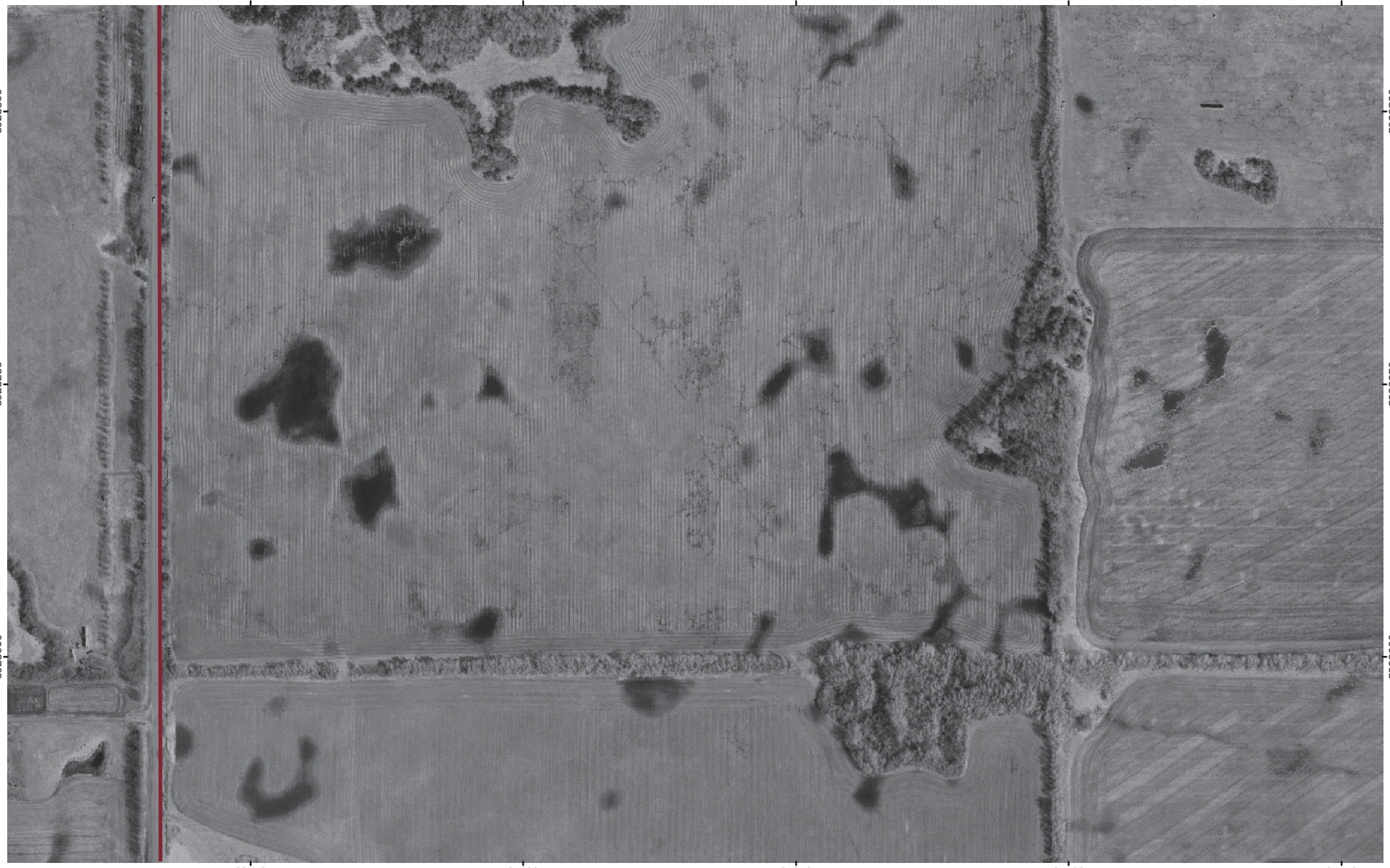

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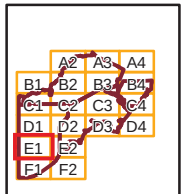

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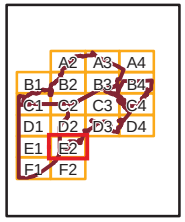

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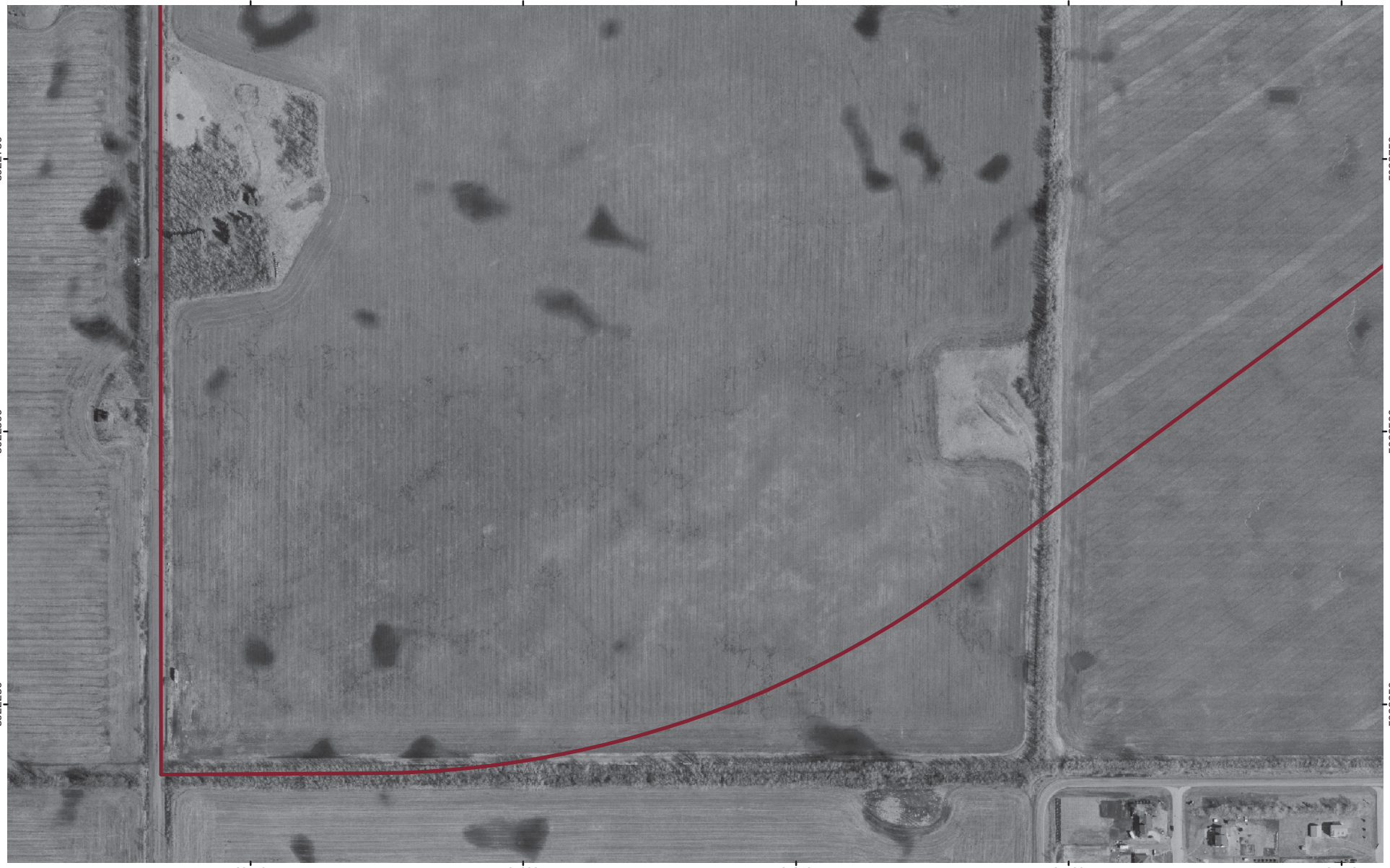

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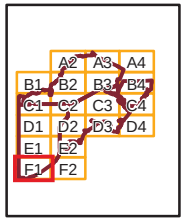

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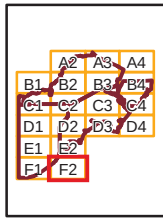

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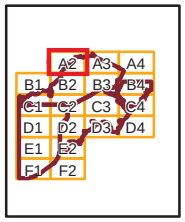

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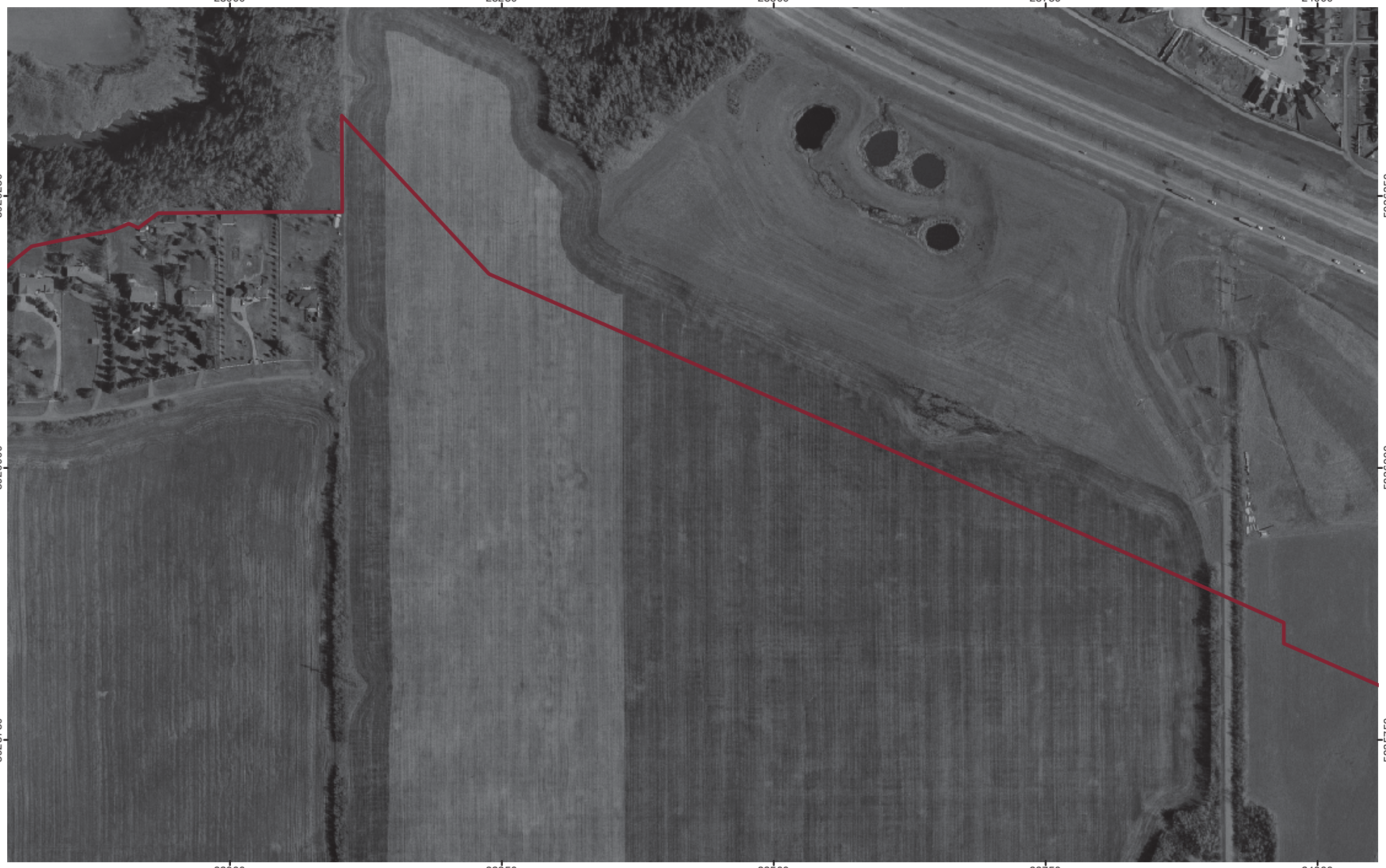

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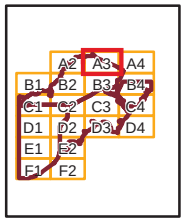

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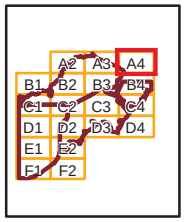

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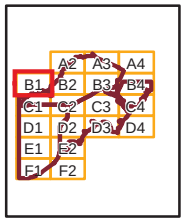

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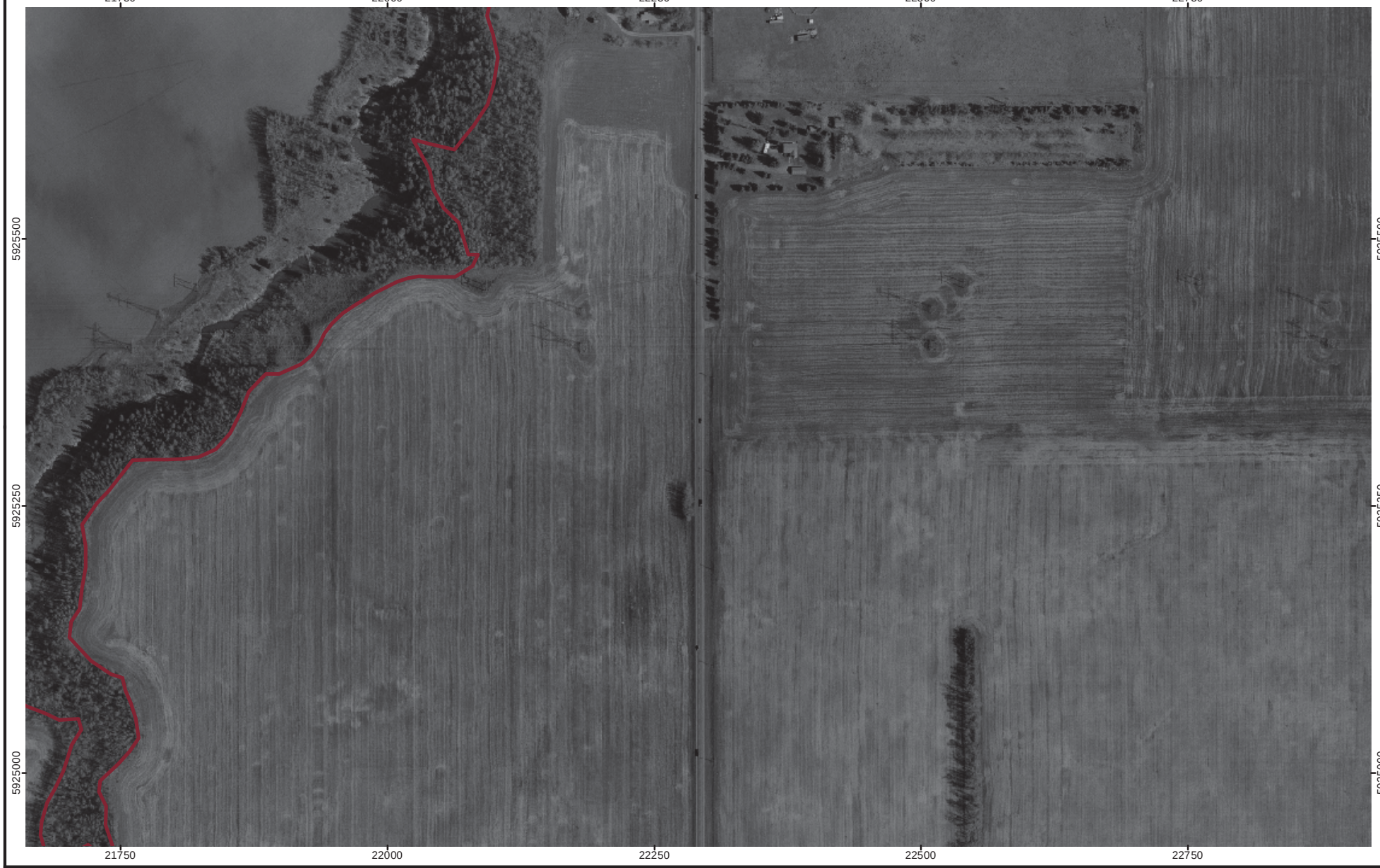

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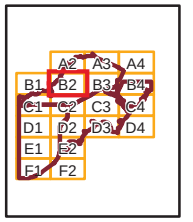

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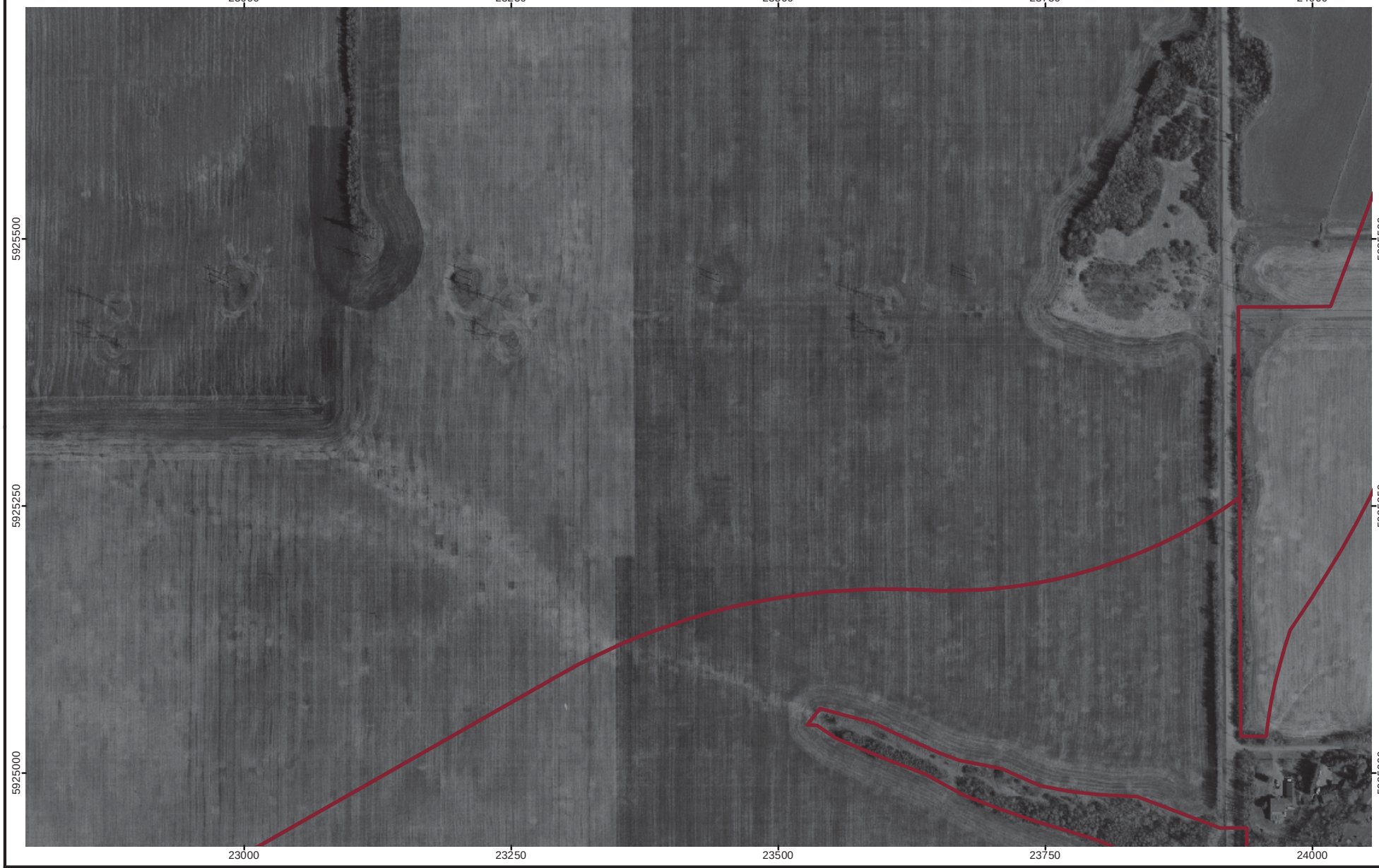

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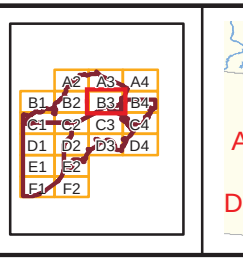

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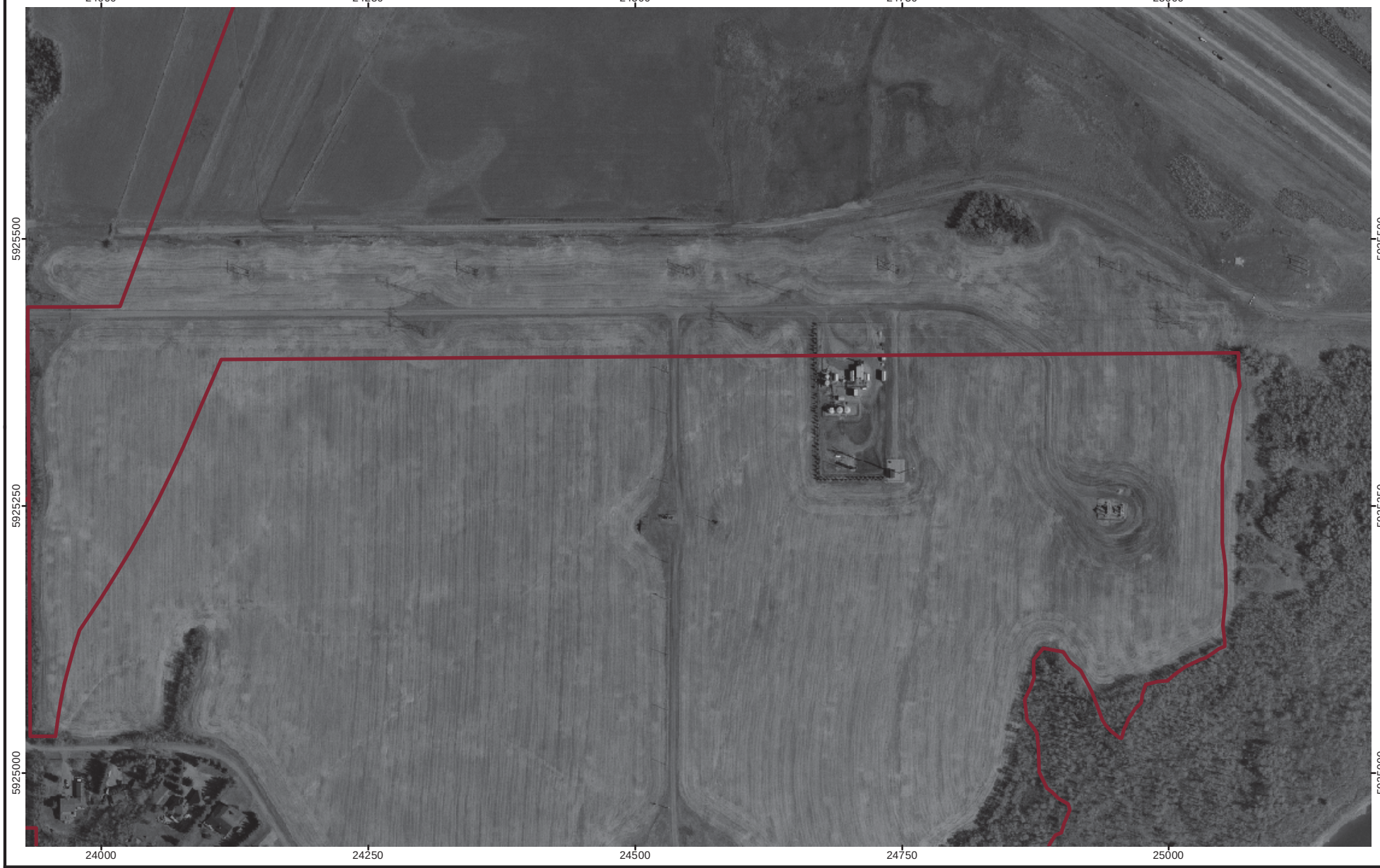

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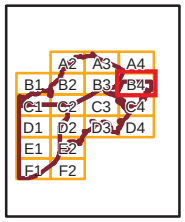

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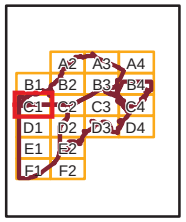

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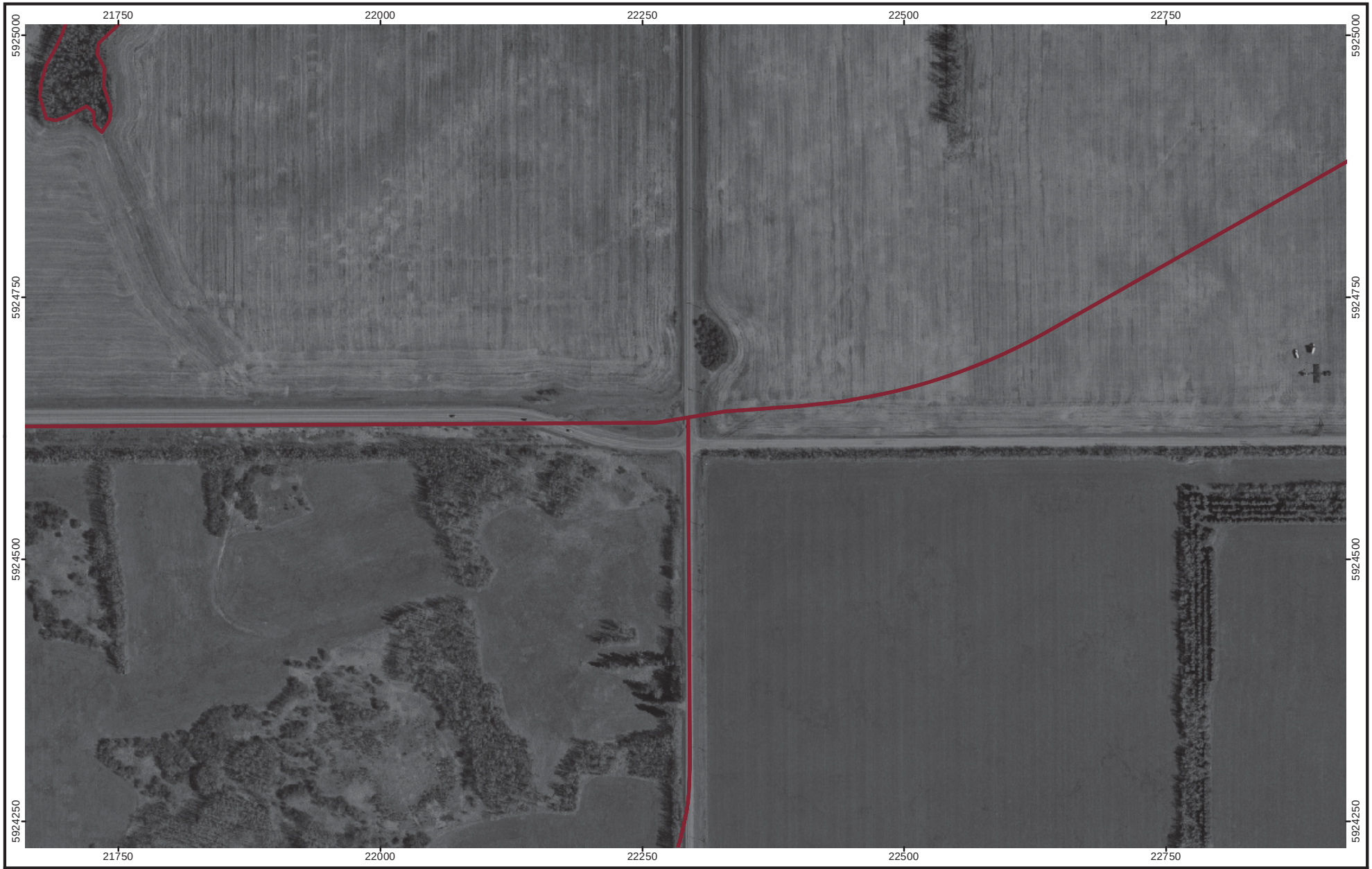

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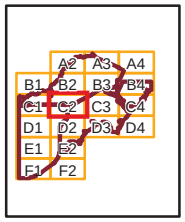

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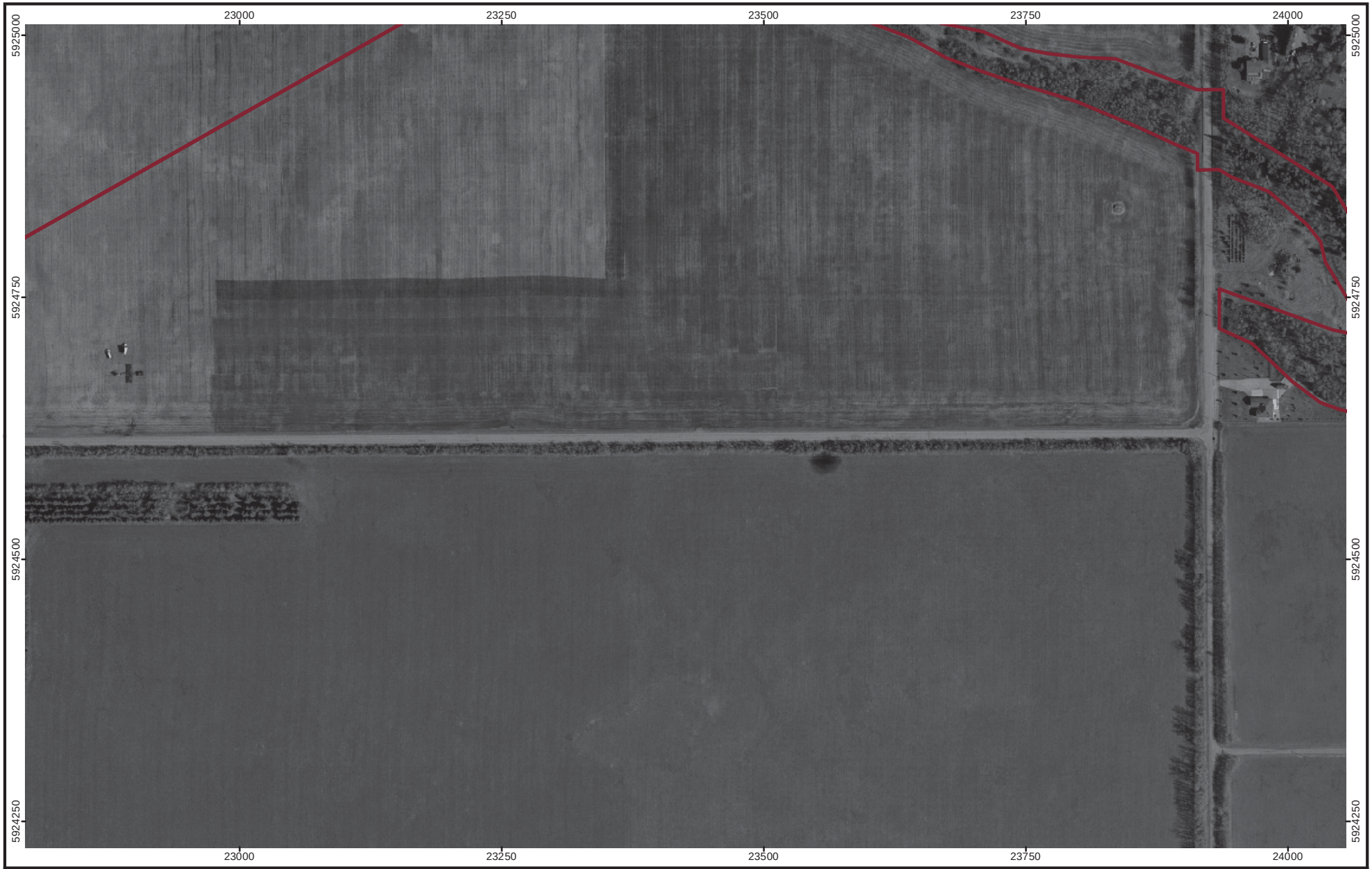
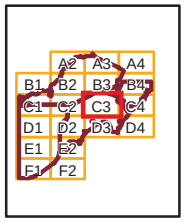


Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2010



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Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2010.

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Study Area

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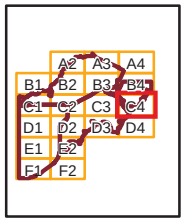

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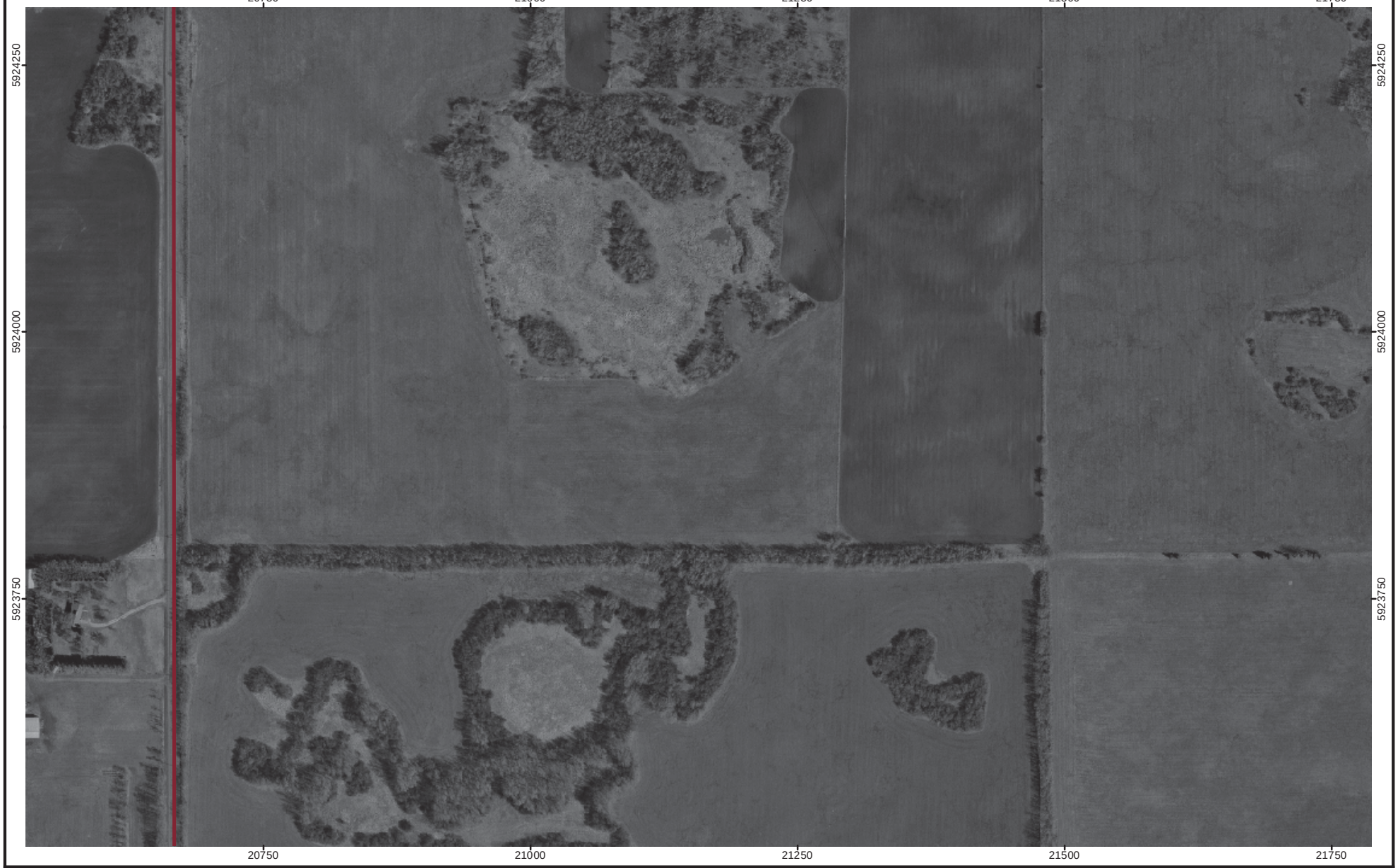

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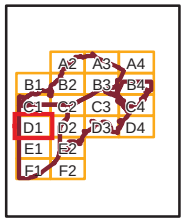
Historical Aerial Review 2010



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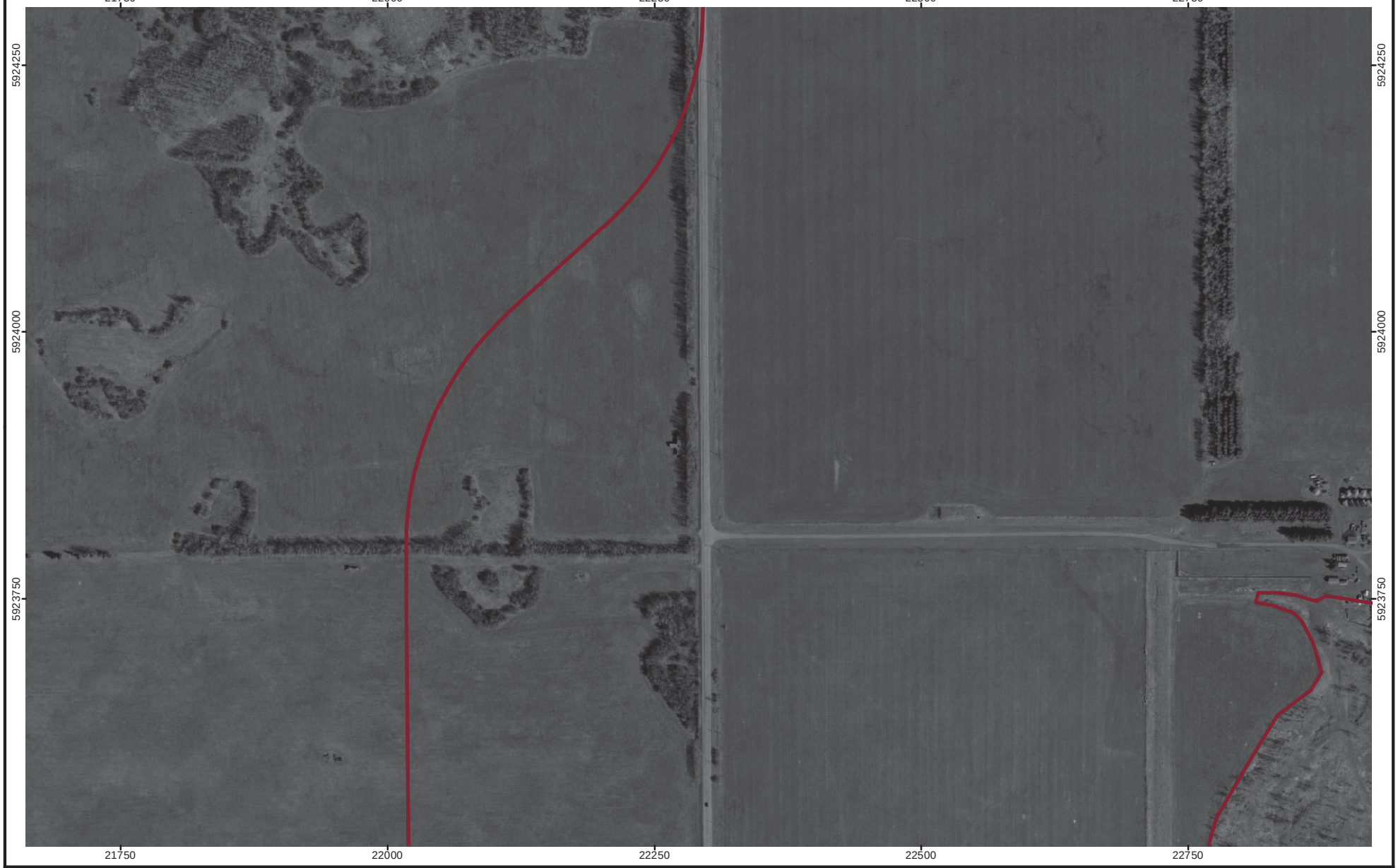

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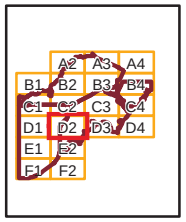
Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2010



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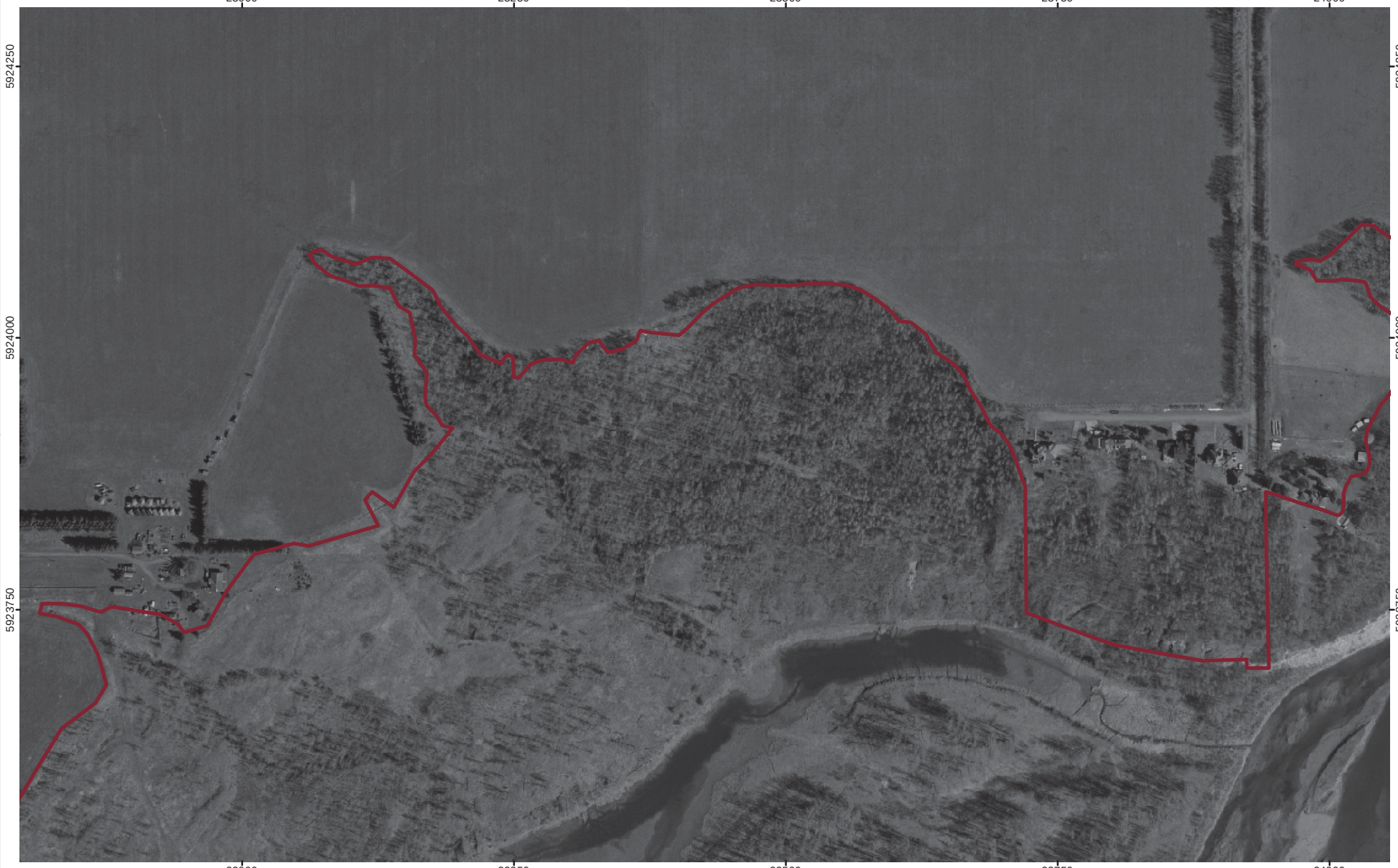

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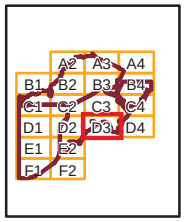

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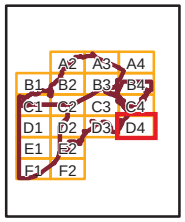

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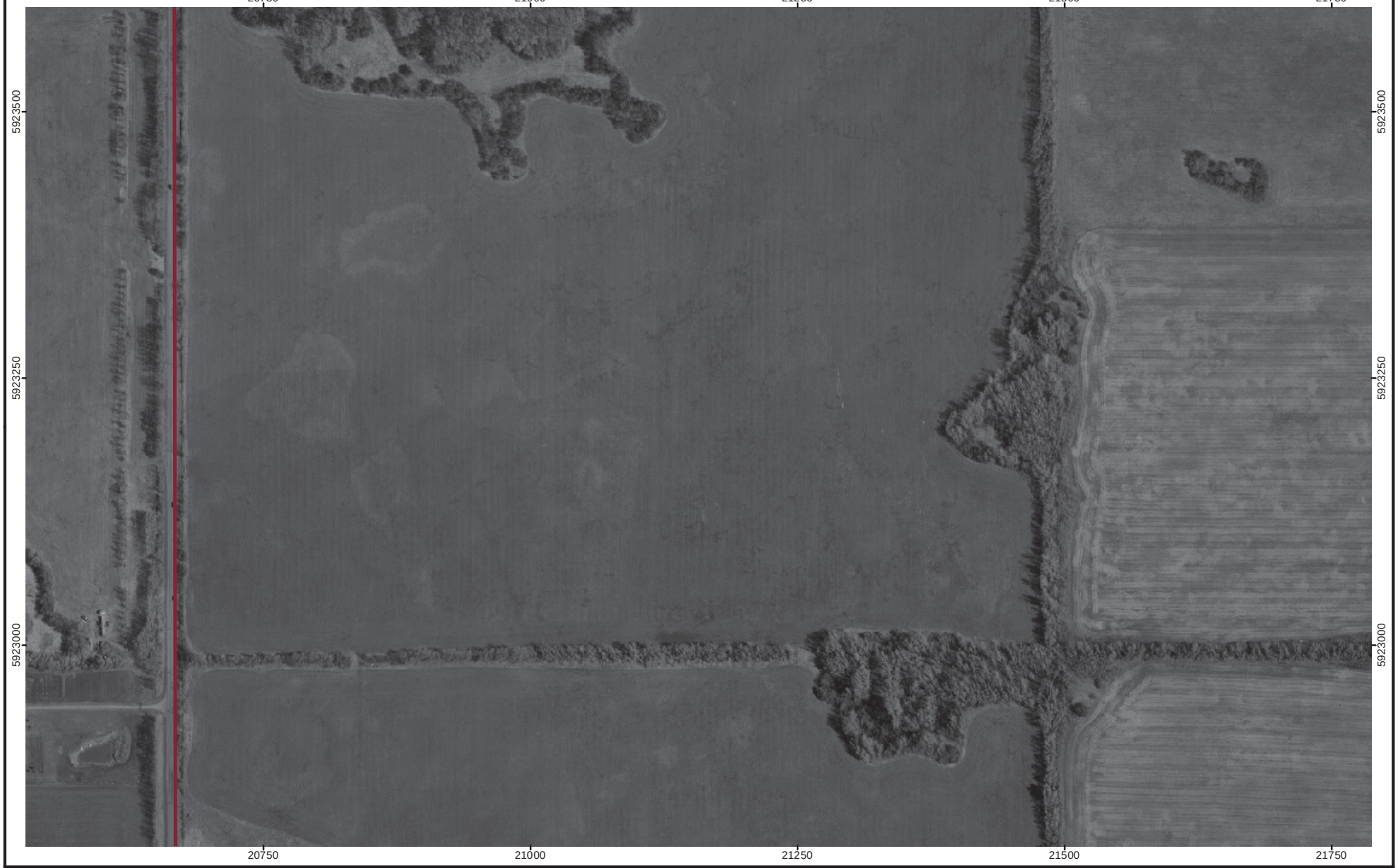

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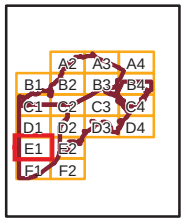

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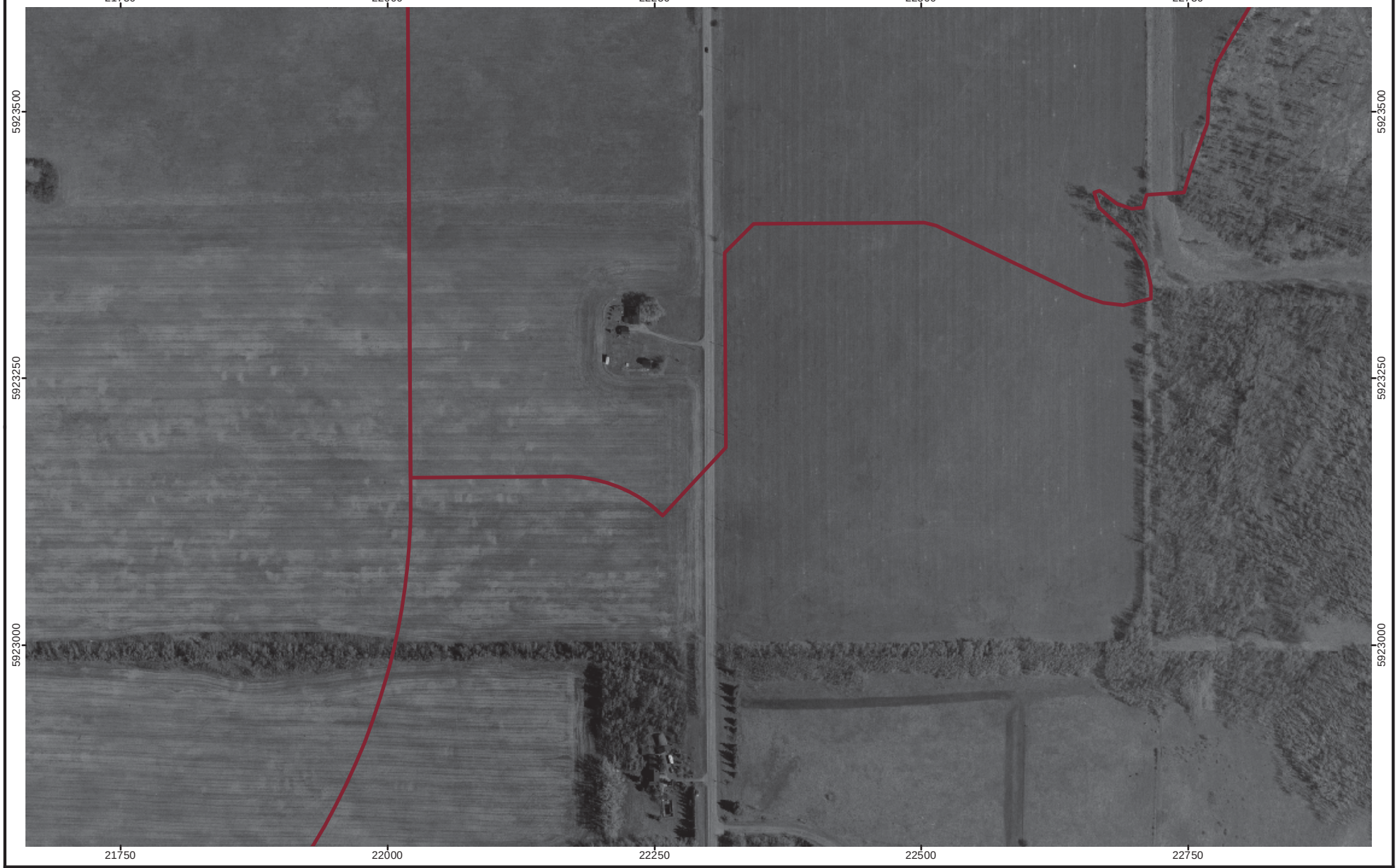

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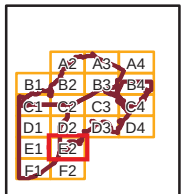

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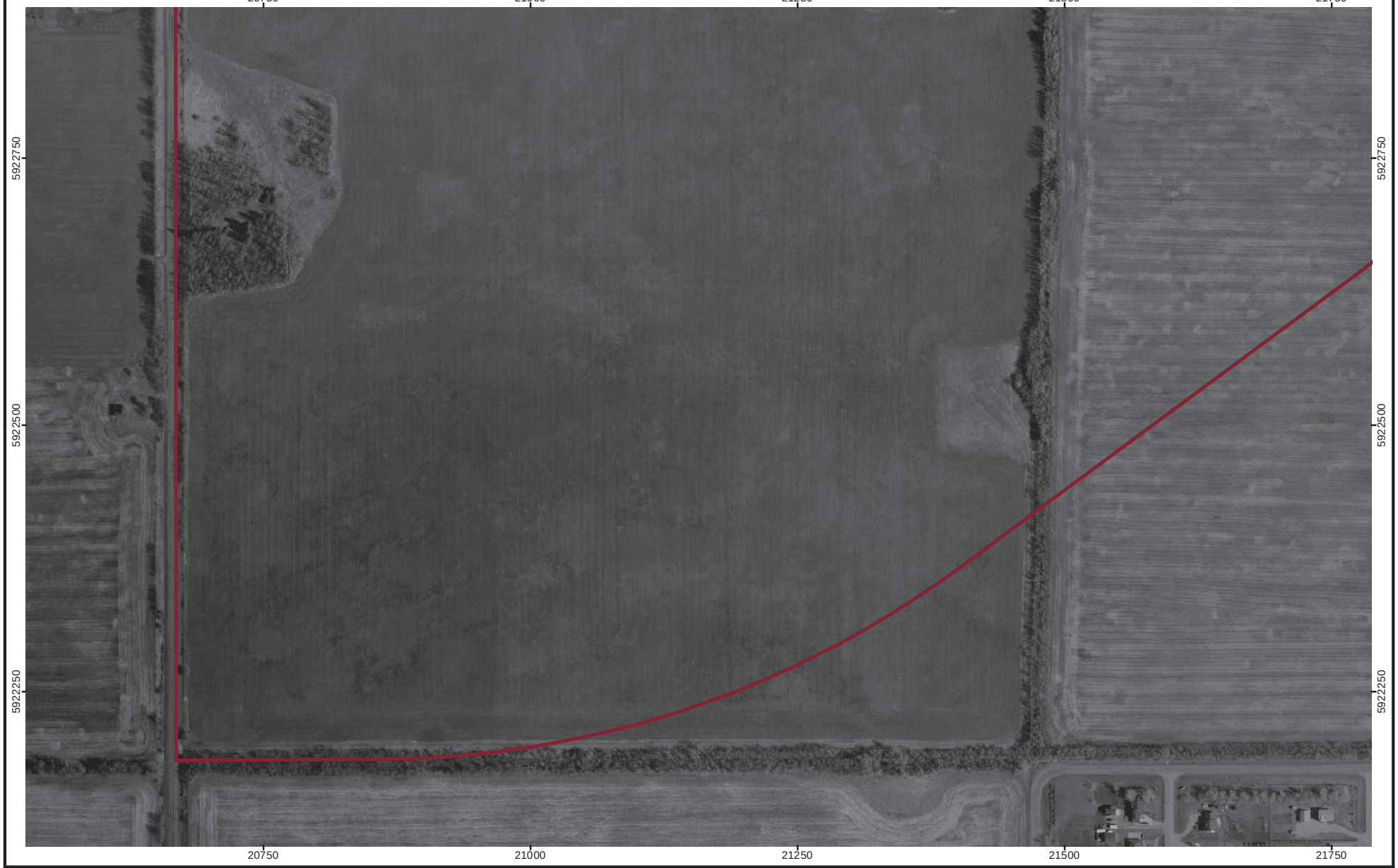

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Riverview Owners Group - Phase II ENR Riverview

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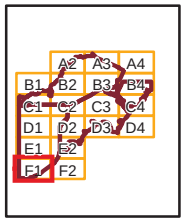

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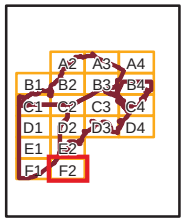

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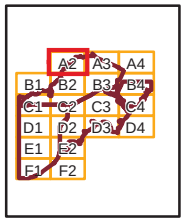
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



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Meters

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Stantec	Riverview Owners Group

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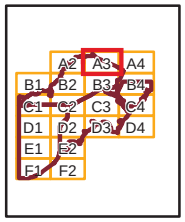
Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



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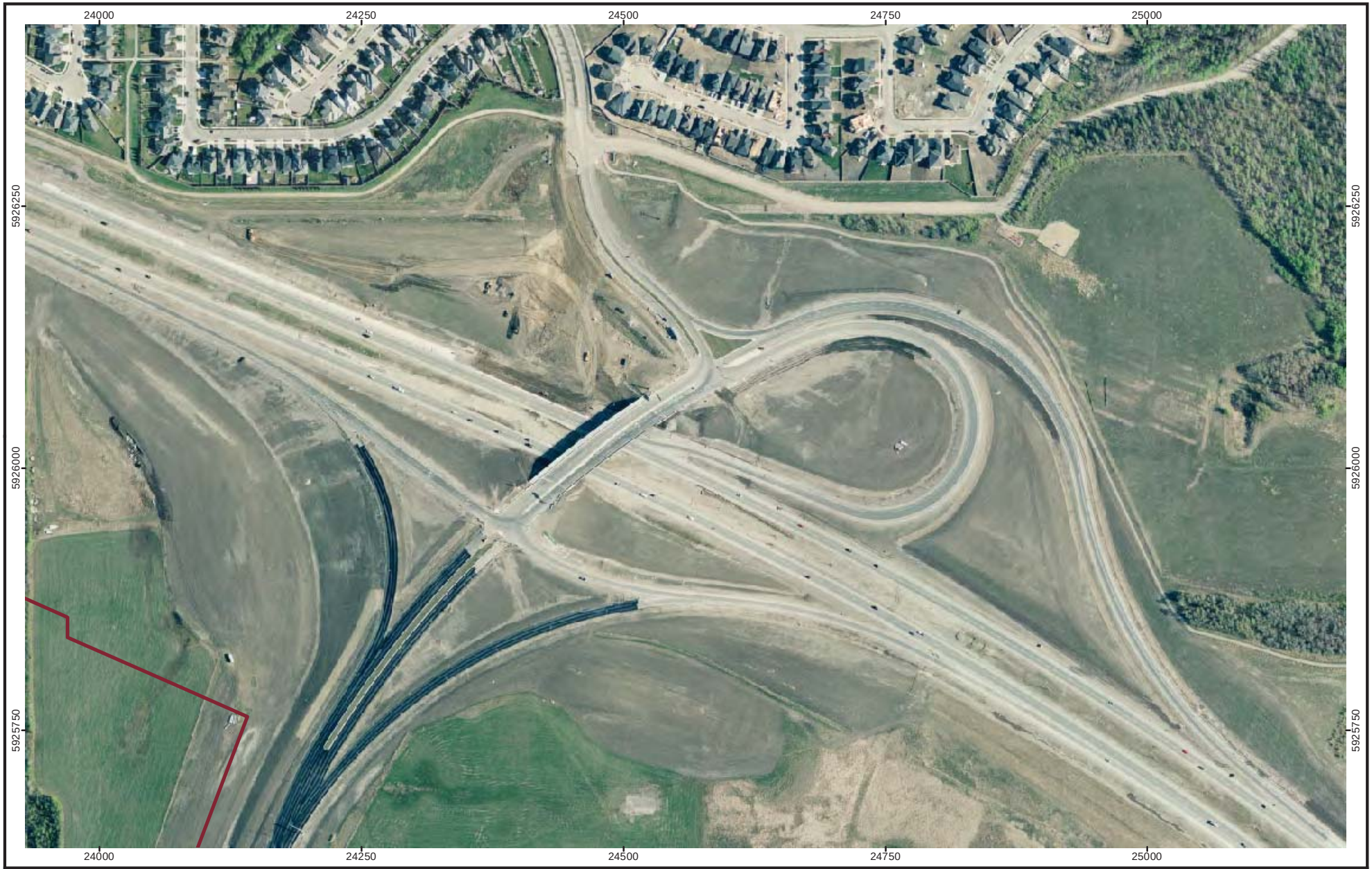

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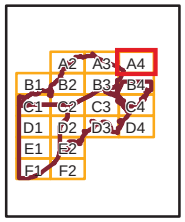
Historical Aerial Review 2012



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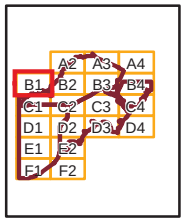

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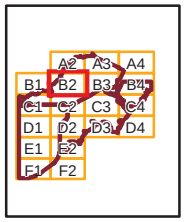

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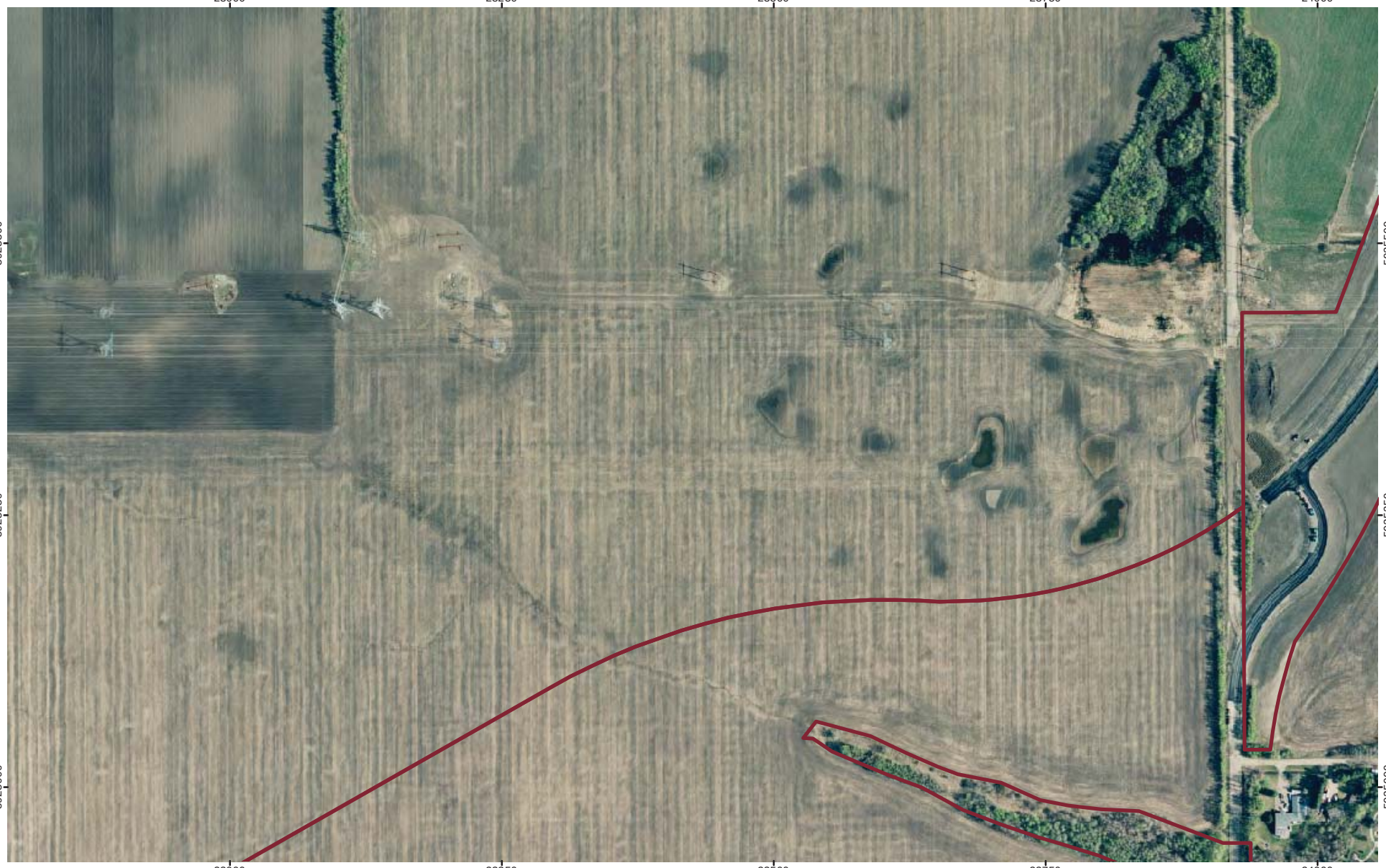

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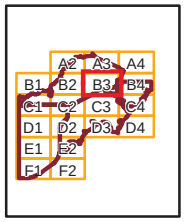

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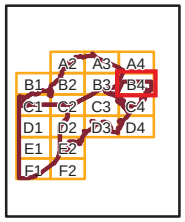

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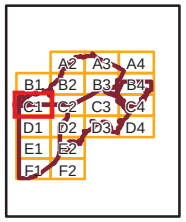

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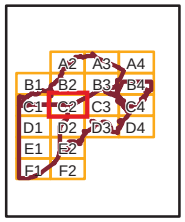

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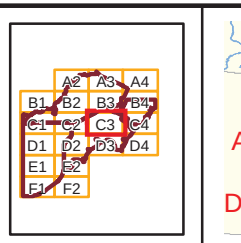

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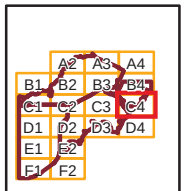

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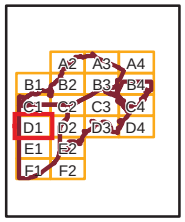
Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

PREPARED BY

Stantec

PREPARED FOR

Riverview Owners Group

DRAFT DATE	SCALE
December 12, 2012	1:5,000
REVISION DATE	PROJECT
May 23, 2014	110218864

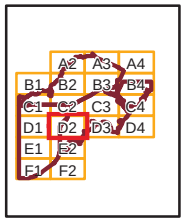
DRAWN	CHECKED	APPROVED	VOL	FIGURE NO.
JC	LF			2012

V:\1102\active\110218864\gis\Figures\Subsite_2012_MapbookSk.mxd

Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

PREPARED BY	Stantec
PREPARED FOR	Riverview Owners Group
DRAFT DATE	December 12, 2012
SCALE	1:5,000
REVISION DATE	May 23, 2014
PROJECT	110218864
FIGURE NO.	2012
DRAWN	JC
CHECKED	LF
APPROVED	
VOL	

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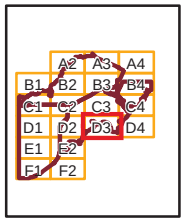
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

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PREPARED FOR Riverview Owners Group

DRAFT DATE	SCALE
December 12, 2012	1:5,000
REVISION DATE	PROJECT
May 23, 2014	110218864

DRAWN	CHECKED	APPROVED	VOL	FIGURE NO.
JC	LF			2012

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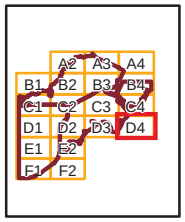
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

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DRAFT DATE	SCALE
December 12, 2012	1:5,000
REVISION DATE	PROJECT
May 23, 2014	110218864

FIGURE NO. 2012

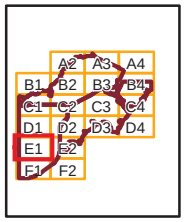
DRAWN	CHECKED	APPROVED	VOL
JC	LF		

V:\1102\active\110218864\gis\Figures\Subsite_2012_Mapbook5k.mxd

Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

PREPARED BY

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PREPARED FOR

Riverview Owners Group

DRAFT DATE	SCALE
December 12, 2012	1:5,000

REVISION DATE	PROJECT	FIGURE NO.
May 23, 2014	110218864	2012

DRAWN	CHECKED	APPROVED	VOL
JC	LF		

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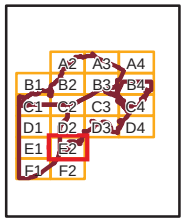
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

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Riverview Owners Group

DRAFT DATE	SCALE
December 12, 2012	1:5,000
REVISION DATE	PROJECT / FIGURE NO.
May 23, 2014	110218864 / 2012

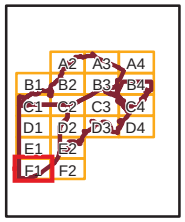
DRAWN	CHECKED	APPROVED	VOL
JC	LF		

V:\1102\active\110218864\gis\Figures\Subsite_2012_Mapbook5k.mxd

Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

PREPARED BY
Stantec

PREPARED FOR
Riverview Owners Group

DRAFT DATE: December 12, 2012			SCALE: 1:5,000	
REVISION DATE: May 23, 2014			PROJECT: 110218864	FIGURE NO.: 2012
DRAWN: JC	CHECKED: LF	APPROVED:	VOL:	

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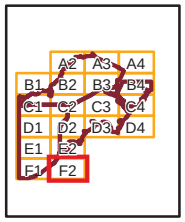
Study Area

Riverview Owners Group - Phase II ENR Riverview

Historical Aerial Review 2012



N

0 50 100 150 200

Meters

Projection: 3TM CM:114° Datum: NAD 83

Acknowledgements:
Imagery obtained from City of Edmonton, Transportation, 2012.

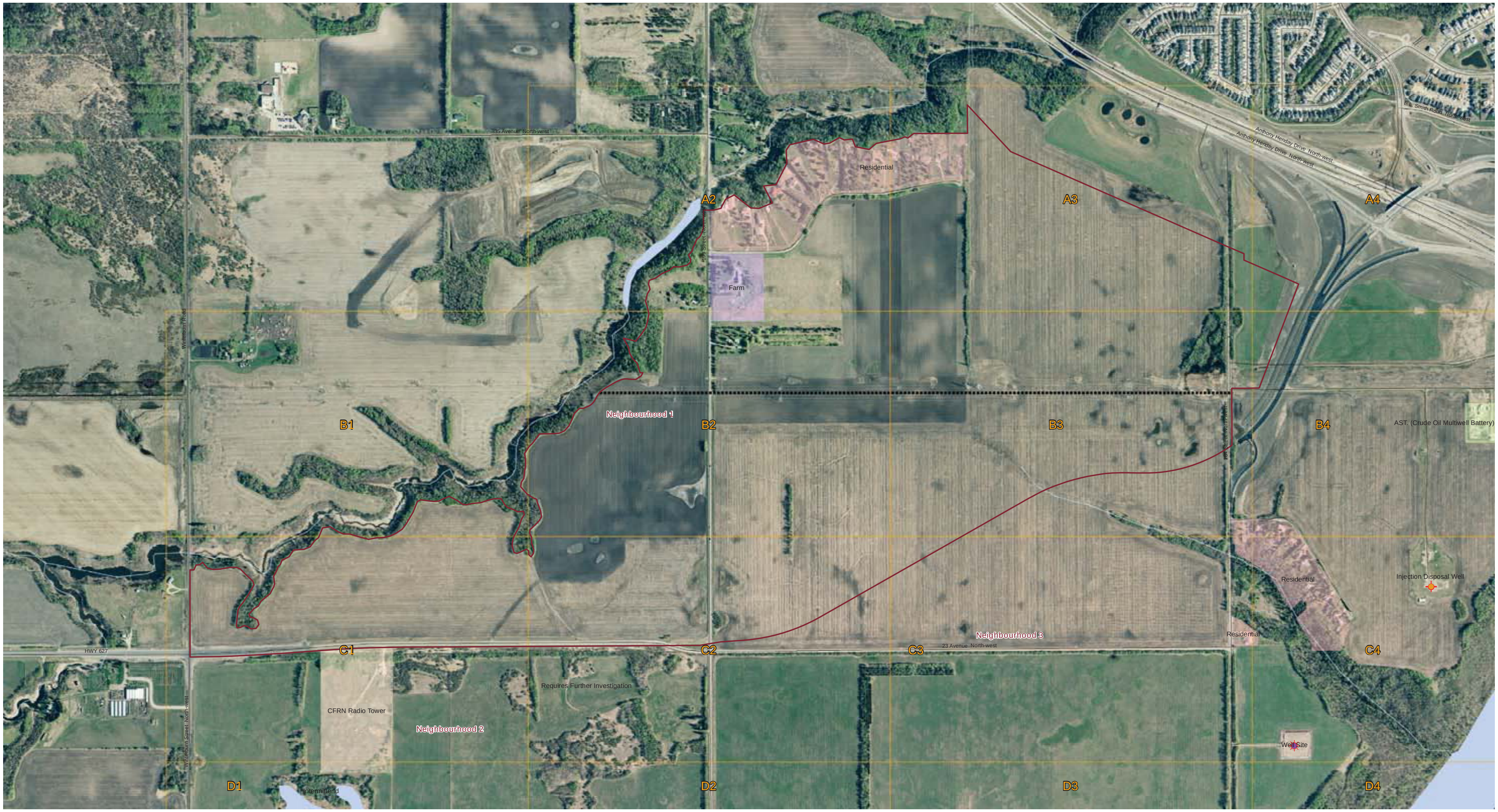
PREPARED BY: Stantec

PREPARED FOR: Riverview Owners Group

DRAFT DATE: December 12, 2012			SCALE: 1:5,000	
REVISION DATE: May 23, 2014			PROJECT: 110218864	FIGURE NO.: 2012
DRAWN: JC	CHECKED: LF	APPROVED:	VOL:	

V:\1102\active\110218864\gis\Figures\Subsite_2012_Mapbook5k.mxd

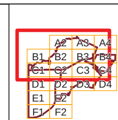
Appendix B
Figures



Injection Disposal Well	Farm	Road
Pump Jack	Residential	Power Line (Altalink Management Ltd.)
Well Site	Well Site	
Neighbourhood 1	Grid Index	
AST. (Crude Oil Multiwell Battery)	Waterbody	
CFRN Radio Tower	Watercourse	

Riverview Owners Group - Phase II ENR Riverview

Flagging Map
Neighbourhood 1



N

0 100 200 400 600

Meters

Coordinate System: NAD 1983 3TM 114
Base features produced under license with Geogratis,

Imagery obtained from City of Edmonton, Transportation, 2012

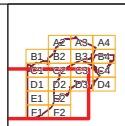
PREPARED BY Stantec

DRAFT DATE	SCALE	
June 09, 2014	1:6,000	
REVISION DATE	PROJECT 110218864	FIGURE NO. A
DRAWN MK / CHECKED JC / APPROVED LF	VOL	

Injection Disposal Well
Pump Jack
Well Site
Neighbourhood 2
AST. (Crude Oil Multiwell Battery)
CFRN Radio Tower
Farm
Intermittend
Requires Further Investigation
Residential
Well Site
Grid Index
Waterbody
Watercourse
Road

Riverview Owners Group - Phase II ENR Riverview

Flagging Map
Neighbourhood 2



N

0 100 200 400 600

Meters

Coordinate System: NAD 1983 3TM 114
Base features produced under license with Geogratis,
©Department of Natural Resources Canada, All rights reserved.
Imagery obtained from City of Edmonton, Transportation, 2012

PREPARED BY
Stantec

DRAFT DATE: June 09, 2014	SCALE: 1:6,000
REVISION DATE:	PROJECT: 110218864
DRAWN: MK / CHECKED: JC / APPROVED: LF	VOL:
	FIGURE NO.: B

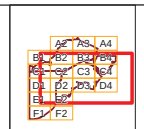
Injection Disposal Well
Pump Jack
Well Site
Neighbourhood 3
AST. (Crude Oil Multiwell Battery)
CFRN Radio Tower

Farm
Residential
Well Site
Grid Index
Waterbody
Watercourse

Road
Power Line (Altalink Management Ltd.)

Riverview Owners Group - Phase II ENR Riverview

Flagging Map
Neighbourhood 3



N

0 100 200 400 600

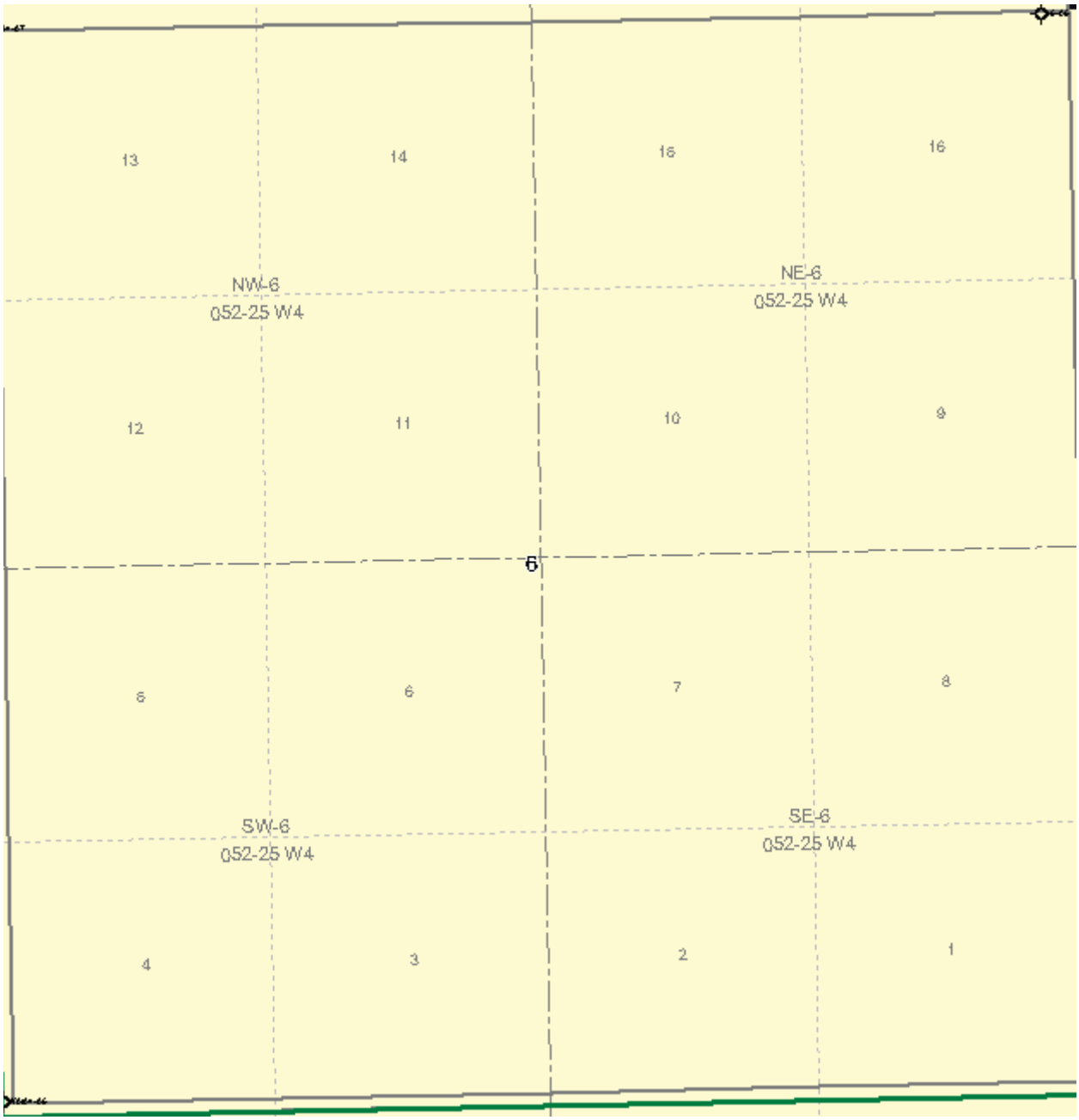
Meters

PREPARED BY
Stantec

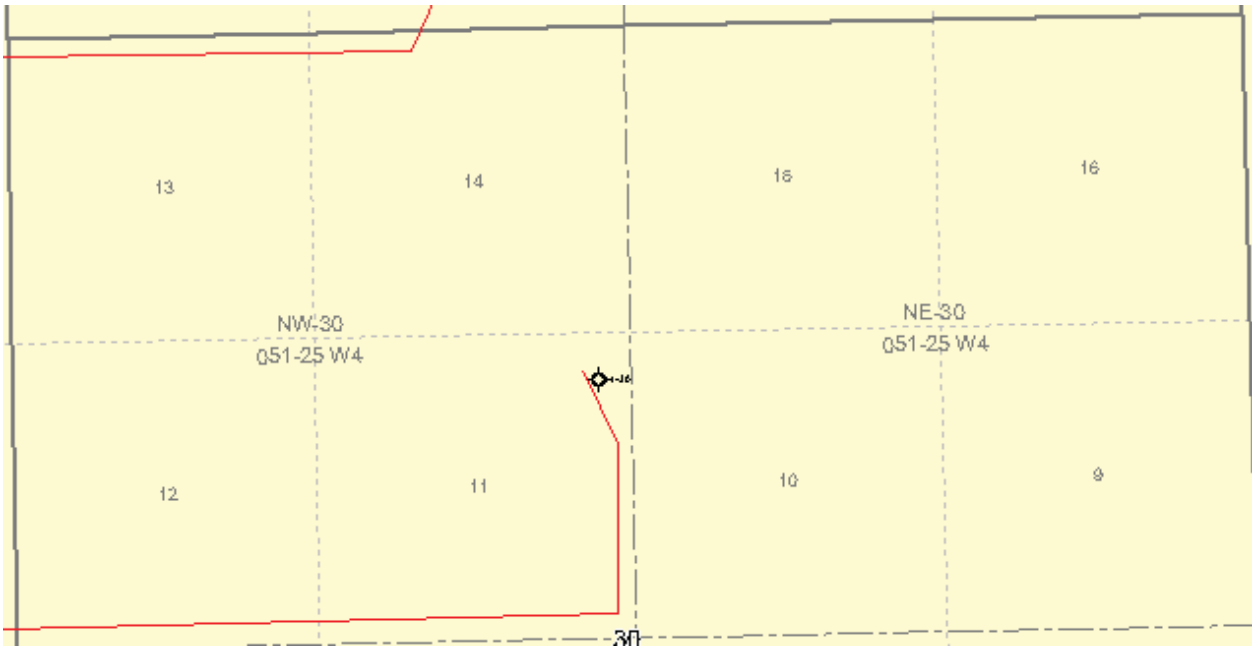
DRAFT DATE: June 09, 2014				SCALE: 1:6,000	
REVISION DATE:				PROJECT: 110218864	FIGURE NO.: C
DRAWN: MK	CHECKED: JC	APPROVED: LF	VOL:		

Appendix C
Pipelines and Oil Well Sites

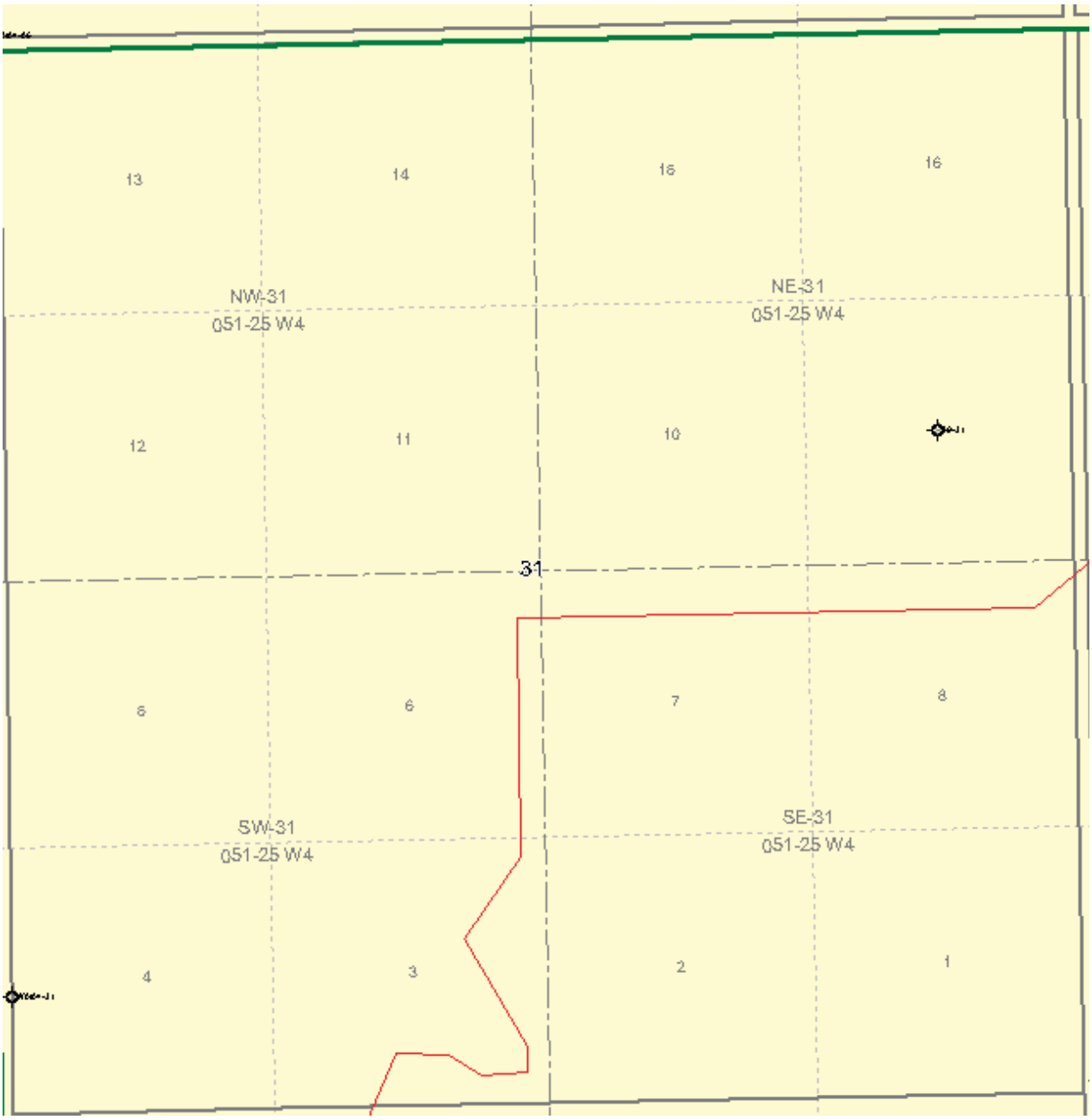
SW, SE, NE 06-052-25 W4M



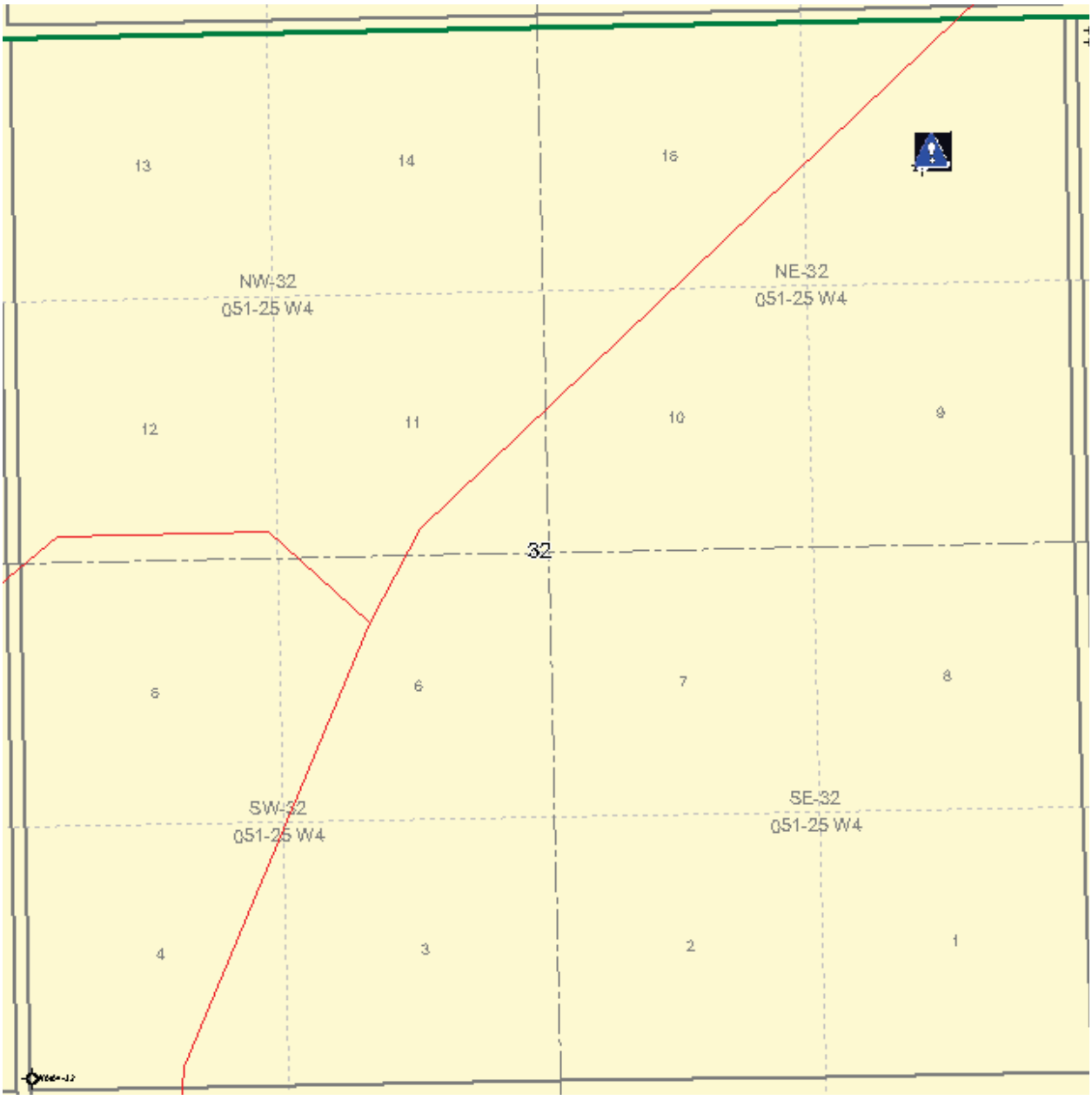
NW, NE 30-051-25 W4M



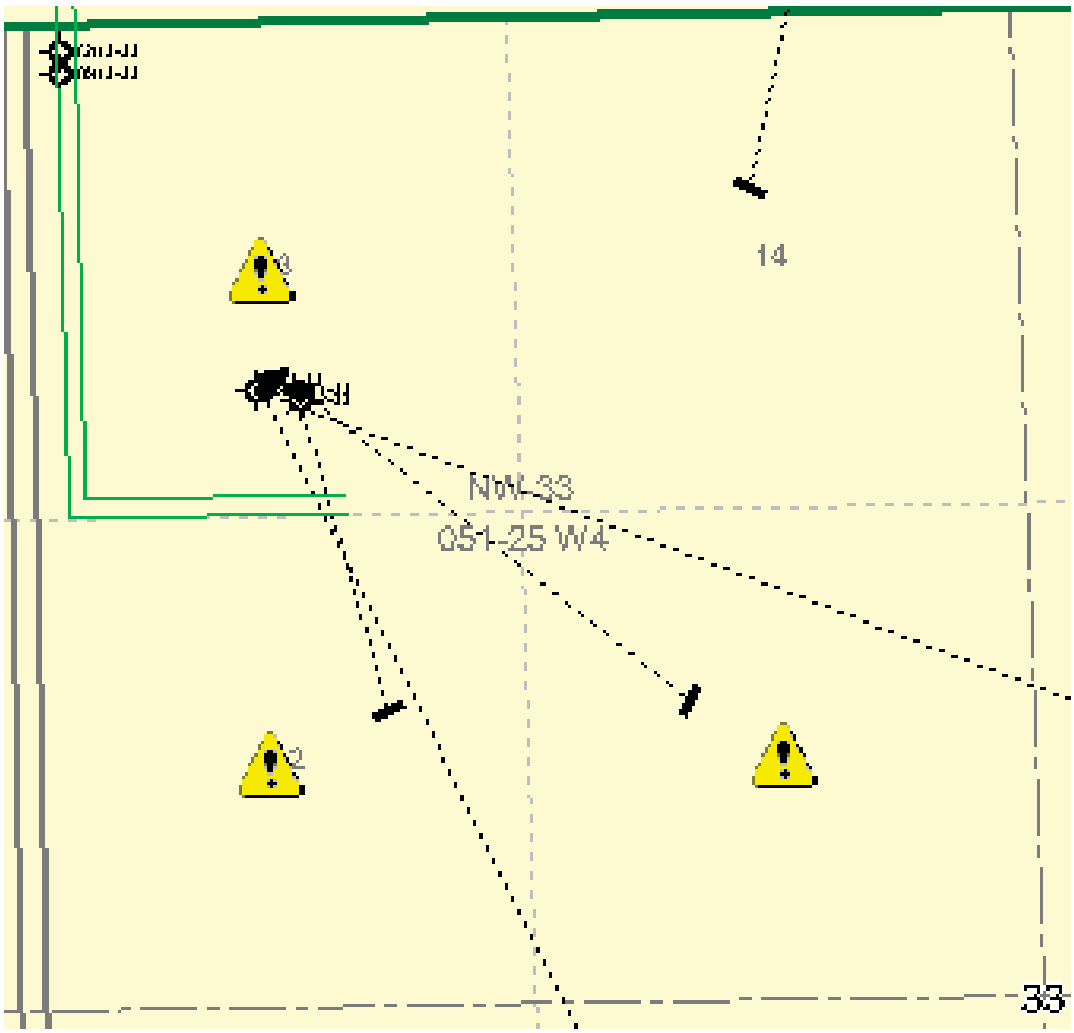
NW, NE, SW, SE 31-051-25 W4M



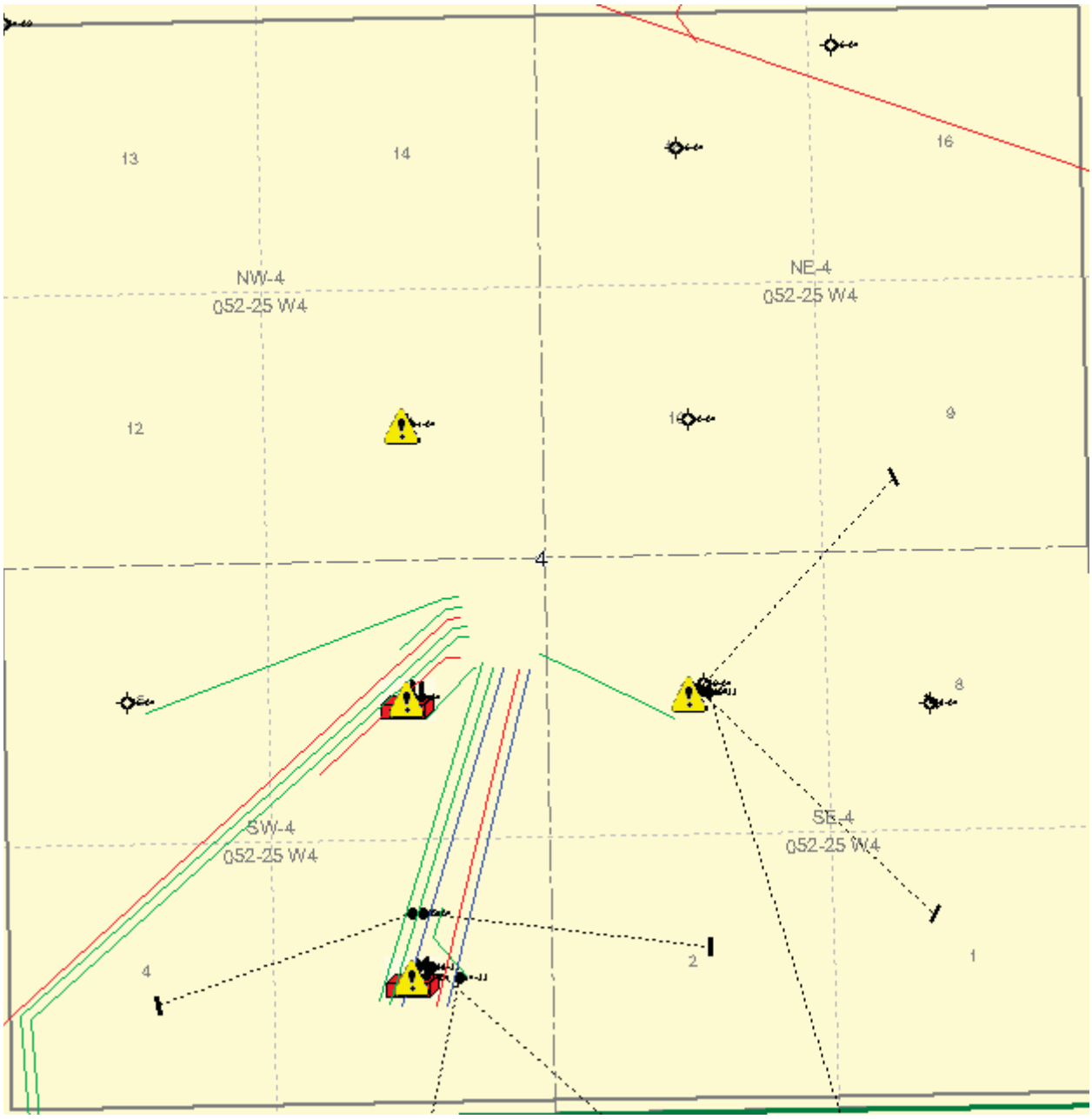
NW, NE, SW 32-051-25 W4M



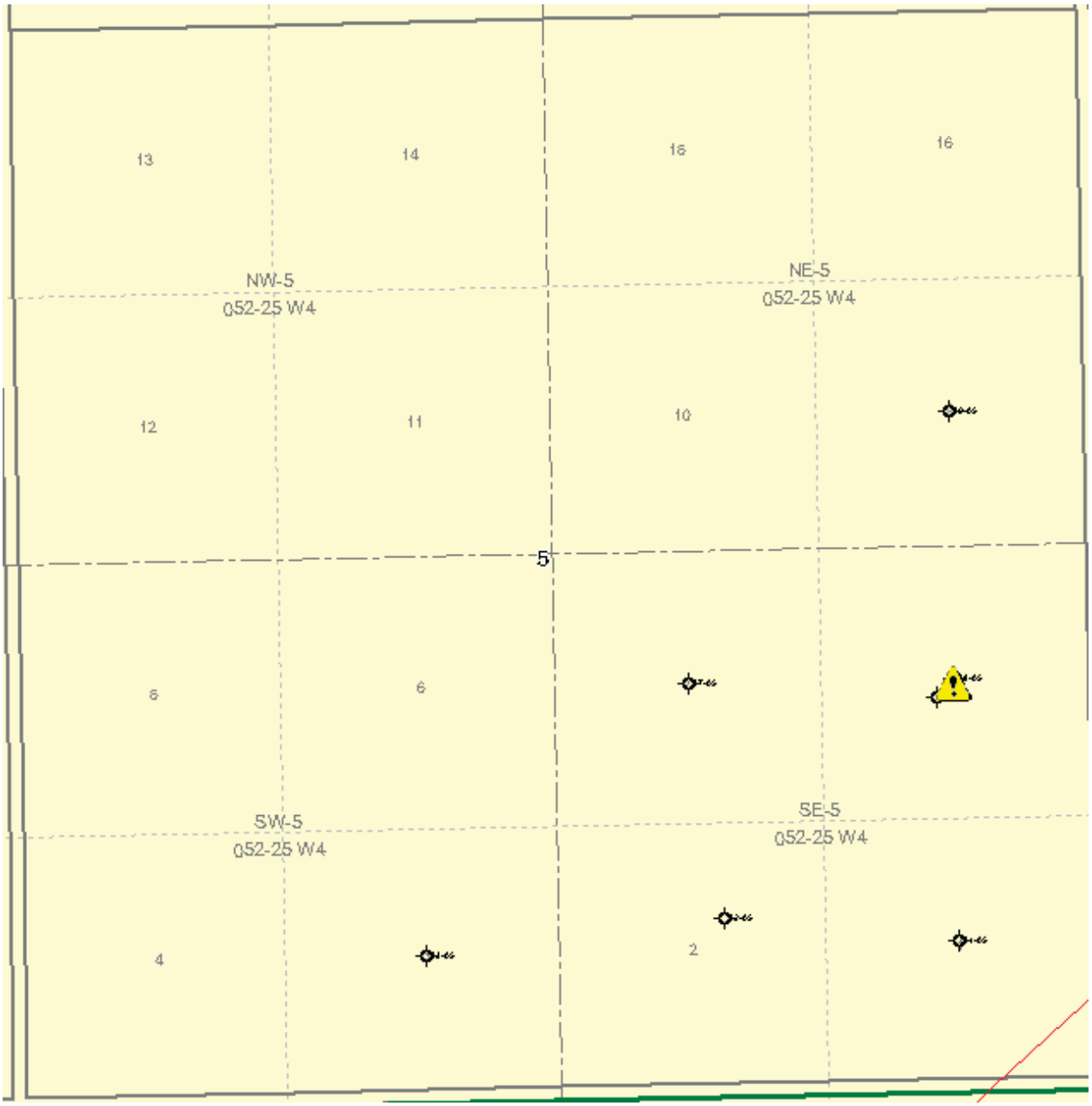
NW 33-051-25 W4M



NW, SE, SW 04-052-25 W4M



NE,NW, SE, SW 05-052-25 W4M



AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 06-33-051-25 W4 / 0		
LICENCE #:	0146471	**LICENCE DATE:**	NOVEMBER 23, 1990
WELL NAME:	NCE ENER ARMISIE 6-33-51-25		
WITHIN:	13-33-051-25 W4	**H2S (mol/kmol):**	2.81 (H2S CONTENT)
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	FEBRUARY 4, 1991	**FINAL DRILL DATE:**	FEBRUARY 16, 1991
STATUS:	CR-OIL PUMP	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	S 299.9 E 186	OFFSETS:	N 715.2 E 461.3
LATITUDE:	53.451274	LATITUDE:	53.445893
LONGITUDE:	113.636815	LONGITUDE:	113.632595
GROUND ELEVATION:	681.3 m 2235 '	TOTAL DEPTH:	1512.5 m 4962 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

Select Info to View

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 01-04-052-25 W4 / 0		RecCertified
LICENCE #:	0088090	**LICENCE DATE:**	JANUARY 7, 1981
WELL NAME:	DENISON ARMISIE 1-4-52-25		
WITHIN:	07-04-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	CALFRAC WELL SERVICES LTD.		
SPUD DATE:	FEBRUARY 7, 1981	**FINAL DRILL DATE:**	FEBRUARY 27, 1981
STATUS:	ABD	**ABANDONED DATE:**	MARCH 2, 1981
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 606.1 W 601.6	OFFSETS:	N 267.2 W 268.1
LATITUDE:	53.459591	LATITUDE:	53.456541
LONGITUDE:	113.624129	LONGITUDE:	113.618996
GROUND ELEVATION:	681.2 m 2235 '	TOTAL DEPTH:	1420 m 4659 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 01-05-052-25 W4 / 0			RecExempt	
LICENCE #:	0004473		**LICENCE DATE:**	APRIL 4, 1952	
WELL NAME:	OLD SMOKY NO. 2				
WITHIN:	01-05-052-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	WARDEAN DRILLING CO. LIMITED				
SPUD DATE:	APRIL 30, 1952		**FINAL DRILL DATE:**	MAY 17, 1952	
STATUS:	CR-OIL ABD		**ABANDONED DATE:**	DECEMBER 5, 1955	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 207.3 W 201.2		OFFSETS:	N 207.3 W 201.2	
LATITUDE:	53.456015		LATITUDE:	53.456015	
LONGITUDE:	113.64299		LONGITUDE:	113.64299	
GROUND ELEVATION:	682.8 m	2240 '	TOTAL DEPTH:	1280.2 m	4200 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 02-04-052-25 W4 / 0				
LICENCE #:	0075094		**LICENCE DATE:**	MARCH 30, 1979	
WELL NAME:	NCE PET (W) ET AL ARMISIE 2-4-52-25				
WITHIN:	03-04-052-25 W4		**H2S (mol/kmol):**	2.05 (H2S CONTENT)	
LICENCEE:	PENN WEST PETROLEUM LTD.				
SPUD DATE:	MARCH 30, 1979		**FINAL DRILL DATE:**	APRIL 8, 1979	
STATUS:	CR-OIL PUMP		**ABANDONED DATE:**		
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 282.8 E 613.1		OFFSETS:	N 224.3 W 603	
LATITUDE:	53.45669		LATITUDE:	53.456159	
LONGITUDE:	113.63042		LONGITUDE:	113.624028	
GROUND ELEVATION:	681.9 m	2237 '	TOTAL DEPTH:	1425 m	4675 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 02-05-052-25 W4 / 0		RecExempt
LICENCE #:	0005092	**LICENCE DATE:**	AUGUST 1, 1952
WELL NAME:	OLD SMOKY NO. 4		
WITHIN:	02-05-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	WARDEAN DRILLING CO. LIMITED		
SPUD DATE:	AUGUST 5, 1952	**FINAL DRILL DATE:**	AUGUST 20, 1952
STATUS:	CR-OIL ABD	**ABANDONED DATE:**	MARCH 8, 1956
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 249.9 W 554.7	OFFSETS:	N 249.9 W 554.7
LATITUDE:	53.456393	LATITUDE:	53.456393
LONGITUDE:	113.648315	LONGITUDE:	113.648315
GROUND ELEVATION:	685.5 m 2249 '	TOTAL DEPTH:	1269.8 m 4166 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 03-05-052-25 W4 / 0			RecExempt	
LICENCE #:	0005016		**LICENCE DATE:**	JULY 19, 1952	
WELL NAME:	EDMONTON NORTH ST. CLAIR ARMISIE 3-5				
WITHIN:	03-05-052-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	EDMONTON NORTH OIL COMPANY LIMITED				
SPUD DATE:	AUGUST 22, 1952		**FINAL DRILL DATE:**	SEPTEMBER 28, 1952	
STATUS:	ABD		**ABANDONED DATE:**	SEPTEMBER 30, 1952	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 201.2 E 604.4		OFFSETS:	N 201.2 E 604.4	
LATITUDE:	53.455948		LATITUDE:	53.455948	
LONGITUDE:	113.655109		LONGITUDE:	113.655109	
GROUND ELEVATION:	687.6 m	2256 '	TOTAL DEPTH:	1650.5 m	5415 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	W0 / 04-31-051-25 W4 / 0		RecExempt
LICENCE #:	J0001934K	**LICENCE DATE:**	AUGUST 28, 1950
WELL NAME:	IMP 54 CAMAO TH 4-31-51-25		
WITHIN:	04-31-051-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	IMPERIAL OIL RESOURCES LIMITED		
SPUD DATE:	AUGUST 28, 1950	**FINAL DRILL DATE:**	AUGUST 28, 1950
STATUS:	ABD	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 176.8 W 1619.3	OFFSETS:	N 176.8 W 1619.3
LATITUDE:	53.441053	LATITUDE:	53.441053
LONGITUDE:	113.688885	LONGITUDE:	113.688885
GROUND ELEVATION:	690 m 2264 '	TOTAL DEPTH:	244 m 801 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 04-04-052-25 W4 / 0				
LICENCE #:	0075203		**LICENCE DATE:**	APRIL 10, 1979	
WELL NAME:	NCE PET (W) ET AL ARMISIE 4-4-52-25				
WITHIN:	03-04-052-25 W4		**H2S (mol/kmol):**	1.02 (H2S CONTENT)	
LICENCEE:	PENN WEST PETROLEUM LTD.				
SPUD DATE:	APRIL 14, 1979		**FINAL DRILL DATE:**	APRIL 26, 1979	
STATUS:	CR-OIL PUMP		**ABANDONED DATE:**		
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 282.8 E 598.1		OFFSETS:	N 153 E 218.2	
LATITUDE:	53.45669		LATITUDE:	53.455527	
LONGITUDE:	113.630646		LONGITUDE:	113.636369	
GROUND ELEVATION:	682.3 m	2239 '	TOTAL DEPTH:	1425 m	4675 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 05-04-052-25 W4 / 0			RecExempt	
LICENCE #:	0003490	**LICENCE DATE:**		SEPTEMBER 18, 1951	
WELL NAME:	ARMISIE NO. 4				
WITHIN:	05-04-052-25 W4	**H2S (mol/kmol):**		NOT AVAILABLE	
LICENCEE:	ARMISIE OIL COMPANY LIMITED				
SPUD DATE:	SEPTEMBER 18, 1951	**FINAL DRILL DATE:**		OCTOBER 7, 1951	
STATUS:	CR-OIL ABD	**ABANDONED DATE:**		OCTOBER 31, 1961	
SURFACE:		**DOWNHOLE:**			
OFFSETS:	N 603.5 E 181.1	OFFSETS:		N 603.5 E 181.1	
LATITUDE:	53.459578	LATITUDE:		53.459578	
LONGITUDE:	113.63693	LONGITUDE:		113.63693	
GROUND ELEVATION:	683.1 m	2241 '	TOTAL DEPTH:	1261.9 m	4140 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**		NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 05-04-052-25 W4 / 0		RecExempt
LICENCE #:	0003490	**LICENCE DATE:**	SEPTEMBER 18, 1951
WELL NAME:	ARMISIE NO. 4		
WITHIN:	05-04-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	ARMISIE OIL COMPANY LIMITED		
SPUD DATE:	SEPTEMBER 18, 1951	**FINAL DRILL DATE:**	OCTOBER 7, 1951
STATUS:	CR-OIL ABD	**ABANDONED DATE:**	OCTOBER 31, 1961
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 603.5 E 181.1	OFFSETS:	N 603.5 E 181.1
LATITUDE:	53.459578	LATITUDE:	53.459578
LONGITUDE:	113.63693	LONGITUDE:	113.63693
GROUND ELEVATION:	683.1 m 2241 '	TOTAL DEPTH:	1261.9 m 4140 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 07-04-052-25 W4 / 0		
LICENCE #:	0002713	**LICENCE DATE:**	MARCH 19, 1951
WELL NAME:	NCE PET (W) ET AL ARMISIE 7-4-52-25		
WITHIN:	07-04-052-25 W4	**H2S (mol/kmol):**	0.43 (H2S CONTENT)
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	MARCH 29, 1951	**FINAL DRILL DATE:**	APRIL 23, 1951
STATUS:	CR-OIL PUMP	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 603.5 W 603.5	OFFSETS:	N 603.5 W 603.5
LATITUDE:	53.459568	LATITUDE:	53.459568
LONGITUDE:	113.624157	LONGITUDE:	113.624157
GROUND ELEVATION:	680.3 m 2232 '	TOTAL DEPTH:	1252.7 m 4110 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 07-05-052-25 W4 / 0		RecExempt
LICENCE #:	0004985	**LICENCE DATE:**	JULY 11, 1952
WELL NAME:	OLD SMOKY NO. 3		
WITHIN:	07-05-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	WARDEAN DRILLING CO. LIMITED		
SPUD DATE:	JULY 13, 1952	**FINAL DRILL DATE:**	JULY 31, 1952
STATUS:	CR-OIL ABD	**ABANDONED DATE:**	JULY 7, 1957
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 604.4 W 603.5	OFFSETS:	N 604.4 W 603.5
LATITUDE:	53.45958	LATITUDE:	53.45958
LONGITUDE:	113.649053	LONGITUDE:	113.649053
GROUND ELEVATION:	684.3 m 2245 '	TOTAL DEPTH:	1263.4 m 4145 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 08-04-052-25 W4 / 0			RecExempt	
LICENCE #:	0003805		**LICENCE DATE:**	NOVEMBER 19, 1951	
WELL NAME:	ARMISIE NO. 6				
WITHIN:	08-04-052-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	ARMISIE OIL COMPANY LIMITED				
SPUD DATE:	NOVEMBER 24, 1951		**FINAL DRILL DATE:**	DECEMBER 15, 1951	
STATUS:	ABD		**ABANDONED DATE:**	OCTOBER 31, 1961	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 580.3 W 262.3		OFFSETS:	N 584.5 W 259.5	
LATITUDE:	53.459355		LATITUDE:	53.459394	
LONGITUDE:	113.619007		LONGITUDE:	113.618971	
GROUND ELEVATION:	656.8 m	2155 '	TOTAL DEPTH:	1238.1 m	4062 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	02 / 08-05-052-25 W4 / 2		RecCertified
LICENCE #:	0060394	**LICENCE DATE:**	SEPTEMBER 28, 1976
WELL NAME:	CORVAIR ET AL ARMISIE 8-5-52-25		
WITHIN:	08-05-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	NOVEMBER 2, 1976	**FINAL DRILL DATE:**	NOVEMBER 7, 1976
STATUS:	ABD	**ABANDONED DATE:**	NOVEMBER 22, 1991
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 576.1 W 228.6	OFFSETS:	N 576.1 W 228.6
LATITUDE:	53.459331	LATITUDE:	53.459331
LONGITUDE:	113.643405	LONGITUDE:	113.643405
GROUND ELEVATION:	683.7 m 2243 '	TOTAL DEPTH:	1277.1 m 4190 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 09-04-052-25 W4 / 0		
LICENCE #:	0163419	**LICENCE DATE:**	DECEMBER 21, 1993
WELL NAME:	ECA ARM 9-4-52-25		
WITHIN:	07-04-052-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	ENCANA CORPORATION		
SPUD DATE:	AUGUST 31, 1994	**FINAL DRILL DATE:**	SEPTEMBER 11, 1994
STATUS:	ABD	**ABANDONED DATE:**	SEPTEMBER 12, 1994
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 614.4 W 595.7	OFFSETS:	S 695.4 W 303.4
LATITUDE:	53.459665	LATITUDE:	53.462377
LONGITUDE:	113.624043	LONGITUDE:	113.619742
GROUND ELEVATION:	680.5 m 2233 '	TOTAL DEPTH:	1388 m 4554 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 09-05-052-25 W4 / 0			RecExempt	
LICENCE #:	0004283		**LICENCE DATE:**	FEBRUARY 29, 1952	
WELL NAME:	WESTERN DOME ARMISIE 5-9				
WITHIN:	09-05-052-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	SUNCOR ENERGY INC.				
SPUD DATE:	MARCH 5, 1952		**FINAL DRILL DATE:**	MARCH 31, 1952	
STATUS:	ABD		**ABANDONED DATE:**	APRIL 4, 1952	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	S 603.5 W 201.2		OFFSETS:	S 603.5 W 201.2	
LATITUDE:	53.463193		LATITUDE:	53.463193	
LONGITUDE:	113.642995		LONGITUDE:	113.642995	
GROUND ELEVATION:	684.3 m	2245 '	TOTAL DEPTH:	1294.5 m	4247 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 09-31-051-25 W4 / 0		RecExempt
LICENCE #:	B0002057	**LICENCE DATE:**	MARCH 18, 1948
WELL NAME:	CONSOLIDATED HOMESTEAD NO. 2		
WITHIN:	09-31-051-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	INTER-CITY GAS CORPORATION		
SPUD DATE:	APRIL 13, 1948	**FINAL DRILL DATE:**	JUNE 25, 1948
STATUS:	ABD	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	S 603.5 W 201.5	OFFSETS:	S 603.5 W 201.5
LATITUDE:	53.44852	LATITUDE:	53.44852
LONGITUDE:	113.667548	LONGITUDE:	113.667548
GROUND ELEVATION:	690.4 m 2265 '	TOTAL DEPTH:	1763.6 m 5786 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 09-33-051-25 W4 / 2		
LICENCE #:	0335815	**LICENCE DATE:**	AUGUST 4, 2005
WELL NAME:	PW PTF ENERGY ARM 16-33-51-25		
WITHIN:	07-04-052-25 W4	**H2S (mol/kmol):**	0 (NO ANALYSIS)
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	DECEMBER 1, 2005	**FINAL DRILL DATE:**	DECEMBER 29, 2005
STATUS:	CR-OIL FLOW	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 603.6 W 589	OFFSETS:	S 568.3 W 255.7
LATITUDE:	53.459564	LATITUDE:	53.448848
LONGITUDE:	113.623932	LONGITUDE:	113.618716
GROUND ELEVATION:	682.7 m 2240 '	TOTAL DEPTH:	2038 m 6686 '
WELL TYPE:	PRODUCTION	**SUBSTANCE:**	CRUDE OIL

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 10-33-051-25 W4 / 0			RecExempt	
LICENCE #:	0146470		**LICENCE DATE:**	NOVEMBER 23, 1990	
WELL NAME:	CORVAIR ARMISIE 10-33-51-25				
WITHIN:	13-33-051-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	PENN WEST PETROLEUM LTD.				
SPUD DATE:	FEBRUARY 19, 1991		**FINAL DRILL DATE:**	MARCH 6, 1991	
STATUS:	ABD		**ABANDONED DATE:**	MARCH 10, 1991	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	S 299.9 E 179		OFFSETS:	S 590.9 W 736.5	
LATITUDE:	53.451274		LATITUDE:	53.448651	
LONGITUDE:	113.63692		LONGITUDE:	113.625958	
GROUND ELEVATION:	681.3 m	2235 '	TOTAL DEPTH:	1611 m	5285 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 11-30-051-25 W4 / 0		
LICENCE #:	0222609	**LICENCE DATE:**	APRIL 23, 1999
WELL NAME:	POST ARMISIE 11-30-51-25		
WITHIN:	11-30-051-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	JULY 31, 1999	**FINAL DRILL DATE:**	AUGUST 7, 1999
STATUS:	GAS ABD	**ABANDONED DATE:**	OCTOBER 27, 2004
SURFACE:		**DOWNHOLE:**	
OFFSETS:	S 462.9 E 767.3	OFFSETS:	S 462.9 E 767.3
LATITUDE:	53.435316	LATITUDE:	53.435316
LONGITUDE:	113.677336	LONGITUDE:	113.677336
GROUND ELEVATION:	689.8 m 2263 '	TOTAL DEPTH:	1345 m 4413 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 11-33-051-25 W4 / 0		
LICENCE #:	0084329	**LICENCE DATE:**	JULY 21, 1980
WELL NAME:	NCE ENER ARMISIE 11-33-51-25		
WITHIN:	13-33-051-25 W4	**H2S (mol/kmol):**	1.1 (H2S CONTENT)
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	JULY 25, 1980	**FINAL DRILL DATE:**	AUGUST 6, 1980
STATUS:	CR-OIL PUMP	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	S 299.7 E 215.4	OFFSETS:	S 560.5 E 525.1
LATITUDE:	53.451276	LATITUDE:	53.448928
LONGITUDE:	113.636372	LONGITUDE:	113.631676
GROUND ELEVATION:	680.9 m 2234 '	TOTAL DEPTH:	1385 m 4544 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 12-33-051-25 W4 / 0				
LICENCE #:	0085267		**LICENCE DATE:**	AUGUST 27, 1980	
WELL NAME:	NCE ENER ARMISIE 12-33-51-25				
WITHIN:	13-33-051-25 W4		**H2S (mol/kmol):**	0 (NO ANALYSIS)	
LICENCEE:	PENN WEST PETROLEUM LTD.				
SPUD DATE:	AUGUST 30, 1980		**FINAL DRILL DATE:**	SEPTEMBER 10, 1980	
STATUS:	DRL&C		**ABANDONED DATE:**		
SURFACE:			**DOWNHOLE:**		
OFFSETS:	S 308.8 E 215.4		OFFSETS:	S 563.1 E 281.2	
LATITUDE:	53.451194		LATITUDE:	53.448907	
LONGITUDE:	113.636371		LONGITUDE:	113.635348	
GROUND ELEVATION:	680.5 m	2233 '	TOTAL DEPTH:	1345 m	4413 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 13-33-051-25 W4 / 0				
LICENCE #:	0063496		**LICENCE DATE:**	APRIL 19, 1977	
WELL NAME:	NCE ENER ARMISIE 13-33-51-25				
WITHIN:	13-33-051-25 W4		**H2S (mol/kmol):**	1.38 (H2S CONTENT)	
LICENCEE:	PENN WEST PETROLEUM LTD.				
SPUD DATE:	MAY 11, 1977		**FINAL DRILL DATE:**	MAY 17, 1977	
STATUS:	CR-OIL PUMP		**ABANDONED DATE:**		
SURFACE:			**DOWNHOLE:**		
OFFSETS:	S 293.2 E 193.2		OFFSETS:	S 286.4 E 192.7	
LATITUDE:	53.451334		LATITUDE:	53.451396	
LONGITUDE:	113.636707		LONGITUDE:	113.636715	
GROUND ELEVATION:	681.5 m	2236 '	TOTAL DEPTH:	1271 m	4170 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 14-33-051-25 W4 / 0		
LICENCE #:	0083960	**LICENCE DATE:**	JULY 7, 1980
WELL NAME:	NCE ENER ARMISIE 14-33-51-25		
WITHIN:	03-04-052-25 W4	**H2S (mol/kmol):**	1.1 (H2S CONTENT)
LICENCEE:	PENN WEST PETROLEUM LTD.		
SPUD DATE:	JULY 8, 1980	**FINAL DRILL DATE:**	JULY 19, 1980
STATUS:	CR-OIL FLOW	**ABANDONED DATE:**	
SURFACE:		**DOWNHOLE:**	
OFFSETS:	N 186.5 E 666.2	OFFSETS:	S 141.9 E 587.5
LATITUDE:	53.455824	LATITUDE:	53.452691
LONGITUDE:	113.629619	LONGITUDE:	113.630787
GROUND ELEVATION:	682.5 m 2239 '	TOTAL DEPTH:	1364 m 4475 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	00 / 16-32-051-25 W4 / 0		RecCertified
LICENCE #:	0082864	**LICENCE DATE:**	MAY 16, 1980
WELL NAME:	CAMEL ET AL ARMISIE 16-32-51-25		
WITHIN:	16-32-051-25 W4	**H2S (mol/kmol):**	NOT AVAILABLE
LICENCEE:	CONOCOPHILLIPS CANADA RESOURCES CORP.		
SPUD DATE:	JUNE 14, 1980	**FINAL DRILL DATE:**	JUNE 21, 1980
STATUS:	ABD	**ABANDONED DATE:**	JULY 22, 1995
SURFACE:		**DOWNHOLE:**	
OFFSETS:	S 222.5 W 222.5	OFFSETS:	S 222.5 W 222.5
LATITUDE:	53.451969	LATITUDE:	53.451969
LONGITUDE:	113.643281	LONGITUDE:	113.643281
GROUND ELEVATION:	684.4 m / 2245 '	TOTAL DEPTH:	1301 m / 4268 '
WELL TYPE:	NOT AVAILABLE	**SUBSTANCE:**	NOT AVAILABLE

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

WELL INFORMATION
CURRENT TO DECEMBER 31, 2013

EVENT: 0

WELL ID:	W0 / 04-32-051-25 W4 / 0			RecExempt	
LICENCE #:	0003867I		**LICENCE DATE:**	NOVEMBER 28, 1951	
WELL NAME:	ROYALITE 31 STONY TH 4-32-51-25				
WITHIN:	04-32-051-25 W4		**H2S (mol/kmol):**	NOT AVAILABLE	
LICENCEE:	CONOCOPHILLIPS CANADA RESOURCES CORP.				
SPUD DATE:	NOVEMBER 28, 1951		**FINAL DRILL DATE:**	NOVEMBER 28, 1951	
STATUS:	ABD		**ABANDONED DATE:**	NOVEMBER 29, 1951	
SURFACE:			**DOWNHOLE:**		
OFFSETS:	N 17.4 W 1619.3		OFFSETS:	N 17.4 W 1619.3	
LATITUDE:	53.43965		LATITUDE:	53.43965	
LONGITUDE:	113.664144		LONGITUDE:	113.664144	
GROUND ELEVATION:	688.9 m	2260 '	TOTAL DEPTH:	213 m	699 '
WELL TYPE:	NOT AVAILABLE		**SUBSTANCE:**	NOT AVAILABLE	

OPTIONS

Open Well Plat

Request Divestco Log

Create CBM Report

Add To Custom Well List

Print Screen

MORE INFO

select

AER DATA | ATTACHED FILES

Close Screen

AER PIPELINE INFORMATION
CURRENT TODECEMBER 31, 2013

LICENCE/LINE #:	35962 - 1		**PERMIT DATE:**	JUNE 16, 2011	
ABACUS #:	38953		**LICENCE DATE:**	AUGUST 15, 2001	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-32-051-25 W4M PL		**TO LOCATION:**	14-25-051-26 W4M PL	
LENGTH:	4.23 kms	2.63 mi	**STATUS:**	O	
SUBSTANCE:	NG		**H2S:**	9.9 mol/kmol	9,900 ppm
OD:	114.3 mm	4.50 "	**WT:**	4 mm	0.16 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2902		**MOP:**	3100 kPa	450 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	15 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	FEBRUARY 15, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	35962 - 1		**NEB REG:**	No	

OPTIONS

View Company Info

View Installation Info

View Entire Licence

View Licence Ticket

View Spill Incidents

Highlight Line

Highlight Entire Licence

Print Screen

AER DATA | ATTACHED FILES

Close Screen

AER PIPELINE INFORMATION
CURRENT TODECEMBER 31, 2013

LICENCE/LINE #:	35962 - 2		**PERMIT DATE:**	JUNE 6, 2001	
ABACUS #:	45697		**LICENCE DATE:**		
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-04-052-25 W4M B		**TO LOCATION:**	06-32-051-25 W4M PL	
LENGTH:	2.65 kms	1.65 mi	**STATUS:**	O	
SUBSTANCE:	NG		**H2S:**	9.9 mol/kmol	9,900 ppm
OD:	88.9 mm	3.50 "	**WT:**	5.49 mm	0.22 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	A		**MOP:**	3100 kPa	450 psi
JOINTS:	W		**INTL COATING:**	E	
STRESS LEVEL:	12 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	FEBRUARY 15, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	30285 - 17		**NEB REG:**	No	

OPTIONS

View Company Info

View Installation Info

View Entire Licence

View Licence Ticket

View Spill Incidents

Highlight Line

Highlight Entire Licence

Print Screen

AER DATA | ATTACHED FILES

Close Screen

AER PIPELINE INFORMATION
CURRENT TODECEMBER 31, 2013

LICENCE/LINE #:	1118 - 4		**PERMIT DATE:**		
ABACUS #:	45702		**LICENCE DATE:**	APRIL 17, 1984	
COMPANY:	IMPERIAL OIL RESOURCES LIMITED				
FROM LOCATION:	06-04-052-25 W4M B		**TO LOCATION:**	06-04-052-25 W4M PL	
LENGTH:	0.18 kms	0.11 mi	**STATUS:**	A	
SUBSTANCE:	CO		**H2S:**	0 mol/kmol	0 ppm
OD:	88.9 mm	3.50 "	**WT:**	5.49 mm	0.22 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	A		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	1118 - 4		**NEB REG:**	No	

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AER PIPELINE INFORMATION
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LICENCE/LINE #:	25553 - 1		**PERMIT DATE:**	JUNE 18, 2012	
ABACUS #:	45700		**LICENCE DATE:**	NOVEMBER 27, 1991	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	13-33-051-25 W4M WE		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	1.49 kms	0.93 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	4 mm	0.16 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	3592		**MOP:**	1400 kPa	203 psi
JOINTS:	Z		**INTL COATING:**	T	
STRESS LEVEL:	4 %		**ENVIRONMENT:**	CC	
ORIGINAL PERMIT DATE:	OCTOBER 9, 1991		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	25553 - 1		**NEB REG:**	No	

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AER PIPELINE INFORMATION
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LICENCE/LINE #:	6020 - 2		**PERMIT DATE:**	MARCH 18, 2002	
ABACUS #:	45704		**LICENCE DATE:**		
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-04-052-25 W4M BE		**TO LOCATION:**	03-04-052-25 W4M BE	
LENGTH:	0.48 kms	0.30 mi	**STATUS:**	D	
SUBSTANCE:	SW		**H2S:**	0 mol/kmol	0 ppm
OD:	88.9 mm	3.50 "	**WT:**	3.96 mm	0.16 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	X42		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	6020 - 2		**NEB REG:**	No	

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LICENCE/LINE #:	14977 - 3		**PERMIT DATE:**		
ABACUS #:	45705		**LICENCE DATE:**	DECEMBER 18, 1979	
COMPANY:	ENCANA CORPORATION				
FROM LOCATION:	05-04-052-25 W4M WE		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	0.61 kms	0.38 mi	**STATUS:**	A	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	4.78 mm	0.19 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	B		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	14977 - 3		**NEB REG:**	No	

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LICENCE/LINE #:	17227 - 1		**PERMIT DATE:**	JULY 26, 2011	
ABACUS #:	45706		**LICENCE DATE:**	JANUARY 31, 1980	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	03-04-052-25 W4M PL		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	0.46 kms	0.29 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	2.77 mm	0.11 "
MATERIAL:	S		**TYPE:**	5LX	
GRADE:	X42		**MOP:**	1400 kPa	203 psi
JOINTS:	W		**INTL COATING:**	L	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**	MARCH 22, 2004	
ORIGINAL LICENCE/LINE #:	17227 - 1		**NEB REG:**	No	

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AER PIPELINE INFORMATION
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LICENCE/LINE #:	17227 - 2		**PERMIT DATE:**	JULY 26, 2011	
ABACUS #:	45707		**LICENCE DATE:**	JANUARY 31, 1980	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	03-04-052-25 W4M PL		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	0.46 kms	0.29 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	2.77 mm	0.11 "
MATERIAL:	S		**TYPE:**	5LX	
GRADE:	X42		**MOP:**	1400 kPa	203 psi
JOINTS:	M		**INTL COATING:**	L	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:			**CONST. DATE:**	MARCH 22, 2004	
ORIGINAL LICENCE/LINE #:	17227 - 2		**NEB REG:**	No	

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LICENCE/LINE #:	25553 - 2		**PERMIT DATE:**	JULY 26, 2011	
ABACUS #:	45701		**LICENCE DATE:**	NOVEMBER 27, 1991	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	13-33-051-25 W4M WE		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	1.49 kms	0.93 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	4 mm	0.16 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	3592		**MOP:**	1400 kPa	203 psi
JOINTS:	Z		**INTL COATING:**	T	
STRESS LEVEL:	4 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	OCTOBER 9, 1991		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	25553 - 2		**NEB REG:**	No	

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LICENCE/LINE #:	34023 - 1		**PERMIT DATE:**	FEBRUARY 5, 2000	
ABACUS #:	38954		**LICENCE DATE:**	FEBRUARY 15, 2006	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	11-30-051-25 W4M BE		**TO LOCATION:**	14-25-051-26 W4M BE	
LENGTH:	3.12 kms	1.94 mi	**STATUS:**	A	
SUBSTANCE:	NG		**H2S:**	0 mol/kmol	0 ppm
OD:	88.9 mm	3.50 "	**WT:**	3.2 mm	0.13 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2901		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	FEBRUARY 5, 2000		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	34023 - 1		**NEB REG:**	No	

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LICENCE/LINE #:	35962 - 4		**PERMIT DATE:**	JUNE 6, 2001	
ABACUS #:	45699		**LICENCE DATE:**		
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-04-052-25 W4M BE		**TO LOCATION:**	06-04-052-25 W4M BE	
LENGTH:	0.09 kms	0.06 mi	**STATUS:**	D	
SUBSTANCE:	NG		**H2S:**	9.9 mol/kmol	9,900 ppm
OD:	88.9 mm	3.50 "	**WT:**	5.49 mm	0.22 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2411		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	FEBRUARY 15, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	30285 - 17		**NEB REG:**	No	

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LICENCE/LINE #:	36615 - 1		**PERMIT DATE:**	JUNE 6, 2001	
ABACUS #:	45709		**LICENCE DATE:**		
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-04-052-25 W4M WE		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	0.21 kms	0.13 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	4.78 mm	0.19 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	B		**MOP:**	1380 kPa	200 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	5 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	JUNE 6, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	4556 - 55		**NEB REG:**	No	

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LICENCE/LINE #:	36615 - 2		**PERMIT DATE:**	JUNE 6, 2001	
ABACUS #:	45710		**LICENCE DATE:**		
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	07-04-052-25 W4M WE		**TO LOCATION:**	06-04-052-25 W4M B	
LENGTH:	0.27 kms	0.17 mi	**STATUS:**	O	
SUBSTANCE:	OE		**H2S:**	25 mol/kmol	25,000 ppm
OD:	88.9 mm	3.50 "	**WT:**	4.78 mm	0.19 "
MATERIAL:	S		**TYPE:**	5L	
GRADE:	B		**MOP:**	1380 kPa	200 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	5 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	JUNE 6, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	4556 - 55		**NEB REG:**	No	

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LICENCE/LINE #:	36961 - 1		**PERMIT DATE:**	AUGUST 13, 2001	
ABACUS #:	45711		**LICENCE DATE:**	FEBRUARY 13, 2002	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	06-04-052-25 W4M B		**TO LOCATION:**	03-04-052-25 W4M WE	
LENGTH:	0.5 kms	0.31 mi	**STATUS:**	O	
SUBSTANCE:	SW		**H2S:**	0 mol/kmol	0 ppm
OD:	88.9 mm	3.50 "	**WT:**	6.35 mm	0.25 "
MATERIAL:	G		**TYPE:**	FSLP	
GRADE:	1500		**MOP:**	10340 kPa	1500 psi
JOINTS:	M		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	AUGUST 13, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	36961 - 1		**NEB REG:**	No	

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AER PIPELINE INFORMATION
CURRENT TODECEMBER 31, 2013

LICENCE/LINE #:	36962 - 1		**PERMIT DATE:**	SEPTEMBER 23, 2011	
ABACUS #:	45712		**LICENCE DATE:**	FEBRUARY 13, 2002	
COMPANY:	PENN WEST PETROLEUM LTD.				
FROM LOCATION:	03-04-052-25 W4M BE		**TO LOCATION:**	06-04-052-25 W4M BE	
LENGTH:	0.5 kms	0.31 mi	**STATUS:**	D	
SUBSTANCE:	NG		**H2S:**	9.9 mol/kmol	9,900 ppm
OD:	114.3 mm	4.50 "	**WT:**	3.2 mm	0.13 "
MATERIAL:	S		**TYPE:**	Z245.1	
GRADE:	2902		**MOP:**	0 kPa	0 psi
JOINTS:	W		**INTL COATING:**	U	
STRESS LEVEL:	0 %		**ENVIRONMENT:**		
ORIGINAL PERMIT DATE:	AUGUST 13, 2001		**CONST. DATE:**		
ORIGINAL LICENCE/LINE #:	36962 - 1		**NEB REG:**	No	

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AER SPILL / COMPLAINT INCIDENTS FOR 03-04-052-25W4M

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COMPLAINT - OCTOBER 19, 2012 - INCIDENT NUMBER: 20122157			
AER NOTIFIED:	OCTOBER 19, 2012	**INCIDENT COMPLETE:**	
LICENCE #:	17227 (Pipeline Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	MULTIPHASE PIPELINE		
SOURCE IN COMPLAINCE?			
CAUSE:	PROCEDURAL OR DESIGN - INADEQUATE PROCEDURE		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - NUISANCE OPERATIONAL IMPACT - SPILL HEALTH - HUMAN		
COMPLAINT - MARCH 4, 2004 - INCIDENT NUMBER: 20040595			
AER NOTIFIED:	MARCH 4, 2004	**INCIDENT COMPLETE:**	MARCH 4, 2004
LICENCE #:	17227 (Pipeline Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	MULTIPHASE PIPELINE		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	EQUIPMENT FAILURE - DEFECT		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - SPILL		
COMPLAINT - JANUARY 8, 2004 - INCIDENT NUMBER: 20040068			
AER NOTIFIED:	JANUARY 9, 2004	**INCIDENT COMPLETE:**	JANUARY 9, 2004
LICENCE #:	17227 (Pipeline Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	MULTIPHASE PIPELINE		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	UNKNOWN		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		
SPILL - JANUARY 8, 2004 - INCIDENT NUMBER: 20040067			
AER NOTIFIED:	JANUARY 9, 2004	**INCIDENT COMPLETE:**	APRIL 29, 2004
LICENCE #:	17227 - 2 (Pipeline Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	MULTIPHASE PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	2.77
PIPELINE GRADE:	X42		
CAUSE:	EQUIPMENT FAILURE - INTERNAL CORROSION		
FAILURE TYPE:	CORROSION INTERNAL		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:		**# OF DEATHS:**	
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	OVER 100 BUT LESS THAN 1000 SQUARE METERS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JANUARY 14, 2004

SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) 0.6 m3 CRUDE OIL (0.6 m3 RECOVERED) 2.4 m3 SALT/PRODUCED WATER (2.4 m3 RECOVERED)		
COMPLAINT - NOVEMBER 17, 1999 - INCIDENT NUMBER: 19992460			
AER NOTIFIED:	NOVEMBER 17, 1999	**INCIDENT COMPLETE:**	NOVEMBER 17, 1999
LICENCE #:	0003609 (Well Licence)		
LICENCEE:	ENCANA OIL & GAS CO. LTD.		
SOURCE:	SERVICE WELL		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - SPILL ODOURS - H2S		
SPILL - NOVEMBER 17, 1999 - INCIDENT NUMBER: 19992443			
AER NOTIFIED:	NOVEMBER 17, 1999	**INCIDENT COMPLETE:**	JULY 6, 2000
LICENCE #:	0083960 (Well Licence)		
LICENCEE:	NCE ENERGY CORPORATION		
SOURCE:	SERVICE WELL		
CAUSE:	CONVERSION		
FAILURE TYPE:	EQUIPMENT FAILURE		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JULY 6, 2000
SUBSTANCES SPILLED:	10 m3 SALT/PRODUCED WATER (5 m3 RECOVERED)		
COMPLAINT - MAY 20, 1998 - INCIDENT NUMBER: 19981395			
AER NOTIFIED:	MAY 20, 1998	**INCIDENT COMPLETE:**	MAY 20, 1998
LICENCE #:			
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

AER SPILL / COMPLAINT INCIDENTS FOR 06-04-052-25W4M

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COMPLAINT - FEBRUARY 11, 2009 - INCIDENT NUMBER: 20090320			
AER NOTIFIED:	FEBRUARY 11, 2009	**INCIDENT COMPLETE:**	FEBRUARY 13, 2009
LICENCE #:	20254 (Facility Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	CRUDE OIL GROUP BATTERY		
SOURCE IN COMPLAINCE?	NO		
CAUSE:	UNKNOWN		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	HEALTH - HUMAN		
SPILL - MARCH 7, 2006 - INCIDENT NUMBER: 20060617			
AER NOTIFIED:	MARCH 7, 2006	**INCIDENT COMPLETE:**	OCTOBER 31, 2006
LICENCE #:	20254 (Facility Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	EQUIPMENT FAILURE - INTERNAL CORROSION		
FAILURE TYPE:	EMERGENCY FLARE		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:		**# OF DEATHS:**	
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	PUBLIC NOTIFIED - POTENTIAL HAZARD		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MAY 1, 2006
SUBSTANCES SPILLED:	2 m3 CRUDE OIL (0 m3 RECOVERED) 0.1 (1000m^3) GAS PRODUCTION (RAW)		
COMPLAINT - APRIL 10, 2005 - INCIDENT NUMBER: 20050867			
AER NOTIFIED:	APRIL 10, 2005	**INCIDENT COMPLETE:**	APRIL 13, 2005
LICENCE #:	20254 (Facility Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	CRUDE OIL GROUP BATTERY		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	UNKNOWN		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		
COMPLAINT - DECEMBER 10, 2002 - INCIDENT NUMBER: 20022873			
AER NOTIFIED:	DECEMBER 10, 2002	**INCIDENT COMPLETE:**	DECEMBER 11, 2002
LICENCE #:			
LICENCEE:	PETROFUND CORP.		
SOURCE:	CRUDE OIL GROUP BATTERY		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		
COMPLAINT - NOVEMBER 25, 2002 - INCIDENT NUMBER: 20022789			
AER NOTIFIED:	NOVEMBER 25, 2002	**INCIDENT COMPLETE:**	NOVEMBER 28, 2002

LICENCE #:			
LICENCEE:	PETROFUND CORP.		
SOURCE:	CRUDE OIL GROUP BATTERY		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	PHYSICAL IMPACT - LEASE MANAGEMENT		
COMPLAINT - NOVEMBER 7, 2002 - INCIDENT NUMBER: 20022588			
AER NOTIFIED:	NOVEMBER 7, 2002	**INCIDENT COMPLETE:**	NOVEMBER 8, 2002
LICENCE #:			
LICENCEE:	UNKNOWN OPERATOR/ADDRESS - USED BY FIELD SURVEILLANCE		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		
SPILL - MARCH 20, 2001 - INCIDENT NUMBER: 20010910			
AER NOTIFIED:	MARCH 20, 2001	**INCIDENT COMPLETE:**	MARCH 22, 2001
LICENCE #:	6020 - 2 (Pipeline Licence)		
LICENCEE:	ENCANA OIL & GAS CO. LTD.		
SOURCE:	WATER PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	3.96
PIPELINE GRADE:	X42		
CAUSE:	CONVERSION		
FAILURE TYPE:	CORROSION INTERNAL		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MARCH 22, 2001
SUBSTANCES SPILLED:	0.1 m3 SALT/PRODUCED WATER (0.1 m3 RECOVERED)		
SPILL - MARCH 19, 2001 - INCIDENT NUMBER: 20010917			
AER NOTIFIED:	MARCH 19, 2001	**INCIDENT COMPLETE:**	MARCH 19, 2001
LICENCE #:	17227 - 1 (Pipeline Licence)		
LICENCEE:	ENCANA OIL & GAS CO. LTD.		
SOURCE:	MULTIPHASE PIPELINE		
PIPELINE DAMAGE:	HIT	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	2.77
PIPELINE GRADE:	X42		
CAUSE:	CONVERSION		
FAILURE TYPE:	DAMAGE BY OTHERS		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		

WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MARCH 19, 2001
SUBSTANCES SPILLED:			
SPILL - FEBRUARY 7, 2001 - INCIDENT NUMBER: 20010484			
AER NOTIFIED:	FEBRUARY 7, 2001	**INCIDENT COMPLETE:**	JUNE 12, 2001
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	OIL WELL		
CAUSE:	CONVERSION		
FAILURE TYPE:	EQUIPMENT FAILURE		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JUNE 12, 2001
SUBSTANCES SPILLED:	70 m3 SALT/PRODUCED WATER (69 m3 RECOVERED)		
COMPLAINT - NOVEMBER 21, 2000 - INCIDENT NUMBER: 20011006			
AER NOTIFIED:	NOVEMBER 21, 2000	**INCIDENT COMPLETE:**	NOVEMBER 22, 2000
LICENCE #:			
LICENCEE:	UNKNOWN OPERATOR/ADDRESS - USED BY FIELD SURVEILLANCE		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		
COMPLAINT - AUGUST 7, 2000 - INCIDENT NUMBER: 20002342			
AER NOTIFIED:	AUGUST 7, 2000	**INCIDENT COMPLETE:**	AUGUST 7, 2000
LICENCE #:			
LICENCEE:	ALBERTA ENERGY COMPANY LTD.		
SOURCE:	CRUDE OIL GROUP BATTERY		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - FLARE OPERATIONAL IMPACT - FIRE		
COMPLAINT - JUNE 10, 1999 - INCIDENT NUMBER: 19991288			
AER NOTIFIED:	JUNE 10, 1999	**INCIDENT COMPLETE:**	JUNE 10, 1999
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	ENCANA OIL & GAS CO. LTD.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

COMPLAINT - MARCH 1, 1999 - INCIDENT NUMBER: 19990684			
AER NOTIFIED:	MARCH 1, 1999	**INCIDENT COMPLETE:**	MARCH 1, 1999
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	ENCANA OIL & GAS CO. LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

SPILL - SEPTEMBER 19, 1998 - INCIDENT NUMBER: 19982388			
AER NOTIFIED:	SEPTEMBER 19, 1998	**INCIDENT COMPLETE:**	OCTOBER 29, 1998
LICENCE #:			
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	CONVERSION		
FAILURE TYPE:	FLARE STACK		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	OCTOBER 29, 1998
SUBSTANCES SPILLED:	0.1 m3 CRUDE OIL (0.1 m3 RECOVERED)		

COMPLAINT - JULY 6, 1998 - INCIDENT NUMBER: 19981851			
AER NOTIFIED:	JULY 6, 1998	**INCIDENT COMPLETE:**	JULY 7, 1998
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

COMPLAINT - JULY 4, 1998 - INCIDENT NUMBER: 19981848			
AER NOTIFIED:	JULY 4, 1998	**INCIDENT COMPLETE:**	JULY 7, 1998
LICENCE #:			
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

SPILL - APRIL 28, 1998 - INCIDENT NUMBER: 19981200			
AER NOTIFIED:	APRIL 28, 1998	**INCIDENT COMPLETE:**	JUNE 5, 1998
LICENCE #:			
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	CRUDE OIL GROUP BATTERY		

CAUSE:	CONVERSION		
FAILURE TYPE:	TANK LEAK		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JUNE 5, 1998
SUBSTANCES SPILLED:	8 m3 CRUDE OIL (6 m3 RECOVERED)		

COMPLAINT - NOVEMBER 11, 1997 - INCIDENT NUMBER: 19973293			
AER NOTIFIED:	NOVEMBER 11, 1997	**INCIDENT COMPLETE:**	NOVEMBER 11, 1997
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

COMPLAINT - OCTOBER 13, 1995 - INCIDENT NUMBER: 19952479			
AER NOTIFIED:	OCTOBER 13, 1995	**INCIDENT COMPLETE:**	OCTOBER 13, 1995
LICENCE #:	0003078 (Well Licence)		
LICENCEE:	ENCANA WESTERN RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - SO2		

SPILL - MARCH 13, 1986 - INCIDENT NUMBER: 19860416			
AER NOTIFIED:	MARCH 13, 1986	**INCIDENT COMPLETE:**	MARCH 13, 1986
LICENCE #:	6020 - 2 (Pipeline Licence)		
LICENCEE:	CWCP RESOURCES INC.		
SOURCE:	MULTIPHASE PIPELINE		
PIPELINE DAMAGE:	RUPTURE	**PRESSURE TEST FAILURE?**	YES
PIPELINE OD:	88.9	**PIPELINE WT:**	3.96
PIPELINE GRADE:	0290		
CAUSE:	CONVERSION		
FAILURE TYPE:	CORROSION INTERNAL		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MARCH 13, 1986
SUBSTANCES SPILLED:	1 m3 FRESH WATER (0 m3 RECOVERED)		

SPILL - MARCH 10, 1986 - INCIDENT NUMBER: 19860390			
AER NOTIFIED:	MARCH 10, 1986	**INCIDENT COMPLETE:**	JUNE 29, 1988
LICENCE #:	6020 - 2 (Pipeline Licence)		
LICENCEE:	CWCP RESOURCES INC.		
SOURCE:	MULTIPHASE PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	3.96
PIPELINE GRADE:	0290		
CAUSE:	CONVERSION		
FAILURE TYPE:	CORROSION INTERNAL		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JUNE 29, 1988
SUBSTANCES SPILLED:	20 m3 SALT/PRODUCED WATER (18 m3 RECOVERED) 1 m3 CRUDE OIL (1 m3 RECOVERED)		

SPILL - JULY 5, 1983 - INCIDENT NUMBER: 19830573			
AER NOTIFIED:	JULY 5, 1983	**INCIDENT COMPLETE:**	SEPTEMBER 26, 1988
LICENCE #:			
LICENCEE:	DENISON ENERGY INC.		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	CONVERSION		
FAILURE TYPE:	FLARE STACK		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	SEPTEMBER 26, 1988
SUBSTANCES SPILLED:	1 m3 CRUDE OIL (0 m3 RECOVERED)		

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SPILL - JULY 17, 2013 - INCIDENT NUMBER: 20131382			
AER NOTIFIED:	JULY 17, 2013	**INCIDENT COMPLETE:**	
LICENCE #:	36615 - 2 (Pipeline Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	MULTIPHASE PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	4.78
PIPELINE GRADE:	B		
CAUSE:	EQUIPMENT FAILURE - MALFUNCTION		
FAILURE TYPE:	VALVE OR FITTING FAILURE		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	
SUBSTANCES SPILLED:	0.1 m3 CRUDE OIL (0 m3 RECOVERED) 0.1 m3 SALT/PRODUCED WATER (0 m3 RECOVERED) 0 m3 WASTE (0.1 m3 RECOVERED)		

SPILL - MARCH 5, 2006 - INCIDENT NUMBER: 20060589			
AER NOTIFIED:	MARCH 5, 2006	**INCIDENT COMPLETE:**	DECEMBER 12, 2006
LICENCE #:	0335815 (Well Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	OIL WELL		
CAUSE:	OPERATOR ERROR - ACCIDENTAL		
FAILURE TYPE:	LUBRICATOR		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:		**# OF DEATHS:**	
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MARCH 5, 2006
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) 0.5 m3 CRUDE OIL (0.5 m3 RECOVERED)		

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COMPLAINT - DECEMBER 23, 2009 - INCIDENT NUMBER: 20092495			
AER NOTIFIED:	DECEMBER 23, 2009	**INCIDENT COMPLETE:**	DECEMBER 24, 2009
LICENCE #:			
LICENCEE:	UNKNOWN		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	UNKNOWN		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

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COMPLAINT - APRIL 23, 1977 - INCIDENT NUMBER: 19770499			
AER NOTIFIED:	APRIL 23, 1977	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

COMPLAINT - FEBRUARY 4, 1977 - INCIDENT NUMBER: 19770201			
AER NOTIFIED:	FEBRUARY 4, 1977	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

SPILL - FEBRUARY 4, 1977 - INCIDENT NUMBER: 19770200			
AER NOTIFIED:	FEBRUARY 4, 1977	**INCIDENT COMPLETE:**	APRIL 20, 1977
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	CONVERSION		
FAILURE TYPE:	UNKNOWN		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	APRIL 20, 1977
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) (0 (1000m^3) RECOVERED)		

COMPLAINT - DECEMBER 21, 1976 - INCIDENT NUMBER: 19761590			
AER NOTIFIED:	DECEMBER 21, 1976	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:	0060394 (Well Licence)		
LICENCEE:	TUNDRA OIL & GAS LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

SPILL - DECEMBER 21, 1976 - INCIDENT NUMBER: 19761589			
AER NOTIFIED:	DECEMBER 21, 1976	**INCIDENT COMPLETE:**	DECEMBER 21, 1976

LICENCE #:	0060394 (Well Licence)		
LICENCEE:	TUNDRA OIL & GAS LIMITED		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	CONVERSION		
FAILURE TYPE:	FLARE OUT		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	DECEMBER 21, 1976
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) (0 (1000m^3) RECOVERED)		

COMPLAINT - DECEMBER 7, 1976 - INCIDENT NUMBER: 19761549			
AER NOTIFIED:	DECEMBER 7, 1976	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - NOISE ODOURS - OTHER		

SPILL - DECEMBER 7, 1976 - INCIDENT NUMBER: 19761548			
AER NOTIFIED:	DECEMBER 7, 1976	**INCIDENT COMPLETE:**	DECEMBER 10, 1976
LICENCE #:	0004185 (Well Licence)		
LICENCEE:	AMERICAN LEDUC PETROLEUMS LIMITED		
SOURCE:	GAS WELL		
CAUSE:	CONVERSION		
FAILURE TYPE:	FLARE STACK		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	DECEMBER 10, 1976
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

COMPLAINT - DECEMBER 5, 1976 - INCIDENT NUMBER: 19761539			
AER NOTIFIED:	DECEMBER 5, 1976	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - NOISE		

	ODOURS - OTHER		
COMPLAINT - NOVEMBER 27, 1976 - INCIDENT NUMBER: 19761476			
AER NOTIFIED:	NOVEMBER 27, 1976	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	WESTHILL RESOURCES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		
SPILL - NOVEMBER 27, 1976 - INCIDENT NUMBER: 19761475			
AER NOTIFIED:	NOVEMBER 27, 1976	**INCIDENT COMPLETE:**	NOVEMBER 29, 1976
LICENCE #:	0004185 (Well Licence)		
LICENCEE:	AMERICAN LEDUC PETROLEUMS LIMITED		
SOURCE:	SWEET DRILLING WELL		
CAUSE:	CONVERSION		
FAILURE TYPE:	SERVICE RIG TANK		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	NOVEMBER 29, 1976
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) (0 (1000m^3) RECOVERED)		

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COMPLAINT - SEPTEMBER 12, 2009 - INCIDENT NUMBER: 20091777			
AER NOTIFIED:	SEPTEMBER 12, 2009	**INCIDENT COMPLETE:**	SEPTEMBER 12, 2009
LICENCE #:	0063496 (Well Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	EQUIPMENT FAILURE - MALFUNCTION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - NOISE OPERATIONAL IMPACT - NUISANCE		

COMPLAINT - JANUARY 14, 2009 - INCIDENT NUMBER: 20090093			
AER NOTIFIED:	JANUARY 14, 2009	**INCIDENT COMPLETE:**	APRIL 28, 2009
LICENCE #:	0084329 (Well Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	FLARING - TEST		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	OPERATIONAL IMPACT - FLARE		

COMPLAINT - MARCH 2, 2007 - INCIDENT NUMBER: 20070605			
AER NOTIFIED:	MARCH 2, 2007	**INCIDENT COMPLETE:**	MARCH 2, 2007
LICENCE #:	0084329 (Well Licence)		
LICENCEE:	PENN WEST PETROLEUM LTD.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?	NO		
CAUSE:	OPERATOR ERROR - OVERSIGHT		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - THC		

COMPLAINT - DECEMBER 29, 2004 - INCIDENT NUMBER: 20043092			
AER NOTIFIED:	DECEMBER 29, 2004	**INCIDENT COMPLETE:**	APRIL 4, 2005
LICENCE #:	0063496 (Well Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?	YES		
CAUSE:	EQUIPMENT FAILURE - MECHANICAL/STRCTURAL		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

COMPLAINT - DECEMBER 29, 2004 - INCIDENT NUMBER: 20043127			
AER NOTIFIED:	DECEMBER 30, 2004	**INCIDENT COMPLETE:**	FEBRUARY 2, 2005
LICENCE #:	0084329 (Well Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	OIL WELL		
SOURCE IN COMPLAINCE?	NO		
CAUSE:	EQUIPMENT FAILURE - DEFECT		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		

SPILL - DECEMBER 29, 2004 - INCIDENT NUMBER: 20043101			
AER NOTIFIED:	DECEMBER 29, 2004	**INCIDENT COMPLETE:**	SEPTEMBER 6, 2005
LICENCE #:	0084329 (Well Licence)		
LICENCEE:	PETROFUND CORP.		
SOURCE:	OIL WELL		
CAUSE:	EQUIPMENT FAILURE - MECHANICAL/STRCTURAL		
FAILURE TYPE:	MECHANICAL DAMAGE		
JURISDICTION:			
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:		**# OF DEATHS:**	
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	DECEMBER 29, 2004
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) 0.2 m3 CRUDE OIL (0.2 m3 RECOVERED)		

SPILL - FEBRUARY 6, 1989 - INCIDENT NUMBER: 19890219			
AER NOTIFIED:	FEBRUARY 6, 1989	**INCIDENT COMPLETE:**	FEBRUARY 10, 1989
LICENCE #:			
LICENCEE:	BP CANADA ENERGY COMPANY		
SOURCE:	CRUDE OIL GROUP BATTERY		
CAUSE:	CONVERSION		
FAILURE TYPE:	FLARE STACK		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	FEBRUARY 10, 1989
SUBSTANCES SPILLED:	1 m3 CRUDE OIL (1 m3 RECOVERED)		

SPILL - NOVEMBER 16, 1987 - INCIDENT NUMBER: 19871529			
AER NOTIFIED:	NOVEMBER 16, 1987	**INCIDENT COMPLETE:**	NOVEMBER 17, 1987
LICENCE #:			
LICENCEE:	DOME PETROLEUM LTD.		
SOURCE:	MISCELLANEOUS		
CAUSE:	CONVERSION		
FAILURE TYPE:	NEGLECT		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	NOVEMBER 17, 1987
SUBSTANCES SPILLED:	1 m3 SALT/PRODUCED WATER (1 m3 RECOVERED)		

COMPLAINT - FEBRUARY 28, 1985 - INCIDENT NUMBER: 19850309			
AER NOTIFIED:	FEBRUARY 28, 1985	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	DOME PETROLEUM LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

COMPLAINT - FEBRUARY 7, 1985 - INCIDENT NUMBER: 19850202			
AER NOTIFIED:	FEBRUARY 7, 1985	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	DOME PETROLEUM LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

COMPLAINT - SEPTEMBER 26, 1980 - INCIDENT NUMBER: 19800779			
AER NOTIFIED:	SEPTEMBER 26, 1980	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	DOME PETROLEUM LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

AER SPILL / COMPLAINT INCIDENTS
FOR
16-32-051-25W4M

COMPLAINT - MARCH 14, 1997 - INCIDENT NUMBER: 19970696			
AER NOTIFIED:	MARCH 14, 1997	**INCIDENT COMPLETE:**	MARCH 14, 1997
LICENCE #:			
LICENCEE:	UNKNOWN OPERATOR/ADDRESS - USED BY FIELD SURVEILLANCE		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - H2S		
COMPLAINT - SEPTEMBER 29, 1983 - INCIDENT NUMBER: 19830867			
AER NOTIFIED:	SEPTEMBER 29, 1983	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	CAMEL RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		
COMPLAINT - OCTOBER 19, 1980 - INCIDENT NUMBER: 19800855			
AER NOTIFIED:	OCTOBER 19, 1980	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:			
LICENCEE:	CAMEL RESOURCES LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	ARM	**FIELD CENTRE:**	ST. ALBERT
CONCERNS:	ODOURS - OTHER		

OPTIONS

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AER FACILITY INFORMATION
FOR
06-04-052-25 W4M

FACILITY DATA CURRENT TO JANUARY 10, 2014
FLARING, VENTING & PRODUCTION DATA CURRENT TO DECEMBER 20, 2013

OPTIONS

View Licencee/Operator Info

Print Screen

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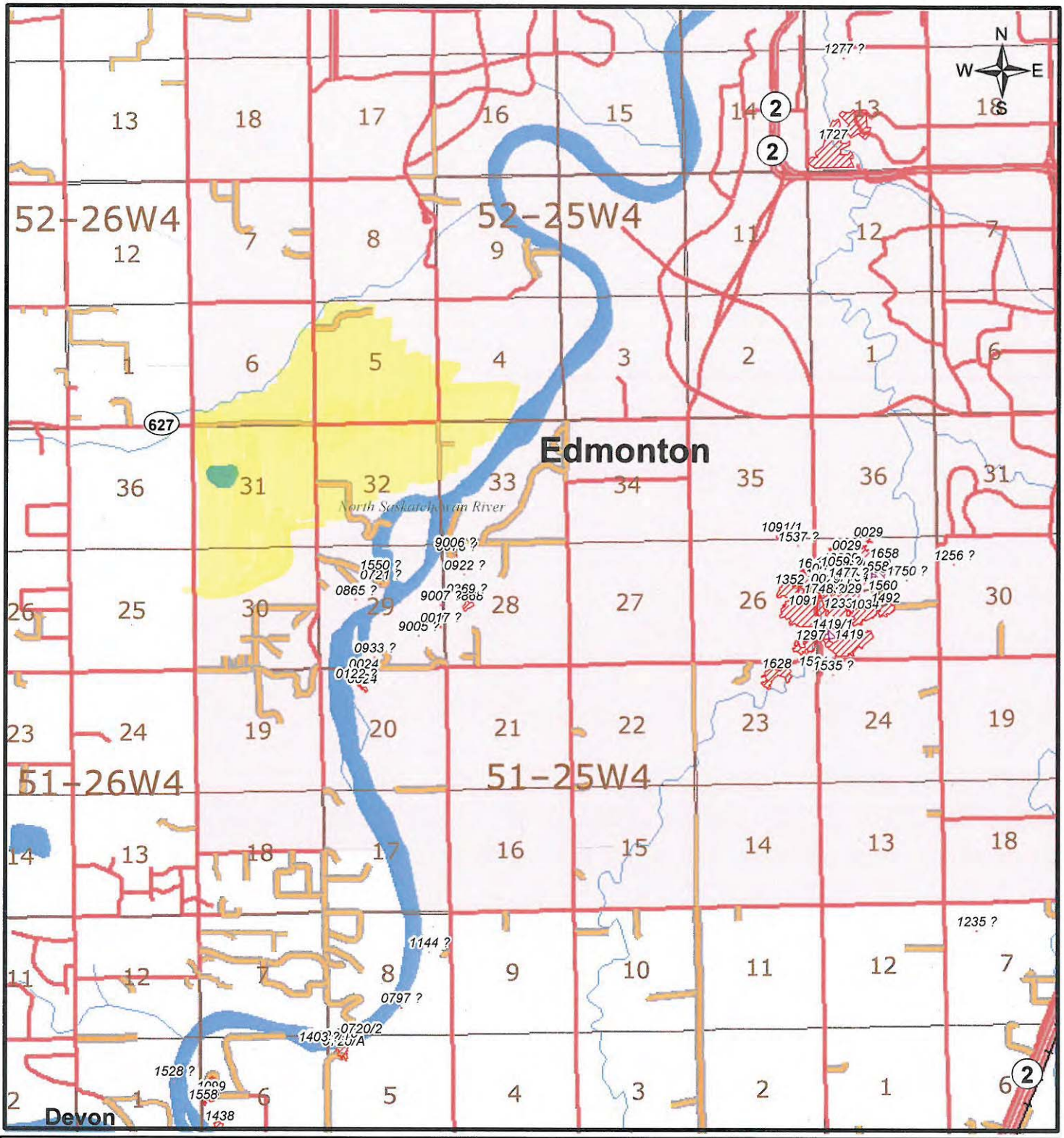
BATTERY			
VIEW ALL WELLS RELATED TO THIS BATTERY			
TYPE:	CRUDE OIL MULTIWELL PRORATION BATTERY		
STATUS:	ACTIVE	**LICENCE #:**	F20254
NAME:	CWCP ARMISIE BTY 1		
OPERATOR:	PENN WEST PETROLEUM LTD.		
LICENCEE:	PENN WEST PETROLEUM LTD.		
FLARING, VENTING & PRODUCTION DATA			
FIELD CENTRE:	ST. ALBERT	**# OF WELLS:**	10
AREA:	ARMISIE		
OIL (m3)			
PRODUCED:	738.1	**RECEIVED:**	0
OPENING INVENTORY:	50.2	**CLOSING INVENTORY:**	79.6
SHIPPED:	708.7		
GAS (1000 m3)			
PRODUCED:	251.2	**RECEIVED:**	0
FLARED:	0	**VENTED:**	2.7
MEASUREMENT DIFF:	0	**SHIPPED:**	247.6
LEASE FUEL:	0.9		
WATER (m3)			
PRODUCED:	10353.6	**RECEIVED:**	0
OPENING INVENTORY:	50	**CLOSING INVENTORY:**	8.6
MEASUREMENT DIFF:	0	**SHIPPED:**	10395

Appendix D
Coal Mines

Coal Mine Number	1550
Coal Mine Name	Model
Owner	George Burham
Coal Mine Type	Underground
Status	Abandoned
Mining Method	Room and Pillar
Graphic Type	Symbol
Uncertain Location	Yes
Comments	

Coal Mine Number	0721
Coal Mine Name	Worthington and Cunningham
Owner	H.G. Worthingham and R. Cunningham
Coal Mine Type	Underground
Status	Abandoned
Mining Method	Adit (Tunnel)
Graphic Type	Symbol
Uncertain Location	Yes
Comments	

Coal Mine Number	0865
Coal Mine Name	Farnell's
Owner	J.H. Farnell
Coal Mine Type	Underground
Status	Abandoned
Mining Method	Adit (Tunnel)
Graphic Type	Symbol
Uncertain Location	Yes
Comments	



ERCB Energy Resources Conservation Board

Alberta Coal Mine Locations

Disclaimer: The abandoned coal mine information is for informative purposes and represents the best data available to the ERCB at this time but its accuracy cannot be guaranteed. The ERCB is not responsible for damages caused by the use of this information.

In cases where there is a discrepancy between the coal mine data listing and the coal mine map, consider the coal mine data listing to be the most accurate.

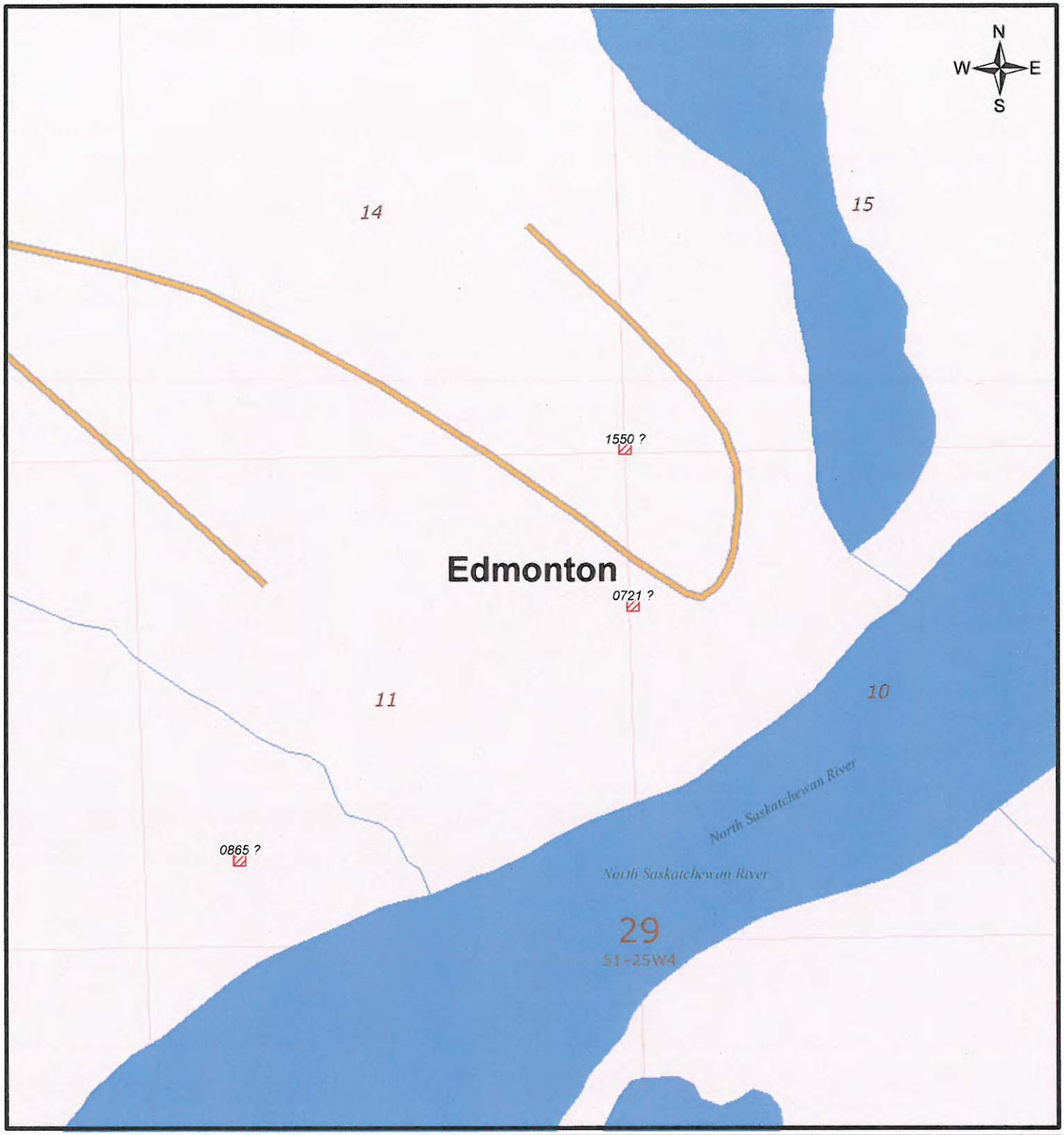
Printed on 2/5/2014

Coal Mine Map Legend

?	Mine location uncertain		Underground mine
9999	Mine number		Surface mine
C99-99	Mine permit number		Coal Mine Permit

0 0.5 1 2 Kilometres

Base data provided by Spatial Data Warehouse Ltd.



ERCB Energy Resources Conservation Board

Alberta Coal Mine Locations

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Printed on 2/5/2014

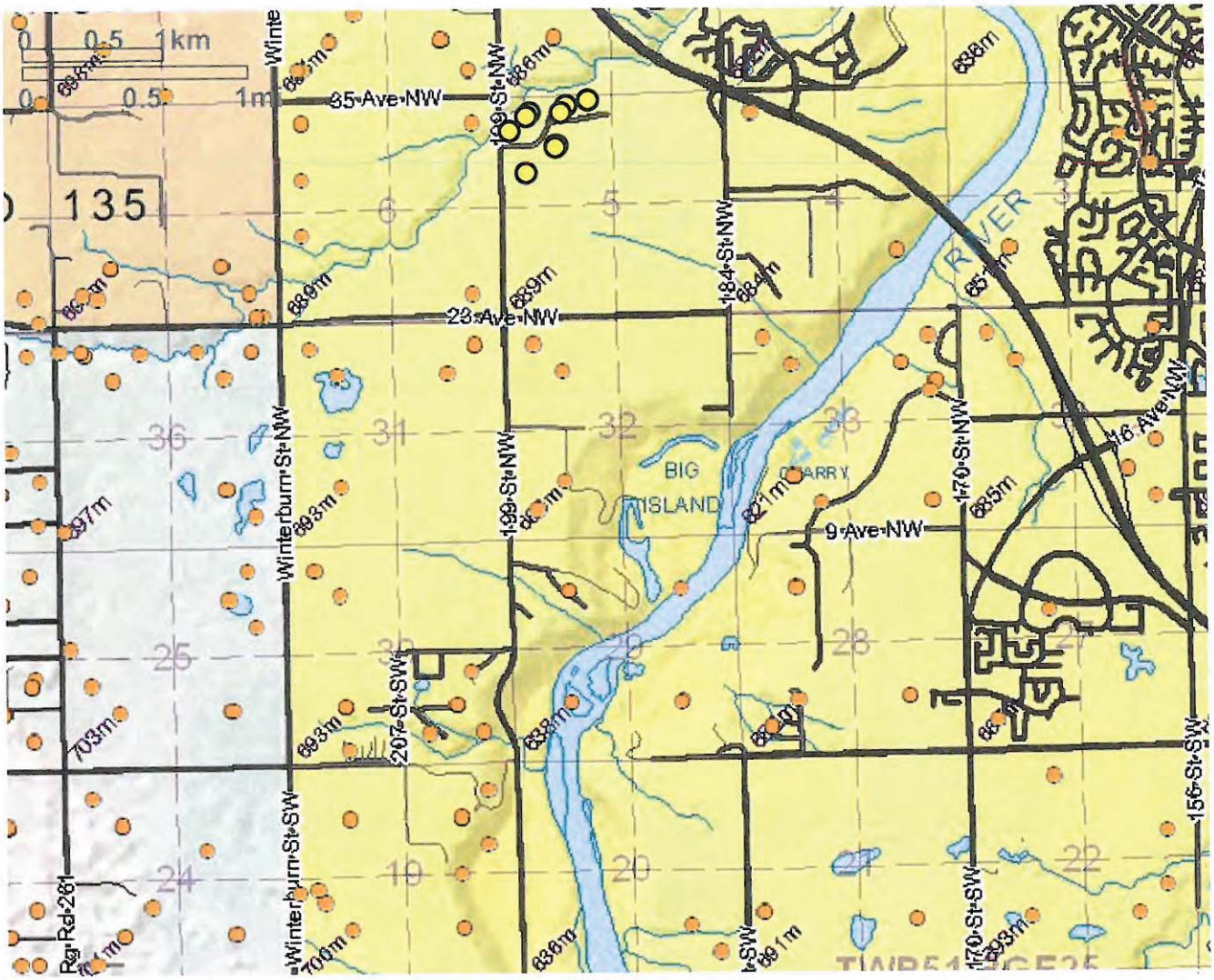
Coal Mine Map Legend

?	Mine location uncertain		Underground mine
9999	Mine number		Surface mine
C99-99	Mine permit number		Coal Mine Permit

0 0.05 0.1 0.2 Kilometres

Base data provided by Spatial Data Warehouse Ltd.

Appendix E
Water Well site



Alberta Water Well Information Database Map

Projection
Alberta 10TM

Datum
NAD 83

Date Printed
2/5/2014 7:51:42 AM

egend
- Groundwater Drilling Report
- Baseline Water Well Report

http://groundwater.alberta.ca/WaterWells/

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
40266	NW	05	052	25	4	D&D WATER WELL DRILLING & SERVICING LTD.	2002-02-06	190.00	New Well	Domestic		9	17	ARPI'S INDUSTRIES CAN LTD	52.00	10.00
1130937	NW	5	52	25	4	BIG IRON DRILLING LTD.	1973-11-01	140.00	New Well	Unknown		5	1	DAILEY, PAT	41.00	0.50
1130943	NW	5	52	25	4	BIG IRON DRILLING LTD.		140.00	New Well	Domestic		8		DAILY, PAT	41.00	0.50
1165502	14	5	52	25	4	CALIBRE DRILLING LTD.	2009-09-16	200.00	New Well	Domestic		12	26	KARDYBAN, KEN & DEBORAH	55.90	9.99
1165642	14	5	52	25	4	CALIBRE DRILLING LTD.	2010-11-12	200.00	New Well	Domestic		9	26	PATOCKA, TERRY & RACHEL	53.28	9.99
1300051	NW	05	052	25	4	GERALD MCGINN DRILLING LTD.	2004-09-10	160.00	New Well	Domestic		10	22	FRIESER, GEORGE P.	44.62	10.00
1300346	13	5	52	25	4	GERALD MCGINN DRILLING LTD.	2010-09-08	164.00	New Well	Domestic		11	22	MYSHAK, MIKE	60.76	7.00
1300367	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1987-07-02	166.00	New Well	Unknown		9	1	SIMS, PHILIP	65.00	7.00
1300368	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1987-06-30	171.00	New Well	Unknown		11	2	WU, RAYMOND	55.00	5.00
1300370	13	5	52	25	4	GERALD MCGINN DRILLING LTD.	1988-05-25	180.00	New Well	Domestic	1	9	1	LEVASSEUR, JERRY	60.00	2.50
1300371	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1976-04-27	180.00	New Well	Domestic		8	1	B & H HOMES EDMONTON LTD.	80.00	7.00
1300372	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1989-11-01	171.10	New Well	Unknown		12	1	BANNMAN, DOROTHY	55.00	7.50
1300373	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1976-05-12	199.00	New Well	Domestic		20	1	VENSON, OSCAR	75.00	2.00
1300374	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1987-07-03	166.00	New Well	Unknown		7	1	MCAMMOND, DAVE	60.00	7.00
1300375	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1987-07-03	166.00	New Well	Unknown		7	2	MCCAMMOND, DAVE	60.00	7.00
1300376	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1979-09-27	130.00	New Well	Domestic		8	2	EKLUND, MERT	50.00	7.00
1300377	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1976-05-13	160.00	New Well	Domestic		13		VENSON, OSCAR / C/O B & H HOMES		30.00
1300378	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1976-11-04	170.00	New Well	Domestic		9	2	STOSKY, ALEX	85.00	7.00
1300380	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1974-08-07	170.10	New Well	Domestic		13		B & H HOMES	50.00	15.00
1300381	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1975-06-12	180.00	New Well	Domestic		8		TOTTRUP, AAGE		7.00

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Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
1300384	NW	5	52	25	4	GERALD MCGINN DRILLING LTD.	1970-09-19	105.00	New Well	Domestic & Stock		5		STECKHAHN, ARTHUR	17.00	2.00
1495419	13	5	52	25	4	MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	2009-02-03	135.00	New Well	Domestic		4	18	KALINOWSKI, ALICE	51.77	9.99
1795288	NW	5	52	25	4	WESTAR WATER WELL DRILLING LTD.	1988-09-30	145.00	New Well	Domestic		7	1	SC PROPERTY	22.00	5.00
2092817	12	5	52	25	4	UNKNOWNDRILLINGCOMP11	1972-09-01	120.00	New Well	Domestic		16		VENNASON, O.	50.00	8.00
2092818	NW	5	52	25	4	UNKNOWNDRILLINGCOMP11	1975-09-17	90.00	New Well	Domestic		4	1	VELTMAN, CASEY	70.00	2.00
2092837	13	5	52	25	4	UNKNOWNDRILLINGCOMP11	1958-10-10	164.00	New Well	Domestic		8	3	CAMPBELL, COLIN	55.00	5.00
2092841	NW	5	52	25	4	UNKNOWNDRILLINGCOMP11	1972-11-01	148.00	New Well	Domestic		6		SIMS, PHILL	44.00	11.00
2092869	13	5	52	25	4	UNKNOWNDRILLINGCOMP11	1968-07-31	75.00	Test Hole	Unknown		5		PROVINCIAL GOVERNMENT		
2093333	12	5	52	25	4	UNKNOWNDRILLINGCOMP11	1919-07-22	140.00	Well Inventory	Unknown		1		NANSAY, R. J.		

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
2092815	SE	4	52	25	4	UNKNOWNDRILLINGCOMP11	1970-09-01	180.00	New Well	Domestic		13		ENOCH BAND (GARRY MORIN)		1.00
2092816	SE	4	52	25	4	UNKNOWNDRILLINGCOMP11	1970-09-01	112.00	New Well	Domestic		5		ENOCH BAND (GARRY MORIN)		
2093268	13	4	52	25	4	UNKNOWNDRILLINGCOMP11		85.00	Test Hole	Unknown		4		HOLE # 62		

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88937	SW	32	051	25	4	BIG IRON DRILLING LTD.	1981-03-13	315.00	New Well	Stock	1	13		SUMMERFELD, OSCAR	121.00	1.00
88938	04	32	051	25	4	UNKNOWN DRILLER		100.00	Unknown	Unknown		6		RCA#WELL 34 71-121		
88939	NW	32	051	25	4	BIG IRON DRILLING LTD.	1969-05-01	115.00	New Well	Domestic		5		MCPHEE, BUD		
88940	13	32	051	25	4	UNKNOWN DRILLER	1971-09-01	87.00	Unknown	Unknown		5		RCA#WELL 49 71-123		

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88941	01	33	051	25	4	UNKNOWN DRILLER	1971-09-01	110.00	Unknown	Unknown		7		RCA#HOLE 33 71-142		
88942	SW	33	051	25	4	UNKNOWN DRILLER		75.00	Chemistry	Domestic	1			LINDBERT, S.		
88943	SW	33	051	25	4	UNKNOWN DRILLER		54.00	Chemistry	Domestic	1			SEATON, TOM		
88944	03	33	051	25	4	UNKNOWN DRILLER		487.00	Chemistry	Domestic	3			IRWIN ENGINEERING		
88945	01	33	051	25	4	UNKNOWN DRILLER		92.00	Chemistry	Unknown	1			IRWIN ENGINEERING		
88946	SW	33	051	25	4	BIG IRON DRILLING LTD.	1983-01-31	452.00	New Well	Domestic		14		HAGAN, EVERETT F.	172.00	1.00
88947	SW	33	051	25	4	NORTHERN WW BORING	1965-09-27	89.00	New Well	Domestic	1	7		HAEBERLE		
88948	9	33	51	25	4	UNKNOWN DRILLER	1965-01-01	0.00	Chemistry	Domestic				KITAR, STEVE		
88948	9	33	51	25	4	TOWN & COUNTRY WATER WELL BORING LTD.	1966-06-17	84.00	New Well	Domestic		5		KITAR, STEVE	34.00	
88949	SW	33	051	25	4	UNKNOWN DRILLER	1975-09-01	75.00	Chemistry	Domestic	2			WIEDE, H.		
88950	SW	33	051	25	4	NORTHERN WW BORING	1965-01-01	62.00	New Well	Domestic		4		DAY, IVEN		
88951	13	33	051	25	4	UNKNOWN DRILLER	1971-09-01	90.00	Unknown	Unknown		4		RCA#WELL 48 71-120		
88952	09	33	051	25	4	UNKNOWN DRILLER		75.00	Chemistry	Domestic	1			UNDERSCHULTZ, L.		
88953	16	33	051	25	4	UNKNOWN DRILLER		0.00	Spring	Unknown	2			#SPRING		
88954	NE	33	051	25	4	UNKNOWN DRILLER	1965-01-01	68.00	Chemistry	Domestic	1			NIEBERDING, R.		
88955	NE	33	051	25	4	CARIBOU DRILLING LTD.	1970-09-09	86.00	New Well	Domestic		7		FRERICHS, RON	66.00	2.00
295104	NW	33	051	25	4	COBOB PUMPS & SERVICES LTD.	2000-06-23	540.00	New Well	Domestic		42	22	GOTAAS, DARREL	153.00	7.00

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88892	SE	29	051	25	4	UNKNOWN DRILLER		0.00	Chemistry	Domestic				WINDERMERE GOLF & COUNTRY		
88893	SW	29	051	25	4	UNKNOWN DRILLER		0.00	Spring	Domestic	2			KACHUK, N.		
88894	NW	29	051	25	4	UNKNOWN DRILLER		160.00	Chemistry	Domestic	1			MALMLOFF		
88895	NW	29	051	25	4	UNKNOWN DRILLER		160.00	Chemistry	Domestic	1			JANZEN		
88896	NW	29	051	25	4	UNKNOWN DRILLER		65.00	Chemistry	Domestic	1			JANSEN, DANIEL		
88897	NW	29	051	25	4	UNKNOWN DRILLER		65.00	Chemistry	Domestic	1			KAMINSKY, PAUL		
88899	NE	29	051	25	4	CORALTA DRLG	1965-07-30	28.00	New Well	Industrial		5		BIG ISLAND DEV	0.00	
212066	SW	29	051	25	4	MID-WEST WATER WELLS LTD.	1993-06-18	420.00	New Well	Domestic		23		YALTHO, MATHEW	130.00	2.00
285663	NW	29	051	25	4	SUMMERS DRILLING LTD.	1994-12-08	48.00	New Well	Domestic		3	18	HOWERY, KEN	26.00	45.00
1520014	SE	29	051	25	4	MID-WEST DRILLING LTD.	2003-02-11	40.00	New Well	Other		3	4	WINDERMERE GOLF COUNTRY CLUB	21.00	40.00

Baseline Water Well Tests

Please click the water Test ID to generate the Baseline Water Well Test Report.

Test ID	GIC Well ID	LSD	QTR	SEC	TWP	RGE	M	Resource Company	Testing Date	Water Quality	Pump Test	Gas	Isotopes
1181767			SW	29	51	25	4	Trident Energy Corp	2007-12-11	Yes	Yes	-	-

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Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88900	SE	30	051	25	4	UNKNOWN DRILLER		40.00	Chemistry	Domestic	1			DOUGLAS, P.A.		
88901	01	30	051	25	4	CARIBOU DRILLING LTD.	1975-05-21	68.00	New Well	Domestic		3		HANLAN, WADE	20.00	
88902	SE	30	051	25	4	UNKNOWN DRILLER	1980-07-01	85.00	Chemistry	Domestic	1			WEBB		
88903	SE	30	051	25	4	UNKNOWN DRILLER		90.00	Chemistry	Domestic	2			BISSELL, WALTER		
88904	02	30	051	25	4	KAP'S DRILLING LTD.	1981-03-12	100.00	New Well	Domestic	2	8		KINGSFORD, PAT	30.00	1.00
88905	SE	30	051	25	4	GERALD MCGINN DRILLING LTD.	1980-08-21	105.00	New Well	Domestic		8		RENDEX CONSTR	70.00	1.50
88906	SE	30	051	25	4	HOLLAND DRILLING LTD.	1978-06-08	105.00	Dry Hole	Domestic		4		HEATH, DAVE	25.00	0.50
88907	SE	30	051	25	4	GROVE DRILLING ENTERPRISES (1980) LTD.	1985-05-16	240.00	New Well	Domestic		12		NOWICKE, TERRY	150.00	1.50
88908	SE	30	051	25	4	UNKNOWN DRILLER		270.00	Chemistry	Domestic				TOUCHINGS, BARRIE		
88909	SE	30	051	25	4	GERALD MCGINN DRILLING LTD.	1975-11-17	274.00	New Well	Domestic		25		BLINSTON, RON	110.00	1.50
88910	SE	30	051	25	4	GERALD MCGINN DRILLING LTD.	1981-09-09	424.00	New Well	Domestic		24		REWDEK CONSTR	150.00	1.50
88911	01	30	051	25	4	MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	1980-06-25	220.00	New Well	Domestic		10		LEIMAN, ED	149.00	2.00
88912	SE	30	051	25	4	UNKNOWN DRILLER		200.00	Chemistry	Domestic	1			LEIMAN, M.		
88913	SW	30	051	25	4	UNKNOWN DRILLER		40.00	Chemistry	Domestic	1			GOLDGRABE, K.		
88914	SW	30	051	25	4	UNKNOWN DRILLER		46.00	Chemistry	Domestic	1			ARMITAGE, GEORGE J.		
88915	SW	30	051	25	4	CARIBOU DRILLING LTD.	1975-03-06	48.00	New Well	Domestic		4		CARD, BILL	0.30	15.00
88916	SW	30	051	25	4	UNKNOWN DRILLER		48.00	Chemistry	Domestic	1			ARMITAGE, GEORGE		
88917	13	30	051	25	4	UNKNOWN DRILLER		55.00	Chemistry	Domestic	1			ABEL, HUBERT		
88918	SW	30	051	25	4	UNKNOWN DRILLER		107.00	Chemistry	Domestic	1			HEATH, DAVID		
88919	SW	30	051	25	4	ELK POINT DRILLING CORP.	1983-04-27	120.00	New Well	Domestic		6		POTTER, SAM	83.50	9.00

Government of Alberta

Reconnaissance Report

View in Metric

Export to Excel

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88920	SW	30	051	25	4	ELK POINT DRILLING CORP.	1983-04-26	140.00	New Well	Domestic	3	9		HARTMETZ, DIETER	79.70	9.00
88921	SW	30	051	25	4	ELK POINT DRILLING CORP.	1980-08-08	140.00	New Well	Domestic		7		POTTER, SAM	84.00	12.00
88922	SW	30	051	25	4	ELK POINT DRILLING CORP.	1983-04-26	140.00	New Well	Domestic	1	9		HARTMETZ, DIETER	79.70	9.00
88923	SW	30	051	25	4	BANKS WELL SERVICE	1978-10-04	240.00	New Well	Domestic	1	11		METCALFE, RICK	110.00	1.00
88924	SW	30	051	25	4	GERALD MCGINN DRILLING LTD.	1976-09-10	244.00	New Well	Domestic	1	23		LAF, JOSEF	130.00	1.00
88925	SW	30	051	25	4	GROVE DRILLING ENTERPRISES (1980) LTD.	1979-08-01	248.00	New Well	Domestic	1	11		EDWARDS, JACK	0.00	1.50
88926	SW	30	051	25	4	BIG IRON DRILLING LTD.	1987-07-06	260.00	New Well	Domestic		15		RISSELADA, DICK	110.00	6.00
88927	13	30	051	25	4	UNKNOWN DRILLER		30.00	Well Inventory	Domestic	1			RESEARCH COUNCIL#WELL 17		
151104	SE	30	051	25	4	BIG IRON DRILLING LTD.	1990-05-15	278.00	New Well	Domestic		17		BUDENZ, G.	175.00	3.00
157621	SE	30	051	25	4	BIG IRON DRILLING LTD.	1991-06-11	230.00	New Well	Domestic		15		SUPERIOR TRENCHING LTD	150.00	4.00
165144	SE	30	051	25	4	MID-WEST WATER WELLS LTD.	1992-08-07	360.00	New Well-Abandoned	Domestic		24		HORVAT, CHARLES	160.00	0.30
167832	SE	30	051	25	4	MID-WEST WATER WELLS LTD.	1992-08-10	300.00	Dry Hole	Domestic		16		HORVAT, CHARLES		
169483	SE	30	051	25	4	MID-WEST WATER WELLS LTD.	1992-09-22	300.00	New Well	Domestic		16		HORVAT, CHARLES#WELL 5	80.00	2.00
169484	SE	30	051	25	4	MID-WEST WATER WELLS LTD.	1992-09-18	300.00	Dry Hole	Domestic		16		HORVAT, CHARLES#WELL 4		
169485	SE	30	051	25	4	MID-WEST WATER WELLS LTD.	1992-09-14	300.00	Dry Hole	Domestic		22		HORVAT, CHARLES		
186717	08	30	051	25	4	UNKNOWN DRILLER		500.00	Chemistry	Domestic				HORVAT, DRAGO		
195400	SE	30	51	25	4	MID-WEST WATER WELLS LTD.	1992-11-27	300.00	Dry Hole-Abandoned	Domestic		13		HORVAT, CHARLES		
195401	SE	30	51	25	4	MID-WEST WATER WELLS LTD.	1992-11-29	480.00	Deepened	Domestic		4		HORVAT, CHARLES	170.00	0.75
195401	SE	30	51	25	4	MID-WEST WATER WELLS LTD.	1992-11-29	480.00	Deepened	Domestic		4		HORVAT, CHARLES	0.00	0.75
1165392	03	30	051	25	4	CALIBRE DRILLING LTD.	2008-07-18	130.00	New Well	Domestic		8	14	WITTY, JOAN	86.97	7.00

Government of Alberta

Reconnaissance Report

View in Metric

Export to Excel

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
1575284	NW	30	051	25	4	PAPLEY DRILLING LTD.			Old Well-Abandoned	Unknown				WALTON INTERNATIONAL GROUP		

Government of Alberta

Reconnaissance Report

View in Metric

Export to Excel

Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
88929	SW	31	051	25	4	UNKNOWN DRILLER		50.00	Chemistry	Domestic	1			CRANZ, H.		
88930	NW	31	051	25	4	UNKNOWN DRILLER		40.00	Chemistry	Domestic	1			STELTER, DALE		
88931	13	31	051	25	4	UNKNOWN DRILLER		110.00	Unknown	Unknown		5		RCA#HOLE 50 71-172		
88932	NE	31	051	25	4	UNKNOWN DRILLER		50.00	Chemistry	Domestic				CRANNA, JIM		
88933	16	31	051	25	4	UNKNOWN DRILLER	1934-01-01	30.00	Federal Well Survey	Domestic				ROBERTSON		
88934	16	31	051	25	4	UNKNOWN DRILLER	1934-01-01	65.00	Federal Well Survey	Domestic				ROBERTSON		
88935	16	31	051	25	4	UNKNOWN DRILLER	1934-01-01	300.00	Federal Well Survey	Unknown				ROBERTSON		
88936	16	31	051	25	4	UNKNOWN DRILLER	1934-01-01	340.00	Federal Well Survey	Domestic & Stock				ROBERTSON		

Government of Alberta

Reconnaissance Report

View in Metric

Export to Excel

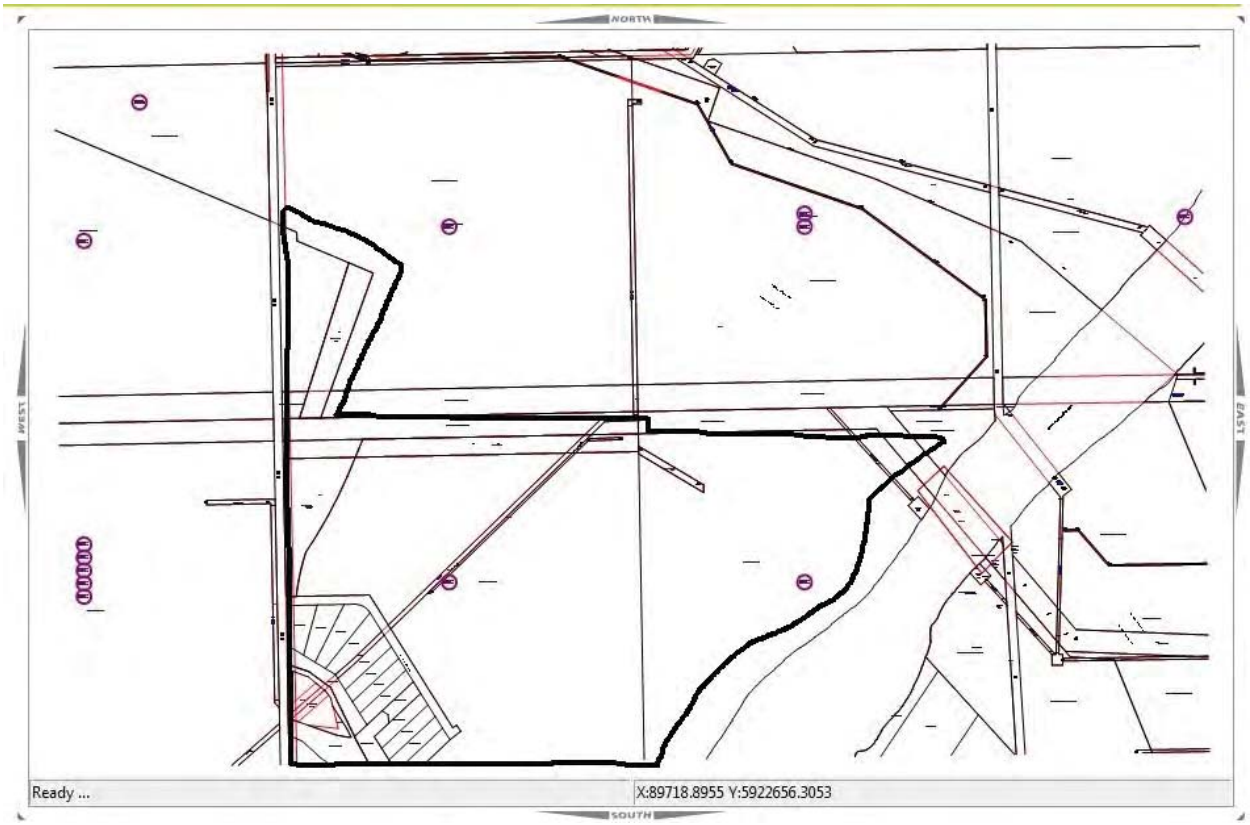
Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
2092810	12	6	52	25	4	UNKNOWNDRILLINGCOMP11	1977-05-11	195.00	New Well	Industrial		5	1	CANADIAN REFORMED SCHOOL	84.00	15.00
2092871	13	6	52	25	4	UNKNOWNDRILLINGCOMP11	1958-07-16	29.00	New Well	Unknown		3		KULAK, L.M.		
2092874	1	6	52	25	4	UNKNOWNDRILLINGCOMP11	1965-09-16	165.00	New Well	Unknown		9		RCA		
2093269	13	6	52	25	4	UNKNOWNDRILLINGCOMP11		108.00	Test Hole	Unknown		8		HOLE # 64		
2093270	16	6	52	25	4	UNKNOWNDRILLINGCOMP11		110.00	Test Hole	Unknown		6		HOLE # 63		
2093332	5	6	52	25	4	UNKNOWNDRILLINGCOMP11	1933-07-22	38.00	Spring	Stock		1		PLANTE, A.		
2093363	13	6	52	25	4	UNKNOWNDRILLINGCOMP11	1969-11-15	150.00	New Well - Abandoned	Domestic & Stock		13		LILLYDALE POULTRY FARMS	8.00	1.00

Appendix F
Environmental Site Assessment Repository (ESAR) Search

04-052-25 W4M – ESAR SEARCH

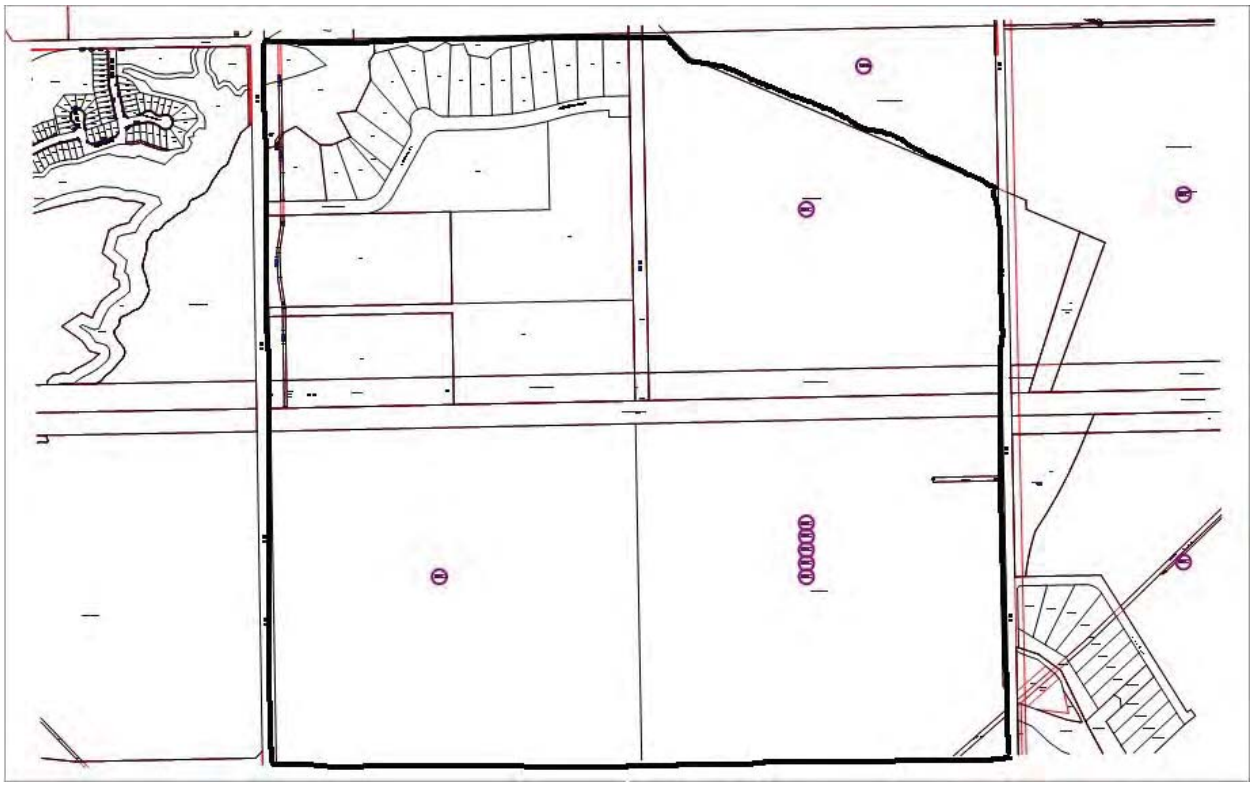


Approximate Study Area

Reclamation Certificates

Reports

05-052-25 W4M – ESAR SEARCH



Approximate Study Area

Reclamation Certificates

Reports

06-052-25 W4M – ESAR SEARCH

Approximate Study Area

Reclamation Certificates

Reports

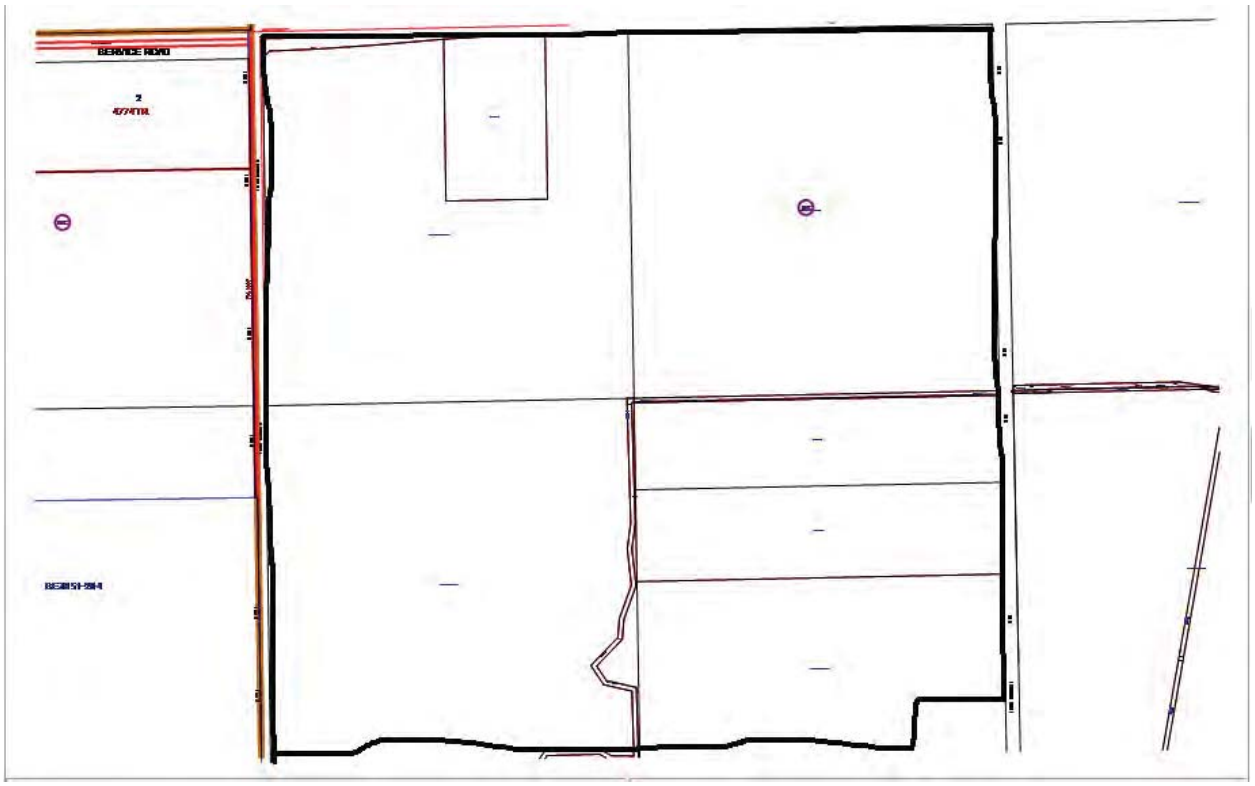
30-051-25 W4M – ESAR SEARCH

Approximate Study Area

Reclamation Certificates

Reports

31-051-25 W4M – ESAR SEARCH

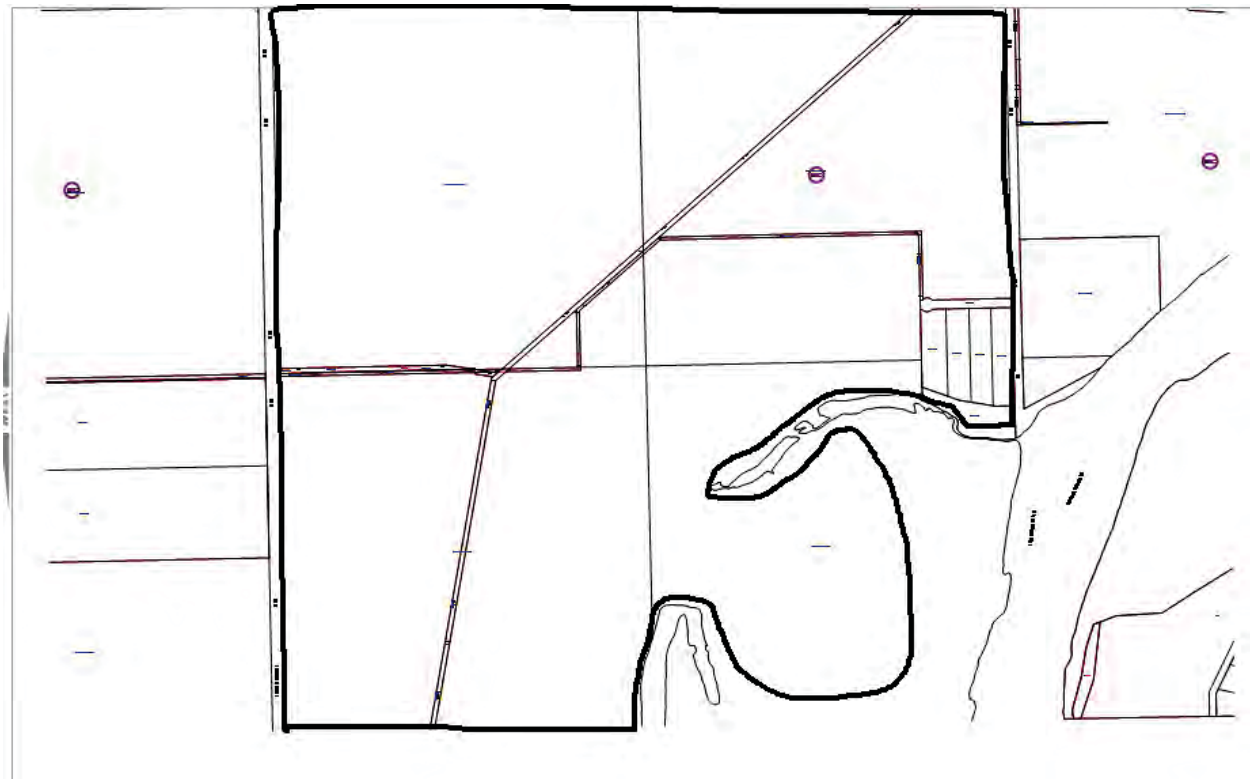


Approximate Study Area

Reclamation Certificates

Reports

32-051-25 W4M – ESAR SEARCH

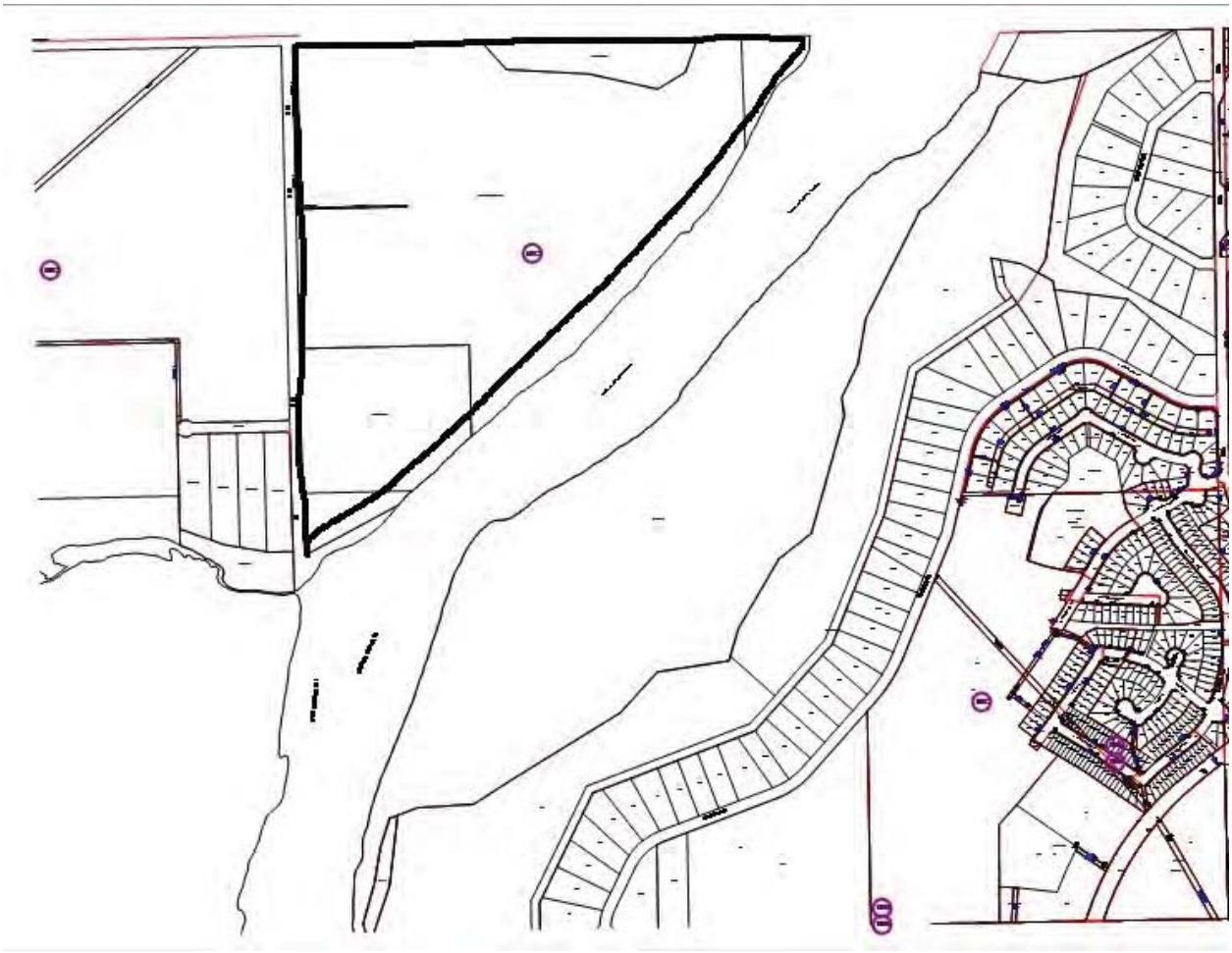


Approximate Study Area

Reclamation Certificates

Reports

33-051-25 W4M – ESAR SEARCH



Approximate Study Area

Reclamation Certificates

Reports

33-51-25-W4M							
Well Name	**Well ID Number**	**Cert. No.**	**Reclamation Date**	**Abondoned (mm/dd/yyyy)**	**Title Date**	**Surface Owner**	**Areas of Concern**
Corvair Armisie 6-33-51-25	262300	E-23-90(8)	N/A	?	11/?/1990	Penn West Petroleum Ltd.	N/A

32-51-25-W4M							
Well Name	**Well ID Number**	**Cert. No.**	**Reclamation Date**	**Abondoned (mm/dd/yyyy)**	**Title Date (mm/dd/yyyy)**	**Surface Owner**	**Areas of Concern**
Camel et al Armisie 16-32-51-25	132400	37626	7/26/2000	N/A	6/14/1980	Crestar Energy Inc.	N/A

31-51-25-W4M							
Well Name	**Well ID Number**	**Cert. No.**	**Reclamation Date**	**Abondoned (mm/dd/yyyy)**	**Title Date (mm/dd/yyyy)**	**Surface Owner**	**Areas of Concern**
Consolidated Homestead No. 2	114226	4044	5/16/1967	6/26/1948	1/18/1952	William and Katherine Wesolosky	N/A

04-52-25-W4M							
Well Name	**Well ID Number**	**Cert. No.**	**Reclamation Date**	**Abondoned (mm/dd/yyyy)**	**Title Date (mm/dd/yyyy)**	**Surface Owner**	**Areas of Concern**
Armisie No. 4	116398	6162	7/2/1968	9/11/1962	9/18/1964	Tom Michas and Eftyghia Michas	N/A
Armisie No. 6	116399	6163	?/02/1968	7/11/1962	9/18/1964	Tom Michas and Eftyghia Michas	N/A
Armisie No. 3	116400	6164	7/12/1968	5/26/1958	10/15/1965	Sloane Investments Ltd.	N/A

05-52-25-W4M							
Well Name	**Well ID Number**	**Cert. No.**	**Reclamation Date**	**Abondoned (mm/dd/yyyy)**	**Title Date (mm/dd/yyyy)**	**Surface Owner**	**Areas of Concern**
Western Dome Armisie 5 - 9	116401	6165	7/12/1968	4/4/1952	3/20/1962	Catherine Joan Pettinger, Joyce Ralphene Anderson, and Flora Marion	N/A
Edmonton North St. Clair Armisie 3 - 5	116402	6166	7/12/1968	9/1/1953	1/12/1959	Market Furniture Ltd.	N/A
Old Smoky No. 3	116403	6167	7/19/1968	5/14/1958	1/2/1962	Raymond Donald Pahal	N/A
Old Smoky No. 4	116404	6168	7/19/1968	5/14/1958	1/2/1962	Raymond Donald Pahal	N/A
Old Smoky No. 2	116405	6169	7/19/1968	5/14/1958	3/30/1965	Irene Evelyn Fraser	N/A
Old Smoky No. 1	116407	6170	7/12/1968	8/14/1958	3/30/1965	Irene Evelyn Fraser	N/A
Westhill Armisie 8-5-52-25	94583	30270	9/7/1994	N/A	N/A	Corvair Oils Ltd.	topsoil spread all over the property

APPENDIX E

Historical Resources Impact Assessment Clearance Letter

Application for *Historical Resources Act* Clearance

Alberta Culture

Activity Administration

Date Received: October 09, 2013 HRM File: 4835-12-0015

Purpose of Application:	☑ All New Lands	☐ Additional Lands	☐ No New Lands

Project Category:	Subdivisions (4835)

Project Type:	☑ Area Structure Plan / Outline Plan	ESRI Shapefiles are attached (yes/no)	no

Project Identifier:	Riverview Area Structure Plan
Additional Identifier(s):	

Key Contact:	Jean-Paul Foster	Affiliation:	Stantec Consulting Ltd.
Address:	#200 1719 10th Avenue SW	City / Province:	Calgary, AB
Postal Code:	T3C 0K1	Phone:	(403) 476-1056
E-mail:	Jean-Paul.Foster@stantec.com	Fax:	() -
		Your File Number:	124910731.200

Is the Proponent the same as the Key Contact? ☐ Yes ☑ No If no, complete the following:

Proponent:	Walton Development and Management L.P.	Contact Name:	Chris Davis
Address:	202 East Tower, Coronation Plaza 14310 - 111 Avenue	City / Province:	Edmonton, AB
Postal Code:	T5M 3Z7	Phone:	(780) 702-6610
E-mail:	CDavies@walton.com	Fax:	(780) 702-6602

Proposed Development Area					Land Ownership			
MER	RGE	TWP	SEC	LSD List	FRH	SA	CU	CT
4	25	51	32	4-6, 9-16	☑	☐	☐	☐
4	25	51	31	1-16	☑	☐	☐	☐
4	25	52	6	1-4, 7-9, 16	☑	☐	☐	☐
4	25	51	19	1-16	☑	☐	☐	☐
4	25	52	5	1-16	☑	☐	☐	☐
4	25	51	30	1-16	☑	☐	☐	☐
4	25	51	18	9-16	☑	☐	☐	☐
4	25	51	33	12,13	☑	☐	☐	☐
4	25	52	8	2-4	☑	☐	☐	☐
4	25	52	4	3-7,12,13	☑	☐	☐	☐
4	25	51	29	5,11-14	☑	☐	☐	☐

Historical Resources Impact Assessment:

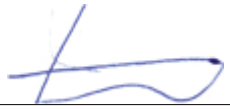
For archaeological resources:

Has a HRIA been conducted? ☑ Yes ☐ No Permit Number (if applicable): 13-056

For palaeontological resource:

Has a HRIA been conducted? ☐ Yes ☑ No

Historical Resources Act clearance is granted for the activities described on this application and its attached plan(s)/sketch(es) subject to the conditions specified in the attached document(s).



David Link

December 16, 2013

Date

VOLUME 2

APPENDIX F

Preliminary Geotechnical Investigation

Preliminary Geotechnical Investigations

completed by Hoggan Engineering & Testing (1980) Ltd. (February 2014)

FILE NO: 6004-32

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RIVERVIEW NEGHBOURHOODS 1-3
APPROXIMATELY 199 STREET AND 23 AVENUE NW
EDMONTON, ALBERTA

February 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

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RIVERVIEW NEGHBOURHOODS 1-3
APPROXIMATELY 199 STREET AND 23 AVENUE NW
EDMONTON, ALBERTA

TABLE OF CONTENTS

GEOTECHNICAL INVESTIGATION

PROJECT: Proposed Riverview Neighbourhoods 1-3

LOCATION: Approximately 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 Neighbourhoods 1-3 development in southwest Edmonton, Alberta. The purpose of this report is to determine the project subsurface soil conditions within the area in order to provide geotechnical recommendations for neighbourhood level design and NSP approvals. Authorization to proceed was received from Nick Dyjach of Stantec Consulting Ltd. Fieldwork for the project was completed in September to December 2013.

The report is intended to be preliminary with each subdivision stage requiring further investigation.

Hoggan Engineering and Testing Ltd. (Hoggan) also performed a slope stability assessment of the east bank of the Wedgewood Creek and the west bank of the North Saskatchewan River (NSR) present onsite. The slope assessments are not included in this report and will be submitted separately.

2.0 SITE DESCRIPTION

The proposed development is located in southwest Edmonton, Alberta. The intersection of 199 Street and 23 Avenue NW is near the middle of the subject site. Wedgewood Creek and the NSR are the main geological features onsite. Wedgewood Creek runs along the northwest border of the site and the NSR runs along the east side of the site. The site is bordered by 215

Street to the west, Anthony Henday Drive to the north and future Riverview Neighbourhood 4 to the south. The majority of subject site located within quarter sections SW and SE 6-52-25-W4M, NW, NE, SW and SE 5-52-25-W4M, NW, NE and SW 32-51-25-W4M, NW 33-51-25-W4M, SW and SE 4-52-25-W4M, NW, NE, SW and SE 31-51-25-W4M and NW and NE 30-51-25-W4M. A plan labelling the quarter sections within the study area is located in Appendix A.

Quarters sections NE 31-51-25, SW 31-51-25-W4M and NW 30-51-25-W4M are mainly farmland with several treed areas spread throughout. The remaining quarter sections were mostly farmland with fewer trees. A single residence with associated outbuildings was located along the NSR slope off 199 Street, within the NW 32-51-25. However during the field investigation the house was removed from the site, but the associated outbuildings remained. Active resource wells are present within SW-4-52-25-W4M and NW 33-51-25-W4M. A drainage channel runs through the west half of SE 5-52-25-W4M and another drainage channel runs from 23 Ave to Wedgewood Creek in SE 6-52-25-W4M. Overall, the site consisted of flat, gently rolling. Hummocky terrain was noted within quarter section NW 31-51-25-W4M, and overall drainage was towards the NSR and Wedgewood Creek. The boundaries of the three subject neighborhoods are shown on a plan in Appendix A.

Access to the testholes was gained off 215th Street, 199th Street, 184th Street, 23rd Avenue, 17th Avenue and River Heights Drive. Several quarters sections had to be accessed by locked gates.

3.0 BACKGROUND INFORMATION

3.1 Air Photo Review

Several sets of aerial photography taken between 1962 and 2012, covering the subject site and surrounding areas, were obtained from the City of Edmonton Mapping Department and the Alberta Sustainable Resource Development Library. The photos were reviewed to identify any signs of disturbances within the site.

The photo coverage obtained is summarized as follows:

Year	**Catalogue No.**	**Photo No.**	**Scale**
2012	Digital		
2001	ED 2001-01	109, 110, 138,139, 140	1:20,000
1993	AS 4383	116 and 209	1:20,000
1974	AS 1313	169,170, 194, 196, 198, 220, 222, 223	1:12,000
1962	AS 818	14 and 15	1:31,680
1962	AS 819	159	1:31,680

1962

In 1962, 17th Avenue, 23rd Avenue, 215th Street, 199th Street, 184th Street and River Heights Drive are present. No houses are present on 17th Avenue or along River Heights Drive. There are several low and/or wet areas noted throughout the site. A large wet area filled with water is present within NW 31-51-25-W4M. Ground disturbance is noted within SE 6-52-25-W4M. Two farmyards with associated house, outbuildings, dirt roads and treed areas are noted within NE 31-51-25-W4M and NW 30-51-25-W4M. Gravel approach roads are present leading south off of 23rd Avenue, into NW, NE -31-51-25-W4M. The majority of the site and surrounding areas appear to be farm or pasture land. No major development is noted in the area, a few farmyards and houses are noted in the surrounding area. Houses are noted off 199 Street on the north side of the site. There are a few rows of trees throughout the site, with no densely treed or forested areas, with the exception of along the NSR and Wedgewood Creek banks. Two separate drainage channels are noted within both SE 5-52-25-W4M and NW 32-51-25-W4M leading towards the NSR. Ground disturbances off intersection of 184th Street and 23rd Avenue are noted. A dirt road is present leading from this area towards the NSR. There are several white or discolored areas noted throughout the site. A row of trees borders quarter sections SW and SE 5-52-25-W4M. Ground disturbance and a few buildings are noted within SW 32-51-25-W4M. Wedgewood Creek and NSR are both present. The NSR appears to still flow into the now abandoned oxbow lake, as well as along the current river channel. A house is present within SE 31-51-25-W4M. The Windermere Golf and Country Club is noted on the east side of the NSR.

1974

In 1974, a farmyard and associated buildings is present on the west side of NW 30-51-25-W4M. A small country residential subdivision development is noted to the east of the site within

the future Riverview Neighborhood 4. There are still several low, wet and/or discolored areas present throughout the site. Water is still present in a slough within NW 31-51-25-W4M; a grove of trees surrounds it. A few houses are now present along River Heights Drive. A road within SW 32-51-25-W4M is present leading from the farmyard south, down the NSR slope towards Big Island. This road crosses the oxbow lake. A second smaller dirt road is present leading down from the farmyard in SW 32-51-25-W4M towards the NSR. At the north of the site, Woodbend Wynd is now present, with a residential subdivision present along it.

1993

In 1993, some residential development is noted in surrounding areas. Well sites are noted within NW 33-51-25-W4M and SW 4-52-25-W4M. The oxbow lake is now abandoned. There are still several low and wet areas present throughout the site. Ground disturbance is still noted within SE 6-52-25-W4M. More outbuildings are present within farmyard within SW 32-51-25-W4M. The majority of the site and surrounding area is still farmland. A power line on the north side of the site is now present. Houses are now present along 17th Avenue. The small country residential subdivision along Woodbend Wynd is more developed. More houses are present along River Heights Drive.

2001

In 2001, residential development is noted to the north. The Anthony Henday Drive is under construction to current Lessard Road. The majority of the site is still farmland. Ground disturbance is noted around the well site within SW 4-52-25-W4M. Ground disturbance and discoloration is still noted within SE 6-52-25-W4M. There appears to be less low and/or wet areas throughout the site: possibly due to farming activities. Buildings are noted within the north portion of NW 31-51-25-W4M. The drainage channel in NW 32-51-25-W4M appears to be filled in. The NSR slope near Big Island is now less densely treed.

2012

In 2012, the house and associated buildings within NE 31-51-25-W4M are no longer present. No ground disturbances are noted within SE 6-52-25-W4M. Anthony Henday Drive is present to the north of the site. Residential development of Cameron Heights, the Hamptons and

Windermere is noted in surrounding areas. The farmyard and associated buildings within NW 30-51-25-W4M are no longer present. The majority of the site is still farmland. 184th Street is cut off in NE 5-52-25-W4M, with a new exit off of the Anthony Henday Drive. The road leading from the farmyard in SW 32-51-25-W4M appears to be abandoned, however is still visible, and no longer connects to Big Island.

The main concerns noted from the aerial photography review are noted as follows:

- Possible fill due to the removal of the farmyards and associated buildings.
- Possible fill due to the abandoned road leading to Big Island.
- Possible environmental concerns associated with resource wells present on site. (Any remediation of environmental contaminants can lead to geotechnical concerens)
- Possible fill associated with channels and low areas filled in possibly by farming activities.
- Possible fill associated with the abandonment of the old 184th Street alignment.

3.2 Current Site Conditions

At the start of the investigation the majority of the site was stubble fields or pasture land and travel throughout the site was possible by normal two-wheel drive vehicles. During the months of November and December the site was snow covered. A track rig had to be utilized to drill Testhole 2013-44 due to inaccessibility for normal wheeled vehicles. During the investigation the house within SW-32-51-25-W4M was taken off its foundation and moved from the site.

In general, the site terrain was considered flat to rolling, with the exception of the slopes along the NSR and Wedgewood Creek. Within section NW 31-51-25-W4M hummocky terrain was noted. No free water was noted in any low areas observed in the air photo review.

3.3 Coal Mine Atlas Review

No coal mining information of the area was found in the Alberta Coal Mine Atlas ST45 made available by Energy Resources Conservation Board. Coal mining related issues should not be a concern for this site and were not investigated further.

3.4 Geotechnical Report Review

A search for geotechnical information was requested from the City of Edmonton Engineering Services Library. The following reports were reviewed:

- Top of Bank Assessment, 18425 – 17 Avenue, Edmonton, Alberta, Prepared by: EBA Engineering Consultants Ltd., Edmonton, Alberta, EBA Project #: 0107-7100136, April 2003.
- Geotechnical Assessment, 1st Avenue and 184 Street, Lot B, Plan 1494 M.C., Edmonton, Alberta, EBA Engineering Consultants Ltd., August 1976.
- Slope Stability Evaluation, Proposed House on 17th Avenue and 184th Street, EBA Engineering Consultants Ltd., EBA File #: 0106-10742, August 1991.
- Top of Bank Study, Lot C, Plan 660 TR, 184 Street and 17 Avenue, Edmonton, Alberta, EBA Engineering Consultants Ltd., EBA File #: 104-65-20706, January 1996

Previous onsite geotechnical reports by J.R. Paine and Associates Ltd. were utilized for the subject investigation. These consist of the following reports:

- Preliminary Geotechnical Assessment, Riverview Lands, 184th Street to 199th Street, Near 23rd Avenue, NW, Edgemont Subdivision, Edmonton, Alberta, JRP File #1166-398, September 2012
- Preliminary Geotechnical Assessment, Riverview Lands, 199th Street and 23rd Avenue NW, Edgemont Subdivision, Edmonton, Alberta, JRP File #1166-401, December 2012
- Preliminary Geotechnical Assessment, Riverview Lands, 184th Street and 23rd Avenue NW, Edgemont Subdivision, Edmonton, Alberta, JRP File #1166-402, January 2013

A total of forty-four testholes were used from these investigations and the logs are included in Appendix A.

3.5 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 mudstone were formed at the bottom of these seas and are termed the Horseshoe Canyon Formation of the Edmonton Group. For slope stability assessments, the key feature of these bedrock soils is the

presence of bentonite layers. Volcanic ash spewed from the mountains west of Edmonton drifted over and were deposited with the bedrock soils. These layers, along with the more bentonitic shales weaken as they are stressed. The presence or absence of these bentonite layers can be the governing factor for slope stability when bedrock soils are present in the slope profile, as is the case for this site.

Long after the bedrock formation, 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. A drawing is located in Appendix B which shows the potential sand and gravel deposits present on this site. However, it is noted that none of the deep testholes in this study encountered this formation.

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.

On the west edge of the Lake Edmonton lacustrine deposits, aeolian (wind) deposits consisting of sand and silt were formed and a few of the site testholes have this stratum.

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.

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. Bedrock coring was completed by Mobile Augers and Research Ltd. of Edmonton, Alberta and Garritty & Baker Drilling Inc. A total of forty-four 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 8.8 and 67 meters below ground surface. The testholes were advanced at locations chosen, and surveyed by Hoggan.

Ground elevation was referenced to ASCM 444836. Testholes 2013-1 to 2013-11, 2013-16 to 2013-21, 2013-43 and 2013-44 were advanced to deeper depths as part of the slope stability assessment done for the NSR and Wedgewood creek.

The testholes were advanced with 150-millimeter diameter solid or hollow stem augers in 1.5-meter increments for sold stem-augering. 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.

The deep slope testholes were advanced in a separate hole within 5 meters of the shallow namesake testhole utilizing wet rotary coring in the bedrock zone, after quick advancement through the overburden.

Following the drilling operation, slotted piezometric standpipes were inserted into all testholes for watertable level determination, with the exception of Testholes 2013-43 and 2013-44. A vibrating wire piezometer was installed in Testholes 2013-2, 2013-7 and 2013-43. The testholes were backfilled with cuttings, with a bentonite seal placed at the surface of the testholes. Watertable readings were obtained between 1 and 108 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 Appendix A.

6.0 SOIL CONDITIONS

A detailed description of the soils encountered is found on the attached testhole logs in Appendix A. 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 deep testholes, clay till and bedrock were encountered with depth.

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 40 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.

SILT

Silt was encountered in Testholes 2013-1 to 2013-7, 2013-10 to 2013-12, 2013-14 to 2013-16, 2013-29, 2013-30, 2013-42, 2012-4, to 2012-8, 2012-18 to 2012-22, 2012-24 and 2012-26 (1166-398), 2012-5 and 2012-6 (1166-401) and 2012-1 to 2012-4 (1166-402) within or below the lacustrine clay material noted in all the testholes. The silt material was typically clayey, sandy, non to low plastic, moist to wet, firm to very soft, grey and trace to very sensitive. Moisture contents typically ranged from approximately 21 to 40 percent. Atterberg Limit tests on this soil revealed plastic limit of approximately non-plastic to 40 percent, and liquid limit of approximately 18 to 33 percent. Standard Penetration Test "N" values were in the range of 3 to 18 blows per 300 millimeters. All shallow neighbourhood testholes were terminiated within either the lacustrine clay or silt material at depths of 8.8 to 13.4 meters BGS.

CLAY TILL

Below the silt or clay a clay till material was encountered in Testholes 2013-1 to 2013-11, 2013-16 to 2013-19, 2013-43 and 2013-44 at depths between 9.8 to 16.6 meters BGS, with the exception of Testhole 2013-44 where clay till was encountered at 1.5 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 lenses. 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. Atterberg Limit test on this soil revealed plastic limit of approximately 26 to 62 percent, and liquid limit of approximately 13 to 14 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.

SAND

Within the clay till in Testholes 2013-1, 2013-4, 2013-6, 2013-7 and 2013-8 sand was encountered. This sand material was typically medium to coarse grained, brown or grey, very moist to wet. Sand was also encountered near the surface in Testholes 2013-2, 2013-12 to 2013-15. This sand material was typically silty, clayey, damp to moist, fine to medium grained, loose and brown in color. Standard Penetration Test "N" values were typically in the range of 5 to 9 blow per 300 millimters.

BEDROCK

Bedrock was encountered in Testholes 2013-1 to 2013-11, 2013-43 and 2013-44 at depths between 13.7 to 41.5 meters BGS in Testholes 2013-44 and 2013-2 respectively. This bedrock material was classified as either Clayshale or Sandstone. The clayshale material was typically soft to hard, bentonitic, high plastic, silty, and grey. The sandstone material was typically moderately hard to hard. Bentonite seams were encountered within the bedrock in the majority of the deep testholes. Limits were taken to determine the bentonite content. Atterberg Limit tests on the bedrock material revealed plastic limits of approximately 15 to 31 percent and liquid limits of approximately 72 to 192 percent. Testholes 2013-1 to 2013-11, 2013-43 and 2013-44 were terminated within this bedrock material.

At the completion of drilling, minor 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:

Testhole Conditions at Completion		
Testholes	**Approximate Water Thickness at Hole Bottom (m)**	**Approximate Slough Thickness At Hole Bottom (m)**
2013-13	2.90	1.98
2013-14	4.57	0.76
2013-16	dry	11.20
2013-19	12.65	12.65
2013-20	3.05	none
2013-29	dry	0.60
Previous JRP Report # 1166-398		
2012-5	dry	0.6
2012-6	dry	0.6
Previous JRP Report # 1166-401		
2012-1	0.6	2.4
2012-2	2.4	2.4
2012-3	2.4	3.7
2012-4	4.4	1.2
2012-5	1.8	3.7
2012-6	dry	0.6
2012-7	dry	3.35
Previous JRP Report # 1166-402		
2012-1	0.6	none
2012-2	0.9	none
2012-3	dry	4.57
2012-4	1.52	0.3

7.0 GROUNDWATER CONDITIONS

The groundwater table within this study was variable, with low to high 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 should be below the seasonal average levels. A plan depicting the groundwater table is located in Appendix B. Two to three sets of water table readings were taken within the 2013 testholes, with the results as follows:

Groundwater Table Readings Riverview Neighbourhood 1-3 (Metres Below Ground Surface)							
Testhole	Surface Elev. (m)	Date Drilled	Depth(days)				
			Oct. 22	Nov. 20	Dec. 3	Jan. 9/14	Watertable Elevation (m)
2013-1	686.4	Oct. 1, 2013	16.15 (21)	16.54 (50)	16.6 (63)	16.6 (100)	670.25
2013-2*	684.8	Oct. 7, 2013	below 12.4 (29)	below 12.4 (43)	12.46 (56)	12.45 (94)	672.3
2013-3	684.2	Sept. 27, 2013	15.12 (25)	15.3 (53)	15.1 (67)	15.12 (104)	669.10
2013-4	683.8	Sept. 30, 2013	14.44 (22)	13.45 (28)	13.12 (64)	13.04 (101)	670.76
2013-5	684.5	Oct. 2, 2013	14.46 (20)	13.65 (48)	13.06 (62)	13.53 (99)	671.44
2013-6	682.4	Oct. 8, 2013	16.52 (28)	15.97 (42)	15.4 (55)	14.7 (93)	667.70
2013-7	673.0	Oct. 9, 2013	15.38 (35)	14.75 (41)	13.17 (54)	11.49 (92)	661.51
2013-8	678.5	Oct. 10, 2013	below 18.0 (27)	below 18.0 (40)	17.69 (53)	7.7 (91)	670.8
2013-9	681.6	Oct. 11, 2013	16.92 (33)	below 18.4 (39)	18.58 (52)	17.59 (90)	664.7
2013-10	683.1	Sept. 23, 2013	14.10 (26)	13.50 (54)	13.28 (71)	13.59 (108)	669.8
2013-11	680.0	Sept. 23,2013	5.20 (29)	5.10 (57)	5.12 (71)	5.26 (108)	674.9
2013-12	683.0	Sept. 30, 2013	5.10 (22)	5.10 (28)	5.18 (64)	-	677.9
2013-13	688.3	Nov. 15, 2013	2.23 (18)	-	-	-	686.1
2013-14*	688.9	Oct. 9, 2013	3.05 (41)	3.14 (54)	-	-	685.85
2013-15*	689.1	Oct. 8, 2013	2.89 (28)	2.96 (41)	3.03 (55)	-	686.21
2013-16	690.3	Nov. 8, 2013	9.17 (25)	-	-	9.13 (62)	681.25
2013-17	689.3	Nov. 12, 2013	7.8 (21)	-	-	7.68 (58)	681.62
2013-18	689.2	Nov. 13, 2013	11.8 (20)	-	-	8.98 (57)	680.2
2013-19	689.1	Nov. 13, 2013	12.49 (20)	-	-	9.1 (57)	680.00
2013-20	689.9	Nov. 13, 2013	4.85 (20)	-	-	4.92 (57)	685.08
2013-21	689.1	Nov. 12, 2013	5.04 (21)	-	-	5.05 (58)	684.14
2013-22	690.6	Nov. 15, 2013	9.04 (18)	-	-	-	681.56
2013-23	690.7	Nov. 14, 2013	6.31 (19)	-	-	-	684.48
2013-24	691.2	Nov. 14, 2013	7.88 (19)	-	-	-	683.32
2013-25	691.3	Nov. 14, 2013	5.78 (19)	-	-	-	685.52
2013-26	690.2	Oct. 15, 2013	below 8.8 (22)	8.40 (35)	below 8.8 (49)	-	681.8
2013-27	689.4	Oct. 15, 2013	4.09 (22)	4.05 (35)	4.2 (49)	-	685.5
2013-28	689.6	Oct. 15, 2013	6.90 (22)	6.98 (35)	6.97 (49)	-	682.72
2013-29	691.0	Oct. 9, 2013	below 8.8 (22)	8.40 (35)	below 8.8 (54)	-	below 682.2
2013-30	690.8	Oct. 2, 2013	below 8.8 (20)	below 8.8 (33)	below 8.8 (62)	-	below 682
2013-31	691.7	Oct. 15, 2013	4.11 (35)	4.25 (49)	-	-	687.6
2013-32	690.6	Oct. 15, 2013	6.90 (35)	7.02 (49)	-	-	683.7
2013-33	690.7	Nov. 15, 2013	5.96 (18)	-	-	-	684.74
2013-34	691.0	Nov. 15, 2013	below 8.8 (18)	-	-	-	below 682.2
2013-35	691.8	Oct. 15, 2013	6.65 (22)	6.70 (35)	6.88 (49)	-	685.28
2013-36	689.8	Oct. 15, 2013	below 8.8 (35)	8.8 (49)	-	-	681.0
2013-37	690.4	Oct. 15, 2013	7.57 (35)	7.62 (49)	-	-	682.8
2013-38	691.2	Nov. 14, 2013	8.02 (19)	-	-	-	683.28
2013-39	689.9	Nov. 14, 2013	below 8.8 (19)	-	-	-	below 681.1
2013-40	691.1	Nov. 14, 2013	below 8.8 (19)	-	-	-	below 682.3
2013-41	690.7	Nov. 14, 2013	below 8.8 (19)	-	-	-	below 681.9
2013-42	692.2	Nov. 14, 2013	6.91 (19)	-	-		685.32

A first set of water table readings were attempted on Oct. 22, 2013 in Testhole 2013-14 and 2013-15, however the standpipes were damaged due to farming activities. The standpipes were repaired and water table readings were obtained. An obstruction was encountered in Testhole 2013-2 at a depth of 12.4 m BGS.

A second standpipe was installed in the deeper slope testholes along the NSR to obtain a water table reading within the bedrock layer. The coring process requires water therefore the deep slope holes were full of water at completion and insertion of the standpipe. Testholes 2013-5, 2013-6 and 2013-8 to 2013-11 were pumped out on December 16, 2013 to help verify bedrock watertable readings. These watertable readings are still being evaluated. For Testholes 2013-2, 2013-7, and 2013-43 a vibrating wire piezometer was installed instead of a second standpipe. The bedrock watertable readings are as follows:

Bedrock Groundwater Table Readings
Riverview Neighbourhood 1-3
(Metres Below Ground Surface)

Testhole	Surface Elev. (m)	Date Drilled	Depth(days) Nov. 5	Nov. 17	Dec. 1	Jan. 7/14	Watertable Elev. (m)
2013-1	686.4	Oct. 29/13	21.80 (7)	29.98 (21)	31.86 (35)	31.67 (72)	654.73
2013-3	684.2	Oct. 31/13	35.10 (6)	35.60 (19)	35.14 (33)	34.92 (70)	649.28
2013-4	683.8	Nov. 4/13	28.70 (1)	28.84 (15)	32.98 (29)	34.57 (66)	655.10

Vibrating Wire Piezometer Readings - Bedrock
Riverview Neighbourhood 1-3
(Metres Below Ground Surface)

Testhole	Elevation (m)	Date Drilled	Depth (days) Nov. 19	Dec. 3	Jan. 9/14	Watertable Elevation (m)
2013-2	684.8	Nov. 7, 2013	35.1 (12)	34.6 (26)	34.9 (63)	650.20
2013-7	673.0	Nov. 7, 2013	29.6 (12)	31.2 (26)	32.1 (63)	643.43
2013-43	657.8	Nov. 12, 2013	16.2 (7)	18.6 (21)	20.2 (58)	639.20

The watertable readings in the testholes from previous investigations onsite are shown in the following tables:

Groundwater Table Readings - JRP Investigation 1166-398 (2012)
Riverview Pre-Purchase
(Metres Below Ground Surface)

Testhole	Date Drilled	Surface Elev. (m)	Depth (days) July 19	Depth (days) Aug. 2	Watertable Elevation
2012-1	June 19/12	679.95	>8.84 (30)	>8.84 (44)	below 671.1
2012-2	June 19/12	677.26	>8.84 (30)	>8.84 (44)	below 668.4
2012-3	June 19/12	682.98	>8.84 (30)	>8.84 (44)	below 674.1
2012-4	June 19/12	684.52	6.4 (30)	4.92 (44)	679.60
2012-5	June 19/12	683.61	6.04 (30)	5.28 (44)	678.33
2012-6	June 19/12	682.9	5.78 (30)	4.95 (44)	677.95
2012-7	June 19/12	683.47	5.49 (30)	3.94 (44)	679.53
2012-8	June 19/12	684.58	3.94 (30)	3.45 (44)	681.13
2012-9	June 27/12	682.36	>8.84 (22)	>8.84 (36)	below 673.5
2012-10	June 27/12	684.03	>8.84 (22)	>8.84 (36)	below 675.2
2012-11	June 27/12	684.78	>8.84 (22)	>8.84 (36)	below 675.9
2012-12	June 27/12	683.1	>8.84 (22)	>8.84 (36)	below 674.3
2012-13	June 27/12	684.04	>8.84 (22)	>8.84 (36)	below 675.2
2012-14	June 27/12	685.6	>8.84 (22)	>8.84 (36)	below 676.8
2012-15	June 27/12	685.89	>8.84 (22)	>8.84 (36)	below 677.1
2012-16	June 27/12	685.07	>8.84 (22)	>8.84 (36)	below 676.2
2012-17	June 27/12	686.51	8.21 (22)	8.17 (36)	678.34
2012-18	June 28/12	685.06	8.38 (21)	8.36 (35)	676.7
2012-19	June 28/12	686.76	8.07 (21)	8.09 (35)	678.69
2012-20	June 28/12	687.86	>8.84 (21)	>8.84 (35)	below 679.0
2012-21	June 28/12	688.88	>8.84 (21)	>8.84 (35)	below 680.0
2012-22	June 28/12	689.2	>8.84 (21)	>8.84 (35)	below 680.4
2012-23	June 28/12	688.8	>8.84 (21)	>8.84 (35)	below 680.0
2012-24	June 28/12	688.45	0.65 (21)	0.6 (35)	687.85
2012-25	June 28/12	689.04	1.5 (21)	1.43 (21)	687.61
2012-26	June 29/12	688.82	2.26 (20)	1.79 (34)	687.03
2012-27	June 29/12	688.02	2.33 (20)	1.76 (34)	686.26
2012-28	June 29/12	688.46	4.06 (20)	3.09 (34)	685.37
2012-29	June 29/12	688.99	5.55 (20)	4.62 (34)	684.37
2012-30	June 29/12	687.56	5.97 (20)	5.29 (34)	682.27
2012-31	June 29/12	686.24	3.94 (20)	3.25 (34)	682.99
2012-32	June 29/12	687.56	3.22 (20)	2.46 (34)	685.1

Groundwater Table Readings - JRP Investigation 1166-401 (2012) Riverview Pre-Purchase (Metres Below Ground Surface)					
Testhole	**Surface Elev. (m)**	**15-Oct-12**	**29-Oct-12**	**20-Nov-12**	**Watertable Elevation**
2012-1	688.50	1.49	1.02	-	687.25
2012-2	688.32	1.02	1.15	-	687.24
2012-3	689.50	1.84	1.96	-	687.60
2012-4	688.96	2.82	2.89	-	686.11
2012-5	689.30	-	2.03	2.13	687.22
2012-6	688.88	-	1.81	1.83	687.06
2012-7	689.13	1.72	1.74	-	687.4
2012-8	689.38	7.09	7.02	-	682.33

Groundwater Table Readings - JRP Investigation 1166-402 Riverview Pre-Purchase (Metres Below Ground Surface)				
Testhole	**Surface Elev. (m)**	**7 Day 29-Oct-12**	**28 Day 19-Nov-12**	**Watertable Elevation**
2012-1	685.98	6.67	6.84	679.23
2012-2	685.93	5.25	5.20	680.71
2012-3	680.92	0.83	0.78	680.12
2012-4	684.69	3.49	3.54	681.18

The 1166-398 readings should be near the seasonal high levels while the 1166-401 and 1166-402 readings should be below the seasonal average levels.

8.0 RECOMMENDATIONS

8.1 General Summary

The soil and groundwater conditions at this site are feasible for residential subdivision development. The soil conditions range from moist clays and silts near optimum which present no concerns with design and construction; to wet, very sensitive soils that will cause construction difficulties in some locations. The watertable is also variable at less than 1 meter from the surface to greater than 8 meters below the surface.

Similar soil and groundwater conditions have been observed by JRP in the neighboring Edgemont Neighborhood and Hamptons Neighborhood where residential land development construction has already occurred. Overall, Riverview Neighborhoods 1-3 are considered to have better conditions than these two adjacent neighborhoods.

The key to previous successful development in this area has been separating the upper clay (where present) from the lower, very moist, very silty clays during the site grading and trenching operations. Adequate pavement support has been obtained by ensuring that the top 1.5 meters of the road subgrade is constructed entirely of the upper clay soils only. If the lower very silty clays are allowed to mix into the upper portion of the trench, this may result in a soft subgrade and provide inadequate support for normal pavement structures. This method is known as the clay cap method. Careful management of materials during construction is necessary for the placement of the clay cap. In high water table areas where upper clay is absent extra backfill drying and other measures will be required.

Based on the testhole soils and the watertable level, Hoggan has introduced a category rating system for the expected underground and road construction soil conditions at this site on a relative scale from A to C, with A being satisfactory, B fair, and C poor. There are no definite boundaries between A to C, but rather transitions from one category to another. A Table showing these testhole soil categories for residential subdivision construction is located in Appendix B. These categories are shown on a plan in Appendix B as well.

Most of the testholes contain a B or a C soil with depth. The challenging construction conditions arise when the B or C soils are encountered at shallower depths. Basically, the higher elevation C ratings are concentrated in the quarter sections north of the 23 Avenue and adjacent to 199 Street. It would be advantageous to design the sewer depths for this neighborhood to avoid the C category soils as much as possible.

The categories apply to the lacustrine and aeolian soils encountered in the testholes. All the glacial clay till and bedrock soils should not present any major difficulties for underground construction. These soils are likely not a factor for development as the till was more than 10 meters deep and the bedrock more than approximately 30 meters deep, where encountered. The exception would be deep trunk sewers.

Standard open-cut trenching will work for most underground utility installation, with the required material management noted above. Standard bedding sand should be adequate for

shallow utilities, while washed rock pipe bedding may be required in some areas where sewers will be installed below or near the water table. Additionally, utility trenches below this depth may encounter ingressing groundwater and sidewall sloughing in select areas, especially if a high water table is present. Moister areas of the lower very silty clays and clayey silts have little cohesion, and are sensitive and saturated.

Installing deep sewers below approximately 5 to 7 meters depth may encounter difficulties during construction, mainly in the C category areas of this site. Possible problems include base heave, base quicking or boiling, piping, sidewall instability, and ingressing groundwater. Specialized dewatering may be required during construction. It is recommended that the sewer designs set the pipe inverts as high as possible in these areas. Keeping the sewers high will also minimize the amount of very moist, very silty material that will need to be used as backfill.

Trench compaction will require considerable drying at deeper depths with some drying of the upper soils. As mentioned, in some areas it is recommended that the upper clays be separated from the very silty materials and utilized in the top 1.5 meters as a clay cap.

Subgrade preparation will be largely dependent on the degree of trench backfill drying during underground utility installation. This makes weather a main factor for road design and construction in the very moist to wet soil areas. Cement stabilizing is the recommended minimum subgrade preparation method. The exact cement content and depths should be decided in the field during construction.

All of the inorganic native silt and clay soils encountered in the testholes are suitable for supporting a single family dwelling with a concrete basement on strip and spread footings. Some testholes had bearing capacities that will require larger than normal footings.

Due to the large site area and varying soil conditions, our firm should review the design of each stage of subdivision to help ensure geotechnical issues are addressed adequately. At that time, more information will be known regarding proposed design grades of the site, which will be a factor in determining the appropriate construction measures. As well, further testholes are recommended prior to any subdivision design or construction.

8.2 Residential Housing Units

1. The subsurface soil conditions encountered throughout this site are considered fair for supporting single-family dwellings utilizing standard concrete footing foundations applying the Alberta Building Code Section 9. The surficial topsoil encountered in the testholes is not considered suitable for footing or slab-on-grade support. The very silty clay materials encountered throughout the site were soft to firm and very moist, therefore the bearing capacity of these materials may fall below the minimum 75 kilopascals required for applying the Alberta Building Code Section 9. In such cases, a wider strip footing will be required.
2. Proper lot grading away from the houses must be provided to minimize the ingress of surface water into the subsoil. All houses will require at least 1.5 meters of earthen cover to prevent potential frost heave problems, and to minimize movements associated with seasonal variations in moisture content. The amount of cover should be increased to 2.0 meters for exterior isolated footings or for footings of non-continuously heated structures.
3. Engineered fill may be considered in areas where low elevations necessitate deep fill zones. This option should be reviewed prior to implementation by a geotechnical consultant to evaluate site conditions and borrow material sources. Basically, engineered fill is fill, which is placed in a controlled manner under the full-time monitoring and inspection of a qualified soils technician. The fill is placed and compacted to a minimum 98 percent of its Standard Proctor Density near its optimum moisture content, in maximum 150 millimeter lifts. All topsoil must first be stripped from the engineered fill area. Engineered fill construction requires full-time monitoring and extensive testing by the geotechnical consultant during construction. However, proper placement of engineered fill will negate the need for pile foundations in deep lot fill areas, and possibly reduce the foundation costs to the builders and developer.

   It should be noted that engineered fill construction is not possible in all situations. One of these situations occurs when soft, very moist, underlying soils are exposed once stripping has been completed. Compacting the first lift of fill material over these soft underlying soils to the engineered fill standard may be impossible. Where a minimum fill depth condition is met, construction of a clay pad approximately of 300 to 500

millimeters in thickness will be required to obtain an adequate working platform to start from. This pad should be compacted to a minimum of 95 percent of Standard Proctor Density where possible. The normal engineered fill lift thickness and compaction criteria mentioned above should be applied to successive lifts. To employ this method, a minimum of 1.0 meter of engineered fill must be placed on top of the clay pad. If this condition is not met, the fill would not be considered to have met engineered fill standards.

In addition, engineered fill requires fill depth differentials across the building footprint of less than 1.5 meters. In some cases, removal of native material may allow for the minimum fill depth or the maximum fill differential conditions to be met. However, this may not always be the most economical solution.

4. Some testholes had lacustrine high plastic clay soils near the surface. Similar high plastic clays are encountered in many areas across Edmonton. Good construction practices and house and lot drainage are typically adequate to keep any shrinkage or swelling to acceptable levels.
5. Temporary dewatering may be required for basement excavations advanced below the water table.
6. In the case of pile foundations, some installation problems may be encountered. Some accumulations of free water and slough were present at the completion of drilling in some of the testholes around the site. Slow ingressing groundwater and minor sloughing may be encountered; therefore, casing of the piles may be required. At the very least, pile concrete should be on-site during the pile drilling to allow for quick concrete placement.

8.3 Underground Utilities

1. The subsurface soil conditions encountered in the testholes are considered generally poor to satisfactory for the installation of underground utilities incorporating the City of Edmonton backfilling and compaction requirements. Most of the clay and silt soils would be considered fair to satisfactory, with some very moist to wet materials encountered in the testholes considered poor. Topsoil and other organic materials are not considered suitable for backfill material.
2. The water table at this site was highly variable and was located at between 0.6 and lower

than 17 meters below ground surface in the neighbourhood testholes, indicating that saturated conditions will likely be encountered in some of the trenches, depending on the design elevations and nature of the subsoil. The majority of the site had a low to moderate water table and a plan showing the high water table areas is located in Appendix B. Trace to moderate amounts of free water were encountered in some of the testholes at completion of drilling, and low to moderate amounts of ingressing water in the trenches can be expected. Varying amounts of trench dewatering will likely be required depending on trench depths and locations. Deep sewers below 5 to 7 meters in some areas may require significant dewatering. Opening relatively long portions of utility trench is not recommended for this site.

3. Standard trenching cutback angles of approximately 45 degrees from the vertical are anticipated for most areas of the site, although some portions of the very moist, very silty clays may require increased cutback angles of more than 45 degrees in order to remain stable, due to their low strength and elevated moisture contents. Actual cutback angles should be determined in the field during construction. Exact stable slope values cannot be pinpointed without detailed and extensive analysis. For this reason, this information should be used as a guideline only and that the optimum cutback angles for utility trenches should be determined in the field during construction. The Occupational Health and Safety Act, Part 32 Excavations and Tunnelling should be strictly followed, except were superseded by this report.

4. Pipe bedding and trench backfill procedures should adhere to the City of Edmonton specifications as outlined in The Servicing Standards manual. The backfill material beneath and above the pipe should be an approved bedding sand material where conditions allow. This material should be hand placed and hand tamped, with care taken to fill the underside of the pipe. However, some sensitive, very moist to wet, and soft material were encountered at depths of approximately 1.5 to 8.8 meters BGS in the testholes around the site. To overcome the installation difficulties which may be encountered where ingressing groundwater and/or poor bearing conditions may be a problem, it is recommended that a washed rock and geotextile separator be utilized for pipe bedding in these areas. The washed rock and geotextile configuration should be determined in the field during construction. The need for this configuration will be low to moderate at this site, depending

on the depth of the sewers.

5. In high water table areas where washed rock bedding is utilized, it is recommended to leave the rings off the storm pipe, and to wrap the joints in filter cloth. Alternatively, the washed rock could be connected to the manholes via small extension pipes. This measure can be effective in lowering the water table, and helping to minimize the frost heave potential and to improve pavement structure performance. The storm pipe should be placed at a minimum of 3.0 meters below final subgrade elevation, in order to lower the water table enough for these measures to be effective.

6. Deep sewers below approximately 5 to 7 meters depth may have difficulty during construction at this site in the moderate to high water table areas. Possible problems include base heave, base quicking or boiling, sidewall instability, and ingressing groundwater. A main factor in the amount of difficulty will be the depth of the trench bottom below the water table. Based on our experience in nearby subdivisions, the critical depth below the water table is approximately 3 to 5 meters. Some form of temporary dewatering will likely be required in order to properly install deep sewers at these depths or more below the water table. It is recommended that the sewer designs set the pipe inverts as high as possible. Keeping the sewers high will also minimize the amount of very moist, very silty material that will be used as backfill.

   As noted earlier, it would be advantageous to locate the deep trunk sewers in areas with lower watertables and deeper C category soils.

7. The moisture content of the soils encountered in the testholes were variable. The underlying clays were generally above optimum moisture content, and became very silty and very moist to wet at depth, with moisture contents well above optimum moisture content. The variable condition of the soils will cause a corresponding variability in the utility trench pipe bedding and backfill conditions. As a minimum, drying of some portions of the clay backfill prior to placement in the trench will be required when adequate compaction cannot be achieved at the natural moisture content.

8. Trench compaction requirements of the City of Edmonton are 100 percent of the One-Point Proctor Density above a depth of 1.5 meters, and 97 percent of the One-Point Proctor Density below this level. The maximum lift thickness is 300 millimeters. This degree of compaction should be achievable with variable amounts of mixing or moisture

conditioning of the trench backfill. The wetter soils will require considerable drying prior to backfill.

Aggressive drying of the trench backfill may be performed in order to improve road subgrade conditions, and should be considered for this site.

Sands and non-plastic soils require trench backfill of 95 percent of the Standard Proctor Density (SPD) below the top 1.5 meters and 98 percent of the SPD above 1.5 meters below subgrade or specialized moisture criterion.

In road areas where no utility installations occur, uniform backfill is not required as long as suitable soils are present below design subgrade elevation.

8.4 Surface Utilities

1. The subsurface soil conditions encountered throughout this site are considered generally poor to satisfactory for the construction of roads, curbs, and sidewalks in undisturbed areas. Poor conditions will be encountered in areas where the very moist, very silty clays are encountered near the surface, either in trenched or in undisturbed areas, as well as in high water table areas. The existing topsoil and other deleterious materials should be removed prior to construction of roads, sidewalks and other surface utilities. It is recommended to design fills for high water table areas to improve the road conditions.
2. The main concern for surface utility construction at this site is the elevated moisture content of the very silty clay materials as well as occasional portions of the upper clay, which were also well above optimum moisture content. Most of the upper clay materials were slightly above optimum moisture content, but mixing and disturbance during underground utility installation will degrade the soil conditions. If the lower very silty clays are allowed to mix into the upper portion of the trench, the road subgrade will be soft and provide inadequate support for normal pavement structures. Extra subgrade work would then be required in order to construct an adequate working platform for the pavement structure placement and long term support. It is noted that the degree of material separation, and trench backfill drying during underground utility installation affects the soil conditions for road and sidewalk construction, with increased drying improving the soil conditions.

   The key to the development success will be in ensuring that suitable soils are in place below subgrade elevation to adequately bridge the lower wet silty soils found in

most of the testholes. This would be accomplished during the site grading and trenching operations by either the construction of a clay cap, or by extensive drying.

3. Past experience has shown that cement stabilization is effective in reducing the swelling potential of high plastic clays and in maintaining the subgrade strength during the design life. Therefore, cement stabilization is the recommended minimum subgrade preparation method for this site. As a minimum, the addition of 10 kilograms of cement per square meter of subgrade mixed to a depth of 150 millimeters is recommended. Moister areas will require more cement mixed to greater depths, typically up to 30 kilograms of cement per square meter mixed to a depth of 300 millimeters. Application rates would best be determined in the field during construction.
4. An alternative to the clay cap or extensive drying is the use of a pit-run gravel subbase. The estimated thickness of subbase to support the roadway is 600 to 900 millimeters. A medium duty woven geotextile should initially be placed below the gravel for separation and reinforcement. The placement of wic drains within the granular sub-base recommended. The wic drains should extend longitudinally along both sides of the roadway and should be tied into catch basins. The need for a pit-run subbase is dependent on the success of the construction of the clay cap, trench backfill drying, and weather. The potential should be limited to the higher C areas of the site.
5. The near surface inorganic clays encountered in most of the testholes were generally low to high plastic in nature, and are susceptible to swelling. Cement stabilization is the recommended subgrade preparation method where these clays are encountered. Past experience has shown that cement stabilization is effective in reducing the swelling potential of high plastic clays.
6. The observed water table depths are highly variable at this site at between approximately 0.6 and 17.0 meters below ground surface. The surficial clays are of low to high frost susceptibility, with the susceptibility becoming severally high in the soils encountered at depth. A high water table within approximately 3.0 meters of the road surface is required for significant frost heaving to occur. The closer the water table is to the surface, the higher is the frost heave potential. Over half of the standpipes have shown the water table to be above or near this level, and the potential for frost heave will be moderate to high near those testholes and moderate in areas where the water table is below 3.0 meters

below ground surface. Therefore, the design grade should be set as high as possible in high water table areas. In addition, employing the clay cap method will result in the subgrade being comprised of less frost susceptible material.

In areas where the clay cap is not utilized, or in areas where it is utilized but a very high water table exists, an attempt should be made to lower the water table. This may be accomplished by using sub-drains, usually consisting of perforated pipe and manhole inlets, to collect groundwater below the road area. Other options which may be utilized are connecting the bedding materials to the manholes, or leaving the rings off the storm sewers during construction, allowing groundwater to seep into the sewer. Another option would be the use of rigid insulation placed below the pavement structure.

7. The following preliminary pavement designs are provided for neighbourhood planning. An estimated California Bearing Ratio of 3.0 percent is used in the design, as well as a design life of 20 years. The previous items have discussed the possible difficulty and recommended options for attaining this estimated CBR at this site, and need to be referenced. The stated Equivalent Single Axel Load (ESAL) values for different roadway designations were obtained from City of Edmonton guidelines. The major collector with 1 bus route assumes a maximum of 64 runs per day, and no bus traffic prior to the Stage 2 overlay.

Preliminary Staged Roadway Structures
Riverview Neighborhoods 1-3

STAGE 1 **Granular Base Option**	**Local Residential** ($3.6x10^4$ ESALs)	**Minor Collector** ($1.8x10^5$ ESALs)	**Major Collector (1 bus route)** ($3.6x10^5$ ESALs)
Asphaltic Concrete	70 mm (ACR)	75 mm (ACO)	75 mm (ACO)
Crushed Gravel (20 mm)	250 mm	300 mm	375 mm
STAGE 2			
Asphaltic Concrete Overlay	35 mm (ACR)	35 mm (ACO)	35 mm (ACO)

Note: ACR = City of Edmonton Designation Asphaltic Concrete Residential
ACO = City of Edmonton Designation Asphaltic Concrete Overlay

8. New City Standards contain new asphaltic concrete mix types. The old versus new mix type changes are shown in the following table. The City will allow the old mix types for the year 2014 but require the new mix types for 2015 and beyond:

New AC Mix Types	
Old Mix Type	**New Mix Type**
ACR	ACF - LT
ACO	ACF - HT

8.5 Cement

Tests on selected soil samples indicated negligible to severe concentrations of water-soluble soil sulphates in the near surface clay deposits. Therefore sulphate resistance will be an important design item for all concrete coming into contact with the soil. Concrete used for all underground pipes must be constructed of C.S.A. Type HS, sulphate resistant Portland cement, regardless of the soil sulphate content. All concrete for surface improvements such as sidewalks and curbs may be constructed using CSA Type GU, normal Portland cement, regardless of the soil sulphate content.

8.6 Groundwater and Drainage Issues

1. The groundwater readings in the proposed subdivision were low to high and highly variable, and are a concern in design and construction of underground utilities and house construction. A plan showing the water table levels across the site is located in Appendix B.
2. It is recommended that grading fill be designed for high watertable areas in order to raise the site. Large cuts should not place the design grade elevation near the watertable.
3. The groundwater seepage rates into utility trenches from the very silty clay materials encountered at depth should be low to moderate. It is expected that low to moderate trench dewatering may be necessary, and construction delays can be expected. Opening relatively long portions of trench should be avoided. Deep trenches may have higher groundwater seepage and require special dewatering.
4. Foundation drain services are mandatory as per City of Edmonton guidelines and are recommended in the higher watertable areas at this site.

5. At a minimum, peripheral exterior weeping tile lines are recommended for all house basements. Basements located near the water table may require upgraded drainage measures which include interior drains and clean tile rock beneath the floor.
6. Water dispersed on the property from the roof leaders must not be allowed to accumulate against the foundation walls. To ensure positive drainage, the soil surface of all lots should be made sloping away from all buildings. This will require a positive lot grading of at least five percent away from the foundation walls toward the sidewalk for a minimum of 1.5 metres. In cases where the lot drainage runs from the back of the lot to the front, runoff should be kept 1.2 metres away from the house.
7. In high water table areas, frost heaving and subgrade softening below surface utilities is a concern. In these areas, attempts should be made to lower the water table. This may be accomplished by using sub-drains, usually consisting of perforated pipe and manhole inlets, to collect groundwater below the road area. Other options which may be utilized are hydraulically connecting the bedding materials to the manholes, or leaving the rings off of the storm sewers during construction, allowing groundwater to seep into the sewer. When employing this method, it is important to wrap the joints in filter cloth to prevent silting. Care should be taken to ensure that road areas with a high water table have a storm sewer present, placed at a minimum 3.0 meters below the road surface. The exact configuration and need for the sub-drains should be determined during construction. The City may require approval prior to allowing groundwater into the storm sewer.

8.7 Storm Water Management Facilities

1. The soils in the testholes were comprised of topsoil overlaying medium to high plastic clay underlain by silt or very silty clay. The clays and silts should yield sufficiently low permeability characteristics for water retention purposes. No liner is considered necessary.

   Sand soils were encountered in Testholes 2013-12 and 2012-2 (1166-398) and these sands will require a liner if present within a stormwater pond.
2. The clays encountered in the above mentioned testholes were generally moist near the surface and became very moist to wet with increased depth. Excavation of the lower very moist to wet clay and silt soils will likely require the use of a track mounted hoe.

Excavation of the upper moist clay soils may be possible by scrapers. Stabilized water level measurements in the testholes indicate a groundwater level at 0.6 to 17.0 meters BGS.

3. Dry pond construction below the watertable may produce constant water seepage into the outlets, and a soft, saturated pond bottom. Therefore, a dry pond would require specialized design and construction measures near or below the above noted watertable levels and locations. Our firm should review any dry pond designs below the watertable prior to finalizing.
4. If large sand layers or pockets are encountered during pond construction, they may need to be excavated and/or plugged with clay. Our firm should be called to inspect such layers if encountered during construction.
5. The clay and silt materials being excavated from the stormwater ponds are suitable for engineered lot fill, although substantial drying of the lower very moist clay and silt soils will be required to achieve engineered fill compaction criteria. The clay is suitable for road fill; however the silt material is not recommended due to its high frost susceptibility in the upper 1.5 meters below subgrade. The silt material is suitable for road fill below 1.5 meters from subgrade if needed.
6. Side slope stability is a critical issue in some areas of the site due to soft soils and high water table. The following table summarizes the approximate stable angles expected for the sideslopes in various conditions:

Preliminary Storm Pond Sideslope Angles

Upper moist Clay, above the high water level	3H:1V
Upper moist Clay, in the drawdown zone or below normal water level	4H:1V
Very moist to wet Very Silty Clay	7H:1V to 9H:1V

The 9:1 slopes will mainly be needed in high water table areas, within Category C soils. It is recommended to design SWMF pond bottoms higher in the high water table areas, or avoid ponds in these areas if possible.

7. The very silty soils are susceptible to erosion, and therefore the erosion protection should be placed as early as possible.

8. In high water table areas, base heave and piping may be a concern and should be addressed in the further subdivision investigation.

8.8 Preliminary Commercial Building Foundations

1. The following building foundation comments are preliminary in nature. Each individual building should conduct a site specific geotechnical investigation.
2. A footing foundation system is considered geotechnically satisfactory for commercial building development in the subject area where the soft wet silts and clays are not near the footing level. Settlement becomes a concern for footings bearing on or near the wet silts and clays. The footings must be founded on undisturbed, native non-organic soils. The topsoil and peat encountered in the testholes is not considered suitable for footing support. The native sand and clay soils are considered suitable for footing support. The upper clays are typically high plastic and susceptible to shrinkage and swelling. Footings bearing on high plastic clays are a concern due to swelling and shrinkage. Care must be taken to not cause any moisture changes in the clays throughout the life of the structure.
3. The soils encountered at this site are suitable for bored cast-in-place pile foundation in the upper clays and sands. The very silty clays and silts have low skin friction and will likely cause delays in the construction of bored cast-in-place piles due to the water and sloughing associated with these soils. Suitable end bearing soils were not encountered in any of the 8.8 meters neighborhood testholes but were encountered in the deeper slope testholes at depths ranging between 9.8 to 16.6 meters BGS. The clay till encountered in the slope testholes is considered suitable as end-bearing material. However, some of the clay till has low end-bearing strength. Also the sand lenses and sandy nature of the clay till is a concern for proper bell formation. All pile holes should be carefully inspected to ensure that no water or slough material is present prior to concrete placement. Accumulations of free water and slough material were noted in most of the testholes. The water table stabilized between 0.6 and 17.0 meters BGS in the neighbourhood testholes. Therefore, casing will likely be required. The pile concrete should be placed as soon as possible after the pile has been bored to minimize the volume of ingressing groundwater.
4. Driven steel and concrete piles, and augered cast-in-place (ACIP) concrete piles are considered suitable for this site. These pile types may be utilized in areas with high water

table levels and areas that featured large amounts of sloughing in the testholes. Driven piles tend to be relatively expensive. In the wet silts and clays, the skin friction and end bearing capacities will be relatively low. Suitable end bearing soils were not encountered in any of the 8.8 meters neighborhood testholes but were encountered in the deeper slope testholes at depths ranging between 9.8 to 16.6 meters below ground surface. The clay till encountered in the slope testholes is considered suitable as end-bearing material

5. All topsoil and deleterious material should be completely removed from below the slab. The native existing sand and clay encountered at this site are considered adequate for slab-on-grade support.
6. Some of the clay material is of high plasticity, and has a high potential for shrinkage and swelling. Therefore, it is important that changes in moisture content be avoided both during construction and throughout the life of the structure. When using a slab-on-grade above high plastic clays, the swelling potential must be addressed. If slab movement cannot be tolerated, a structural floor slab or soil replacement is recommended where high plastic clay exists.

9.0 CLOSURE

This report has been prepared for the exclusive and confidential use of Qualico Developments Inc., Walton Development & Management LP, Melcor Developments, Sunwapta Holdings Corporation, S.P. Singh, MMM Group, Stantec Consulting Ltd and the City of Edmonton. Use of this report is limited to the subject proposed Neighborhood 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.

This report is preliminary and intended for NSP level design and planning. Each subdivision stage should have its own geotechnical investigation for detailed design and construction.

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

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

(for)

Leah Falk, E.I.T.
Project Engineer

Reviewed by,

PROFESSIONAL ENGINEER ALBERTA
RICHARD A. EVANS

Feb. 12/14

Rick Evans, P. Eng.
Manager, Geotechnical Engineering

APEGA Permit to Practice #P3691

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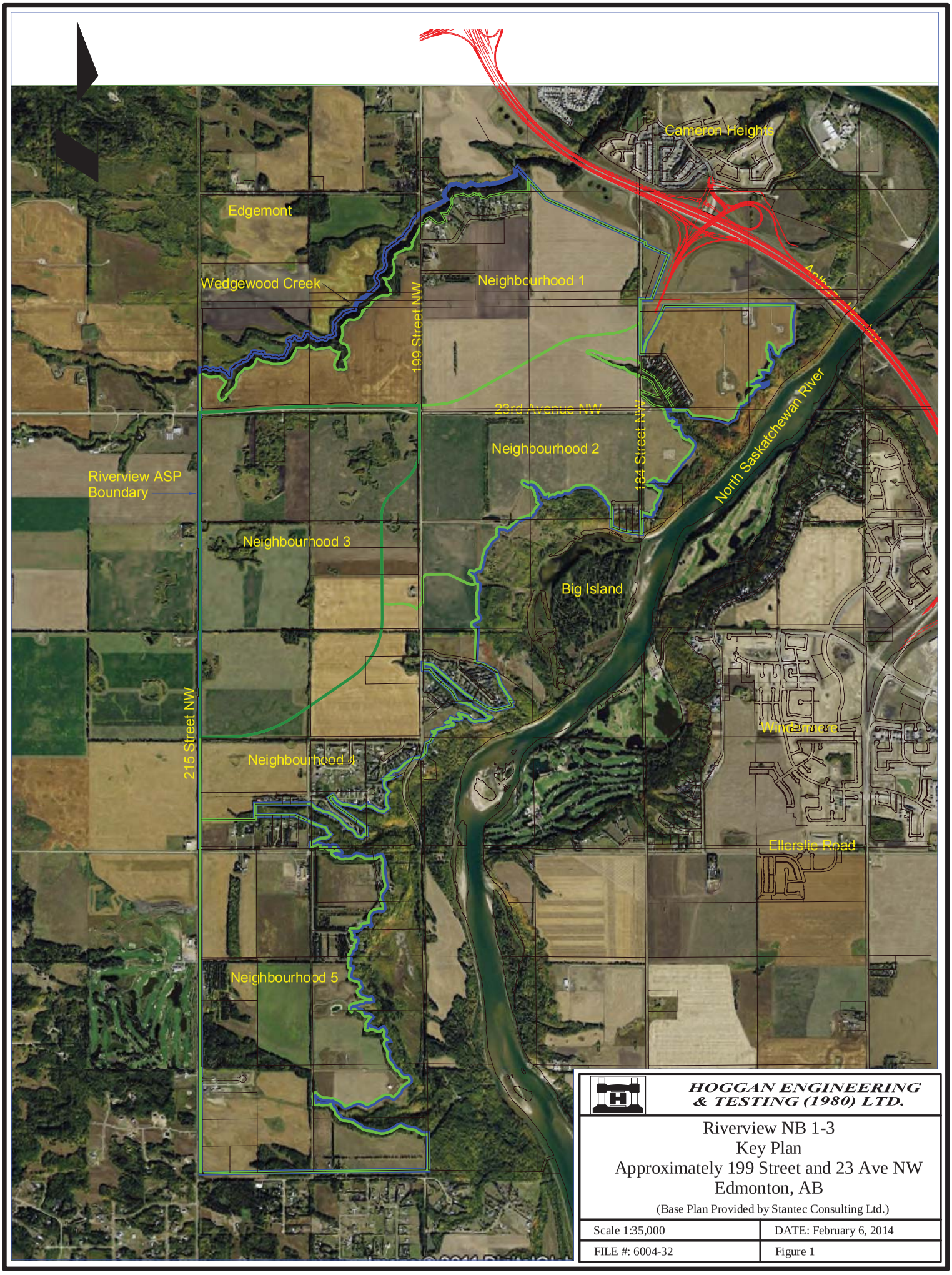
RE&LF/re&lf

A P P E N D I X A

Key Plan, Site Plans, Testhole Logs



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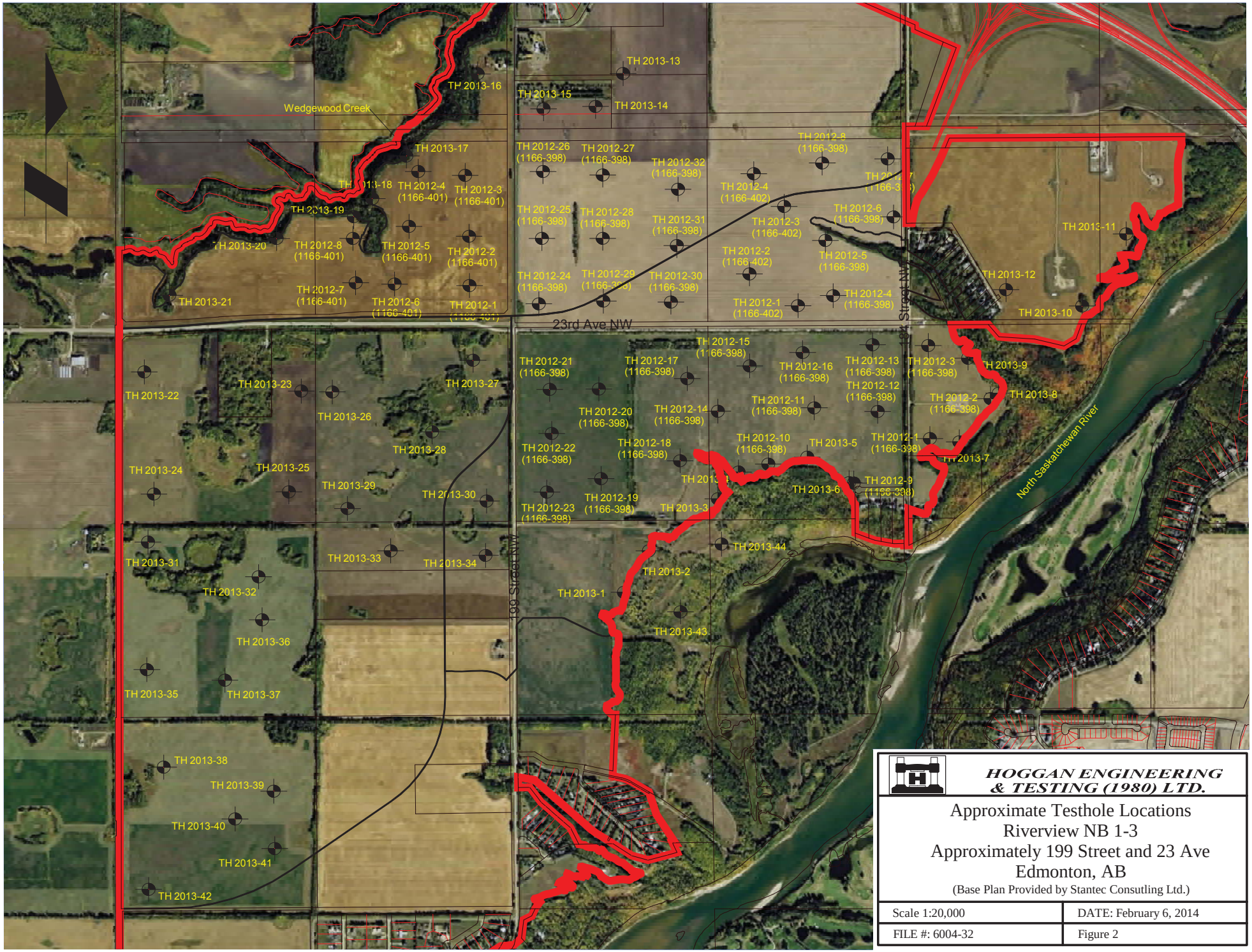
Riverview NB 1-3
Key Plan
Approximately 199 Street and 23 Ave NW
Edmonton, AB

(Base Plan Provided by Stantec Consulting Ltd.)

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



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Approximate Testhole Locations
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 2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-01**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 686.4 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	Elevation (m)
0		OR	**TOPSOIL** : silty, damp, black 200 mm					686
1			**CLAY** : very silty, medium to high plastic, damp, brown -Below 0.5m: trace white inclusions, very stiff		19	14.5, 18.5		685
2						19.6		
3		CI-CH	-Below 2.7m: sandy, friable, trace oxides		15	21.4, 24		684
4					13	20.2, 16.9, 23.9		683
5			-Below 4.9m: damp to moist			32.6		682
			5.5 m					
6			**SILT** : sandy, clayey, low plastic, damp to moist, soft to friable, brown		12	23.1, 26.2		681
7					7	36.1, 22, 19.4		680
8		ML				22.7		679
9			-Below 8.8m: clayey to very clayey in seams -Below 9.1m: trace sensitive, moist to very moist		5	26, 29.9		678
10					7	36.9, 38.8, 34.2		677
11			-Below 10.5m: grey			34.5		676
			11.3 m					
12			**CLAY TILL** : silty, sandy, medium plastic, moist, firm, trace coal and gravel -Below 12.2m: trace sand pockets		17	17.6, 17.1, 16.4		675
13					19	15.9, 14.6		674
14						16.5		673
15					20	16.1, 17		672
16			-Below 16m: stiff		22	17.2, 15.4, 15.5		671
17		CI				15.1, 13.1, 34.1	P.L. = 13.1 L.L. = 34.1 M.C. = 15.1 **Soluble Sulphates:** Negligible	670
18					27	14.5, 14.1		669
19			-At 19.1m: approximately 1" sand seam in SPT			14.1		668
20					28	13.9, 17.4, 13.5		667

Well 1: 16.60

Well 1: 669.80

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

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LOGGED BY: L Falk	COMPLETION DEPTH: 46.02 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/29/13
Fig. No: 1	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-01**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 686.4 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	SLOTTED PIEZOMETER	Elevation (m)
20						13				666
21					33	7.7				665
			-At 21.5m: difficult drilling, sample ground up on auger, cobbles			15.3				
22			-At 22.1m: coarse grained sand lens at bottom of SPT		50 for 6"	11.7 / 15.1				664
23			-At 22.9m: ground up on augers 23.2 m			16.4				663
			SAND : gravel, coarse grained, light brown and light pink, very moist to wet, clay till intermixed			19 / 15.1				
24		SA	-At 23.5m: free water noted on auger		34					662
25			25.3 m							
			CLAY TILL : silty, sandy, medium plastic, moist, firm, trace coal and gravel		45	14.5				661
26		CI				21	-At 25.9m: to much slough in testhole, switched to hollow stem			660
			-At 26.7m: olive grey, fine grained sand at bottom of SPT			14.5 / 21				
27					41					659
28			28.2 m							
		SA	**SAND** : very moist to wet, medium to coarse grained, grey, trace coal		67	17				658
29										657
30		SA	-At 29.7m: possible weathered bedrock at the bottom of SPT		59	20				656
										Well 2: 654.73
31			31.2 m							655
			CLAYSHALE : silty, sandy, high plastic, moist, blueish grey, bentonitic		50	20.4				
32										654
33		CS	-Below 32.9m: mixture of sandstone and shale, ironstone moduals 33.1 m		14-28-50 for 6"	16.5	-Note: coring started at 32.9m, some overlap from original testhole on Oct. 1, 2013			653
34			**CLAYSHALE** : soft, moist, odd sandstone lenses							
			-Below 33.7m: moderately hard		84	16.1				652
35			-Below 33.8m: some sandstone mixed in, possibly re-worked, non-layered 35.5 m							651
36		SS	**SANDSTONE** : soft to moderately hard, not re-worked		-36-50 for 5"	15.3				
			-Below 36m: clay stringers 36.7 m				-End of testhole on Oct. 1, 2013. Continued with bedrock coring on Oct. 28, 2013.			650
37			-At 36.3m: approximately 0.25m thick moderately hard seam							649
			CLAYSHALE : soft to moderately hard, high plastic							
38		CS	-Below 36.9m: soft							648
39			-Below 37.8m: less silty, more clay, some slicken-sided							
			-At 38.0m: coal seam							647
40		SS	-Below 38.1: clayshale, low silt content, moist, 39.8 m							

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LOGGED BY: L Falk	COMPLETION DEPTH: 46.02 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/29/13
Fig. No: 1	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-01**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 686.4 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	SLOTTED PIEZOMETER	Elevation (m)
40		BR	high plastic, soft							646
41			-At 38.6m: approximately 0.25 thick slightly harder seam, still soft to moderately hard							645
42			**SANDSTONE** : soft to moderately hard							644
43		CS	**SAND/CLAYSTONE** 39.9 m **CLAYSHALE** : soft, high plastic, moist -Below 41.2m: blocky, slicken-sided 40.1 m							643
44			-Below 43.1m: soft to moderately hard -Below 43.3m: less blocky -Below 43.7m: blocky			26.8 (20.9 – 72.4)	P.L. = 20.9 L.L. = 72.4 M.C. = 26.8 **Soluble Sulphates:** Negligible			642
45		BEN	44.7 m **BENTONITE** : soft 44.8 m							641
46		CS	**CLAYSHALE** : high plastic, moist, soft, slightly blocky -At 45.3m: approximately 3" thick moderately hard seam							640
47			-Below 45.7m: hard to moderately hard, some sand, slightly moist							639
48			**END OF TESTHOLE @ 46.0 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 36.12 m. Well 2: Slotted standpipe installed to 45.72 m.							638
49										637
50			**Well 1** : 6 day waterlevel reading: 16.82 m bgs. **Well 1** : 21 day waterlevel reading: 16.15 m bgs. **Well 1** : 50 day waterlevel reading: 16.54 m bgs. **Well 1** : 63 day waterlevel reading: 16.60 m bgs. **Well 2** : 7 day waterlevel reading: 21.80 m bgs. **Well 2** : 21 day waterlevel reading: 29.98 m bgs. **Well 2** : 35 day waterlevel reading: 31.86 m bgs. **Well 1** : 100 day waterlevel reading: 16.60 m bgs. **Well 2** : 72 day waterlevel reading: 31.67 m bgs.							636
51										635
52										634
53										633
54										632
55										631
56										630
57										629
58										628
59										627
60										

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LOGGED BY: L Falk	COMPLETION DEPTH: 46.02 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/29/13
Fig. No: 1	Page 3 of 3

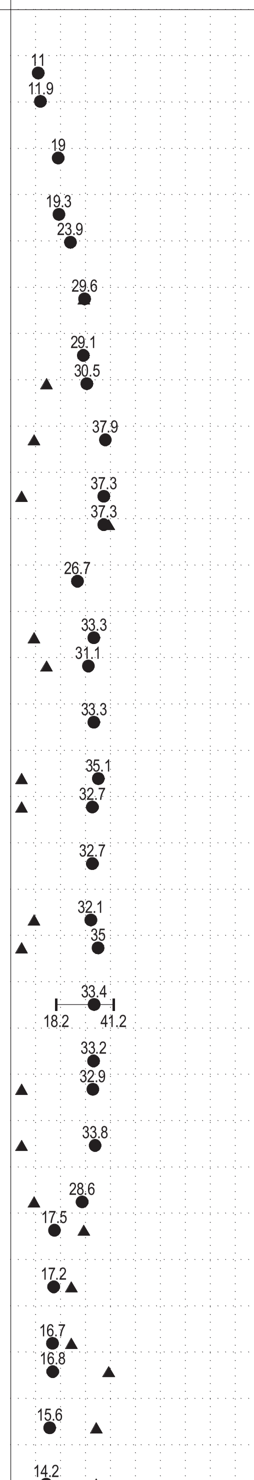
JRP 6004-32.GPJ JRPV3_0.GDT 2/7/14

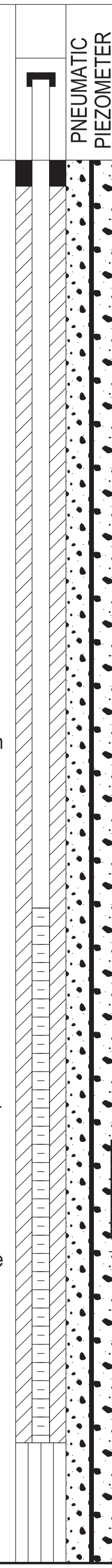
PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-02**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.8 m
OWNER: Ownership Group	LOCATION: As per site plan	

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	SPT (N)	OTHER DATA
0	OR	**TOPSOIL** : damp, black (100 mm)		
	CI-CH	**CLAY** : silty, medium to high plastic, damp, brown, trace rootlets to 0.8m	9	
		-Below 1.5m: trace white residue		
			13	
		-Below 2.9m: sandy, trace oxides		
		-Below 3.1m: firm to stiff to friable, damp to moist		
			7	
4.6 m	CI	-Below 4.6m: very silty, medium plastic, moist		**Shelby Tube:** QU: 109 kPa DD: 1363 Kg/m^3 MC: 37.3 %
		-Below 5.9m: sandy to very sandy in seams		
		-Below 6.4m: grey		-Note slicken sided was noted on shelby tube
			8	
7.3 m	CL-CI	**CLAY** : silty to very silty, medium plastic, moist to very moist, soft, grey		
			5	
		-Below 8.8m: sandy		
			7	
		-Below 10.7m: trace sensitive		P.L. = 18.2 L.L. = 41.2 M.C. = 33.4 **Soluble Sulphates:** Negligible
			8	
		-Below 11.9m: less silt		
				-At 12.4: obstruction in standpipe
		-Below 13.0m: sandy to very sandy, trace till features		
13.1 m		**CLAY TILL** : silty, sandy to very sandy, medium plastic, moist, stiff, grey, trace coal, gravel and sand pockets	22	
			19	





Elevation (m): 684, 683, 682, 681, 680, 679, 678, 677, 676, 675, 674, 673, 672, 671, 670, 669

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LOGGED BY: L Falk	COMPLETION DEPTH: 67.06 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/7/13
Fig. No: 2	

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-02**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.8 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)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	OTHER DATA	Elevation (m)
16	CI	-At 19.8m: sample spun up on augers, very sandy -At 20.6m: approximately 1 to 2" thick sand lens in SPT, medium to coarse grained, moist to very moist -At 21.0m: approximately 0.9m thick sandy seam, very moist to wet, fine to medium grained, grey -At 21.3m: free water noted on auger, sample spun up on auger -At 22.6m: approximately 0.5m thick sandy seam, very moist to wet, fine to medium grained, grey -Below 23.2m: trace cobbles		24		668
17						
18				15		667
19				34		666
20						665
21				41		664
22				3-4-50 for 5"		663
23						662
24				40-50 for 3"		661
25				67	-At 24.4m: poor recovery, samples spun up on auger, possible slough	660
26						659
27				40	-At 25.9m: poor recovery, samples spun up on auger	658
28				35	-Below 28.2m: difficult drilling	657
29					-At 30.0m: poor recovery	656
30				41		655
31						654
32				50 for 2"	-At 31.2m: rock at bottom of SPT	653

POCKET PEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

P.L. = 16.7 L.L. = 98.1 M.C. =

SLOTTED PIEZOMETER | PNEUMATIC PIEZOMETER

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REVIEWED BY: R Evans | COMPLETION DATE: 7/10/13

Fig. No: 2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-02**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.8 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)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA	Elevation (m)
32					
		32.8 m			
33	SA	**SAND** : fine to medium grained, moist to very moist, light grey	18-50 for 5"	-End of testhole on Oct. 7, 2013 33.2m. Continued with SPT's and bedrock coring on Nov. 7, 2013.	652
34		-At 34.3m: no recovery in SPT	83 for 6"		651
35					650
		35.7 m			
36	CI	**CLAY TILL** : silty, sandy, medium plastic, moist, very stiff, trace coal and gravel	13-50-50 for 3"		649
37	CI	-At 36.9m: very stiff to hard	51-50 for 4"		648
38					647
39	CI	-At 38.4m: trace bedrock pieces	26		646
40	CI	-At 39.9m: trace bedrock pieces	23		645
41					644
		41.5 m			
42		**CLAYSHALE** : soft, moist, high plastic, bentonite mixed in	30-50 for 5.5"	P.L. = 21.7 L.L. = 87.7 M.C. = 18.8	643
		-Below 42m: highly bentonitic, soft to moderately hard, no sheared or very moist zone observed		P.L. = 22.8 L.L. = 163.1 M.C. = 22.4	
43		-Below 43m: soft, moist, high plastic, slightly blocky		P.L. = 26.8 L.L. = 160.0 M.C. = 31.5	642
44	CS	-At 43.3m: bentonite chunk, weathered, more moist than layer above			641
		-Below 43.4m: soft to moderately hard, still slightly blocky			
45		-At 43.7m: burnt shale with coal pieces for approximately 0.2m			640
		-Below 43.9m: slightly blocky, moderately hard, sandy			
46		-Below 44.4m: some fractures, some sand, laminated, moderately hard			639
		46.1 m			
47		-At 44.7m: approximately 0.4m thick coal seam			638
	SS	-Below 46.0m: sandy, laminated, moderately hard, some fractures			
48		**SANDSTONE** : laminated, moderately hard			637

POCKETPEN. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID: 20 40 60 80

SLOTTED PIEZOMETER | PNEUMATIC PIEZOMETER

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LOGGED BY: L Falk	COMPLETION DEPTH: 67.06 m
REVIEWED BY: R Evans	COMPLETION DATE: 7/10/13
Fig. No: 2	Page 3 of 5

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-02**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.8 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)	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)
48		to hard, odd fracture					
		-At 46.9m: clayshale mixed in till 47.1m					
		48.5 m					
49		-Below 47.55m: moderately hard to hard					636
		-At 47.6m: clay noduals till 47.8m					
		CLAYSHALE : moderately hard, high plastic, laminated, some fractures					
50		-Below 49.1m: slightly blocky					635
		-Below 49.8m: blocky					
		-At 50.3m: slicken-sided					
51		-Below 50.6m: sandy, coal specs, moderately hard to hard					634
		-Below 51.0m: slightly blocky					
52							633
		-At 52.6m: approximately 0.1m of burnt shale					
53							632
	CS				16.6 (24.4 – 90.5)	P.L. = 24.4 L.L. = 90.5 M.C. = 16.6	
54							631
55							630
		-Below 55.2m: blocky, slicken-sided, moderately hard					
56							629
					15.9 (31 – 129)	P.L. = 31.0 L.L. = 129.0 M.C. = 15.9	
57							628
		-At 57.2m: sandstone pieces till 57.5m					
58							627
		-At 58.0m: approximately 0.15m of burnt shale, moderately hard					
		58.7 m					
59		-Below 58.2m: coal specs, moderately hard to hard, breaks at flat surfaces					626
		SANDSTONE : hard, odd fracture					
60	SS						625
61							624
		61.3 m					
		CLAYSHALE : sandy, moderately hard to hard					
62		-Below 61.6m: slightly blocky					623
		62.2 m					
		-At 61.7m: slicken-sides					
	BEN CS	**BENTONITE**			15 (24.1 – 192.1)	P.L. = 24.1 L.L. = 192.1 M.C. = 15.0	
63		62.8 m					622
		CLAYSHALE : moderately hard to hard, some sand					
		-At 63.2m: soft to moderately hard lens					
64		-At 63.3m: approximately 0.15m thick					621

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LOGGED BY: L Falk | COMPLETION DEPTH: 67.06 m

REVIEWED BY: R Evans | COMPLETION DATE: 7/10/13

Fig. No: 2

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-02**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.8 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	PNEUMATIC PIEZOMETER	Elevation (m)
64			sandstone lens 64.3 m							
		BEN	**BENTONITE** : softer, moister 64.5 m							
65			**CLAYSHALE** : moderately hard							620
			-At 65.4m: approximately 0.3m thick, moister, softer lens			11.8 (19.5 – 139.4)	P.L. = 19.5 L.L. = 139.4 M.C. = 11.8			
66		CS	-Below 65.8m: moderately hard to hard							619
			-Below 66.0m: laminated sandstone and clayshale							
67			-Below 66.5m: Clayshale, sandy, moderately hard to hard							618
			END OF TESTHOLE @ 67.1 m. No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 14.63 m. Well 2: Slotted standpipe installed to 0 m.							
68										617
69										616
			Well 1 : 15 day waterlevel reading: Dry to 14.63 m bgs.							
70			**Well 1** : 29 day waterlevel reading: Dry to 14.63 m bgs.							615
			Well 1 : 43 day waterlevel reading: Dry to 14.63 m bgs.							
71			**Well 1** : 56 day waterlevel reading: 12.46 m bgs.							614
			Well 2 : 12 day waterlevel reading: 35.10 m bgs.							
72			**Well 2** : 26 day waterlevel reading: 34.60 m bgs.							613
			Well 1 : 94 day waterlevel reading: 12.45 m bgs.							
73			**Well 2** : 63 day waterlevel reading: 34.90 m bgs.							612
74										611
75										610
76										609
77										608
78										607
79										606
80										605

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LOGGED BY: L Falk | COMPLETION DEPTH: 67.06 m
REVIEWED BY: R Evans | COMPLETION DATE: 10/7/13
Fig. No: 2

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-03**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 684.2 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)	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	Elevation (m)
0			750 mm					684
1		CI-CH	**CLAY** : silty, medium to high plastic, damp, very stiff, brown, trace coal, possible fill		12	18.9		683
2			2.3 m					682
		CI-CH	-At 2.3m: very silty, sandy, damp, friable, brown and grey		14	13.2		681
3								
4		CI-CH	-At 3.8m: moist, firm to stiff, trace oxides		10	33.9		680
5			5.3 m					679
		CI	**CLAY** : silty, medium plastic, damp to moist, friable, brown		15	21.2		678
6								
7		CI	-At 6.9m: very silty		19	21.3 (20.1 – 42.2)	P.L. = 20.1 L.L. = 42.2 M.C. = 21.3 **Soluble Sulphates:** Severe	677
8								676
		CI	-At 8.4m: less silt, firm, dark brown		8	25.3		
9								675
10		CI	-At 9.9m: moist, soft, brownish grey		6	32.3		674
11								673
		CI	-At 11.4m: moist, soft, brownish grey		5	32.8		
12								672
13		CI	-At 13.0m: trace till features, soft, moist		10	21.4		671
14								670
			14.5 m					
15		CI	**CLAY TILL** : silty, sandy, medium plastic, moist, soft, grey, trace coal and gravel		10	17		669
16		CI	-At 16.0m: sandy coal lens in SPT		20	18		668
17								

Well 1: 15.12 — Well 1: 669.08

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/31/13
Fig. No: 3	Page 1 of 3

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-03**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 684.2 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)	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	SLOTTED PIEZOMETER	Elevation (m)
17										667
18		CI	-At 17.5m: poor recovery		15	16.9				666
19		CI	-At 19.1m: rock at bottom of SPT		16	16.1				665
20										664
21		CI	-At 20.6m: silty, sandy, medium plastic, moist, soft, grey, trace coal and gravel		15	16.1				663
22		CI	-At 22.1m: very stiff, sand lens in SPT at 22.1m		41	11.6	-At 22.1m: trace water noted on bottom of SPT			662
23										661
24		CI	-At 23.6m: trace bedrock pieces; moist, fine grained sand seam within SPT at 23.6m		38	16.1				660
25		CI	-At 25.2m: very stiff		28	17.9				659
26										658
27		CI	-At 26.7m: very stiff		27	18.6				657
28		CI	-At 28.2m: sand lens within SPT		24	16				656
29										655
			29.7 m							
30		CS	**CLAYSHALE** : sandy, silty, high plastic, damp to moist, friable to hard, light grey		51	20.2				654
31										653
32		CS	-At 31.2m: sandy, silty, high plastic, damp to moist, friable to hard, light grey		78	15.9				652
			32.8 m							
33			**SANDSTONE** : clayey lens, coal stringers		27-39-50 for 4"	14.4	-End of testhole on Sept. 27, 2013. Continued with bedrock coring on Oct. 30, 2013.			651
34			-Below 33.7m: harder							

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/31/13
Fig. No: 3	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-03**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 684.2 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)	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	SLOTTED PIEZOMETER	Elevation (m)
34		SS					-At 33.8m: poor recovery of core sample			650
35			Well 2: 34.92							649
			35.4 m **CLAYSHALE** : soft, high plastic							
36			-Below 35.9m: sandier, medium hard, silty, sandy							648
37		CS	-Below 36.9m: silty, sandy with clayey lens							647
38			38.1 m **SANDSTONE** : clayey, medium hard							646
39		SS								645
			39.8 m **CLAYSHALE** : high plastic, medium hard							
40			-Below 40.0m: silt noduals, high plastic				-At 40.0m: poor recovery of core sample			644
41										643
42			-Below 41.5m: soft to hard, high plastic, black specs -Below 41.9m: softer, moister, possible failure zone							642
43		CS	-Between 42.0 and 42.7m: highly bentonitic or bentonite, moderately hard -Below 42.7m: burnt shale, dark brown, burnt shale ends at 43m							641
44			-Below 43.0m: moderately hard, dark grey, high plastic							640
45			-At 43.4m: approximately 0.15m thick hard, siltier layer -At 44.4m: coal seam, approximately 0.05m thick				-At 44.7m: poor to no recovery			639
46			**END OF TESTHOLE @ 45.7 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 20 m. Well 2: Slotted standpipe installed to 45.72 m.							638
47										637
48										636
49			**Well 1** : 10 day waterlevel reading: 15.18 m bgs. **Well 1** : 25 day waterlevel reading: 15.12 m bgs. **Well 1** : 53 day waterlevel reading: 15.30 m bgs. **Well 1** : 67 day waterlevel reading: 15.10 m bgs. **Well 2** : 6 day waterlevel reading: 35.10 m bgs.							635
50			**Well 2** : 19 day waterlevel reading: 35.60 m bgs. **Well 2** : 33 day waterlevel reading: 35.14 m bgs. **Well 1** : 104 day waterlevel reading: 15.12 m bgs.							634
51			**Well 2** : 70 day waterlevel reading: 34.92 m bgs.							

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/31/13
Fig. No: 3	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-04**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 683.8 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	Elevation (m)
0		OR	**TOPSOIL** : clayey, moist, black 200 mm					
1			**CLAY** : silty, medium to high plastic, damp to moist, stiff to very stiff, brown, trace rootlets and white inclusions		14	20.3, 21.4		683
2			-Below 1.8m: very silty, moist, stiff, light brown and grey mottled			21.3		682
			-Below 2.4m: trace oxides		10	24.2, 25		
3		CI-CH	-Below 2.7m: sandy, very moist			30.2		681
4			-Below 4.3m: moist		8	35.6, 36.4		680
5						21.5		679
			5.8 m		12	26.6, 19.2		
6			**CLAY** : very silty, sandy, low plastic, moist, soft to friable, brown			37.2		678
7		CL			12	21.5, 19.1		677
			7.9 m			36.7		
8		CI	**CLAY** : silty, medium plastic, very moist, firm, grey					676
			-Below 8.5m: very silty, wet 8.8 m		7	34.6		
9			**SILT** : clayey to very clayey, low plastic, very moist to wet, soft, grey			31		675
10			-Below 10.1m: sensitive		9	31, 30.9		674
11		ML				32.6		673
					11	32, 32		
12	Well 1: 13.04					30		672
13			-Below 12.7m: very clayey, soft to firm, trace coal			31.8, 20.5		671
			-At 13.0m: trace features in SPT 13.4 m		16			
14			**CLAY TILL** : silty, sandy, medium plastic, moist, firm to stiff, grey, trace coal and gravel			17.5		670
15					20	15.6, 17		669
						16.7		
16		CI				16.4, 16.5		668
					21			
17						15.8		667
18						15.3, 14.9		666
					27		Well 1: 670.76	

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

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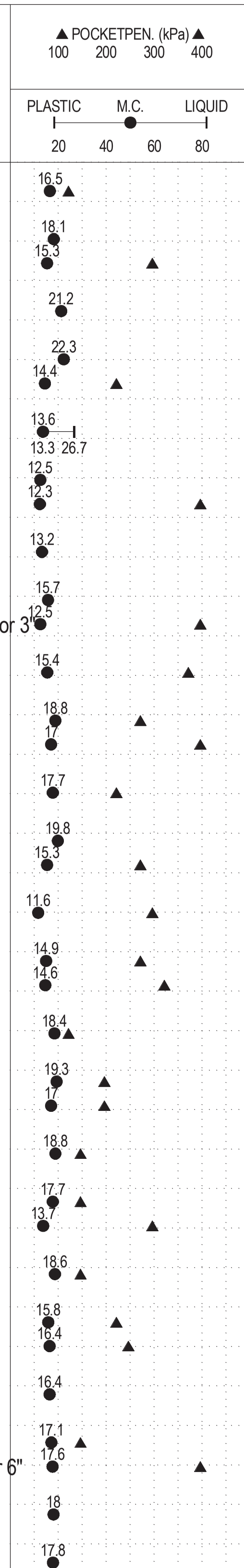
LOGGED BY: L Falk	COMPLETION DEPTH: 46.02 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/4/13
Fig. No: 4	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-04**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 683.8 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	SPT (N)	OTHER DATA
18.6 m	SA	**SAND** : clayey, medium grained, very moist, grey -At 19.1m: trace water noted on SPT -Below 19.5m: very moist to wet, trace coal	44	
20.6 m	CI	**CLAY TILL** : silty, sandy, medium plastic, moist, stiff, trace coal and gravel -Below 20.7m: very sandy -Below 22.1m: very stiff, approximately 1" thick sandy seam in SPT -At 23.8m: approximately 0.5m thick sand seam -Below 24.4m: trace sand pockets, free water noted on augers -Below 29.7m: trace bedrock and bentonite pieces -At 33.2m: approximately 0.6m thick bedrock seam, light brown, ground up on auger, friable	38, 69, 29-50-50 for 3", 71, 48, 79, 54, 49, 29	P.L. = 13.3 L.L. = 26.7 M.C. = 13.6 **Soluble Sulphates:** Negligible
34.3 m	CS	**CLAYSHALE** : soft to moderately hard, bentonitic	27-50 for 6"	



Well 2: 34.57

Well 2: 649.23

SLOTTED PIEZOMETER | SLOTTED PIEZOMETER | Elevation (m): 665, 664, 663, 662, 661, 660, 659, 658, 657, 656, 655, 654, 653, 652, 651, 650, 649, 648

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LOGGED BY: L Falk	COMPLETION DEPTH: 46.02 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/4/13
Fig. No: 4	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-04**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 683.8 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	SLOTTED PIEZOMETER	Elevation (m)
36			36.1 m ~~36.3 m~~ **-BELOW 36.1M** : sandy **SANDSTONE** : moderately hard, for approximately 0.6m clayshale lens within Sandstone		50 for 6"	164	-End of testhole on Sept. 30, 2013. Continued bedrock coring on Nov. 4, 2013.			
37										647
38										646
39		SS								645
40										644
41										643
			-At 41.3m: approximately 0.2m thick hard layer 41.9 m **CLAYSHALE** : moderately hard, slightly blocky, bentonitic, some soft layers							
42										642
43										641
44		CS								640
45			-At 44.7m: approximately 0.2m thick coal seam -Below 45.0m: slicken-sides, slightly blocky, bentonitic, moderately hard 45.6 m							639
46		SS	**SANDSTONE** : moderately hard, some clayshale layers **END OF TESTHOLE @ 46.0 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 20 m. Well 2: Slotted standpipe installed to 46 m.							638
47										637
48										636
49			**Well 1** : 7 day waterlevel reading: 17.63 m bgs. **Well 1** : 22 day waterlevel reading: 14.44 m bgs. **Well 1** : 28 day waterlevel reading: 13.45 m bgs. **Well 1** : 64 day waterlevel reading: 13.12 m bgs. **Well 2** : 1 day waterlevel reading: 28.70 m bgs. **Well 2** : 15 day waterlevel reading: 28.84 m bgs. **Well 2** : 29 day waterlevel reading: 32.98 m bgs. **Well 1** : 101 day waterlevel reading: 13.04 m bgs. **Well 2** : 66 day waterlevel reading: 34.57 m bgs.							635
50										634
51										633
52										632
53										631
54										630

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REVIEWED BY: R Evans	COMPLETION DATE: 11/4/13
Fig. No: 4	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-05**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.5 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)	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** : silty, damp, black 200 mm				684
		CLAY : silty, medium to high plastic, damp, brown		11.9, 20.4		
1		-Below 1.2m: sandy	11			683
				21.3		
2				22.3, 19.1		682
			21			
3	CI-CH			25.1		681
		-Below 3.1m: brown mottled grey				
		-Below 3.4m: moist, trace oxides		29.4, 30.5		
4		-Below 4.0m: silty to very silty	11			680
		-Below 4.3m: very silty, wet, soft to firm		36.5		
5				35.6		679
		5.8 m	12	24.4		
6		**SILT** : clayey to very clayey in seams, low plastic, moist, friable, brown		24.5		678
				34.2		
7		-Below 6.9m: very moist	12	28.5		677
		-At 7.3m: sandy		23.2		
8		-Below 7.9m: very moist, soft, trace sensitive		36.7		676
			8	29		
9	ML			33.6		675
		-Below 9.1m: very moist to wet				
10		-At 9.9m: very clayey		33.3, 35.6		674
		-Below 10.4m: grey	12			
11				32.6		673
				32.7		
12			11	30.5		672
				31.4		
13 (13.53)	CI-CH	-Below 12.5m: clayey to very silty clay, medium to high plastic, moist, firm, grey		31.3, 18, 25.2, 59	P.L. = 18.2 L.L. = 59.0 M.C. = 31.3 **Soluble Sulphates:** Moderate	671 (670.97)
		-Below 13.0m: trace till features	14			
		13.6 m				
14		**CLAY TILL** : silty, sandy, medium plastic, moist, firm to stiff, grey, trace coal and gravel		16.5		670
				16.3, 18.5		
15			13			669
				16.8		
16		-Below 15.7m: trace sand pockets		15.7, 15.2		668
			21			
17				16		

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 5/11/13
Fig. No: 5	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-05**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.5 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
17					16.1, 16.5		667
18				23			
19					16		666
20					15.3, 17.1		
	CI	-At 20.6m: sand pocket in SPT		22	14.6		665
21		-Below 21.3m: sandy to very sandy in seams, stiff to very stiff			14, 14.9		664
22				34	14.3		663
					13.8, 13.4		
23				42	14.1		662
24					15, 12.2		661
				71	14.4		
25					18.3, 18.2		660
26		-Below 25.8m: trace bedrock pieces		34	19.4		659
27					18, 23.2		658
				33			
		27.6 m			20.8		657
28		-Below 27.6m: bedrock intermixed with till, silty, sandy, moist, high plastic, light grey, stiff, ground up on auger			21.7, 20.6		
29				30	19.9 (14 – 62.3)	P.L. = 14.0 L.L. = 62.3 M.C. = 19.9 **Soluble Sulphates:** Negligible	656
	CH				17.6, 19.2		655
30		-Below 30.2m: less bedrock		33	19		
31		-Below 30.8m: bedrock intermixed with till -Below 31.1m: trace bentonite pieces			21, 18.3		654
		-At 31.2m: sand lens in SPT 31.7 m		23			653
32		**CLAYSHALE** : silty, high plastic, moist, friable, light grey, ground up on augers			18.4		
					19, 18.7		652
33	CS	-At 32.8m: slightly bentonitic at bottom of SPT, difficult drilling		3-50 for 6"			
		-Below 33.5m: poor recovery, ground up on			15.4		651
34							

SLOTTED PIEZOMETER | SLOTTED PIEZOMETER

Well 2: 23.81 m

Well 2: 660.69 m

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/5/13
Fig. No: 5	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-05**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 684.5 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	SLOTTED PIEZOMETER	Elevation (m)
34			augers			20.2				650
			34.4 m			17				
			CLAYSHALE : moderately hard, bentonitic		9-50 for 6"		-End of testhole on Oct. 2, 2013. Continued with bedrock coring on Nov. 4, 2013.			
35		CS								649
			-At 35.5m: approximately 0.3m thick soft layer							
36			-Below 35.8m: soft to moderately hard 36.1 m							648
			SANDSTONE : moderately hard, odd soft lens							
37										647
38										
										646
39		SS								
40										645
41										644
42			42.0 m							643
			CLAYSHALE : top 4" soft, below 4" moderately hard to hard, bentonitic							
43		CS								642
			43.4 m							
			SANDSTONE : moderately hard							641
44										
		SS								640
45										
										639
			-Below 45.7m: hard							
46			**END OF TESTHOLE @ 45.7 m.** No water and no slough on completion of testhole.							638
			Well 1: Slotted standpipe installed to 20 m.							
47			Well 2: Slotted standpipe installed to 45.7 m.							637
48										
			Well 1 : 5 day waterlevel reading: 17.07 m bgs.							636
			Well 1 : 20 day waterlevel reading: 14.46 m bgs.							
49			**Well 1** : 48 day waterlevel reading: 13.65 m bgs.							635
			Well 1 : 62 day waterlevel reading: 13.06 m bgs.							
50			**Well 1** : 99 day waterlevel reading: 13.53 m bgs.							634
			Well 2 : 65 day waterlevel reading: 23.81 m bgs.							
51										

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/5/13
Fig. No: 5	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-06**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 682.4 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	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					682
1			**CLAY** : silty, medium to high plastic, moist, stiff, brown		17	22.4, 20.9		
			-Below 0.8m: trace white residue					
			-Below 1.2m: moist, friable to stiff			24.4, 21.6, 55.7	P.L. = 21.6 L.L. = 55.7 M.C. = 24.4	681
2			-Below 1.8m: sandy			30.8, 23.2	**Soluble Sulphates:** Negligible	
			-Below 2.3m: brown mottled grey, trace oxides, very moist		16			680
3		CI-CH				33.7		
			-Below 3.4m: silty to very silty, moist to very moist, trace coal			32.6, 25.3		679
4							**Shelby Tube:** QU: N/A DD: N/A MC: 25.3 %	
			-Below 4.3m: slightly friable			24.4		678
5						32.9		
			5.8 m		16	30.9	-At 3.8m: shelby tube was attempted but sample was to friable for QU	677
6			**CLAY** : silty to very silty, sandy, medium plastic, very moist, friable, brown			22.7		
						36.1, 35.4		676
7		CI			11			
			-Below 7.3m: light and dark brown			33.3		675
8						33.6, 32.6		
			8.7 m		10			674
9			**SILT** : sandy, clayey in seams, low plastic, very moist to wet, soft, brown			35.5		
		ML	-Below 9.5m: wet, trace sensitive			34.8, 32		673
10					13			
			10.5 m			32.3		672
11			**CLAY** : very silty, sandy, low to medium plastic, very moist, soft to firm, brown mottled grey			31.7, 31.7		
		CL-CH	-Below 11.0m: trace till features		11			671
12			-Below 11.9m: grey 12.2 m			22.1		
			CLAY TILL : silty, sandy, medium plastic, moist, firm to stiff, grey, trace coal and gravel			16.8, 15.9		670
13					23			
						15.3		669
14	14.7					14.8, 16.9		667.70
15		CI			22			668
						14.9		
16						15.3, 15.1		667
					19			
17						15.7		666
			-Below 17.1m: trace bedrock and sand pockets 17.8 m			15, 14.7		
18		SA	**SAND** : clayey, fine to medium grained, very moist, grey, trace gravel 18.4 m		29	17.8		665
			CLAY TILL : silty, sandy, medium plastic, moist, stiff, grey, trace coal and gravel			15.1, 16.5		
19					34			664
			-At 19.1m: free water noted on auger, rock and sand in SPT			13.8		
20								663

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LOGGED BY: L Falk	COMPLETION DEPTH: 48.77 m
REVIEWED BY: R Evans	COMPLETION DATE: 2/11/13
Fig. No: 6	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-06**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 682.4 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	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	SLOTTED PIEZOMETER	Elevation (m)
20			-At 19.2m: approximately 0.3m thick sand seam			14.7				662
21		CI	-Below 19.5m: very sandy in seams, trace sand pockets		67	13.9				661
22			-At 20.4m: approximately 0.15m thick sand seam			15.1				660
23			-Below 22.6m: very sandy, friable		57	14.3 12.6				659
24			-At 23.6m: sand seam in SPT		70	14.6				658
			24.5 m			14.1 14.3				
25		SA	**SAND** : clayey, fine to medium grained, dense, moist to very moist, grey		30-50 for 5"	14.9 21.3 17.4	**Sieve Analysis** Gravel: 0.5 % Sand: 54 % Fines: 45.5 %			657
26			-At 25.9m: no recovery on auger							656
			26.7 m							
27		CI	**CLAY TILL** : silty, very sandy, medium plastic, moist to very moist, friable to firm, grey, trace coal and gravel, spun up on augers		21-50 for 5"	12.7				655
28			-Below 28m: difficult drilling			17.8 15.1				654
		SA	28.2 m **SAND** : clayey, fined to medium grained, very moist to wet, grey, trace gravel		13-50 for 5"	16.7				
29		CI	28.8 m **CLAY TILL** : silty, very sandy, medium plastic, moist to very moist, friable to firm, grey, trace coal and gravel			15.3				653
			29.7 m			17				
30		SA	**SAND** : clayey, fined to medium grained, wet, grey, trace gravel		21-50 for 6"	17.9				652
			30.5 m			26.7				
31		CI	**CLAY TILL** : silty, very sandy, medium plastic, trace dark grey and olive bedrock pieces			20.6				651
32										650
			32.8 m							
33		BR	**BEDROCK** : silty, high plastic		43	27				649
34										648
35										647
36										646
			36.9 m							
37		CI	**CLAY TILL** : silty, sandy, medium plastic, trace gravel							645
38										644
			38.4 m							
39			**CLAYSHALE** : moderately hard, bentonitic -Below 39.0m: fractured							643
40										

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LOGGED BY: L Falk	COMPLETION DEPTH: 48.77 m
REVIEWED BY: R Evans	COMPLETION DATE: 2/11/13
Fig. No: 6	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-06**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid/Hollow Stem/Coring	ELEVATION: 682.4 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	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	SLOTTED PIEZOMETER	Elevation (m)
40		CS								642
41			-At 41.2m: slicken-sided							641
			41.9 m							
42			**SANDSTONE** : moderately hard, clayey -Below 42.0m: moderately hard to hard							640
43		SS								639
44										638
			-Below 44.5m: soft to moderately hard 44.8 m							
45		CS	**CLAYSHALE** : soft at transition, moderately hard to hard							637
			45.9 m							
46		SS	**SANDSTONE** : moderately hard							636
			46.4 m							
		CS	**CLAYSHALE** : hard, bentonitic 46.7 m							
47		SS	**SANDSTONE** : clay laminations, moderately hard 47.2 m							635
48		CS	**CLAYSHALE** : moderately hard to hard, bentonitic -At 47.6m: slicken-sides							634
49			**END OF TESTHOLE @ 48.8 m.** 0.6 m of water and 10.67 m of slough on completion of testhole. Slotted standpipe installed to 20.12 m. 14 day waterlevel reading: 17.25 m bgs. 28 day waterlevel reading: 16.52 m bgs. 42 day waterlevel reading: 15.97 m bgs. 55 day waterlevel reading: 15.4 m bgs. 93 day waterlevel reading: 14.7 m bgs. 68 day waterlevel reading: 25.93 m bgs.							633
50										632
51										631
52										630
53										629
54										628
55										627
56										626
57										625
58										624
59										623
60										

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LOGGED BY: L Falk	COMPLETION DEPTH: 48.77 m
REVIEWED BY: R Evans	COMPLETION DATE: 2/11/13
Fig. No: 6	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-07**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 673 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)	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** : clayey, black, damp				
		900 mm				
1		**CLAY** : silty, sandy, low to medium plastic, damp, friable, light brown	5	20.1, 18.3		672
2		Below 1.8m: damp to moist		15.5		
		-Below 2.4m: moist, brown mottled grey, trace oxides	12	17.4, 31.5		671
3	CL-CI	-Below 2.7m: silty to very silty, trace white residue		32.6	-At 3.8m: shelby tube was attempted but was too friable for QU	670
4		-Below 4.3m: soft		21.3, 26	**Shelby Tube:** QU: N/A DD: N/A MC: 26.0 %	669
5		-Below 5.0m: very moist		26		668
		5.9 m	4	36.9, 19.5 33.3 43	P.L. = 19.5 L.L. = 43.0 M.C. = 36.9 **Soluble Sulphates:** Negligible	
6	CI-CH	**CLAY** : silty, medium to high plastic, very moist, stiff, grey mottled brown, trace coal and oxides		35		667
		7.0 m		33		
7		**SILT** : clayey, low plastic, very moist, soft, dark brown	9	33.7		666
8	ML			33.5		665
				35.3, 33.5		
9		-Below 8.9m: very clayey, grey	12			664
		-Below 9.3m: trace till features		30.3		
		9.8 m				
10		**CLAY TILL** : silty, sandy, medium plastic, moist, firm to stiff, grey, trace coal and gravel	15	21.2, 17		663
11		11.49		16.1		662
		-Below 11.0m: trace sand pockets and lens		16.9, 15.2		
12	CI		18	15.6		661
13				16.6, 16		660
			22			
14				15.4		659
				16.1, 15.9		
15		15.1 m	22			658
		SAND : clayey, very moist to wet, fine to medium grained, grey		21.1		
16	SA			21.4, 22.3		657
		16.6 m	23			
17		**CLAY TILL** : silty, sandy, medium plastic,		15.4		

THERMISTOR STRING

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 7/11/13
Fig. No: 7	Page 1 of 3

CLIENT: Stantec Consulting Ltd | DRILL METHOD: Solid Stem Auger/Coring | ELEVATION: 673 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	SPT (N)	M.C. (%)	OTHER DATA	Elevation (m)
17	CI	moist, stiff, grey, trace coal, gravel, sand pockets and lens, free water noted on auger	14	15.1, 18.1		
18				16.1		655
19			24	16.6, 18.6		654
20				20.6		653
21			24	18.7, 21.8		652
22				20.7		651
22			16	22.7, 20.9		
23				22.4		650
24			18	24, 18.6		649
25				20		648
25			44	28, 21.8		
26				21		647
27			32	19.4, 19.1	-End of testhole on Oct. 9, 2013. Continued with SPT's and bedrock coring on Nov.5, 2013.	646
28	BR	28.7 m	21-50 for 4"	19.2		645
29		**CLAYSHALE** : soft, moist, bentonitic -Below 29.0m: no longer bentonitic, soft to moderately hard, slightly blocky -At 29.4m: soft, moist layer				644
30						643
31		-Below 31.1m: slightly blocky, slicken sides 31.4 m				642
32		**SANDSTONE** : moderately hard				641
33		-Below 33.2m: hard				640
34						

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

Well 2: 32.10 | Well 2: 640.9

Columns: SOIL SYMBOL, SAMPLE TYPE, SLOTTED PIEZOMETER, THERMISTOR STRING

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LOGGED BY: L Falk | COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans | COMPLETION DATE: 11/7/13
Fig. No: 7

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-07**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 673 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 THERMISTOR STRING	Elevation (m)
34			-Below 34.1m: moderately hard to hard						
			34.6 m						
35			**CLAYSHALE** : moist, bentonitic, soft for approximately 3"						638
			-Below 34.7m: hard						
			-Below 35.1m: moderately hard to hard with odd soft lens, bentonitic (35.7 m – 36.0 m)						
36			-Below 35.4m: moderately hard						637
			SANDSTONE : moderately hard to hard						
37			**CLAYSHALE** : moderately hard to hard						636
			-At 36.1m: coal lens approximately 5" thick						
			-Below 36.3m: moderately hard						
38			-Below 36.6m: bentonitic						635
			-At 36.8m: soft, moist, blocky, disturbed lens, approximately 6" thick						
39			-Below 37.3m: some soft, moist zones, soft to moderately hard in general, still bentonitic						634
			-Below 38.1m: moderately hard to hard						
40			-At 38.2m: slicken-sided						633
			-At 38.9m: coal seam, approximately 4" thick						
			-From 39.0 to 39.6m: soft lens, odd bentonite seam						
41			-Below 39.6m: moderately hard to hard, bentonitic						632
			-At 40.0m: soft, moist lens						
42			-At 40.5m: soft, moist lens						631
			-Below 41.2m: moderately hard, bentonitic						
			-At 41.8m: soft, moist lens						
43			-Below 42.7m: bentonitic, moderately hard						630
			-At 43m: approximately 0.25m thick, moist, soft lens						
44			-At 43.4m: soft moist lenses till 43.6m						629
			-At 43.8m: moist, soft lens			100.1			
			-Below 44.2m: moderately hard						
45			-At 44.4m: moist, soft lens						628
			-At 45.0m: moist, soft lens						
46			**END OF TESTHOLE @ 45.7 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 17.68 m. Well 2: Slotted standpipe installed to 0 m.						627
47									626
48									625
49			**Well 1** : 13 day waterlevel reading: 15.76 m bgs. **Well 1** : 35 day waterlevel reading: 15.38 m bgs. **Well 1** : 41 day waterlevel reading: 14.75 m bgs. **Well 1** : 54 day waterlevel reading: 13.17 m bgs. **Well 2** : 12 day waterlevel reading: 29.57 m bgs. **Well 2** : 26 day waterlevel reading: 31.20 m bgs. **Well 1** : 92 day waterlevel reading: 11.49 m bgs. **Well 2** : 63 day waterlevel reading: 32.10 m bgs.						624
50									623
51									

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/7/13
Fig. No: 7	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-08**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 678.5 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)	POCKET PEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0		OR	**TOPSOIL** 450 mm					678
1			**CLAY** : silty, low to medium plastic, damp, friable, brown, trace rootlets to approximately 0.6m		4	15.8, 17.2		
2			-Below 1.2m: silty to very silty, sandy, very moist, firm to stiff			30.1		677
3			-Below 2.7m: soft to firm		5	33.8, 36.3, 27.6		676
4		CL-CI	-Below 3.7m: trace oxides, moist to very moist		11	34.9, 23.3		675
5			-Below 4.4m: trace white residue -Below 4.7m: brown mottled grey			26.9		674
6					14	19.7, 18.5, 27.6	-At 6.9m: shelby tube was attempted but was to friable for QU **Shelby Tube:** QU: N/A DD: N/A MC: 24.4 %	673
7			7.5 m			31.1, 24.4		672
8			**CLAY** : silty, high plastic, moist, stiff, grey mottled brown, trace oxides and coal, high plastic in seams			31.3, 27.8, 23.2, 16.5, 57.5	P.L. = 16.5 L.L. = 57.5 M.C. = 27.8 **Soluble Sulphates:** Moderate	671
9		CH	-Below 8.84m: sandy to very sandy in seams, trace sand lens and pockets		19	19.2		670
10			-Below 9.5m: trace gravel, till like 10.1 m			18.8, 21.3		669
11			**CLAY TILL** : silty, sandy, medium plastic, moist, stiff, brownish grey, trace coal, oxides, gravel and sand pockets		26	17		668
12			-Below 11.9m: brown mottled grey		30	16.1, 16.6		667
13			-At 12.5m: ground up on auger, trace white crystal and medium grained sand particles			17.8, 13.6, 34.9	P.L. = 13.6 L.L. = 34.9 M.C. = 17.8 **Soluble Sulphates:** Moderate	666
14			-Below 13.7m: difficult drilling, testhole was tight		31	16.2, 15.9, 15.4		665
15					26	16.1, 14.8, 15.6		664
16			-Below 15.5m: grey		29	15.2, 13.8, 14.8	-At 15.5m: ground up on auger	663
17					35	15.6, 14	-At 17.1m: ground up on auger	662
18			-Below 17.4m: very stiff			13.3	-At 18.3m: ground up on auger	661
19		CI	-Below 18.8m: very sandy		55	13.2, 13.5		660
20			-At 19.1m: approximately 1" sand seam in SPT			15.8		659

Well 1: 7.70

Well 1: 670.80

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LOGGED BY: L Falk	COMPLETION DEPTH: 67.06 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/5/13
Fig. No: 8	Page 1 of 4

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-08**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 678.5 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	SLOTTED PIEZOMETER	Elevation (m)
20			-Below 19.5m: trace to some sand lens in till			14.7				658
21			-At 19.8m: approximately 0.5m thick sand and till seam, fine to medium grained		33	17.3				
			-At 20.0m: free water noted on auger			15.8				657
22			-At 20.6m: approximately 5" thick sand seam in SPT			19.9				
			-Below 21.0m: trace sand lens		34	20.2				656
23			-At 22.1m: approximately 5" of sand in SPT, medium to coarse grained, moist to very moist, grey			16.2				
24			-At 23.6m: approximately 3" of sand in SPT		34	15.4 / 17.4				655
						18				654
25						18.7				
			-At 25.2m: approximately 6" of sand in SPT		17-25-50 for 5"	21				653
26						14.9				
			-At 26.2m: poor recovery on augers			15.8				652
27			27.1 m		17-33-50 for 5"	10.3				
			SAND : clayey to very clayey, fine grained, moist			14.2				651
28		SA	-Below 27.7m: poor recover, possible till intermixed 28.2 m		19-41-50 for 6"	15.6 / 12.6				650
29			**CLAY TILL** : silty, sandy to very sandy, medium plastic, moist, stiff, grey, trace coal, gravel, trace sand lens and pockets			15.9				
		CI				16.1				649
30			30.2 m		20-32-50 for 5"	16.9				
			CLAYSHALE : silty, high plastic, damp to moist, friable, ground up on augers			18.4				648
31			-Below 30.5m: high plastic, blocky, soft, bentonitic			20.9	-At 30.6m: start of bedrock coring, overlapped with original testhole			
					50 for 6"	18.3				647
32			-Below 30.8m: soft to moderately hard			12.2				
			-Below 31.7m: moderately hard, bentonitic, slightly blocky			15.5				646
33		CS	-At 32.9m: slicken-sides, blocky		50 for 6"	16.4 / 78.5				
						16.1				645
34						16				
					50 for 5"	17.8				644
35			35.0 m				-End of testhole on Oct. 10, 2013. Continued with bedrock coring on Nov. 5, 2013.			
			SANDSTONE : moderately hard							643
36		SS	-At 35.9m: clayshale lens, bentonitic							
			36.6 m							642
37			**CLAYSHALE** : moderately hard, bentonitic							
			-At 37.0m: slightly blocky till 37.3m							641
38		CS								
			-At 38.1m: approximately 0.2m thick coal seam 38.5 m							640
39		BEN	39.0 m **BENTONITE** : moderately hard			86.1				
			CLAYSHALE : bentonitic, moderately hard to hard							639
40										

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-08**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 678.5 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	SLOTTED PIEZOMETER	Elevation (m)
40		CS	-At 39.5m: 0.3 m thick more bentonitic lens -Below 39.8m: moderately hard, bentonitic							638
41			41.2 m							
42		SS	**SANDSTONE** : coal laminations, moderately hard 41.9 m							637
43			**CLAYSHALE** : moderately hard, sandy -Below 42.5m: bentonitic -Below 42.7m: moderately hard, sandy, bentonitic, waxy							636
44										635
45			-Below 44.2m: blocky, slicken-sides, soft to moderately hard, bentonitic -Below 44.9m: moderately hard, not blocky							634
46		CS								633
47			-Below 45.7m: slightly blocky, bentonitic, moderately hard -At 46.4m: approximately 0.2m thick highly bentonitic, soft to moderately hard seam			93.9				632
48			-Below 46.6m: bentonitic, soft to moderately hard -Below 47.4m: moderately hard, slightly blocky, bentonitic							631
49			-Below 47.6m: more bentonitic -Below 47.9m: slightly blocky, moderately hard, sandy, bentonitic 49.4 m							630
50		SS	**SANDSTONE** : some clayshale laminations and lens, moderately hard 50.5 m							629
51			**CLAYSHALE** : bentonitic, moderately hard, slightly blocky -At 51.2m: approximately 0.2m thick sandy seam							628
52										627
53			-At 53.1m: approximately 0.5m thick sandy seam							626
54			-Below 53.8m: more bentonitic -Below 54.1m: moderately hard to hard, bentonitic							625
55			-Below 55.2m: moderately hard, sandy							624
56		CS	At 55.8m: thin, moist, bentonite seam, less than 1" thick, bedrock is soft for 1" below bentonite							623
57			Below 55.9m: soft to moderately hard, non-sandy							622
58			-Below 56.2m: moderately hard, sandy, bentonitic							621
59			-At 57.3m: slicken-sides, slightly blocky, some coal lens -At 57.4m: higher bentonite content, soft to moderately hard, bentonite in portions							620
60										619

Well 2: 641.84

Well 2: 636.66

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LOGGED BY: L Falk | COMPLETION DEPTH: 67.06 m

REVIEWED BY: R Evans | COMPLETION DATE: 11/5/13

Fig. No: 8

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-08**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 678.5 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	SLOTTED PIEZOMETER	Elevation (m)
60			-Below 57.5m: bentonitic, moderately hard							618
61			-At 57.9m: soft, moist bentonite lens, less than 1"thick							617
			-Below 57.9m: bentonitic, moderately hard							
62			-At 58.7m: for approximately 0.15m, slicken-sides, coal seams							616
			62.0 m							
			-Below 58.7m: blocky							
63		SS	-Below 59.4m: slightly blocky, moderately hard, bentonitic							615
			-Below 61m: moderately hard to hard							
64		CS	63.8 m -Below 61.4m: moderately hard, slightly blocky, poor recovery							614
			64.0 m -Below 61.7m: moderately hard to hard, sandy							
65			**SANDSTONE** : moderately hard to hard							613
		SS	**CLAYSHALE** : moderately hard to hard, bentonitic							
66			**SANDSTONE** : hard							612
67			**END OF TESTHOLE @ 67.1 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 17.37 m. Well 2: Slotted standpipe installed to 67.06 m.							611
68										610
69										609
70			**Well 1** : 12 day waterlevel reading: Dry to 17.37 m bgs.							608
71			**Well 1** : 27 day waterlevel reading: Dry to 17.37 m bgs.							607
72			**Well 1** : 40 day waterlevel reading: Dry to 17.37 m bgs.							606
73			**Well 1** : 53 day waterlevel reading: 17.69 m bgs. **Well 1** : 91 day waterlevel reading: 7.70 m bgs. **Well 2** : 65 day waterlevel reading: 41.84 m bgs.							605
74										604
75										603
76										602
77										601
78										600
79										599
80										

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LOGGED BY: L Falk	COMPLETION DEPTH: 67.06 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/5/13
Fig. No: 8	Page 4 of 4

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-09**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 681.6 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	Elevation (m)
0		OR	**TOPSOIL** 100 mm					681
			CLAY : silty, low to medium plastic, damp, friable, light brown, mixed with topsoil and rootlets to approximately 0.6m			9.4		
1			-Below 0.8m: trace white inclusions		12	14.6		
			-Below 1.2m: sandy, moist			18.5		680
2			-At 2.0m: odd high plastic seam, dark brown mottled grey to 3.5m			20.4		
					17	19.2		679
3			-Below 2.7m: trace oxides			23.7		
			-Below 3.4m: sandy to very sandy, silty to very silty, damp to moist			16.3		678
4					15	13.8		
			-At 4.1m: light brown mottled light grey					
		CL-CI				13.8 (21.3 38.7)	P.L. = 21.3 L.L. = 38.7 M.C. = 13.8 **Soluble Sulphates:** Negligible	677
5						12.9		
					10	14.1		676
6						17.1		
						16.1		675
7					10	18.2		
			-Below 7.5m: moist			22		674
8						24.1		
			8.8 m		15	22.8		673
9			**CLAY** : silty to very silty, sandy, low plastic, very moist, soft to firm, dark brown, trace sensitive			31.8		
		CL				35.6		672
10			-Below 9.9m: very silty		13	31.2		
			-Below 10.4m: till like 10.5 m					671
			CLAY TILL : silty, sandy, medium plastic, moist, stiff, brown and grey, trace coal, gravel, clear crystal particles			26.2		
11			-Below 11.3m: grey			18.6		
					20	17.5		670
12								

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LOGGED BY: L Falk	COMPLETION DEPTH: 54.86 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/6/13
Fig. No: 9	Page 1 of 5

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-09**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 681.6 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	SLOTTED PIEZOMETER	Elevation (m)
12						15				
13					21	15.3, 14.6				669
14						15.5				668
15			-Below 15.1m: trace sand lens, bedrock pieces		22	16.2, 15.5				667
16						14.6, 15.5				666
17	Well 1: 17.59				21	14.8, 15			Well 1: 664.01	665
18					30	15.8, 14.4, 14.6				664
19					34	13.2, 14.1				663
20			-Below 19.5m: very stiff -Below 20.1 to 20.6m: sample ground up on augers			13.3, 13.5				662
21					30	12.1, 13.9				661
22		CI			42	14.7, 14.8				660
23						15.8				659
24					42	13.6, 14.2				658

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LOGGED BY: L Falk | COMPLETION DEPTH: 54.86 m
REVIEWED BY: R Evans | COMPLETION DATE: 11/6/13
Fig. No: 9

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-09**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 681.6 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	SLOTTED PIEZOMETER	Elevation (m)
24										
			-Between 24.5 and 25.2m: sample ground up on augers			13.8				657
25						12.5				
			-At 25.2m: trace free water noted on SPT		18-22-50 for 5"	13.2				656
			-Below 25.6m: very sandy, very moist to wet			18.5				
26										
			-Below 26.1m: sand and till intermixed, medium to coarse grained, wet			18.1				
27			-At 26.2m: poor recovery -Below 26.8m: clay till as before		56	19				655
						18.9				654
28						20.2				
					40	18.1				653
29			-Below 29.0m: some grey mottled brown areas -At 29.1m: poor to no recovery on augers			18.4				
						20.1				652
30					56	17.7				
						20.8				651
31						21.1				
					65	16.9				650
32						20.3				
			-Below 32.3m: trace bedrock -Below 32.6m: trace to moderate bedrock			29				649
			32.9 m							
33			**SANDSTONE** : sandy, silty, high plastic, damp to moist, fine grained, orange and light brown		25-50 for 6"	17.9				
						22.3				648
34		SS				23.2				
					35-48-50 for 4"	23.1				647
			34.8 m							
		CI	**CLAY TILL** : with bentonite, very moist, very stiff (soil consistency) 34.9 m							
35		SS	35.1 m			22.1				
		CI-CH	**SANDSTONE** : clayey, soft (bedrock consistency), moist							646
			35.7 m							
36			**CLAY TILL** : medium to high plastic, very stiff (soil consistency)			22.2				

Well 2: 26.97

Well 2: 654.63

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REVIEWED BY: R Evans	COMPLETION DATE: 11/6/13
Fig. No: 9	Page 3 of 5

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-09**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 681.6 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	SLOTTED PIEZOMETER	Elevation (m)
36			**CLAYSHALE** : soft, bentonitic		23-46-50 for 3"	23.7				
			-Below 36.2m: moderately hard, slightly fractured			26.9 89.3				645
37			-Below 36.3m: slightly blocky -Below 36.4m: bentonitic, moderately hard -At 36.7m: coal lens			24.7				
		CS	-Below 36.8m: moderately hard -Below 37.0m: soft to moderately hard		50 for 3"	20.5				644
38			-Below 38.1m: laminated, moderately hard, high plastic, waxy			23.6				
			-Below 38.7m: slightly blocky			26				643
39			-At 39.1m: soft to moderately hard		50 for 3"	18.5				
			-Below 39.2m: non-blocky, sandy, moderately hard				-End of testhole on Oct. 11, 2013. Continued with bedrock coring on Nov. 6, 2013.			642
			39.6 m **SANDSTONE** : moderately hard							
40										641
41		SS	-Below 41.0m: hard, more sandy, 1" clayshale layer above hard layer, soft to moderately hard, moist							
42			42.3 m							640
			CLAYSHALE : soft to moderately hard, odd slicken-side, slightly blocky, high plastic -Below 42.7m: moderately hard							639
43										
			-Below 43.4m: soft to moderately hard, still slightly blocky							638
44										
			-Below 44.2m: moderately hard -Below 44.4m: soft to moderately hard, slightly blocky							637
45										
			-Below 45.1: slicken-sides, soft to moderately hard							
		CS				14.4 83.2				636
46										
			46.7 m							635
			-BELOW 46.7M : moderately hard, high plastic							
47			-Below 47.4m: soft to moderately hard							
										634
48										

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REVIEWED BY: R Evans | COMPLETION DATE: 11/6/13

Fig. No: 9

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-09**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger/Coring	ELEVATION: 681.6 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	SLOTTED PIEZOMETER	Elevation (m)
48			-At 47.9m: approximately 0.1m thick coal seam -Below 48.0m: clayshale, high plastic, moderately hard							633
49		SS	-At 48.2m: approximately 0.2m thick possible bentonite seam, moderately hard, slightly blocky (49.1 m – 49.5 m) -Below 48.4m: clayshale as above -Below 48.8m: clayshale, high plastic, slightly blocky							632
50			**SANDSTONE** : clayey, moderately hard							
51		CS	**CLAYSHALE** : moderately hard, high plastic, slightly blocky -At 49.9m: approximately 0.1m thick hard seam -Below 50.3m: moderately hard, slightly blocky, slicken-sides -Below 50.7m: soft to moderately hard			16.4 / 21.1 — 100	P.L. = 21.1 L.L. = 100.0 M.C. = 16.4			631
52		BEN	-Below 51.1m: moderately hard, slightly blocky (52.0 m – 52.3 m) -At 51.7m: bentonite mixed in -Below 51.8m: clayshale, slicken-sides, moderately hard, high plastic							630
53			**BENTONITE** : moderately hard, slightly blocky							629
54		CS	**CLAYSHALE** : high plastic, moderately hard, slicken-sides -At 52.8m: possible 0.2m thick bentonite seam, moderately hard, some sand -Below 53.0m: clayshale, moderately hard, high plastic							628
55			-Below 53.3m: some sand, moderately hard to hard -At 53.6m: fracture -Below 54.6m: moderately hard							627
56			**END OF TESTHOLE @ 54.9 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 18.3 m. Well 2: Slotted standpipe installed to 54.86 m.							626
57			**Well 1** : 11 day waterlevel reading: Dry to 18.3 m bgs. **Well 1** : 33 day waterlevel reading: 16.92 m bgs. **Well 1** : 40 day waterlevel reading: Dry to 18.3 m bgs. **Well 1** : 52 day waterlevel reading: 18.30 m bgs. **Well 1** : 90 day waterlevel reading: 17.59 m bgs. **Well 2** : 64 day waterlevel reading: 26.97 m bgs.				-Well 1: 52 day reading, trace water in well at 18.3m			625
58										624
59										623
60										622

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LOGGED BY: L Falk | COMPLETION DEPTH: 54.86 m

REVIEWED BY: R Evans | COMPLETION DATE: 11/6/13

Fig. No: 9

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-10**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 683.1 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)	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	Elevation (m)
0			750 mm					
1		ML	**SILT** : sandy, low plastic, damp, friable, brown		17	11.7		682
2		ML	-At 2.3m: trace oxides		16	17.1		681
3								680
4		CI	3.8 m **CLAY** : very silty, medium plastic, very moist, stiff, brown, trace coal and oxides		9	32.1		679
5								678
6		ML	5.3 m **SILT** : sandy to very sandy, clayey to very clayey, low plastic, moist, friable, brown		12	23.4		677
7		ML	-At 6.9 sandy to very sandy, clayey to very clayey, low plastic, moist, friable, brown		14	26.4		676
8								675
9		CI	8.4 m **CLAY** : silty, medium plastic, very moist, stiff, dark brown, trace coal		8	31.3		674
10		CI	-At 9.9m: firm to stiff		7	33.2		673
11								672
12		CI	11.4 m **CLAY TILL** : silty, sandy, medium plastic, moist, stiff, grey, trace coal and gravel		18	18.7		671
13		CI	-At 13.0m: silty, sandy, medium plastic, moist, stiff, grey, trace coal and gravel		18	16.3	Well 1: 13.59 / Well 1: 669.51	670
14								669
15		CI	-At 14.5m: silty, sandy, medium plastic, moist, stiff, grey, trace coal and gravel		14	14.7		668
16		CI	-At 16.0m: approximately 2" thick damp brown sandy seam in SPT		18	15.4	Well 2: 16.94 / Well 2: 666.16	667
17								666
18		CI	-At 17.5: silty, sandy, medium plastic, moist, stiff, grey, trace coal and gravel		16	14.8		665
19		CI	-At 19.1m: approximately 1" thick sand seam in SPT		19	14.5		664
20								

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REVIEWED BY: R Evans	COMPLETION DATE: 11/13/13
Fig. No: 10	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-10**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 683.1 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)	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	SLOTTED PIEZOMETER	Elevation (m)
20										
21		CI	-At 20.6m: approximately 3" thick sand seam in SPT, free water noted on SPT		24	17.9				662
22		CI	-At 22.1m: very stiff		24	14.7				661
23										660
24		CI	-At 23.6m: some very sandy seams		24	13.7				659
25		CI	-At 25.2m: silty, sandy, medium plastic, moist, very stiff, trace coal and gravel		26	14.1				658
26										657
27		CI	-At 26.7m: silty, sandy, medium plastic, moist, very stiff, trace coal and gravel		26	15.4				656
28		CI	-At 28.2m: possible rock in SPT		31	18.2				655
29										654
30		CI	-At 29.7m: silty, sandy, medium plastic, moist, very stiff, trace coal and gravel		30	18.2				653
31										652
32		CI	-At 31.2m: silty, sandy, medium plastic, moist, very stiff, trace coal and gravel		24	18.9 (12.9 – 49)	P.L. = 12.9 L.L. = 49.0 M.C. = 18.9 **Soluble Sulphates:** Negligible			651
33		CS	32.6 m **CLAYSHALE** : soft, moist, occasional coal piece, slightly blocky, high plastic		50 for 6"	13.9	-Overlap of core samples and SPT from 32.8m to 36.3m			650
34			-Below 33.8m: soft to moderately hard, some sandy portions -Below 34.1m: hard		50 for 6"	13.9				649
35			34.8 m **SANDSTONE** : moderately hard, intact, consistent							648
36		SS	-Below 35.4m: moderately hard		50 for 6"	13.2	-End of testhole on Sept. 26, 2013. Continued with bedrock coring on Nov. 13, 2013			647
37										646
38			38.3 m							645
39			**CLAYSHALE** : burnt, high plastic, soft to moderately hard, slightly blocky, moist -Below 38.4m: moderately hard, slightly fractured, odd coal piece, high plastic							644
40										

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-10**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 683.1 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)	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	SLOTTED PIEZOMETER	Elevation (m)
40		CS	-Below 39.9m: one slicken-sided surface seam							
41			-Below 40.4m: slightly weaker seam, brakes apart easily when handled			17 (23.5 / 126)	P.L. = 23.5 L.L. = 126.0 M.C. = 17.0 **Soluble Sulphates:** Negligible			642
42										641
			42.7 m							
43		SS	**SANDSTONE** : clayey with shale portions, moderately hard, no fractures							640
			43.5 m -Below 43.0m: coal and clay stringers							
44			**CLAYSHALE** : high plastic, soft to moderately hard, some fractures							639
45			-Below 44.5m: burnt, soft to moderately hard, some fractures, high plastic							638
			-At 45.1m: odd coal lens							
46			-Below 45.8m: sandy to 46.7m							637
47			-Below 46.7m: some fractures, soft to moderately hard, high plastic							636
48			-Below 48.1m: breaks apart into pieces							635
49		CS	-Below 49.1m: some fractures, soft to moderately hard			16 (18.3 / 112.2)	P.L. = 18.3 L.L. = 112.2 M.C. = 16.0 **Soluble Sulphates:** Negligible			634
50			-Below 49.3m: possibly bentonitic							633
			-At 49.5m: slicken-sided surface							
51			-Below 49.8m: breaks apart when handled, clayshale, soft to moderately hard							632
			-At 50.6m: approximately 0.4m thick sandy portion							
52			-Below 51m: some fractures, high plastic shale							631
53			-Below 52.1m: sandy, moderately hard, odd fractures							630
			-Below 53.4m: some fractures							
54			-Below 53.6m: odd fractures							629
55			**END OF TESTHOLE @ 54.9 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 22.4 m. Well 2: Slotted standpipe installed to 54.86 m.							628
56										627
57										626
58			**Well 1** : 11 day waterlevel reading: 15.03 m bgs.							625
			Well 1 : 26 day waterlevel reading: 14.10 m bgs.							
59			**Well 1** : 54 day waterlevel reading: 13.50 m bgs.							624
			Well 1 : 71 day waterlevel reading: 13.28 m bgs.							
60			**Well 1** : 108 day waterlevel reading: 13.59 m bgs. **Well 2** : 57 day waterlevel reading: 16.94 m bgs.							

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REVIEWED BY: R Evans	COMPLETION DATE: 11/13/13
Fig. No: 10	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-11**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 680.1 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)	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	Elevation (m)
0			750 mm					680
1		CL-CI	**CLAY** : silty, low to medium plastic, damp, stiff, brown		25	16.4		679
2								678
3		CL-CI	-At 2.3m: trace oxides		10	32.8		677
4		CL-CI	-At 3.8m: very silty, very moist to wet, firm		6	38		676
5			5.3 m					675
6		ML	**SILT** : clayey, low plastic, wet, soft to very soft, brown, trace oxides		3	37.4		674
7		ML	-At 6.9m: dark brown, slightly sensitive		5	36		673
8			8.4 m					672
9		CI	**CLAY** : very silty, medium plastic, moist to very moist, stiff, dark brown, trace oxides		12	30.9		671
10		CI	-At 9.9m: very silty, medium plastic, moist to very moist, stiff, dark brown, trace oxides		10	29.9		670
11								669
12		CI	-At 11.4m: silty to very silty, moist, grey, trace coal		7	21.3		668
13			13.0 m					667
14		CI	**CLAY TILL** : silty, sandy, medium plastic, moist, very stiff, grey, trace coal and gravel		20	12.5		666
15		CI	-At 14.5m: free water noted on SPT, sand and gravel, coarse grained, wet, grey, some gravel, till at bottom of SPT		22	15.3		665
16		CI	-At 16.0m: trace bedrock pieces		24	13.9		664
17								

Well 1: 5.26

Well 1: 674.84

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LOGGED BY: L Falk	COMPLETION DEPTH: 45.72 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/8/13
Fig. No: 11	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3 | PROJECT NO: 6004-32 | BOREHOLE NO: **2013-11**

CLIENT: Stantec Consulting Ltd | DRILL METHOD: Hollow Stem Auger/Coring | ELEVATION: 680.1 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)	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	M.C. / POCKETPEN.	OTHER DATA	Elevation (m)
17.5		-At 17.5m: no recovery in SPT	SPT	38			
19.1	CI	-At 19.1m: sand seam in SPT, medium to coarse grained, wet, some gravel, grey	SPT	14	17.5		
20.6	CI	-At 20.6m: silty, sandy, medium plastic, moist, very stiff, grey, trace coal, gravel and bedrock pieces	SPT	42	18.5		
22.1	CI	-At 22.1m: silty, sandy, medium plastic, moist, very stiff, grey, trace coal, gravel and bedrock pieces	SPT	29	15.3		
23.6	CI	-At 23.6m: silty, sandy, medium plastic, moist, very stiff, grey, trace coal, gravel and bedrock pieces	SPT	28	15 (13.2 – 34.6)	P.L. = 13.2 L.L. = 34.6 M.C. = 15.0 **Soluble Sulphates:** Negligible	
25.2	CI	-At 25.2m: rock at bottom of SPT	SPT	24	17.6		
26.7	CI	-At 26.7m: trace oxides, rock in SPT	SPT	45	16.9		
28.2	CI	-At 28.2m: silty, sandy, medium plastic, moist, very stiff, grey, trace coal, oxides, gravel and bedrock pieces	SPT	28	16.8		
29.7	CI	-At 29.7m: silty, sandy, medium plastic, moist, very stiff, grey, trace coal, oxides, gravel and bedrock pieces	SPT	28	18.5		
31.2	CI	-At 31.2m: poor recovery in SPT	SPT	74	23.8		
32.8	CI	-At 32.8m: poor recovery in SPT	SPT	24	21		

Well 2: 22.59 | Well 2: 657.51

SLOTTED PIEZOMETER | SLOTTED PIEZOMETER

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LOGGED BY: L Falk | COMPLETION DEPTH: 45.72 m

REVIEWED BY: R Evans | COMPLETION DATE: 11/8/13

Fig. No: 11

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-11**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 680.1 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)	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	SLOTTED PIEZOMETER	Elevation (m)
34			34.3 m							646
35		CS	**CLAYSHALE** : silty, sandy, high plastic, damp to moist, very stiff to hard, light grey		31-83 for 6"	16.4 ▲				645
36		CS	-Below 35.8m: hard, dark grey		31-40 for 3"	15.5 ▲				644
37		CS BEN	36.6 m **CLAYSHALE** : soft to moderately hard, high plastic 37.0 m **BENTONITE** : soft to moderately hard 37.3 m				-Start of coring			643
38		CS	**CLAYSHALE** : moderately hard, high plastic -Below 37.7m: bentonitic, moderately hard to hard		20-41 for 6"	17.4 ▲	-End of testhole on Sept. 13, 2013. Continued with bedrock coring on Nov. 7, 2013.			642
39		SS	38.6 m -At 38.5m: soft bentonite layer, very moist, approximately 2" thick **SANDSTONE** : clayey, moderately hard, clayshale lens and layers			108.2				641
40		BEN	40.2 m **BENTONITE** : poor recovery of bentonite, soft to moderately hard 40.4 m							640
41		CS	**CLAYSHALE** : moderately hard -Below 40.6m: fractured, coal pieces -At 40.8m: approximately 0.15m of burnt shale 41.7 m							639
42		BEN	-Below 41.2m: slightly blocky, high plastic, soft for 0.2m 42.3 m -Below 41.4m: moderately hard **BENTONITE** : soft to moderately hard							638
43		CS	**CLAYSHALE** : moderately hard to hard, high plastic -Below 42.7m: hard, laminated -Below 43.4m: some fractures, approximately 0.4m moister lens							637
44			-Below 44.2m: sandstone lens, layered							636
45			-At 44.7m: bentonite lens, moist, soft to moderately hard, approximately 2" thick							635
46			**END OF TESTHOLE @ 45.7 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 23 m. Well 2: Slotted standpipe installed to 45.72 m.							634
47										633
48										632
49			**Well 1** : 14 day waterlevel reading: 5.15 m bgs. **Well 1** : 29 day waterlevel reading: 5.20 m bgs. **Well 1** : 57 day waterlevel reading: 5.10 m bgs. **Well 1** : 71 day waterlevel reading: 5.12 m bgs. **Well 1** : 108 day waterlevel reading: 5.26 m bgs. **Well 2** : 62 day waterlevel reading: 22.59 m bgs.							631
50										630
51										

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REVIEWED BY: R Evans	COMPLETION DATE: 11/8/13
Fig. No: 11	Page 3 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-12**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 683 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** : black, moist 100 mm					
	CL-CI	**CLAY** : silty, sandy, low to medium plastic, damp, friable, light brown			18.4, 22.4		
1		1.2 m		15			682
	SA	**SAND** : silty, clayey, fine grained damp, loose 1.5 m			11.9		
	CL-CI	**CLAY** : silty, sandy, low to medium plastic, damp, friable, light brown			29.7		
2		2.3 m					681
	SA	**SAND** : silty, clayey, damp, fine grained, loose		16	12.4		
3					7.1		680
		3.4 m					
	CL-CI	**CLAY** : silty to very silty, low to medium plastic, moist, stiff, brown mottled grey			25		
4		4.3 m		17	21		679
		SILT : sandy, clayey, low plastic, moist, soft to firm, trace sensitive			25.4		
5		-Below 5.0m: very moist to wet			33.7		678
				9	36.9		
6					39.3		677
	ML				37.5		
7				8	37.7		676
					36.7		
8					36.2		675
				7	35.6		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					674
10							673
11		7 day waterlevel reading: 5.00 m bgs. 22 day waterlevel reading: 5.10 m bgs. 28 day waterlevel reading: 5.10 m bgs. 64 day waterlevel reading: 5.18 m bgs.					672
12							671
13							

Well 1: 5.18

Well 1: 677.82

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 9/30/13
Fig. No: 12	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: **2013-13**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.3 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)	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	Elevation (m)
0			OR	**TOPSOIL** 300 mm					688
			SA	**SAND** : clayey, moist, fine to medium grained, brown			10.3, 24.4		
1				1.1 m		9			
				CLAY : silty, high plastic, moist, stiff, brown mottled grey			29.2		687
2	Well 1: 2.23						31.2 (18, 34.5, 53.7)	P.L. = 18.0 L.L. = 53.7 M.C. = 31.2	
			CH			8		**Soluble Sulphates:** Negligible	686
3				-Below 3.2m: trace oxides, coal			33.2		
				-Below 3.5m: silty to very silty, soft to firm			39.3		685
4				4.1 m		3	42.3	-At 3.8m: free water noted on SPT	
				SILT : clayey, low plastic, very moist to wet, soft to very soft, brown, sensitive			39.2		684
5							38.2		
						8	37.9		683
6				-Below 5.8m: very sensitive			38.4		
			ML						682
				-Below 6.6m: dark brown			37.7	**Sieve Analysis** Gravel: 0 % Sand: 1.1 % Fines: 98.9 %	
7						7	34.7		681
							34.3		
8								-Note: original standpipe was destroyed by farming activities, second standpipe was installed on Nov. 15, 2013	
							37.4		680
				-Below 8.4m: grey		5	32.3		
9				**END OF TESTHOLE @ 8.8 m.** 2.9 m of water and 1.98 m of slough on completion of testhole. Well 1: Slotted standpipe installed to 5.18 m.					679
10									678
11				4 day waterlevel reading: 2.20 m bgs. 18 day waterlevel reading: 2.23 m bgs.					677
12									676
13									

Well 1: 686.07

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/9/13
Fig. No: 13	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: **2013-14**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 688.9 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	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	Elevation (m)
0			OR	**TOPSOIL** 450 mm					688
1			SA	**SAND** : silty, clayey, moist, fine to medium grained, brown 1.2 m		5	10.4, 16.5		687
2			CI-CH	**CLAY** : silty, sandy, medium to high plastic, moist, stiff, grey mottled brown -Below 1.8m: medium to high plastic in seams			28.2, 32, 32.6	**Shelby Tube:** QU: 149 kPa; DD: 1458 Kg/m^3; MC: 32.6 %	686
3	Well 1: 3.14			-Below 3.1m: firm, trace oxides, very moist, medium plastic			35.2		685
4				4.3 m		4	28.4, 36.5	-At 3.8m: free water noted on SPT	684
5				**CLAY** : silty to very silty, medium plastic, very moist to wet, soft to very soft, sensitive, brown, trace oxides			35.8, 36.4	P.L. = 21.1 L.L. = 38.2 M.C. = 36.4	683
6						7	38.2, 41.7	**Soluble Sulphates:** Negligible	682
7			CI	-Below 6.3m: very sensitive, wet			37, 34.9, 34.3		681
8				-Below 7.9m: grey, more silty		7	37.2, 30.3		680
9				**END OF TESTHOLE @ 8.8 m.** 4.57 m of water and 0.76 m of slough on completion of testhole. Well 1: Slotted standpipe installed to 8.08 m.		11	29.6		679
10									678
11				41 day waterlevel reading: 3.05 m bgs. 54 day waterlevel reading: 3.14 m bgs.					677
12									676
13									

Well 1: 685.76

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/9/13
Fig. No: 14	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: **2013-15**
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)	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	OR	**TOPSOIL** : sandy, moist, black 500 mm					689
1	SA	**SAND** : silty, non to low plastic, moist, friable, light brown 1.4 m		7	7.3, 18.8		688
2		**CLAY** : silty, medium to high plastic, moist, firm to stiff, brown and grey			13, 32.6		687
3	CI-CH	-Below 2.7m: trace oxides, silty, very moist		8	35.8		686
4		-Below 3.7m: very silty, firm, brown 4.3 m		7	35.8, 39.1, 38.7		685
5		**CLAY** : very silty, low to medium plastic, wet, soft to firm, brown, sensitive			37.7, 23.6 31.3, 34.7	P.L. = 23.6 L.L. = 31.3 M.C. = 37.7 **Soluble Sulphates:** Negligible	684
6		-Below 5.5m: soft		7	35.4, 37.9		683
7	CL-CI			7	37.2, 37.4		682
8		-Below 7.6m: very silty, more sensitive, wet, very soft, olive to dark grey			39.1	**Sieve Analysis** Gravel: 0 % Sand: 0.7 % Fines: 99.3 %	681
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		7	35.1, 32.3		680
10							679
11		28 day waterlevel reading: 2.89 m bgs. 41 day waterlevel reading: 2.96 m bgs. 55 day waterlevel reading: 3.03 m bgs.					678
12							677
13							

Well 1: 3.03

Well 1: 686.07

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LOGGED BY: D Trommelen	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/8/13
Fig. No: 15	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: **2013-16**
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			679
12	ML	- Below 12.2 m: wet, very soft, dark grey		5	678
13				6	677
14		- Below 13.7 m: sensitive, trace free water			676
15				7	675
16					674
17		**CLAY TILL** : silty, sandy, medium plastic, moist to very moist, stiff, dark grey, trace coal and gravel — 16.6 m		17	673
18	CI			22	672
19					671
20				22	

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. 25 day waterlevel reading: 9.17 m bgs. 62 day waterlevel reading: 9.13 m bgs.						656
35									655
36									654
37									653
38									652
39									651
40									

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REVIEWED BY: R Evans	COMPLETION DATE: 11/8/13
Fig. No: 16	Page 2 of 2

JRP 6004-32.GPJ JRPV2_6.GDT 10/2/14

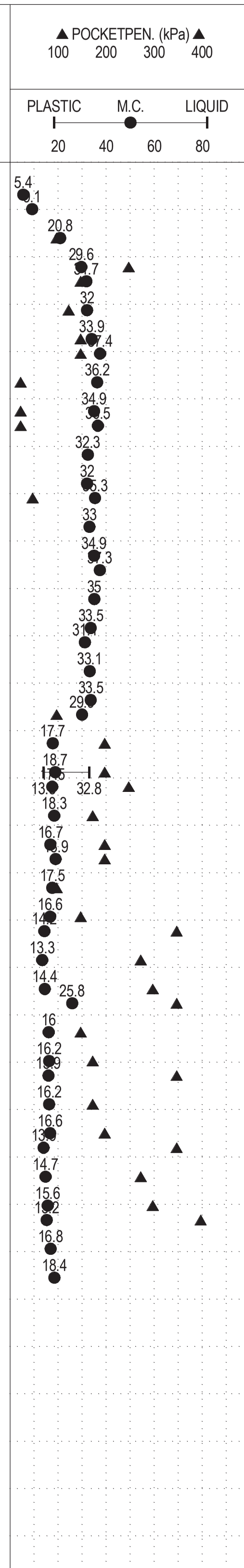
PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-17**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.3 m
OWNER: Ownership Group	LOCATION: As per site plan	

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

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

USC	SOIL DESCRIPTION	Depth	SPT (N)	OTHER DATA
OR	**TOPSOIL/ORGANICS**	300 mm		
CI	**SILT** : clayey silty to very silty clay, medium plastic, damp, friable -Below 1.1m: sandy	1.2 m	12	
CI	**CLAY** : silty, sandy, medium plastic, moist, stiff, brown, trace oxides -Below 1.8m: silty to very silty, odd high plastic seam, very stiff, brown and grey -Below 4.0m: soft, wet -Below 6.1m: trace sensitive -Below 7.0m: trace sand seams -Below 7.6m: very moist to wet -At 8.5m: trace free water on SPT	9.1 m	8, 7, 7, 6, 7	
CL-CI	**CLAY** : very silty, low to medium plastic, wet, very soft, grey	12.2 m	5, 9	-At 11.6m: testhole squeezing
CI	**CLAY TILL** : silty, sandy, medium plastic, moist, stiff to very stiff, grey, trace coal, oxides and gravel -Below 16.5m: very stiff -At 17.5m: sand in SPT, possible slough		15, 16, 24, 31, 20, 37, 30	P.L. = 13.8 L.L. = 32.8 M.C. = 18.7 **Soluble Sulphates:** Negligible

END OF TESTHOLE @ 23.6 m. No water and no slough on completion of testhole. Slotted standpipe installed to 10.97 m.
7 day waterlevel reading: 7.72 m bgs.
21 day waterlevel reading: 7.8 m bgs.
58 day waterlevel reading: 7.68 m bgs.



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

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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0–1	ML	**SILT** : very sandy, clayey, low plastic, damp to moist, friable, dark brown					689–688
1		1.1 m -At 0.9m: approximately 100mm thick medium to high plastic clay lens, grey		11	10.3, 17.2		688
2–3		**CLAY** : very silty, medium plastic, moist, firm to stiff, light brown, some grey regions -Below 2.4m: very moist, soft to firm, trace oxides		7	29.7, 32.1, 28.3, 37.2		687–686
4				7	32.9, 30.3, 30.8		685
5–6	CI			9	28.1, 32.5, 27.1		684–683
6–7		-Below 5.8m: very moist to wet, very soft, dark brown, slightly sensitive		7	26, 36.5		683–682
8		Well 1: 8.98			29.2, 30.1, 30.5		681
8–9		8.8 m		14			681–680
9–10		**CLAY** : silty, sandy, medium to high plastic, moist, firm to stiff, trace coal, oxides and gravel, till like			28.9, 16.8, 26.5, 46	P.L. = 16.8 L.L. = 46.0 M.C. = 28.9 **Soluble Sulphates:** Negligible	680–679
10–11	CI-CH	-Below 9.8m: very silty, very moist, slightly sensitive		10	31.8, 21.4, 22.2, 23.6		679–678
11–12		11.9 m		12			678–677
12–13		**CLAY TILL** : silty, sandy, medium plastic, moist, stiff, trace coal, oxides and gravel -Below 12.2m: occasional high plastic lens		16	19, 16.2		677–676
14					18.2		675
14–15	CI	-At 14.5m: free water noted on SPT		14	17.9, 17.9, 17.1, 13.6, 18.4, 32.5, 17.8	P.L. = 13.6 L.L. = 32.5 M.C. = 17.1 **Soluble Sulphates:** Negligible	674–673
16				15	16.7		673
16–17					16.2, 16.1		672
18				16			671
18–19		**END OF TESTHOLE @ 18.0 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 17.98 m.					671–670
20–21							669–668
22–23		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

Well 1: 680.22

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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

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		10	11.2, 23.6, 29				688
2				-Below 1.4m: very silty, moist, friable, trace oxides			31				687
3						7	32				686
4			CI-CH			9	31.8, 27, 53.8		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			22.3				684
6				-Below 5.2m: very moist, slightly sensitive -At 5.6m: high plastic seam, brown		11	26.8				683
7				-Below 6.4m: very soft, dark brown			29.8, 29.4				682
8				-Below 7.3m: very sensitive		7	33.4				681
9	Well 1: 9.10		CH	-Below 7.6m: transition to high plastic clay, less silt content — 8.5 m **CLAY** : silty, high plastic, moist, stiff, dark brown to grey, some very silty zones		9	29.5, 29			Well 1: 680.00	680
10			CH	-Below 8.8m: soft to firm, grey		7	28.7				679
11			SA	-Below 9.5m: very silty, very moist, firm, slightly sensitive — 10.8 m -Below 10.0m: sandy, grey, moist to very moist, trace coal — 11.9 m		10	31.3, 20.5				678
12			CH	**SAND** : clayey, silty, medium to coarse grained, very moist to wet, trace gravel — 12.2 m			18.9				677
13				**CLAY** : very silty, wet slightly sensitive, soft		11	23.5				676
14				**CLAY TILL** : silty, sandy, medium to high plastic, very moist to wet, trace coal and gravel			16.8				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	18.9				674
16			CI				17.2				673
17						15	18.2				672
18							17.4				671
19						20	18.3				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.			16.7				669
21						24	18.4				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											

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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	

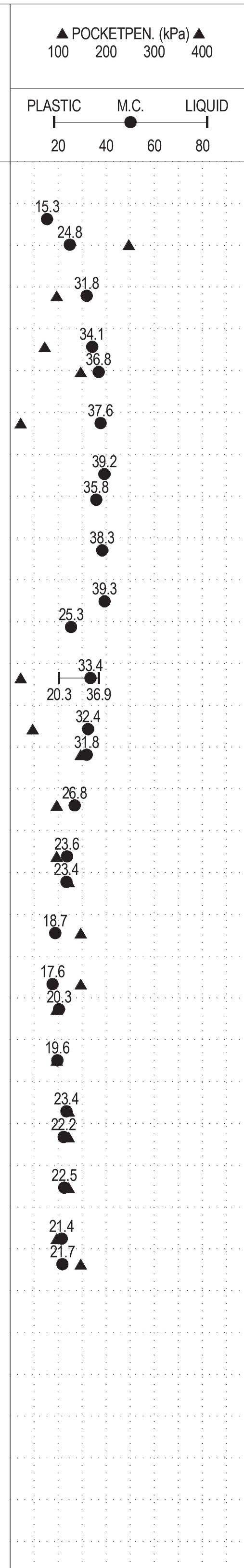
SAMPLE TYPE: SHELBY TUBE, CORE SAMPLE, SPT SAMPLE, GRAB SAMPLE, NO RECOVERY

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

Depth (m) Water Level	Modified USCS	Soil Description	SPT (N)	Other Data	Elevation (m)
0 – 0.75	ML	**SILT** : clayey, damp to moist, friable, dark brown (750 mm)			
0.75 – 6.4	CI	**CLAY** : silty to very silty, medium plastic, moist, light brown mottled grey, trace oxides	10		689
		-Below 2.7m: very silty, very moist, soft to very soft, slightly sensitive	6		
Well 1: 4.92		-Below 4.3m: very moist to wet, highly sensitive, very soft	4		Well 1: 684.98
		-Below 5.8m: slightly sensitive, becoming dark brown and grey, very moist (6.4 m)	7	P.L. = 20.3 L.L. = 36.9 M.C. = 33.4 **Soluble Sulphates:** Moderate	
6.4 – 13.4	CI-CH	**CLAY** : silty, medium to high plastic, moist, stiff, grey, trace gravel and coal	8		
		-Below 8.8m: silty, sandy, till like	7		
		-At 10.4m: very silty, slightly sensitive		**Shelby Tube:** QU: 152 kPa DD: 1751 Kg/m^3 MC: 20.3 %	
			9		
			19		

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.

6 day waterlevel reading: 4.82 m bgs.
20 day waterlevel reading: 4.58 m bgs.
57 day waterlevel reading: 4.92 m bgs.



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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

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)
0	OR	**TOPSOIL/ORGANICS** 200 mm		
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
2				
3	CI-CH	Below 3.0 m: increased moisture, softer with depth		8
4				5
4.6 m				
5	CH	**CLAY** : silty, high plastic, stiff, grey		
5.3 m				
6		**CLAY** : very silty, very moist to wet, soft, medium plastic, grey, sensitive		5
7				2
8		At 7.9 m: high plastic clay seam		
9	CI			7
10				7
11		Below 10.7 m: very sensitive		
11.9 m				8
12		**NOTE** : drilled past 11.9 metre to find till. No till to 17.5 m		
18		**END OF TESTHOLE @ 17.5 m.** No water and no slough on completion of testhole.		
21		7 day waterlevel reading: 4.96 m bgs. 21 day waterlevel reading: 5.04 m bgs. 58 day waterlevel reading: 5.05 m bgs.		

POCKETPEN. (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

22.7, 27.7, 31.4, 30.3, 18.7, 36.9, 52.3, 37.4, 40.9, 39.8, 34.7, 36.9, 36.1, 33.8, 32.5, 33.3, 49, 45.7, 35.6, 35.5, 40.5, 30.8, 31.1, 31.6, 35.5

OTHER DATA

P.L. = 18.7 L.L. = 52.3 M.C. = 30.3

Soluble Sulphates: Negligible

Well 1: 5.05

Well 1: 684.05

Elevation (m): 688, 687, 686, 685, 684, 683, 682, 681, 680, 679, 678, 677, 676, 675, 674, 673, 672, 671, 670, 669, 668, 667

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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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-22**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.6 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	Elevation (m)
0		OR	**TOPSOIL** 150 mm					690
			CLAY : silty, low to medium plastic, damp to moist, stiff, brown			18.9, 21		
1		CL-CI			12			689
						27.1		
2			-Between 1.8 and 2.3m: high plastic, brown and grey, moist, very stiff			31.7		
			2.3 m					
			-Below 2.3m: sandy, medium plastic, trace oxides, moist, friable to stiff		10	33		688
3						27.6		
		CI				31.3		687
4						28.3	**Shelby Tube:** QU: 147 kPa; DD: 1459 Kg/m^3; MC: 28.3 %	
			4.6 m					
			CLAY : silty to very silty, medium plastic, very moist, firm, brown			36.4		686
5						36.9 (23.6, 35.7, 47.7)	-Note: slicked sided was noted on shelby tube; P.L. = 23.6 L.L. = 47.7 M.C. = 36.9; **Soluble Sulphates:** Negligible	
			-Below 5.6m: very moist to wet, soft, grey		4			685
6						37.4		
		CI				38.2		684
7			-Below 6.9m: trace coal in SPT		6	34.7		
			-At 7.3m: trace till features, medium plastic, firm			33.1		683
8						34.8		
					7	32.3		682
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					681
10								680
11			4 day waterlevel reading: Dry to 8.84 m bgs. 18 day waterlevel reading: Dry to 8.84 m bgs.					679
12								
13								678

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/15/13
Fig. No: 22	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: **2013-23**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger		ELEVATION: 690.8 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	SPT (N)	OTHER DATA
0	OR	**TOPSOIL** (300 mm)		
0.3	CL-CI	**CLAY** : silty, low to medium plastic, damp to moist, friable to stiff, brown		
0.8		-Below 0.8m: sandy	11	
1.5		-Below 1.5m: sandy to very sandy		
2.1		-Below 2.1m: occasional odd high plastic seam	16	
2.7 m	CI	-Below 2.7m: medium plastic		
4				**Shelby Tube:** QU: 137 kPa; DD: 1489 Kg/m^3; MC: 28.9 %
4.3		-Below 4.3m: silty to very silty, very moist, firm to soft, trace oxides and sand pockets		
5.5		-Below 5.5m: grey	5	
6.4		-Below 6.4m: very silty, wet, soft		
6.7		-Below 6.7m: trace sensitive	4	P.L. = 18.4 L.L. = 38.6 M.C. = 38.0; **Soluble Sulphates:** Negligible
8.5			6	

END OF TESTHOLE @ 8.8 m. No water and no slough on completion of testhole.
Well 1: Slotted standpipe installed to 8.84 m.

5 day waterlevel reading: 6.22 m bgs.
19 day waterlevel reading: 6.31 m bgs.

Well 1: 6.31 / Well 1: 684.49

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LOGGED BY: L Falk
REVIEWED BY: R Evans
Fig. No: 23
COMPLETION DEPTH: 8.84 m
COMPLETION DATE: 11/14/13

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-24**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691.2 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 600 mm					691
1		**CLAY** : silty, sandy, medium to high plastic, moist, stiff, brown, trace oxides		11	14.5, 25.5		690
		-Below 1.2m: brown and grey, stiff, moist to very moist			25.8 (16 – 53.8)	P.L. = 16.0 L.L. = 53.8 M.C. = 25.8 **Soluble Sulphates:** Negligible	
2					26.1		689
	CI-CH			9	27.6		
3					33.9		688
					29.2		
4				8	37.3		687
		-At 4.3m: occasional odd high plastic seam			40.7		
5		4.9 m -Below 4.9m: silty to very silty, some sand, medium plastic, soft to firm, very moist to wet			37.8		686
				5	37.5		
6					36.1		685
		-Below 6.4m: grey			36		
7	CI			4	34.6		684
					35.7		
8					39		683
				7	36.7		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					682
10							681
11		5 day waterlevel reading: 7.90 m bgs. 19 day waterlevel reading: 7.88 m bgs.					680
12							679
13							

Well 1: 7.88

Well 1: 683.32

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 24	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: **2013-25**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691.3 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 500 mm					691
1		**CLAY** : silty, low to medium plastic, damp, stiff, brown -Below 0.8m: trace white residue		13	15.6, 19.9		690
2	CL-CI	-At 1.4m: very sandy seam -Below 1.5m: occasional odd high plastic seams, moist			24.3, 24.1, 29.3		689
3		3.1 m		11	25.9		688
4	CI-CH	**CLAY** : silty, sandy, medium to high plastic, moist, stiff, brown and grey		9	37.4, 26.3		687
5		4.3 m **CLAY** : silty to very silty, very sandy, low to medium plastic, very moist, soft, brown, trace sensitive -Below 5.5m: wet		5	28.5, 14.8, 32.2, 28.8, 37.3	P.L. = 14.8 L.L. = 32.2 M.C. = 28.5 **Soluble Sulphates:** Negligible	686
6					37.2		685
7		-Below 7.3m: grey		3	36.6, 36.2		684
8					38.1		683
9	CL-CI			6	37.5, 38.5		682
10					34.4		681
11				4	35.7, 35.7		680
12					35.7		679
13				6	34.7, 33.9		678
14		**END OF TESTHOLE @ 13.4 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 13.41 m.			35		677
15					33.5		676
16		5 day waterlevel reading: 6.35 m bgs. 19 day waterlevel reading: 5.78 m bgs.		7	35.5		675
17							

Well 1: 5.78

Well 1: 685.52

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LOGGED BY: L Falk	COMPLETION DEPTH: 13.41 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 25	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: **2013-26**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.2 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 300 mm					690
		CLAY : silty, medium to high plastic, damp, stiff, brown, trace white inclusions			21.4, 23.6		
1				10			689
	CI-CH	-Below 1.2m: brown mottled grey, high plastic seam			23.9		
2		-Below 1.8m: silty, very sandy, low to medium plastic, damp to moist, friable, brown and grey, trace oxides			13.4, 22.4		688
		2.7 m		11			
3		-Below 2.7m: silty to very silty, medium plastic, moist			26.8		687
					25.2, 27.8		
4				12			686
		-Below 4.6m: grey mottled brown, very moist to wet			35.4		
5					37.5		685
	CI			4	32.7		
6		-Below 6.1m: silty to very silty, medium plastic, grey			37.9		684
		-Below 6.6m: sensitive, very moist			37.2		
7				4	37.9		683
					35.7 (17.5 – 44.2)	P.L. = 17.5 L.L. = 44.2 M.C. = 35.7 **Soluble Sulphates:** Negligible	
8					34.2		682
				7	32.5		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					681
10							680
11		7 day waterlevel reading: Dry to 8.84 m bgs. 22 day waterlevel reading: Dry to 8.84 m bgs. 35 day waterlevel reading: 8.40 m bgs. 49 day waterlevel reading: Dry to 8.84 m bgs.					679
12							678
13							

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 26	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-27**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.4 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 Description	Modified USCS	Sample Type	SPT (N)	Pocketpen. (kPa) / Plastic – M.C. – Liquid	Other Data	Elevation (m)
0	**TOPSOIL** 100 mm	OR					689
	CLAY: silty, sandy, medium to high plastic, damp, stiff, brown, trace oxides	CI-CH			23.9, 29.6		
1	1.2 m			6			
	CLAY: silty, medium plastic, very moist, stiff, grey mottled brown, trace oxides, white inclusions and odd high plastic seams				29		688
2					33.1		
				7	35.8		687
3					35		
	-Below 3.4m: silty to very silty, soft						686
4					37.7, 36.9	**Shelby Tube:** QU: N/A DD: N/A MC: 36.9 %	
					38.1	-At 3.8m: shelby tube was attempted but sample was to friable for QU	685
5		CI			37.9		
	-Below 5.5m: very silty			6	36.1		684
6					34.4 (22.3 – 35.9)	P.L. = 22.3 L.L. = 35.9 M.C. = 34.4 **Soluble Sulphates:** Negligible	
	-Below 6.7m: trace sensitive, very moist				33.6		683
7				3	34.9		
	-Below 7.3m: sandy				32.4		682
8					29.6		
				7	31.2		681
9	**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.						680
10							
							679
11	7 day waterlevel reading: 3.90 m bgs. 22 day waterlevel reading: 4.09 m bgs. 35 day waterlevel reading: 4.05 m bgs. 49 day waterlevel reading: 4.20 m bgs.						678
12							
							677
13							

Well 1: 4.20

Well 1: 685.20

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REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 27	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: **2013-28**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.6 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	Elevation (m)
0		OR	**TOPSOIL** 100 mm					689
1			**CLAY** : silty, sandy, medium to high plastic, damp to moist, friable, brown, trace rootlets to 0.75m		9	14.6, 23.4		
			-Below 0.75m: brown mottled grey, trace white inclusions, moist					
2			-Below 1.2m: stiff			25.6 (18.3 – 64.7)	P.L. = 18.3 L.L. = 64.7 M.C. = 25.6	688
						26.1, 27.5	**Soluble Sulphates:** Moderate	
3		CI-CH			9			687
						28.4		
4			-Below 3.7m: grey mottled brown, very moist		7	8.2, 37.7		686
			-Below 4.3m: firm			36.9		
5						34.2, 39.1		685
6			-Below 5.5m: silty to very silty, medium plastic grey, soft to firm, very moist to wet		5	34.5		684
	Well 1: 6.97							Well 1: 682.63
7						34.6, 38.7		683
					5			
8						36.1		682
						35.4		
9			-Below 8.4m: very silty, very moist		6	34.9		681
		CI				34.8		
10						33, 32.3		680
					6			
11						30.6		679
						33, 34.1		
12					7	31.9		678
13						33.1, 33.1		677
					8			
14			**END OF TESTHOLE @ 13.4 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 13.41 m.					676
15								675
16								674
17			7 day waterlevel reading: 6.88 m bgs. 22 day waterlevel reading: 6.90 m bgs. 35 day waterlevel reading: 6.98 m bgs. 49 day waterlevel reading: 6.97 m bgs.					673
18								672
19								671

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REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 28	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: **2013-29**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 300 mm					
		CLAY : silty, medium to high plastic, damp to moist, stiff, brown			15.3, 20.3		
1		-Below 0.75m: trace white residue		15			690
					20.3		
	CI-CH	-At 1.7m: approximately 0.3m thick very sandy seam					
2					23.9 (16.7 – 49.9)	P.L. = 16.7 L.L. = 49.9 M.C. = 23.9	689
		-Below 2.3m: brown and mottled grey, high plastic in seams		13		**Soluble Sulphates:** Negligible	
3					22.3		688
		3.4 m					
		SILT : clayey, sandy, low plastic, damp to moist, friable, brown			25.1	**Sieve Analysis** Gravel: 0 % Sand: 1.7 % Fines: 98.3 %	
4	ML			18	10.1		687
		4.6 m					
		CLAY : silty, sandy, low to medium plastic, very moist, firm, brown			26.6		
5					36		686
					35.1	**Shelby Tube:** QU: 139 kPa DD: 1405 Kg/m^3 MC: 35.1 %	
		-Below 5.8m: very silty, soft to firm					
6		-Below 5.9m: grey mottled brown			37.7		685
		-Below 6.4m: grey, slightly sensitive, wet					
	CL-CI				34		
7				6	34.1		684
		-Below 7.3m: sandy					
					37.9		
8							683
					35.8		
				7	34.4		
9		**END OF TESTHOLE @ 8.8 m.** No water and 0.61 m of slough on completion of testhole. Well 1: Slotted standpipe installed to 8.23 m.					682
10							681
11		13 day waterlevel reading: Dry to 8.23 m bgs. 22 day waterlevel reading: Dry to 8.23 m bgs. 35 day waterlevel reading: 8.40 m bgs. 54 day waterlevel reading: Dry to 8.23 m bgs.					680
12							679
13							

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REVIEWED BY: R Evans	COMPLETION DATE: 10/9/13
Fig. No: 29	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-30**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.8 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	Elevation (m)
0		OR	**TOPSOIL** 100 mm **CLAY** : silty, medium to high plastic, damp, brown			16.2		690
1			-Below 0.8m: brown and grey mottled, very silty, moist		13	21.2		
			-Below 1.2m: high plastic in seams					
			-Below 1.4m: sandy			25.3 (21.1 – 75)	P.L. = 21.1 L.L. = 75.0 M.C. = 25.3 **Soluble Sulphates:** Negligible	689
2						24.4		
					12	26.7		688
3		CI-CH				24.7		
						26.1		687
4			-Below 3.8m: trace oxides		16	25.3		
			-Below 4.6m: very sandy, very silty, friable to firm, very moist			33.9		686
5						36.1		
					10	31.4		685
6			-Below 5.8m: brownish grey 6.1 m **SILT** : clayey, low plastic, wet, soft, brownish grey			39.2		
						39.3		684
7			-Below 6.9m: soft to very soft, trace sensitive, grey		5	35.6		
		ML				34.7		683
8						36		
					7	34.7		682
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					
10								681
11			7 day waterlevel reading: Dry to 8.84 m bgs. 20 day waterlevel reading: Dry to 8.84 m bgs. 33 day waterlevel reading: Dry to 8.84 m bgs. 62 day waterlevel reading: Dry to 8.84 m bgs.					680
12								679
13								678

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REVIEWED BY: R Evans	COMPLETION DATE: 10/2/13
Fig. No: 30	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: **2013-31**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger		ELEVATION: 691.7 m
OWNER: Ownership Group	LOCATION: As per site plan		

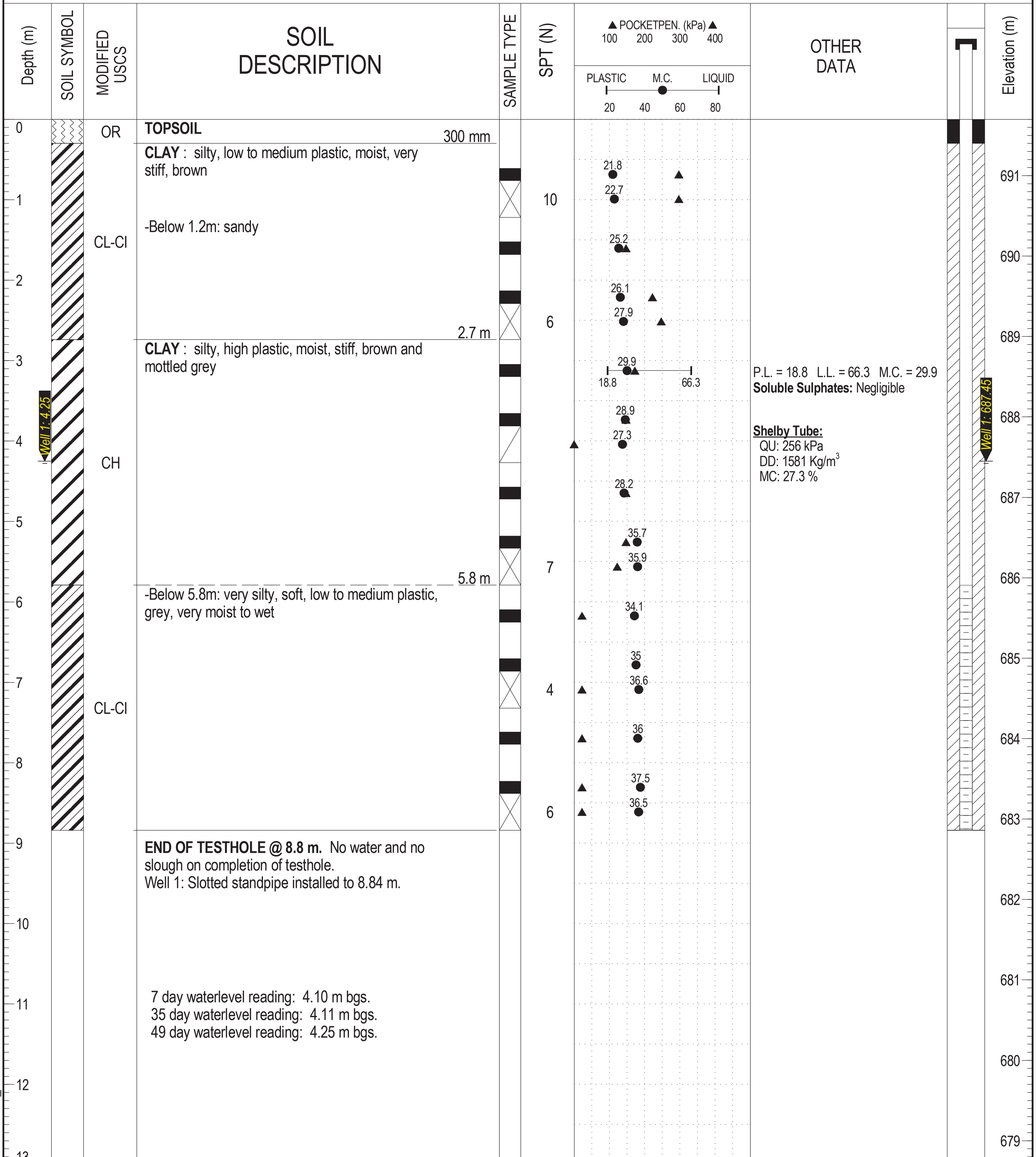
SAMPLE TYPE: SHELBY TUBE, CORE SAMPLE, SPT SAMPLE, GRAB SAMPLE, NO RECOVERY

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

Depth (m)	MODIFIED USCS	SOIL DESCRIPTION	SPT (N)	OTHER DATA
0 – 0.3	OR	**TOPSOIL** (300 mm)		
0.3 – 2.7	CL-CI	**CLAY** : silty, low to medium plastic, moist, very stiff, brown -Below 1.2m: sandy (2.7 m)	10 6	
2.7 – 5.8	CH	**CLAY** : silty, high plastic, moist, stiff, brown and mottled grey (5.8 m)	7	P.L. = 18.8 L.L. = 66.3 M.C. = 29.9 **Soluble Sulphates:** Negligible **Shelby Tube:** QU: 256 kPa DD: 1581 Kg/m^3 MC: 27.3 %
5.8 – 8.8	CL-CI	-Below 5.8m: very silty, soft, low to medium plastic, grey, very moist to wet	4 6	

END OF TESTHOLE @ 8.8 m. No water and no slough on completion of testhole.
Well 1: Slotted standpipe installed to 8.84 m.

7 day waterlevel reading: 4.10 m bgs.
35 day waterlevel reading: 4.11 m bgs.
49 day waterlevel reading: 4.25 m bgs.



Elevation (m): 691, 690, 689, 688, 687, 686, 685, 684, 683, 682, 681, 680, 679

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 31	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-32**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.6 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	Elevation (m)
0		OR	**TOPSOIL** 300 mm					690
1			**CLAY** : silty, sandy, medium to high plastic, damp, very stiff, brown, trace white inclusions and rootlets to approximately 0.9m -Below 0.8m: brown mottled grey		15	15.8, 19.6		
2		CI-CH	-Below 1.2m: occasional odd high plastic seam			20.5		689
3			2.7 m **CLAY** : silty, high plastic, moist, stiff, brown mottled grey		7	25.1, 27.2		688
4		CH			6	28.4, 28.4, 28.6		687
5			-Below 5.0m: grey mottled brown			27.9		686
6			-Below 5.5m: very silty, soft 5.8 m **CLAY** : silty to very silty, low to medium plastic, moist to very moist, soft, brownish grey, trace sensitive		6	38, 22.8, 38.3, 75.8	P.L. = 22.8 L.L. = 75.8 M.C. = 38.0 **Soluble Sulphates:** Moderate	685
7	Well 1: 7.02	CL-CI			3	34.8, 36, 36.1		684
8						37.6		683
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		6	37.9, 36.3		682
10								681
11			7 day waterlevel reading: 6.92 m bgs. 35 day waterlevel reading: 6.90 m bgs. 49 day waterlevel reading: 7.02 m bgs.					680
12								679
13								678

Well 1: 683.58

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REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 32	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: **2013-33**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.7 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	Elevation (m)
0		OR	**TOPSOIL** 500 mm					690
1			**CLAY** : silty, medium plastic, moist, stiff, brown, trace rootlets to approximately 0.9m -Below 0.8m: brown and grey, trace oxides and white residue		18	20.5, 22.2, 21.7		689
2			-Below 1.2m: trace sand pockets			28.8, 27.6		688
3		CI	-Below 2.7m: occasional odd high plastic seams		10	29.7, 26.2, 27.9		687
4			-At 4.3m: approximately 0.5m thick sand seam, find to medium grained, loose, clayey, moist, brown		13	17.1		686
5			-Below 5.0m: brownish grey			39.6, 36.8	**Shelby Tube:** QU: 103 kPa DD: 138 Kg/m^3 MC: 36.8 %	685
6			5.8 m **CLAY** : silty to very silty, sandy, medium plastic, very moist, soft, brown -Below 6.4m: grey			37.1		684
7					4	32.9, 34.2	-Slicken sided was noted on shelby tube	683
8						37.3		682
9					6	41, 34.9		681
10		CI				34.5 (21.9 39.2), 37, 34.8	P.L. = 21.9 L.L. = 39.2 M.C. = 34.5 **Soluble Sulphates:** Moderate	680
11			-Below 10.4m: silty to very silty, sandy to very sandy, wet, soft to very soft, sensitive		6	37.8, 36.9, 36.7		679
12						35.8		678
13					7	34.7, 34.5		677
14			**END OF TESTHOLE @ 13.4 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 13.41 m.					676
15								675
16			4 day waterlevel reading: 6.66 m bgs. 18 day waterlevel reading: 5.96 m bgs.					674
17								

Well 1: 5.96

Well 1: 684.74

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REVIEWED BY: R Evans	COMPLETION DATE: 11/15/13
Fig. No: 33	Page 1 of 1

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PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-34**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 300 mm					691
		CLAY : silty, sandy, medium plastic, moist, stiff, brown			19.2, 20.9		
1		-Below 0.8m: odd high plastic seams, brown and grey, trace white residue		11			690
					27.5		
2					26.9		689
	CI				28.9	**Shelby Tube:** QU: 173 kPa DD: 1515 Kg/m^3 MC: 28.9 %	
3					28.2		688
		-Below 3.5m: trace sand pockets			25.3		
4				16	22.4		687
		4.6 m					
		CLAY : silty to very silty, sandy to very sandy, medium to high plastic, damp to moist, firm, brown, trace oxides			34.3		
5					36.4		686
				6	31.8		
6					35.6 (19.5 – 57.2)	P.L. = 19.5 L.L. = 57.2 M.C. = 35.6 **Soluble Sulphates:** Negligible	685
	CI-CH				37.4		
7				6	38.2		684
					37.8		
8		-Below 8.1m: soft, grey, wet			37.5		683
				6	35.6		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					682
10							681
11		4 day waterlevel reading: Dry to 8.84 m bgs. 18 day waterlevel reading: Dry to 8.84 m bgs.					680
12							679
13							

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/15/13
Fig. No: 34	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: **2013-35**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691.8 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	Elevation (m)
0		OR	**TOPSOIL** 150 mm					691
1			**CLAY** : silty, medium to high plastic, damp to moist, brown, trace rootlets to approximately 0.6m -Below 0.8m: trace white inclusions		13	21.3, 20.5		
2		CL-CI	-At 1.4m: approximately 0.3m thick odd high plastic seam -Below 1.7m: brown mottled grey -Below 2.3m: some sand, moist, trace oxides		16	23.5, 22.5, 12.8		690
3						28.5		689
4			-At 3.8m: sandy, clayey moist silt lens -At 4.0m: approximately 0.5m thick odd high plastic seam 4.6 m		13	22.6, 13.1, 32.2, 18.7, 38.2	P.L. = 18.7 L.L. = 38.2 M.C. = 32.2 **Soluble Sulphates:** Negligible	688
5			**CLAY** : silty to very silty, some sand, medium plastic, very moist, soft to firm, brown			33.9		687
6	Well 1: 6.88		-Below 5.2m: moderate sensitive, wet -Below 5.8m: grey		4	33.2, 36		686
7					4	36.6, 36.7		685
8						37.8		684
9		CI			6	37.5, 36.9, 39		683
10						36.9, 34.5	**Shelby Tube:** QU: 97 kPa DD: 1495 Kg/m^3 MC: 34.5 %	682
11						36.2		681
12			-At 11.9m: approximately 0.3m thick less silty seam		5	39.7, 38.5, 36.6		680
13					5	36.7, 36.7		679
14			**END OF TESTHOLE @ 13.4 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 13.41 m.					678
15								677
16								676
17			7 day waterlevel reading: 6.52 m bgs. 22 day waterlevel reading: 6.65 m bgs. 35 day waterlevel reading: 6.70 m bgs. 49 day waterlevel reading: 6.88 m bgs.					675
18								674
19								673

Well 1: 684.92

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LOGGED BY: L Falk	COMPLETION DEPTH: 13.41 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 35	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: **2013-36**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.8 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	Elevation (m)
0		OR	**TOPSOIL** 450 mm					689
1		CL-CI	**CLAY** : silty, sandy, low to medium plastic, damp, friable, brown -Below 0.8m: brown mottled grey, trace white inclusions		10	14.8, 20.1		688
2			1.5 m **CLAY** : silty, high plastic, moist, stiff, brown mottled grey			21.9		687
3					7	24.8 (18.8, 26, 64.7)	P.L. = 18.8 L.L. = 64.7 M.C. = 24.8 **Soluble Sulphates:** Negligible	686
4		CH			11	28.2, 26.6, 27.1		685
5						36.3, 34.7		684
6			5.6 m **CLAY** : silty to very silty, medium plastic, wet, soft, brownish grey -Below 6.4m: trace sensitive, grey		5	37.3, 36.2		683
7		CI			4	37.6, 35.3		682
8	Well 1: 8.80					38.3, 35.5	Well 1: 681.00	681
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		8	35.1		680
10								679
11			7 day waterlevel reading: Dry to 8.84 m bgs. 35 day waterlevel reading: Dry to 8.84 m bgs. 49 day waterlevel reading: 8.80 m bgs.					678
12								677
13								

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 36	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-37**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.4 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)	POCKETPEN. (kPa) 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** 450 mm					690
1	CL-CI	**CLAY** : silty, low to medium plastic, damp, friable, brown, trace rootlets and topsoil intermixed to 0.6m -Below 0.8m: brown and grey, trace white inclusions 1.4 m		12	14.4, 20.3		689
2		**CLAY** : silty, high plastic, damp to moist, stiff, brown mottled grey			21.3, 22.3, 21.3	**Shelby Tube:** QU: 550 kPa; DD: 1684 Kg/m^3; MC: 21.3 %	688
3		-Below 3.1m: trace oxides, moist			23.9		687
4	CH	-At 4.3m: approximately 0.3m thick very sandy seam, fine grained, damp		13	24.5, 24.6		686
5					29.6		
6		-Below 5.8m: grey mottled brown		9	28, 30.3, 38.9 (21.3 – 73.2)	P.L. = 21.3 L.L. = 73.2 M.C. = 38.9 **Soluble Sulphates:** Negligible	685
7		**CLAY** : silty to very silty, low plastic, very moist, soft, grey 7.0 m		4	36.6, 36.3		684
8	CL	-Below 7.3m: wet, trace sensitive			37.2		683
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		6	37.2, 36.1		682
10							681
11		7 day waterlevel reading: 6.80 m bgs. 35 day waterlevel reading: 7.57 m bgs. 49 day waterlevel reading: 7.62 m bgs.					680
12							679
13							678

Well 1: 7.62

Well 1: 682.78

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REVIEWED BY: R Evans	COMPLETION DATE: 10/15/13
Fig. No: 37	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: **2013-38**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691.2 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)	POCKETPEN. (kPa) / PLASTIC M.C. LIQUID	OTHER DATA	Elevation (m)
0	OR	**TOPSOIL** : damp, black 300 mm					691
		CLAY : silty, low to medium plastic, damp, friable to stiff, brown			15.2		
1		-Below 0.8m: brown mottled grey, trace white residue		14	16.6		690
	CL-CI	-Below 1.5m: very sandy			17.4		
2					15.3		689
				21	17		
3		3.1 m					
		CLAY : silty, sandy, medium to high plastic, moist, stiff, brown mottled grey			23.7		688
4		-Below 3.8m: trace oxides		7	25.8 25.9		687
	CI-CH				30.9		
5					27.8		686
				6	37.5		
6		5.9 m					
		CLAY : very silty, medium plastic, very moist, soft to firm, brown and grey			34.4		685
		-Below 6.4m: trace sensitive			32.4		
7		-At 6.9m: trace water noted on SPT		4	32.9		684
	CI	-Below 7.3m: grey			34.9 20.8 43.6	P.L. = 20.8 L.L. = 43.6 M.C. = 34.9 **Soluble Sulphates:** Moderate	
8					36.8		683
				6	38.2		
9		**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					682
10							681
11		5 day waterlevel reading: 7.92 m bgs. 19 day waterlevel reading: 8.02 m bgs.					680
12							679
13							

Well 1: 8.02

Well 1: 683.18

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 38	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: **2013-39**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 689.941 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	Elevation (m)
0		OR	**TOPSOIL** 500 mm					
1			**CLAY** : silty, sandy, medium to high plastic, damp to moist, friable to very stiff, brown		11	14.4, 19.5		689
2						19.9, 22.8, 21.8	-Slicken sided was noted on shelby tube **Shelby Tube:** QU: 470 kPa DD: 1639 Kg/m^3 MC: 21.8 %	688
3		CI-CH				22.8 (17.9 – 56.2)	P.L. = 17.9 L.L. = 56.2 M.C. = 22.8 **Soluble Sulphates:** Negligible	687
4			-Below 4.3m: stiff to very stiff, brown and grey, moist		11	23.1, 25.1		686
5						26.9, 26.5		685
6			5.8 m **CLAY** : silty to very silty, sandy, medium plastic, very moist, soft to firm, brown		8	30.2, 31.5		684
7		CI	-Below 6.7m: trace sensitive, wet		5	35.4, 37		683
8						36.7		682
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		6	38.2, 36.3		681
10								680
11			5 day waterlevel reading: Dry to 8.84 m bgs. 19 day waterlevel reading: Dry to 8.84 m bgs.					679
12								678
13								

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 39	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: **2013-40**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 691.1 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)	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	Elevation (m)
0		OR	**TOPSOIL** 500 mm					691
1			**CLAY** : silty, sandy, medium to high plastic, damp, stiff, brown -Below 0.8m: trace white residue		11	12.6, 14		690
2						18.9		689
3		CI-CH			12	18.3, 23.7		688
4			-Below 3.4m: trace oxides 4.3 m		10	20, 20.2, 23.2		687
5			-Below 4.3m: silty, sandy, medium plastic, moist, stiff, brown			24.4		686
6			-Below 5.8m: very sandy, very silty, friable to soft, very moist		9	24.1, 34.9		685
7		CI			5	23.7, 30.4, 18.6, 34, 40.6	P.L. = 18.6 L.L. = 40.6 M.C. = 30.4 **Soluble Sulphates:** Negligible	684
8			-Below 7.9m: grey			37.3		683
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.		5	37.5, 34		682
10								681
11			5 day waterlevel reading: Dry to 8.84 m bgs. 19 day waterlevel reading: Dry to 8.84 m bgs.					680
12								679
13								

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 40	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-41**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Solid Stem Auger	ELEVATION: 690.7 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	Elevation (m)
0		OR	**TOPSOIL**					690
			600 mm					
1		CI	**CLAY** : silty, medium plastic, moist, friable, brown, trace rootlets and topsoil intermixed to approximately 0.9m		5	13.1, 13.4		
			-Below 0.9m: sandy, brown and grey, trace oxides 1.5 m					
2			-Below 1.5m: medium to high plastic, stiff to very stiff			24.8		689
						25.1, 25.3		
3		CI-CH			13			688
						27.5		
4						26.4, 27.1		687
			4.3 m		11			
			-Below 4.3m: medium plastic, stiff			24.4 (17.5 – 48)	P.L. = 17.5 L.L. = 48.0 M.C. = 24.4 **Soluble Sulphates:** Negligible	686
5		CI				27.5		
					9	26.6		685
			5.8 m					
6			**CLAY** : silty to very silty, sandy to very sandy, low to medium plastic, very moist, soft, brown			32.3		
						33.9		684
7		CL-CI	-Below 7.0m: trace sensitive, wet, grey		5	36		
						35		683
8						34.3		
					7	35.8		682
9			**END OF TESTHOLE @ 8.8 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 8.84 m.					
10								681
11			5 day waterlevel reading: Dry to 8.84 m bgs. 19 day waterlevel reading: Dry to 8.84 m bgs.					680
12								679
13								678

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LOGGED BY: L Falk	COMPLETION DEPTH: 8.84 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/14/13
Fig. No: 41	Page 1 of 1

PROJECT: Riverview Neighborhood 1-3 | PROJECT NO: 6004-32 | BOREHOLE NO: **2013-42**

CLIENT: Stantec Consulting Ltd | DRILL METHOD: Solid Stem Auger | ELEVATION: 692.2 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	SPT (N)	OTHER DATA
0	OR	**TOPSOIL** (50 mm)		
	CL-CI	**CLAY** : silty, low to medium plastic, damp, friable, brown, trace rootlets to approximately 0.9m -At 0.75m: approximately 0.6m thick low to medium plastic seam -Below 0.8m: trace white residue (1.4 m)	13	
1.4	ML	**SILT** : sandy, clayey, low plastic, damp, friable, brown -Below 2.3m: trace oxides -Below 3.8m: trace coal (5.0 m)	16, 16	**Sieve Analysis** Gravel: 0 % Sand: 11.8 % Fines: 88.2 %
5.0	CI	**CLAY** : silty to very silty, medium plastic, moist, stiff, brown -Below 5.9m: brown mottled grey, trace oxides -At 7.3m: odd high plastic seam -Below 7.6m: very silty, sandy, soft to firm, very moist to wet, trace sensitive -Below 8.8m: trace grey -At 11.4m: trace water noted on SPT -Below 12.7m: less silty, firm to stiff	16, 7, 5, 5, 6	-Slicken sided was noted on shelby tube **Shelby Tube:** QU: 168 kPa DD: 1520 Kg/m^3 MC: 29.8 % P.L. = 17.9 L.L. = 49.9 M.C. = 34.2 **Soluble Sulphates:** Negligible
13.4		**END OF TESTHOLE @ 13.4 m.** No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 13.41 m. 5 day waterlevel reading: 6.88 m bgs. 19 day waterlevel reading: 6.91 m bgs.		

Moisture content (%) by depth: 18.2, 20.6, 12.1, 8.3, 9.2, 9.3, 5.1, 7, 10, 27.9, 26.2, 26.2, 25.7, 29.8, 37.5, 34.2 (PL 17.9, 33.5, LL 49.9), 33.7, 37.5, 36.9, 34.5, 37, 36.6, 35.8, 35.7, 35.2

Well 1: 6.91 (depth); Well 1: 685.29 (elevation)

Elevation (m): 692, 691, 690, 689, 688, 687, 686, 685, 684, 683, 682, 681, 680, 679, 678, 677, 676

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LOGGED BY: L Falk | COMPLETION DEPTH: 13.41 m

REVIEWED BY: R Evans | COMPLETION DATE: 11/14/13

Fig. No: 42

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

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-43**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 657.8 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	PNEUMATIC PIEZOMETER	Elevation (m)
0									
1									657
			1.5 m						
2		CI	**CLAY** : silty, medium plastic, moist, stiff to friable, brown, trace white inclusions, oxides		14	30.5			656
3									655
4		CI	-At 3.4m: sandy, very moist		11	32.6			654
5		CI	-At 4.9m: sandy, very moist		16	30.9			653
6									652
			6.4 m						
7		CL	-At 6.4m: some sand, very silty, low plastic, friable, moist		13	26			651
8		CL	-At 7.9m: low plastic with medium plastic lens, moist		15	25			650
9									649
			9.5 m						
10		CL-CI	-At 9.5m: greyish brown, low to medium plastic, moist, stiff		14	29.5			648
			11.0 m						647
11		CI	-At 11.0m: silty to very silty, firm to friable, very moist, medium plastic		14	28.5			
12									646
			12.5 m						
13		CI	**CLAY TILL** : silty, medium plastic, moist, stiff, trace gravel		26	26.9			645
14		CI	-At 14.2m: silty, sandy, medium plastic, moist, stiff, grey, trace coal, gravel		17	17.6			644
15									643
16		CI	-At 15.5m: silty, sandy, medium plastic, moist, stiff, grey, trace coal, gravel		17	13.4			642
17									641

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LOGGED BY: L Falk	COMPLETION DEPTH: 44.81 m
REVIEWED BY: R Evans	COMPLETION DATE: 11/12/13
Fig. No: 43	Page 1 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-43**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 657.8 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	PNEUMATIC PIEZOMETER	Elevation (m)
17			**CLAYSHALE** : high plastic, slightly blocky, soft to moderately hard	17.1 m		63 for 6"	21.9				640
18			-Below 18.4m: moderately hard, odd fracture -Below 18.6m: moderately hard				22.7 / 25.4	P.L. = 25.4 L.L. = 171.1 M.C. = 22.7 **Soluble Sulphates:** Negligible			639
19		CS	-At 18.9m: approximately 0.2m thick slightly bentonitic seam								
20	Well 1: 20.20		-At 19.1m: approximately 0.1m thick coal seam -At 19.2m: slightly bentonitic layer continues till 19.5m							Well 1: 637.60	638
21			-At 19.5m: approximately 0.3m thick coal seam								637
22		SS	-Below 19.8m: clayshale, high plastic, moderately hard -At 20.4m: slightly blocky, some fractures till 20.6m	21.8 m 22.6 m							636
23			-Below 21.2m: some fractures **SANDSTONE** : clayey, moderately hard								635
24			**CLAYSHALE** : high plastic, laminated, moderately hard -Below 23.0m: no longer laminated, soft to moderately hard, slightly blocky								634
25			-At 23.7m: approximately 0.1m thick coal seam								633
26		CS	-Below 24.2m: no longer blocky, moderately hard, odd fracture, high plastic -Below 25.2m: slightly blocky				13.1 / 15.2	P.L. = 15.2 L.L. = 101.8 M.C. = 13.1 **Soluble Sulphates:** Negligible			632
27			-At 25.6 to 26.5m: possibly bentonitic -Below 26.5m: shale, moderately hard, odd fracture								631
28			-At 26.6 to 27.0m: slightly blocky -Below 27.4m: slightly blocky, some coal lens -At 27.6 to 27.7m: soft to moderately hard, high plastic, slightly blocky	28.5 m							630
29		SS SI CS	-Below 27.7m: moderately hard, not blocky, odd fracture **SANDSTONE** : moderately hard **SILTSTONE** : hard, light brown	29.0 m 29.3 m 29.5 m							629
30		SS	**CLAYSHALE** : high plastic, soft to moderately hard	30.3 m							628
31			**SANDSTONE** : moderately hard **CLAYSHALE** : moderately hard, slightly blocky till 30.6m, high plastic -Below 30.6m: odd fracture								627
32		CS									626
33			-At 32.8 to 33.4m: sandstone lens								625
34			-Below 33.4m: sandy, laminated, moderately hard, medium to high plastic	34.0 m							624

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REVIEWED BY: R Evans	COMPLETION DATE: 11/12/13
Fig. No: 43	Page 2 of 3

PROJECT: Riverview Neighborhood 1-3	PROJECT NO: 6004-32	BOREHOLE NO: **2013-43**
CLIENT: Stantec Consulting Ltd	DRILL METHOD: Hollow Stem Auger/Coring	ELEVATION: 657.8 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 / PNEUMATIC PIEZOMETER	Elevation (m)
34		SS	**SANDSTONE** : clayey, moderately hard to hard						
			34.6 m -Below 34.3m: hard till 34.6m						
35		CS	**CLAYSHALE** : moderately hard, high plastic -Below 34.8m: moderately hard to hard						623
		SS	35.7 m -At 35.2m: approximately 0.2m of sample was blocky						
36			35.9 m **SANDSTONE** : clayey, moderately hard						622
			CLAYSHALE : sandy, moderately hard						
37		CS	-Below 36.1m: some fracture, high plastic, moderately hard to hard -Below 37.4m: hard						621
38			-At 37.6m: approximately 0.1m thick odd fracture seam						620
			38.6 m -Below 37.8m: moderately hard						
39		BEN	**BENTONITE** : moderately hard, slightly moist						619
			39.3 m **CLAYSHALE** : moderately hard to hard, high plastic						
40		CS	-At 39.9m: approximately 0.3m lens, some sand, soft to moderately hard, moist -Below 40.2m: some fractures						618
41			41.0 m -At 40.8m: approximately 0.5m thick bentonite lens, slightly moist						617
		BEN	41.8 m **BENTONITE** : possibly bentonitic shale, slightly moist, moderately hard, slicken-sides						
42			-Below 41.2m: moderately hard to hard -Below 41.7m: soft to moderately hard, moister						616
43		CS	**CLAYSHALE** : high plastic, moderately hard, odd fracture						615
44			-Below 42.6m: some fractures -Below 44.0m: moderately hard, odd coal piece, high plastic, and approximately 0.15m thick burnt shale seam						614
45			-At 44.1 to 44.4m: slicken-sides						613
			END OF TESTHOLE @ 44.8 m. No water and no slough on completion of testhole. Well 1: Slotted standpipe installed to 0 m. Well 2: Slotted standpipe installed to 0 m.						
46									612
47									611
48			7 day waterlevel reading: 16.24 m bgs. 21 day waterlevel reading: 18.58 m bgs. 58 day waterlevel reading: 20.20 m bgs.						610
49									609
50									608
51									607

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LOGGED BY: L Falk | COMPLETION DEPTH: 44.81 m

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

Fig. No: 43

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)
0									
1									657
			1.5 m						
2		CI	**CLAY TILL** : silty, sandy, medium plastic, moist, stiff, brown and grey, trace oxides and gravel		10	17.9			656
3		CI	-At 3.1m: firm to stiff		7	19.1			655
4									654
5		CI	-At 4.6m: silty, sandy, medium plastic, very moist, soft, grey		8	18.5			653
6		CI	-At 6.1m: silty, sandy, medium plastic, very moist, soft, grey		11	19			652
7									651
			7.6 m						
8		SS	**SANDSTONE** : moist, hard, grey, clay stringers in portions		34	19.1			650
			9.1 m						
9		CH	**CLAY TILL** : silty, high plastic, very moist, stiff, grey, trace gravel and bedrock pieces, appears to be reworked		12	20.2			649
10									648
11		CH	-At 10.7m: silty, high plastic, very moist, stiff, grey, trace gravel and bedrock pieces		9	23.9			647
12									646
		CH	-At 12.2m: firm and stiff portions, moist to very moist, trace coal, oxides and shale lens		17	16.3			
13									645
			13.7 m						
14		CS	**CLAYSHALE** : silty, moist, very stiff, grey, weathered, odd very moist lens		41	26.1			644
15									643
		CS BEN	15.3 m -At 15.2m: silty, moist, hard, grey, block, bentonitic, bentonite portions, sandstone lens 15.6 m		29	27.2			
16			**BENTONITE** : moist to very moist, soft, blocky						642
			CLAYSHALE : moderately hard						
17			-At 15.9m: approximately 4" thick coal seam						641
		CS	-Below 16.0m: clayshale, slightly blocky, moderately hard						
18			-At 16.5m: approximately 4" thick very moist, blocky, soft, bentonitic layer						640
19			-Below 16.8m: soft, blocky, slicken-sides, bentonitic -Below 17.4m: soft to moderately hard, slightly blocky						639
20			19.8 m -Below 18.3m: bentonitic, moderately hard, slightly						

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REVIEWED BY: R Evans	COMPLETION DATE: 12/3/13
Fig. No: 44	Page 1 of 3

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)
20		SS	blocky						
		CS	-At 19.7m: approximately 6: thick coal lens						
			20.2 m / 20.4 m						
21			**SANDSTONE** : moderately hard, clayey						637
			CLAYSHALE : moderately hard, bentonitic						
			SANDSTONE : moderately hard, clayey						
22		SS							636
23			-Below 22.9m: sandstone with clayshale lamination till 23.8m						635
			23.8 m						
24			**CLAYSHALE** : slightly blocky, moderately hard						634
			-At 24.1m: approximately 6" thick more bentonitic seam						
25			-Below 24.2m: moderately hard						633
		CS	-At 24.7m: approximately 4" thick more bentonitic layer						
26			-Below 24.8m: moderately hard, slightly blocky						632
			26.8 m						
27		SS	**SANDSTONE** : moderately hard						631
			-Below 27.0m: hard						
			27.3 m						
28		CS	**CLAYSHALE** : bentonitic, soft to moderately hard, slightly blocky						630
			28.4 m						
		SS	**SANDSTONE** : clayey, moderately hard						
29			-Below 28.9m: hard						629
			29.0 m						
			CLAYSHALE : sandy, moderately hard						
30			-Below 29.3m: moderately hard, non-sandy						628
			-Below 29.4m: bentonitic						
			-Below 30.2m: slightly blocky, moderately hard						
31		CS							627
32									626
33									625
			-Below 33.2m: moderately hard						
			33.6 m						
34		SS	**SANDSTONE** : clayshale laminations, clayey, moderately hard						624
			34.4 m						
			CLAYSHALE : moderately hard, bentonitic						
35									623
			-At 35.4m: approximately 0.2m thick sandstone layer						
36		CS	-Below 35.6m: clayshale, slightly blocky						622
			-Below 36.0m: sandy, moderately hard						
			-Below 36.3m: moderately hard to hard, fractured till 36.6m						
37			-Below 37.1m: blocky						621
			37.6 m						
38		SI	**SILTSTONE** : hard						620
			37.9 m						
			CLAYSHALE : moderately hard, bentonitic						
39			-At 38.3m: 0.25m thick bentonite seam, soft to moderately hard						619
			-Below 38.6m: clayshale, moderately hard to hard						
40			-Below 39.2m: moderately hard						

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