

BY-LAW NUMBER 2006/27

BY-LAW NO. 2006/27 is a by-law of the County of Wetaskiwin No. 10 in the Province of Alberta, to authorize the adoption of an Area Structure Plan for the purpose of providing a framework for subsequent subdivision and development of the area known as NW 30-45-6-W5M (Dion Auclair) in accordance with Section 633 of the Municipal Government Act, Chapter M-26.1, Revised Statutes of Alberta 2000, and amendments thereto. Subject to the following amendments being made to the Area Structure Plan:

1. Stormwater Management Contour Map.
2. Groundwater Potential Water Well Map.
3. Traffic Impact Section.
4. The developer shall be responsible for the implementation of the traffic impact study including type IIa intersectional improvements and service road.

WHEREAS: at the requirements of County Council, an Area Structure Plan has been prepared for NW 30-45-6-W5M.

AND WHEREAS: the proposed Area Structure Plan has been widely circulated and discussed within the County pursuant to Section 230, 606(1), and 633(1) of the Municipal Government Act, 2000, Chapter M-26.1, and amendments thereto.

NOW THEREFORE: the County of Wetaskiwin No. 10, duly assembled, hereby enacts as follows:

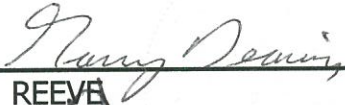
- (a) The document attached to this By-law as "Appendix A", together with accompanying maps, is hereby adopted as the NW 30-45-6-W5M "Dion Auclair".

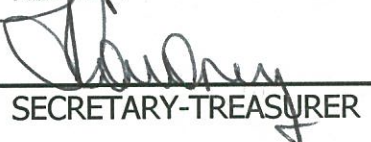
2. This by-law comes into effect on the date of third reading.

READ: A First time this 4th day of May, A.D., 2006.

READ: A Second time this 4th day of May, A.D., 2006.

READ: A Third time and finally passed this 4th day of May, A.D., 2006.


REEVE


SECRETARY-TREASURER

BY-LAW 2006/27
Appendix "A"

Proposed Residential Subdivision Development

NW 30-45-6-W5M

County of Wetaskiwin

Conceptual and Preliminary Design

Technical Information Package

February 22, 2006

**Prepared for:
Mr. Dion Auclair**

**Prepared By:
EXH Engineering Services Ltd.
Red Deer, Alberta
Project No. 4204219**

EXH Engineering
Services
Ltd.

4204219

February 22, 2006

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

Attention: Mr. Dion Auclair:

Re: Proposed Residential Subdivision Development – NW 30-45-6-W5M
Area Structural Plan Requirements

This information package is provided as an up-date to the package issued in April Of 2005. Project up-dates reflect changes to the access location for the proposed subdivision.

As requested, we have reviewed the "Requirements for Area Structure Plans (Policy #6606)" contained in the *Municipal Policy & Procedures Manual*, as provided by the County of Wetaskiwin. The document is attached as Appendix A. This letter is intended to provide the preliminary technical information identified in the document, in support of an Area Structure Plan.

As identified in the County document, Area Structure Plans (ASPs) are broad area plans that specify the development layout and technical considerations for a subject parcel, in the immediate and longer-term. ASPs consider the effects of that development on surrounding lands, and the relationship of the proposed development with any existing adjacent and known proposed and/or approved development in the area. Once adopted and passed through by-law, future application, including rezoning, subdivisions and development applications, are guided by the area structure plan, which is required to be consistent with the Municipal Development Plan and the Land Use Bylaw.

At this stage in the development process, some information is preliminary. Based upon initial comment from the County, detailed design of project components will be completed and submitted to the County for review and approval, as required by the Development Agreement and the Area Structure Plan.

We provide the following comments and information, based upon the section headings and numbering in the County document:

1. PRE-ASP INFORMATION

1.1 Outline of the Planning Area

The attached Drawing 4204219-A, Rev 2 (Appendix B) shows the proposed lay-out for the development. It is proposed to consist of 16 residential, single-family lots. Lot sizes are indicated on the drawing.

This drawing shows the access for the development combined with the access for the existing golf course in a new access to the south.

1.2 Draft Terms of Reference

The proposed lotting configuration for the development is provided herein (Appendix B). A legal plan will be prepared, based upon the positive review comments from the County of Wetaskiwin.

It is intended that the approval process will follow the County of Wetaskiwin process for submission and approval of documents, with a Development Agreement established between the Developer and the County, and an Area Structure Plan prepared and approved.

It is anticipated that there will be a single public information meeting to present information on the proposed development, and to solicit input from area residents.

2. MAPPING/PLAN INFORMATION

2.1 Natural Areas

Drawing 4204219-2, rev 1, shows the development in context with the surrounding area. The land is fairly level, open terrain, sloping, on average, 2% to the east. Typical contours are shown on the drawing.

A report identifying the location of the area groundwater has not been prepared.

2.2 Existing Land Use

There are no intensive livestock operations within 2 km of the proposed development.

There are no sour gas wells on the site. Adjacent to the development, to the east, is a sweet gas well. The lines from the gas well are low pressure. Access to the well site has been maintained through the development.

There are no airport runways in proximity to the proposed development site.

2.3 Boundaries of Adjacent Municipalities

Drawing 4204219-7 shows the location of the proposed development in context with the surround area and communities.

The closest community to the proposed development is Alder Flats, 7 km to the northwest. Buck Lake is located approximately 10 km to the northeast.

2.4 Road, Utilities and Built Features

The configuration of the internal road system is shown on drawings 4204219-A and 4204219-2. These alignments are preliminary, to be confirmed through detailed design. The access is intended to be to the south, combined with the access for the existing golf course.

As the lots are intended to each have their own water and wastewater systems, there are no water distribution or sewage collection lines on the site. Shallow utility (gas, power and telephone) alignment designs have not been obtained. These will be developed, based upon initial approvals from the County of Wetaskiwin, as part of the site servicing design. It is expected that shallow utility servicing will extend from Highway 22 along the proposed access road alignment.

2.5 Municipal and Environmental Reserves

There are no municipal or environmental reserves proposed for the development. The development is located adjacent to a golf course facility.

2.6 Tentative Plan of Subdivision

The tentative plan of subdivision will be prepared by a Legal Survey firm, based upon initial review comments provided by the County, using the attached drawing 4204219-A. The development is proposed to proceed in a single phase.

3. STUDIES AND REPORTS

3.1 Geotechnical/Groundwater and Percolation Reports

An initial assessment of the area soils with respect to establishing the potential for development of septic fields was prepared by EXH Engineering Services Ltd on February 17, 2005. A soil test hole was established, to a depth of 1.2 m. A hydrometer analysis of the clay and a sieve analysis of the sand were conducted. The report, with the associated test results, is attached in Appendix C.

Additional specific percolation tests and sampling will be required to confirm the suitability for each lot, and to allow sizing of the distribution fields.

3.2 Sewage Treatment

It is intended that each lot be serviced by a septic field. Initial assessment of the site, with respect to suitability, is contained in Appendix C. See also comments contained in section 3.1.

3.3 Stormwater Management Plan

A Stormwater Management Plan was prepared by EXH Engineering Services Ltd in March of 2005. This is included in Appendix D. Included as well is a copy of an initial Stormwater Assessment, completed in February.

The necessary temporary stormwater storage has been identified, based upon a 1:100 year design storm and the difference between pre-development and post-development conditions.

The Stormwater Management Plan is based upon the stormwater run-off being accommodated in an off-site pond, specifically an existing low area on the adjacent golf course.

3.3 Water Supply

Section 23(3)(a) of the Water Act requires an assessment of the impact of the proposed development diverting 1250 m³ of water per year per household from the area aquifer.

A Groundwater Potential Assessment was conducted for the site by Waterline Resources Inc. A copy of their report is provided as Appendix E. Waterline concludes that the groundwater source appears suitable to supply the demand of the proposed development and "should not interfere with any existing household users, licensees or traditional agricultural users in the area".

3.5 Traffic and Roads

A Traffic Impact Assessment was conducted by EXH Engineering Services for the proposed development, in order to assess what form of intersection configuration is appropriate for the proposed intersection between the access road and Highway 22. The Traffic Impact Assessment is attached as Appendix F. A Type IIa intersection appears to be appropriate, under present traffic volumes. The report has been submitted to Alberta Infrastructure and Transportation (AIT) for review.

Subsequent to this report, AIT recommended relocation of the subdivision access to the south, combining it with the access for the golf course, with no change in the intersection configuration requirement.

The internal roads are intended to be gravel surfaced, meeting the County of Wetaskiwin standards, as a minimum. In support of the Development Agreement, detailed design drawings for the road system will be submitted to the County for review and approval.

3.6 Environmental Assessment

An Environmental Assessment of the site has not been conducted. The land has been under cultivation and is adjacent to a recreational land use. The land is not considered to be in a natural state.

A formal Environmental Assessment can be carried out, if deemed necessary by the County.

3.7 Archaeological and Historical Assessment

An Archaeological and Historical Assessment of the site has not been conducted. The land, and the surrounding area, have been under cultivation or have been converted to a recreational land use. The land is not considered to be in a natural state. There are no historic buildings on the site.

A formal Archaeological and Historical Assessment can be carried out, if deemed necessary by the County.

3.8 Public Input Plan

Public hearings will be based upon the County of Wetaskiwin requirements. The proposed land use is not subject to public hearings, based upon necessary Alberta Environment or Alberta Transportation approvals.

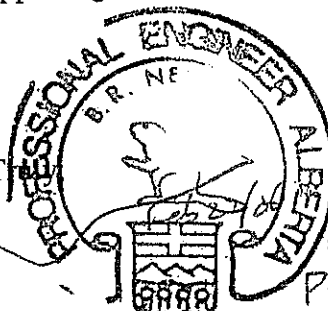
4. FURTHER STUDIES OR DETAILED INVESTIGATION

No additional studies or investigation are provided in support of the development.

5. DOCUMENTS SUBMITTED

At the request of the County of Wetaskiwin, we will provide digital copies of supporting documents attached to this submission.

Yours Truly


Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

Permit #
P-5747

Appendix A

Requirements for Area Structure Plans

Policy #6606

County of Wetaskiwin No. 10

COUNTY OF WETASKIWIN NO. 10**Municipal Policy & Procedures Manual****FUNCTION:****6000 PLANNING AND DEVELOPMENT****SECTION:****6600 SUBDIVISION LAND
AND DEVELOPMENTS****REQUIREMENTS FOR AREA STRUCTURE PLANS
POLICY #6606****POLICY STATEMENT**

The Council of the County of Wetaskiwin No. 10 receives requests from landowners who wish to develop their parcels into multi-lot subdivisions. In order to provide fair and consistent decisions regarding multi-lot subdivisions, Council deemed it necessary to establish this policy.

PROCEDURES

Council requires an Area Structure Plan for any proposed subdivision that will create three (3) or more parcels.

The attached guidelines outline all requirements of an Area Structure Plan. An Area Structure Plan will not be deemed complete until all requirements of the guidelines have been met.

Once an Area Structure Plan has been deemed complete by administration, the proposed Plan will be referred to all required government departments, agencies and adjacent municipalities. Once responses have been received, a public hearing will be held. Prior to the public hearing, the proposed Plan will be circulated to adjacent landowners and advertised in the local paper for two consecutive weeks as per Section 692 of the Municipal Government Act.

Sharon-Joan\POLICY\draftpolicies\Area Structure Plan Requirements 120302.doc

REVISION DATE:	ORIGINAL COUNCIL APPROVAL DATE:	REF. PAGE NO.	NUMBER:
	December 3, 2002	2002/257 C	1 of 6

REQUIREMENTS FOR AREA STRUCTURE PLANS **POLICY #6606**

Purpose:

Area structure plans (ASPs) are broad area plans that specify the development layout and technical considerations for the subject parcel(s) in the immediate and longer term future. ASPs will consider the effects of that development on surrounding lands and the relationship of the proposed development with any existing adjacent and known proposed and/or approved development in the area. Once adopted and passed through bylaw, further applications, including rezonings, subdivisions and development permit applications, are guided by the area structure plan, which is required to be consistent with the Municipal Development Plan and the Land Use Bylaw.

Requirements:

1. Pre-ASP Process Information

Prior to engaging in the Area Structure Plan Process, the applicant shall provide the following to Staff:

1.1 Outline of the Planning Area

Rationale for the area is to be included in the ASP. The area will be determined in consultation with the County.

1.2 Draft Terms of Reference, including:

Description of the proposed plan contents

- i) Procedure and proposed schedule for plan preparation, including key dates, including anticipated Hearing date(s). Staff review
- ii) Graphic representation of the process (i.e. flow chart).
- iv) Public Participation program where deemed appropriate

2. Mapping/Plan Information

The contents of the Area Structure plan should include plans and/or maps Including, but limited to, the following:

2.1 Natural Areas:

Plan of the subject lands and surrounding lands. This shall include:

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REQUIREMENTS FOR AREA STRUCTURE PLANS POLICY #6606

- topographical features, including steeper slopes. Contours, through survey or air photos, will assist in assessing development constraints and storm water runoff projections
- groundwater report showing any near surface water tables,

2.2 Existing Land Use, highlighting potential land use conflicts, (i.e.):

- Location of any intensive livestock operations within **2 kilometres**, and setbacks as per Alberta Agriculture, Food and Rural Development's Minimum Distance Separation Formula (MDS) as contained in the Code of Practice for the Safe and Economic Handling of Animal Manures.
- Location of sour gas installations
- Location of Airport runways and NEF Noise Contours, if applicable.

2.3 Boundaries of Adjacent Municipalities and Referrals

The Plan shall indicate the proximity of adjacent municipalities, including:

- The City of Wetaskiwin or Town of Millet, if within 3.2 km of the area structure plan area;
- Any land included in the Intermunicipal Development Plan between the County of Wetaskiwin and the Summer Villages of Crystal Springs, Norris Beach, Poplar Bay & Grandview.
- Other municipalities if within 0.8 km of the area structure plan area.

Any development within the above distances of neighbouring municipalities will require that any area structure plan(s) and related applications be referred to these municipalities for review.

The above distances may be greater than specified if the potential effects of the proposed development warrant referrals due to air emissions, smell, noise or aesthetic considerations.

2.4 Roads, Utilities and Built Features

The location of existing and proposed roads, as well as existing and proposed utility lines, and oil and gas installations shall be shown on a plan.

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REQUIREMENTS FOR AREA STRUCTURE PLANS

POLICY #6606

2.5 Municipal and Environmental Reserves

The location of any existing and/or proposed municipal and environmental reserves is to be shown on any plans.

2.6 Tentative Plan of Subdivision

Includes phasing plans (this may be preliminary pending an official subdivision application).

3. Studies and Reports

In addition to the above mapped features, the area structure plan should include discussions and/or reports by qualified professionals with regard to:

3.1 Geotechnical/Groundwater and Percolation Reports

- groundwater report showing any near surface water tables,
- percolation and near surface water testing to show any high water tables that could restrict development and showing suitability of the lands for septic fields if the proposed sewage system is individual septic tanks and fields,
- Discussion of slope stability in the area, and how this will be addressed in the tentative plan with regard to adequate development sites as per Alberta Environment regulations.

3.2 Sewage Treatment

A description of the proposed sewage treatment system, whether by individual septic tank and tile fields or by a central treatment system or connection to piped sewer lines. In the case of individual septic tank and tile field systems, a percolation report (as indicated in 3.1 above) done by a geotechnical engineer is required in order to assess the suitability of lands to accept septic fields.

3.3 Stormwater Management Plan

This shall include proposed drainage plan for the site, and pre and post development flows. Also, this shall include an assessment of the 1:100 year flood plain and potential flood risk.

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REQUIREMENTS FOR AREA STRUCTURE PLANS POLICY #6606

3.4 Water Supply

Description of the proposed water supply, whether by Individual wells, piped water system, or cistern system. If water is proposed to be by Individual or shared wells, a preliminary Phase 1 Groundwater Assessment is required which reviews existing well data in the area from Alberta Environment. In the case of subdivisions of 6 or more lots per quarter section, the *Water Act* requires that a detailed Groundwater Assessment be conducted by a professional engineer, geologist, or geophysicist, verifying that the current Alberta Environment standard of 1,250 cubic metres of water per year are available to each Individual lot.

3.5 Traffic and Roads

For multi-lot subdivisions, a statement on traffic impact of the development. This may require a traffic impact assessment by a qualified professional engineer for larger subdivisions.

Road standards, as per County of Wetaskiwin requirements.

Any off-site considerations for road upgrading that may be required as a result of the proposed development.

3.6 Environmental Assessment

The County may request that a qualified professional produce an Environmental Assessment in the case that the subject area and/or surrounding area is known to be environmentally sensitive, in terms of wildlife issues, potential contamination from previous or adjacent land uses, or potential effects on nearby lands, uses, waterways or groundwater tables are anticipated. The exact requirements of such an Environmental Assessment will be noted by staff.

3.7 Archaeological and Historical Assessment

The County may require that a qualified professional produce an Archaeological and Historical Assessment, especially in the case where it is known that the subject or nearby lands are of historical significance, through archaeological findings or known settlements that have occurred in the area. Such an Assessment must meet the guidelines and be acceptable to the Province.

ISION DATE:	ORIGINAL COUNCIL APPROVAL DATE:	REF. PAGE NO.	NUMBER:
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REQUIREMENTS FOR AREA STRUCTURE PLANS

POLICY #6606

3.8. Public Input Plan

As part of the ASP process, it is strongly advised that public input is provided for in your proposed plan. It will be better to obtain this input prior to finalizing the ASP. The applicant should be prepared to address concerns of area residents. Ideally these would be addressed within the ASP.

4. Further Studies or Detailed Investigation

The provision of the above may also indicate that further, more detailed assessments or evaluations are required, as well as possible mitigative measures.

5. Documents Submitted

In addition to paper copy submission, Council also requires the submission of disc ready originals.

6. Council's Option to Waive

This policy may be waived by resolution of Council when, in the opinion of Council, no purpose would be served by preparing an Area Structure Plan.

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COUNTY OF WETASKIWIN NO. 10

PRE CONSTRUCTION SITE INSPECTION

ME: _____
one () During Working Hours: _____
ation: Quarter: _____ Section: _____ Range: _____ Township: _____ Meridian 4 or 5
Lot: _____ Block: _____ Plan: _____ Roll No.: _____

Description of How the Approach is Marked: (Example) (40 feet North of Old Tractor/Red
tag on Post/Red Stake on Approach): _____

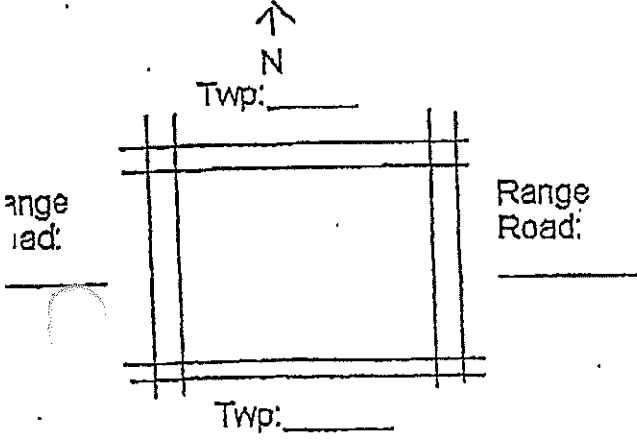
Contractor Information (Name/Phone No.): _____

Conditions of Approval for Approach: _____

CULVERT SIZE REQUIRED: _____

Other: _____

Date of Inspection: _____



PUBLIC WORKS DIRECTOR OR DESIGNATE

**Please Indicate Approximately the Location of Required approach or If multi-lot please attach
separate Sketch.
**Also Include and Identify land marks (ie approaches xx(ft) from Red Barn) on drawing.

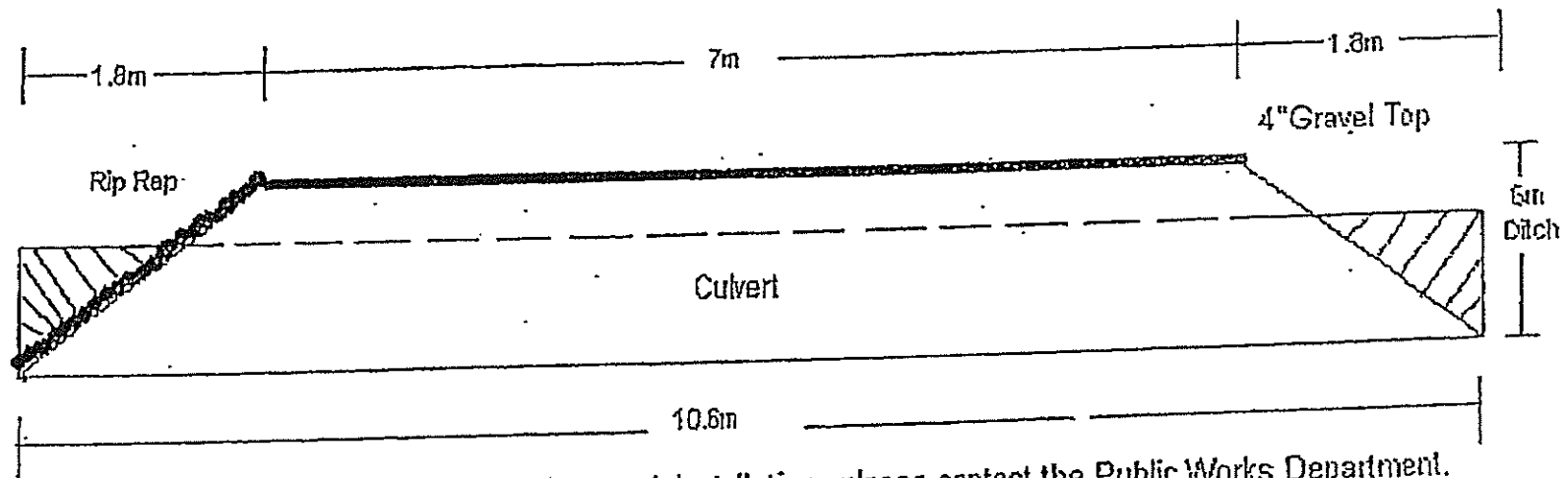
Examples of Culvert Length Required for Depth of Ditch

.6m Ditch = 7m Top + 1.8m Side Slope x 2 = minimum Length of culvert = 10.6m
 1m Ditch = 7m Top + 3m Side Slope x 2 = minimum Length of culvert = 13m
 1.3 Ditch = 7m Top + 3.9m Side Slope x 2 = minimum Length of culvert = 14.8m

1m Ditch = 7m Top + 3m Side Slope x 2 = minimum Length of culvert = 13m

$$1.3 \text{ Ditch} = 7\text{m Top} + 3.9\text{m Side Slope} \times 2 = \text{minimum Length of culvert} = 14.8\text{m}$$

Below is an Example of Culvert Installation for .6m ditch.



Any questions concerning Culvert or Approach Installations please contact the Public Works Department.

Appendix B
Drawings and Figures

Highway 22

Proposed Subdivision

Existing Development

Golf Course

NW 30-45-6 W5M

LEGEND



WATER WELL

NOTES

1. Site limits as provided by owner. To be confirmed as part of detailed design.
2. Lots to accomodate single family dwellings.

[illegible]

Permit	Engineers Stamp
--------	-----------------

EXH Engineering Services Ltd.

project

Auclair Subdivision

Proposed Wild Rose Residential Site

drawing

designed	scale	NTS	date	APR. 2005
drawn	project No.	4204219	control No.	
HC				
checked	drawing No.		revision	
BN				
approved		4204219-2		1

M:\2004\4204219 AUGLAIR SUBDIVISION-FAIRWAYS WEST\4204219.DWG

SE36 45-7-W5M

NE25 45-7-W5M

ABANDON EXISTING
APPROACH

HWY 22

EXISTING
PARKING

NEW
INTERSECTION



2331 m²

2309 m²

2309 m²

2309 m²

1025 m²

LOT 2
962 1220

2200 m²

2220 m²

2211 m²

2211 m²

2216 m²

NW30 45-6-W5M

2604 m²

2800 m²

2800 m²

2180 m²

2178 m²

2169 m²

2165 m²

Not For Construction

NOTES:

1. Site limits as provided by owner. To be confirmed as part of detailed design.
2. Location of roads are conceptual, to be confirmed as part of detailed design.
3. Roadways 7.3m paved rural cross-section.
4. Lots to accommodate single family dwellings.

1	AUG 25 05	REVISED ROAD LAYOUT	BRN	BRN	
0	FEB 15 05	ISSUED FOR REVIEW	BRN	BRN	
No.	Date	revision	by	app.	

Permit Engineers Stamp
EXH Engineering Services Ltd.

Project
**PROPOSED
WILD ROSE SUBDIVISION
FAIRWAYS WEST GOLF COURSE**

Drawing
**PROPOSED
LOTTING AND ROADS**

designed	DJO	scale	1:1000	date	FEB 2005
drawn	DJO	Project No.	4204219	contract No.	
checked	BRN	drawing No.	4204219-A	revision	2
approved					

Appendix C

Geotechnical/Percolation Test Assessment

4204219-2

February 17, 2005

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

Attention: Mr. Dion Auclair:

Re: Proposed Residential Subdivision Development – NW 30-45-6-W5M
Soils/Field Assessment

As requested, we have reviewed the general soil conditions for the proposed development, with respect to establishing septic fields for disposal of domestic waste. To carry this out, a borehole was established on February 2, 2005.

The soil log is attached. To a depth of 1.2 m, clay was found underlying approximately 0.6 m of sand/silt, with a 0.14 m cover of topsoil. A hydrometer analysis of the clay and a sieve analysis of the sand are also attached.

The clay classification, Cl, was compared to the Soil Texture Classification Triangle, as contained in the Alberta Private Sewage Systems guidelines. Due to the potential for variability within this classification, the results indicate the need for specific percolation testing.

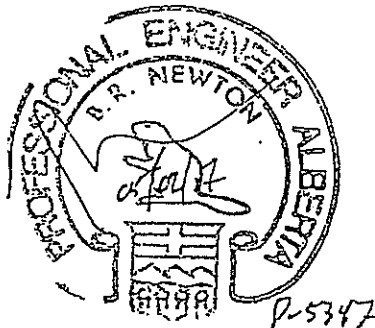
In summary, the site materials found in the site test hole were generally conducive to development of on-site fields or sewage mounds. Additional specific percolation tests and sampling will be required to confirm the suitability for each lot, and to allow sizing of the distribution field.

The information contained herein is general in nature, based upon the samples taken from the site borehole. Conditions may vary across the site.

Please call if you have any questions.

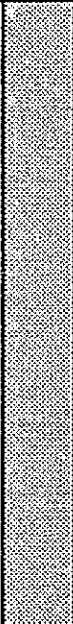
Yours Truly;

Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.



Project:	Auclair Subdivision
Client:	Dion Auclair
Land Location:	NW 1/4 Sec. 30, 45-6-5
Elevation:	
Boring Date:	2-Feb-05
Boring Method:	Drill Truck
Logged by:	Arthur Smith
Drawn By:	Arthur Smith

Project #:	4204219
Testhole #:	TH 01
Completion Depth:	1.22m

Depth (m)	Soil Description	Strata Plot	Depth B.G.S. (m)	Sample Type	Sample Location	Sample ID	Additional Comments
0	Topsoil		0.14	Grab	0-0.14	TH01A	
0.1							
	SMD Sand-Silt Mixture		0.72	Grab	0.14-0.72	TH01B	Light Brown Colour
0.2							
0.3							
0.4							
	Clay 54%-Clay 15%-Sand		1.2	Grab	0.72-1.20	TH01C	Grey Colour
0.5							
0.6							
0.7							
0.8	End of Hole						
0.9							
1							
1.1							
1.2							



Engineering
Services
Ltd.

SIEVE ANALYSIS

PROJECT NO.	4204219	SAMPLE NO.	1
PROJECT NAME:	Auclair Subdivision	JOB NO.	
PIT NAME:		HOURS WORKED	
PIT LOCATION:			hours
MATERIAL:	Sand	OUTPUT	
SOURCE:	Test Hole		t or loads
DATE SAMPLED / TESTED:	Feb 2/05		

MOISTURE CONTENT DETERMINATION

Notes / Calculations

WT. OF WET SAMPLE + PAN	g	368.5
WT. OF DRY SAMPLE + PAN	g	315.0
WT. OF WATER A - B	g	53.5
WT. OF PAN. (NO. _____)	g	
WT. OF DRY SAMPLE B - D	g	315.0
MOISTURE CONTENT 100C/E	%	17.0%

D.W.W. 301.6

SIEVE ANALYSIS

WT. OF WET SAMPLE + PAN	g	
WT. OF PAN (NO. _____)	g	
WT. OF WET SAMPLE G - H	g	
WT. OF DRY SAMPLE 100I/100+F	g	315.0

WASHED SIEVE

SIEVE SIZE	WEIGHT RETAINED	WEIGHT PASSING	PERCENT RETAINED	PERCENT PASSING	SPEC'S
20,000					
16,000					
12,500					
10,000					
5000					
1250	0.3	314.7	0.1%	99.9%	
630	2.8	311.9	0.9%	99.0%	
315	105.6	206.3	33.5%	65.5%	
160	177.0	29.3	56.2%	9.3%	
80	10.5	18.8	3.3%	6.0%	
PAN	0.9		0.3%		
	297.1	TOTAL WIEGH	297.1		
		DRY WASH WII	301.6		
		DIFFERENCE	4.5		
		% DIFFERENCI	1.49		

Materials Technologist: ARTHUR SMITH

General Information:

Lab Partners:	D Wilson	Date:	Feb 16/05
Wt. of Dry weight of Spec. (g):	50.5	Corrected Sample Wt.	50.3
Specific Gravity(Gs):	2.7	Gs correction factor:	0.99
Composite Correction:	5		
Correction factor	0.01312	CLIENT:	Dion Auclair
Hydrometer type:	152 - H	LSD:	

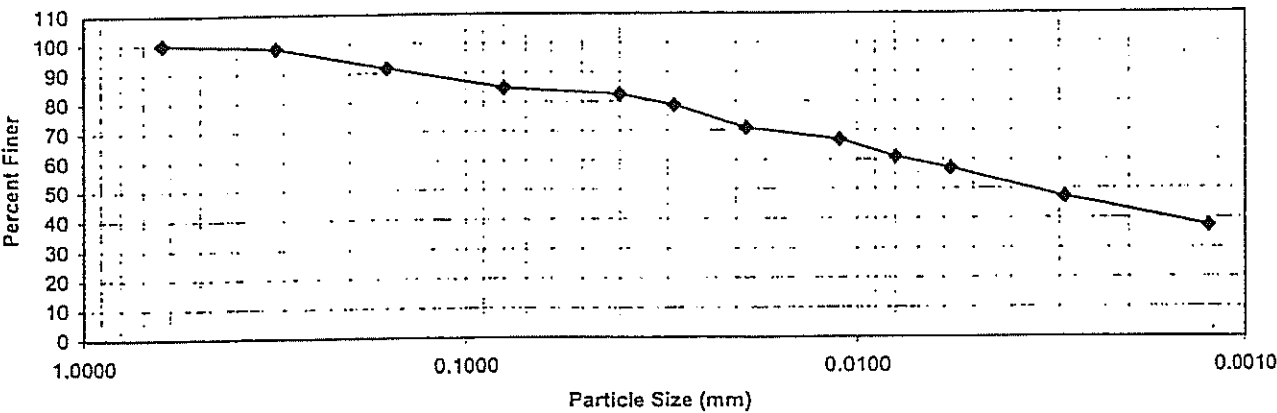
pan No.:	E
Wt. of Pan + Air Dried (g):	58.2
Wt. of Pan + Oven Dried (g):	58.0
Wt. of Water (g):	0.2
Wt. of Pan (g):	8
Wt. of Oven Dried (g):	50
Hygroscopic Moisture (%):	0.40

ASTM D422

LIQUID LIMIT	44.3
PLASTIC INDEX	25.6
GRAVEL	0
SAND (0.074mm-4.75mm)	15
SILT (0.074mm-0.005mm)	30
CLAY(<0.005mm)	54

Test Data:

Time (1st Four are Sieves) (min)	Hydrometer Reading	Adj. Hydrometer Reading	Effective Depth, L (cm)	Percent Finer	D (mm)
630µm				100.00	0.6300
315µm				98.41	0.3150
160µm				91.65	0.1600
80µm				84.90	0.0800
1	47	42	9.4	82.62	0.0402
2	45	40	9.7	78.69	0.0289
5	41	36	10.4	70.82	0.0189
15	39	34	10.7	66.88	0.0111
30	36	31	11.2	60.98	0.0080
60	34	29	11.5	57.05	0.0058
250	29	24	12.4	47.21	0.0029
1440	24	19	13.2	37.38	0.0013



- (d) supplied with *effluent* from a *septic tank* may have a 20% reduction in the area of *weeping lateral trench* bottom required in Article 7A.1.1 when pressure distribution is used in accordance with Article 7A.1.9.

7A.1.4. When using the results of a *percolation test* to size a system, the total area of *weeping lateral trench* bottom required shall be determined from the following formulas

(a)

$$\text{Square Metres} = \frac{\text{Litres per Day}}{\left(\left(\frac{3}{\sqrt{\text{Percolation Rate}}} \right) \times 27.36 \right)}$$

where

Square Metres = trench bottom area in square metres not including trench walls

Litres per Day = expected sewage volume in litres/day

Percolation Rate = percolation rate in min./25 mm, or

(b)

$$\text{Square Feet} = \frac{\text{Gallons per Day}}{\left(\left(\frac{3}{\sqrt{\text{Percolation Rate}}} \right) \times 0.56 \right)}$$

where

Square Feet = trench bottom area in square feet not including trench walls

Gallons per Day = expected sewage volume in gallons/day

Percolation Rate = percolation rate in min./inch.

Note: A table of loading rates, square roots of percolation rates, and calculations using this formula is provided for convenience in the appendix, A.4.A.

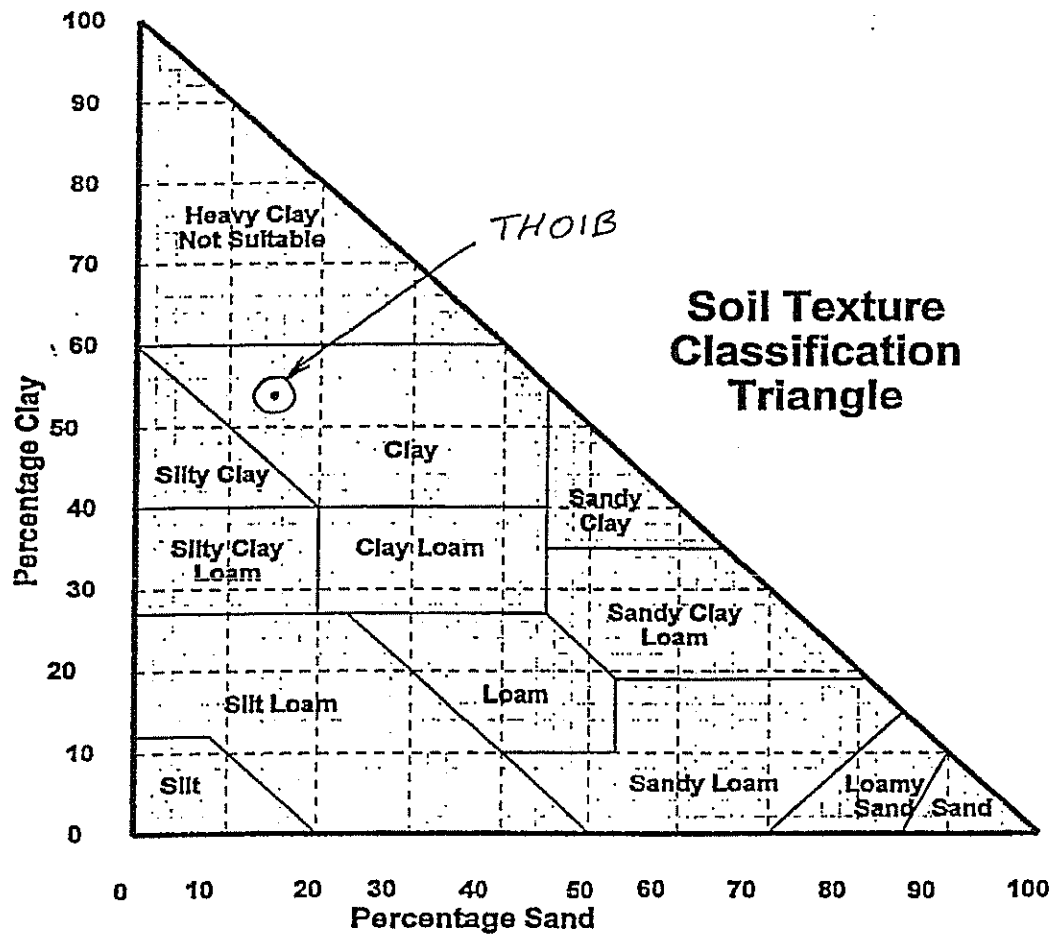
Note: The percolation tests form only part of an acceptable site evaluation. Additional evaluation of the soil type, Sodium adsorption ratio (S.A.R.), clay content and type of clay (table A.3.B. and A.3.C.), depth to impervious layer or water table, terrain, and other factors, must also be conducted.

7A.1.5. When using the results of a soil classification to size a system, the *disposal field weeping lateral* trench bottom area shall be sized so that the *effluent* loading rate per day for soil classifications determined in Table 7.1.5A does not exceed, in a soil classified as

- | | | |
|-----|------------------|--|
| (a) | Clay, | not suitable without further testing |
| (b) | Silty Clay, | not suitable without further testing |
| (c) | Silty Clay Loam, | not suitable without further testing |
| (d) | Sandy Clay, | not suitable without further testing |
| (e) | Clay Loam, | 9.78 L per square metre (0.22 gal per sq. ft.), |
| (f) | Silt, | 11.74 L per square metre (0.25 gal per sq. ft.), |
| (g) | Sandy Clay Loam, | 19.57 L per square metre (0.28 gal per sq. ft.), |
| (h) | Silt Loam, | 18.10 L per square metre (0.28 gal per sq. ft.), |
| (i) | Loam, | 24.46 L per square metre (0.35 gal per sq. ft.), |
| (j) | Sandy Loam, | 24.46 L per square metre (0.45 gal per sq. ft.), |
| (k) | Loamy Sand, | 32.29 L per square metre (0.63 gal per sq. ft.), and |
| (l) | Sand, | not suitable without further testing. |

Intent: Soils classed as "not suitable without further testing" for a disposal field in this table may have an infiltration rate that will accommodate a disposal field. Further testing such as a percolation test, soil structure, and determining the absence of expandable clays may indicate the soil can accommodate a disposal field.

7A.1.5.A. Soil Texture Triangle



Note: Plotting the percentage of sand and clay provides the remaining percentage of silt.

Appendix D

Stormwater Management

4204219-2
February 17, 2005

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

Attention: Mr. Dion Auclair:

Re: Proposed Residential Subdivision Development -- NW 30-45-6-W5M
Stormwater Assessment

As requested, we have reviewed the general stormwater requirements for the proposed development. The lay-out was assumed as per the attached sketch.

Drainage from the site is to the east. In addition, we made the following general assumptions with respect to the level of development on each lot:

- House size 200 - 300 m², including garage,
- Paved driveway, 300 m²,
- Remaining area grassed.

Using these development assumptions, we evaluated the run-off characteristics under pre-development and post-development conditions for a 1:100 year design storm event. The resulting increase in stormwater run-off volume was estimated at 1600 m³.

This volume of stormwater would have to be detained during a major stormwater event, with the discharge from the site maintained to pre-development levels. This water could be stored in temporary or "dry" ponds: depression areas that are normally dry, but which fill with water during run-off events. The proposed MR area, adjacent to lot 15, could be used for some storage, but is likely only large enough to contain 50% of the required volume. The water could also be channelled to a wet pond or wetlands area, although there is no on-site room to develop this type of storage. Storage off-site, on the adjacent golf course, would require an agreement between the two land owners.

Please review this information and advise how you wish to proceed with the stormwater storage requirements for the site. Site grading or pond design would form part of the detailed design of the site.

Please call if you have any questions.

Yours Truly;

Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

4204219-2

March 8, 2005

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

COPY

Attention: Mr. Dion Auclair:

Re: Proposed Residential Subdivision Development – NW 30-45-6-W5M
Stormwater Management Plan

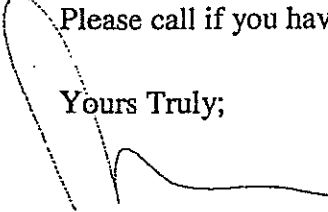
Enclosed you will find three copies of the stormwater management plan for the development. This report has been up-dated and finalized based upon the current development configuration.

The report is also based upon the stormwater run-off from the development being accommodated in an off-site pond, specifically an existing low area on the adjacent golf course. As we discussed, there will have to be an agreement between the two properties allowing for the uncontrolled run-off from one site to enter the other.

As well, the report, although identifying the required run-off restrictions, does not provide a design of the off-site pond. This will have to be carried out in order to ensure the final discharge rates are consistent with identified limits.

Please call if you have any questions.

Yours Truly;


Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

March 7, 2005

File: 4204219

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

Attention: Mr. Auclair:

**Re: Stormwater Management Plan – Proposed Residential Subdivision
NW 30-45-6-W5M**

Fairways West retained EXH Engineering Services Ltd. to carry out a review of the stormwater management requirements associated with a proposed residential subdivision located at NW 30-45-6-W5M within Wetaskiwin County. The site plan for this development is shown in the attached drawing 4204219-C.

The specific issues addressed by this review are:

- Determine the acceptable pre-development peak flow run-off rates from Wetaskiwin County and Alberta Environment.
- Estimate the post-development peak flow run-off rate from the development site.
- Outline the measures required to limit the post-development peak flow run-off rate to the required pre-development rate.

In general, this report is intended to provide recommended measures to limit downstream peak run-off impacts as a result of the proposed development. Stormwater quality issues resulting from the proposed development are not addressed in this report. Neither does this report represent a design of the stormwater management facilities.

Pre-Development Conditions

The proposed country residential subdivision is located at NW 30-45-6-W5M within Wetaskiwin Country, and is approximately 5.3 hectares in size. The site is mildly sloping to the east and south, and the majority of the site is manicured turf. Runoff from the site travels from the northwest to the southeast, and ultimately outlets into an existing wetland south of the proposed subdivision.

Based on the contour plan and the proposed outlet (the wetland), the proposed development area was enclosed into one basin

Proposed Development Site

The development site will consist of 16 residential lots. The lots will be 0.23 hectares in size, on average, for a total development footprint of 5.3 hectares including roads.

For the purpose of this report, the following assumptions were required to determine the amount of development within each lot:

- Approximately 10 % of the total area will be allotted to houses and garages.
- Approximately 25% of the total area will be paved driveways or roads.
- The remaining 65% of the area will be grassed or landscaped.

Estimate of Stormwater Conditions: Pre- and Post-Development Conditions

Pre- and Post-development run-off was modelled using the Soil Conservation Services (SCS) Curve Number (CN) Model provided by Eagle Point software. Modelling was performed using a 1-in-100 year storm of 24-hour duration, which was based on the Intensity-Duration-Frequency (IDF) curves for the Town of Rocky Mountain House. The SCS model estimates run-off based on CN values. The CN value for a site is estimated as a function of land use, soil type and antecedent watershed moisture. CN values typically range from 100 for totally impervious surfaces to 30 for wooded areas.

The pre-development run-off rate for the development area was based upon a CN value of 70. Typically, a regional stream flow analysis calibrated flow rate of approximately 12 L/s/ha is used for the Rocky Mountain House area. Therefore, based upon the total development footprint of 5.3ha, the pre-development run-off rate for the entire subdivision should not exceed 65 L/s. These pre-development flow rates are consistent with Alberta Environment reviews in the area.

The post-development conditions were estimated based on the proposed land use noted previously. Each type of medium is assigned a CN value, which relates to how impervious the surface is. Table 1 summarizes the CN value for each medium type.

Table 1: Proposed Development by Medium Type

MEDIUM TYPE	CN VALUE 1:100
Building	98
Landscaped Areas	70
Paved Driveway	98
Paved Road	98

The CN value for post-development conditions was calculated as a weighted average based on the assumptions noted above. Based on these values, the weighted CN value for post-development was calculated to be 80.

The estimated pre- and post-development flows for a 1:100 year storm event are summarized in Table 2.

Table 2: Pre- and Post-Development Flows for 1:100 Year Storm

BASIN	FLOW (L/s)	
	PRE-DEVELOPMENT	POST-DEVELOPMENT
1	63.6	131.4

On-Site Stormwater Management

Storage requirements generally are based upon the difference between pre- and post-development volumes. A storm pond size and outlet are estimated and the post-development flows are routed through the pond and outlet. The routed outlet values are compared to required pre-development rates and this process is repeated until a satisfactory outflow is obtained. The storm pond details for a 1:100 year storm event are shown in Table 3.

Table 3: Estimated Storm Pond Volume and Outflow Rate

BASIN	MIN. STORAGE VOLUME (m ³)	MAX. OUTFLOW RATE FOR AN EVENT (L/s)	MAX. POND DEPTH FOR AN EVENT (m)
1	1625	45.8	0.6

This pond volume is based upon a 300 mm culvert outflow placed at 0.1% slope.

The owner has advised that a pond will be established in the existing wetland south east of the proposed subdivision (see Drawing 4204219-C). The wetland area will need to be expanded to hold an extra 1625 m³.

Siltation control measures must be implemented during construction of the pond and development of the site, to minimize any potential impacts to the wetland and receiving watercourse.

Conclusions and Recommendations

Based on the information provided to EXH and the assumptions contained herein, we have the following conclusions and recommendations:

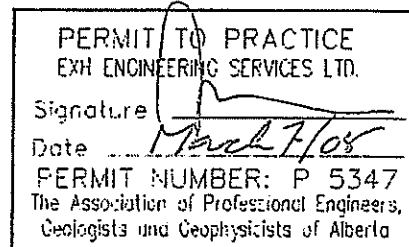
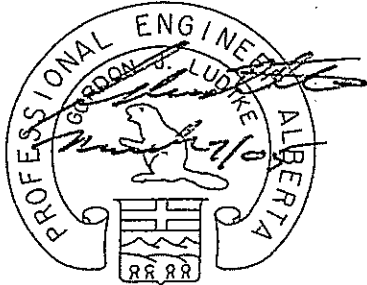
- The minimum storage requirement for the proposed site development has been estimated at 1625 m³, with a maximum pond depth of 0.6 m, based on a 1:100 year storm event and a 300 mm outflow culvert.
- Routing post-development peak 1:100 year flows through the storm pond noted above will reduce peak flows to pre-development rates or less.
- Siltation control measures are strongly recommended during the construction of the pond, outlets and sites to ensure silt does not enter the wetland and downstream watercourse.

Closure

This report has been prepared based upon the best information available at the time, and the assumptions stated herein. Estimates and conclusions may change with the availability of more detailed information.

This report has been prepared for the exclusive use of Fairways West for the development of a residential subdivision at NW 30-45-6-W5M, as detailed in the attached drawing. Use by third parties, or for purposes other than as stated herein, or for other sites or site conditions, is not permitted without the express written permission of EXH Engineering Services Ltd.

Sincerely;



Gordon J. Ludtke, P.Eng.
EXH Engineering Services Ltd.

1. Site limits as provided by owner. To be confirmed as part of detailed design.
2. Location of roads are conceptual, to be confirmed as part of detailed design.
3. Roadways 7.3m paved rural cross-section.
4. Lots to accommodate single family dwellings.
5. Please see stormwater management report dated March 4, 2005 for details.

[illegible]

**PROPOSED
WILD ROSE SUBDIVISION
FAIRWAYS WEST GOLF COURSE**

STORMWATER MANAGEMENT PLAN

designed	DJO	scale	1:1000	date	FEB 2005
drawn	DJO	project No.	4204219	contract No.	
checked	BRN	drawing No.		revision	
approved		4204219--C			1

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Appendix E
Groundwater Potential Assessment

4204219-4
August 16, 2005

County of Wetaskiwin No. 10
Box 6960
Wetaskiwin, AB
T9A 2G5

Attention: Mr. David Blades
Director of Planning and Economic Development

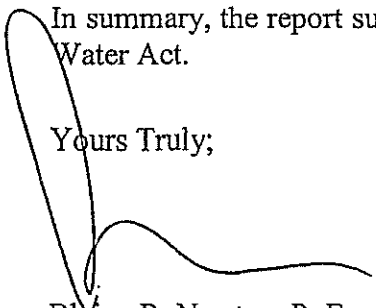
Re: Proposed Residential Subdivision Development
County of Wetaskiwin: NW 30-45-6-W5M
Section 23 – Water Act

Further to your letter of August 12, 2005, the Groundwater Potential Assessment, included as Appendix E of the Technical Information Package previously submitted, addresses the issue of the impact of the proposed site wells on the area aquifer.

Section 23(3)(a) of the Act (copy attached) requires a report assessing the diversion of 1250 m³ of water per year per household. The second bullet of the Assessment conclusions (copy attached) speaks to this issue. The report is signed and sealed by a professional engineer.

In summary, the report submitted is consistent with the requirements of Section 23 of the Water Act.

Yours Truly;


Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

cc: Mr. D. Auclair

Household diversions

23(1) If the Director is of the opinion that there is or may be a significant adverse effect on the aquatic environment or on a licensee or traditional agriculture user resulting from a diversion of water pursuant to section 21, the Director may, subject to the regulations,

(a) issue a water management order under section 97, and

(b) declare that a person described in section 21 who did not divert water as described in section 21 prior to the date of the declaration may not, as of the date of the declaration, divert water as described in section 21 from a source of water specified in the declaration or from any sources of water within the water management area specified in the declaration.

(2) The Director must provide notice of a declaration in a form and manner satisfactory to the Director.

(3) If, on or after January 1, 1999, a subdivision of land of a type or class of subdivision specified in the regulations is approved under the *Municipal Government Act*, a person residing within that subdivision on a parcel of land that adjoins or is above a source of water described in section 21 has the right to commence and continue the diversion of water under section 21 only if

(a) a report certified by a professional engineer, professional geologist or professional geophysicist, as defined in the *Engineering, Geological and Geophysical Professions Act*, was submitted to the subdivision authority as part of the application for the subdivision under the *Municipal Government Act*, and the report states that the diversion of 1250 cubic metres of water per year for household purposes under section 21 for each of the households within the subdivision will not interfere with any household users, licensees or traditional agriculture users who exist when the subdivision is approved, and

(b) the diversion of water for each of the households within the subdivision under section 21 is not inconsistent with an applicable approved water management plan.

(4) Notwithstanding subsection (3), a person residing within a subdivision as described in subsection (3) has the right to commence and continue the diversion of water under section 21 if

(a) the written consent of the subdivision authority is provided to the Director,

(b) the Director is of the opinion that there are or were extenuating circumstances with respect to the submission of the report under subsection (3), and

(c) the Director has approved in writing the right to divert under section 21.

Groundwater Quality

Based on the Tokarsky (1971) report, the regional groundwater quality in the area is mapped as having a total dissolved solids (TDS) concentration in the order of 500 to 1,000 mg/L, with anions dominated by bicarbonate, and cations dominated by sodium/potassium or calcium/magnesium. Four (4) water quality reports listed in the AENV database (AENV, 2005), for area water wells, were accessible for printing and review. Copies of the reports are provided for reference in Appendix A. In the reports, the TDS concentrations range from 500 to 907 mg/L, with the analysis indicating that sodium-bicarbonate water appears to prevail in the study area.

Based on the reviewed analysis, the groundwater is considered potable. However, the dissolved sodium concentration appears to exceed the 200 mg/L Aesthetic Objective of the Guidelines for Canadian Drinking Water Quality (GCDWQ, 1996). Elevated sodium in drinking water can pose a health concern, particularly for people who are on a sodium-restricted diet (GCDWQ, 1996). A full suite of chemistry would be required to confirm the water quality.

CONCLUSIONS AND RECOMMENDATIONS

Waterline has reached the following conclusions regarding the groundwater potential assessment in the study area:

Information available from published reports and from the AENV database indicates that the majority of wells constructed in the study area are likely completed in sandstone beds of the Paskapoo Formation.

- Based on Waterline's review of existing data, the groundwater resource development potential appears to be suitable to supply the demand of a single lot, and existing water well records support the conclusion that the aquifer(s) underlying the proposed development in NW-30-045-06-W5M should meet the groundwater diversion requirement of the proposed subdivision. Therefore, the additional diversion of 20,000 m³/year (1,250 m³/year/lot x 16 lots) of water for household purposes should not interfere with any existing household users, licensees or traditional agriculture users in the area.
- Waterline's conclusion is based on the assessment of potential impacts on local aquifers while only considering present resource utilization, and utilization proposed for the subject subdivision of land. Conclusions presented herein assume that existing and proposed users do not over-exploit the groundwater resource by excessive short-term use and maintain consumption within the statutory limits as presented in the Water Act.
- The TDS groundwater concentrations range from 500 to 907 mg/L, with the analysis indicating that sodium-bicarbonate water appears to prevail in the study area. Based on the reviewed analysis, the groundwater is considered potable. As the enclosed water quality evaluation is based on limited available groundwater chemistry data, a full suite of chemical analysis would be needed to further confirm the quality of groundwater at the Site.

Box 6960, Wetaskiwin, AB T9A 2G5
[780] 352-3321 phone [780] 352-3486 fax
Direct Line [780] 361-6235
E-Mail: dblades@county.wetaskiwin.ab.ca

County of Wetaskiwin No. 10
Environmental Services

Blaine: Note: Please disregard previous FAX
of this afternoon.

David

Fax

To: Blaine R. Newton

From: David Blades

Company: EXH Engineering, Red Deer Office

Total Pages :

Fax: 403-342-7691

Date: 8/10/2005

Re: Dion Auclair Area Structure Plan - Confirmation of Meeting Section 23 of the Water Act

☐ As per request ☐ For Review ☐ Take Necessary Action ☐ Please Reply ☐ Please Recycle

☐ Originals WILL be mailed

☐ Originals WILL NOT be mailed

• Comments:

Dear Blaine:

Ground Water Potential Assessment - March 23, 2005

I am writing regarding the ground water potential assessment provided for Dion Auclair under cover letter dated, March 30, 2005, and would ask if you would provide a brief note stating if the information you have provided meets the requirements of Section 23 of the Water Act. If it does, then we will accept the assessment. If not, we will be recommending appropriate pump tests and chemical analysis before approving the Mr. Auclair's Area Structure Plan.

For any clarification, please contact me at 780-361-6235.

David

David

4204219-2
March 30, 2005

Mr. Dion Auclair
Box 25
Alder Flats, Alberta
T0C 0A0

Attention: Mr. Dion Auclair:

Re: Proposed Residential Subdivision Development – NW 30-45-6-W5M
Groundwater Potential Assessment

Enclosed you will find an original copy of the Groundwater Potential Assessment for your proposed development, as completed by Waterline Resources Inc. Waterline was retained by EXH Engineering as a sub-consultant to carry out this specialized work.

The report identifies the subsurface geology of the area. The main water-bearing unit for domestic water supply is identified as fractured sandstones, with yield probabilities of 23 to 114 l/min. groundwater quality is considered potable, with the total dissolved sodium concentrations exceeding the aesthetic objective of the Guidelines for Canadian Drinking Water Quality.

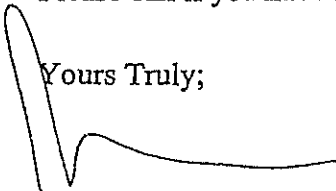
Waterline concludes that the groundwater source appears suitable to supply the demand of the proposed development.

The above comments are general. The report should be read in detail. Regardless of the report conclusions, on-site wells must be established, with appropriate pump tests and chemical analyses.

Copies of this report will be provided to the County as part of the engineering submission in support of your development application.

Please call if you have any questions.

Yours Truly;


Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

Waterline Resources Inc.



Waterline Resources Inc.
2024 - 58 Avenue S.W.
Calgary, Alberta
Canada, T3E 1N2
Tel: (403) 207-6931
Fax: (403) 272-5341
Email: ddavid@waterlineresources.com

March 23, 2005
WL05-1045

EXH Engineering Services Ltd.
7710 Edgar Industrial Court
Red Deer, Alberta
T4P 4E2

Attention: Blaine Newton

Dear Mr. Newton:

RE: GROUNDWATER POTENTIAL ASSESSMENT, PROPOSED AUCLAIR 16 LOT
SUBDIVISION DEVELOPMENT, NW-30-045-06-W5M, NEAR BUCK LAKE,
ALBERTA

INTRODUCTION

Waterline Resources Inc. (Waterline) is pleased to present the results of the groundwater potential assessment for the proposed 16-lot subdivision in NW-30-045-06-W5M (the Site). The proposed development is located approximately 8 kilometres southwest of Buck Lake, Alberta (Figure 1).

Waterline was retained to assess the hydrogeology in the area and to determine the groundwater development potential for the proposed subdivision. Hydrogeological information for the Site, and the surrounding area was assembled and reviewed by Waterline to complete this preliminary assessment. Information sources included the 2005, Alberta Environment (AENV) Provincial Water Well Record database, and relevant and readily attainable published geology and hydrogeology maps and reports. The enclosed report presents the results of the Waterline Phase 1 Groundwater Potential Assessment for the proposed subdivision of land.

INVESTIGATION GUIDELINES

This study was completed in general accordance with the 1994 AENV publication "Interim Guidelines For The Evaluation Of Groundwater Supply For Unserved Residential Subdivisions Using Privately Owned Domestic Water Wells". These guidelines are recommended for use for unserved residential subdivisions where the water supply will be provided by privately owned domestic water wells and, where the number of residential parcels within one-quarter section is six or more.

As stated in the guidelines, the principle of sustainable development should guide the utilization of groundwater resources. Specifically, the guidelines state that: "the threat of groundwater shortages and contamination grows with the density of wells and their collective demand on the local groundwater resources". The guidelines also state that as a component of a General

Municipal Plan, groundwater availability could be mapped and used as criteria for locating future unserviced residential subdivisions. In any area, continued development of the groundwater resource can ultimately exceed recharge of the aquifers causing groundwater mining, which can result in lowering water levels. A regional assessment would have to be completed by/regulatory authorities in order to assess these impacts on the aquifer system. The results of this type of study should be adopted into groundwater management criteria for future use in locating and managing other developments within the County. This philosophy has been incorporated into the Province of Alberta's Water Act (the Act), which came into force January 1, 1999. The Water Act establishes the framework for the future development of "Water Management Plans" within defined watersheds. This approach is also consistent with AENV's move to a wellhead protection and integrated watershed management philosophy.

The Act also addresses household diversions directly under Section 23 (3) which states that a person residing within a subdivision on a parcel of land has the right to commence and continue the diversion of water only if *"a report certified by a professional engineer, professional geologist or professional geophysicist, as defined in the Engineering, Geological and Geophysical Professions Act, was submitted to the subdivision authority as part of the application for subdivision under the Municipal Government Act, and the report states that the diversion of 1,250 cubic metres of water per year for household purposes under section 21 for each of the households within the subdivision will not interfere with any household users, licensees or traditional agriculture users who exist when the subdivision is approved."*

Relevant to the proposed development in the subject area, the Act specifies that the diversion of 1,250 m³/year per household (household use as defined in the Act) for the proposed new undeveloped lots should not interfere with any household users, licensees or traditional agriculture users who exist when the subdivision is approved. Therefore, the objective of this study is to render a professional opinion, based on a review of readily available information, whether aquifers underlying the proposed undeveloped lot in the subject area can sustain production of 20,000 m³/year (1,250 m³/year/lot x 16 lots), equivalent to continuous production of approximately 8.4 imperial gallons per minute (lgpm), and whether managed diversion of that groundwater will negatively impact existing users of the groundwater resource, as defined in the Act.

Waterline's opinion presented herein is based on the assumption that existing domestic users in the area, and users proposed at the Site will utilize less than or equal to 1,250 m³/year/lot obtained at a daily rate of less than or equal to (1,250 m³/year/lot ÷ 365 days) 3.43 m³/day/lot, or 753 imperial gallons per day per lot. The 1994 AENV publication "Interim Guidelines For The Evaluation Of Groundwater Supply For Unserved Residential Subdivisions Using Privately Owned Domestic Water Wells" indicates that residential water needs are estimated to be 0.23 - 0.68 m³/day/person (50 - 150 imperial gallons per day per person). Therefore, a water consumption limit of 3.43 m³/day/lot is considered conservative for an average family.

GEOLOGY

The surficial geology of the general Site area is mapped as including draped moraine till deposits in upland areas, and lacustrine sand and silt deposits along Washout Creek (Shetsen,

1990). Bedrock beneath the Site is mapped as the Paskapoo Formation, which is generally described as consisting of sandstone, siltstone, shale, with coal near the base (Tokarsky, 1971).

Figure 2 presents a geological fence diagram (cross-section) orientated approximately north-south, extending through the general Site area. The cross-section location is shown on Figure 1. The cross-section includes soil and bedrock stratigraphy data obtained from four water wells completed adjacent to the Site area [AENV Well ID No. 401707 (Fraser), 381074 (Fraser), 475323 (Fraser) and 357861 (Morrill's)].

The geology recorded on water well completion records listed in the AENV water well database (AENV, 2005) for the general area is consistent with the regional geologic mapping, and is logged as including clay with/or sand, underlain by layers of shale and sandstone and coal.

HYDROGEOLOGY

AENV Provincial Water Well Database

The AENV database lists 31 water well records within approximately 1.6 km of the Site area, which includes wells in NW-30-045-06-W5M, and all or part of the immediately surrounding 8 sections. Information for all records is summarized in tabular form in Appendix A (Table 1) along with individual water well drilling reports. The records indicate that groundwater use in the area is primarily for domestic/stock purposes (25 wells), with lesser use indicated for industrial (5) and irrigation (1).

Well Completion Depth and Static Water Level

Water wells in the greater study area, for all intended water uses, appear to be completed within 8.5 to 61.0 m (28 to 200 ft) below ground level (bGL), with a calculated average depth of 32.9 m (108 ft) bGL, primarily in sandstone units of the Paskapoo Formation. Static water levels, measured in area wells following well construction, were commonly in the 0 (flowing) to 43.6 m (0 to 143 ft) bGL, with a calculated average static water level depth of 14.9 m (49 ft) bGL. Shallow groundwater flow in the area is not well defined. However, based on local and regional topography, shallow groundwater flow may be expected to flow to the east/northeast towards Washout Creek or Buck Lake, or alternately to the northeast towards the North Saskatchewan River.

Aquifer Depth and Well Yield

The main water-bearing units developed for domestic water supply in the immediate Site area are fractured sandstones in the Paskapoo Formation, with the groundwater yield probability of bedrock wells mapped as 23 to 114 L/min (5 to 25 lpgm) (Tokarsky, 1971). Limited duration well tests, completed by the drilling contractors in the study area following well construction have been conducted in the range of 9 to 137 L/min (2 to 30 lpgm), with a calculated average test rate of 50 L/min (11 lpgm). Therefore, the well test rates encompass the range of safe yields mapped for the area.

Groundwater Quality

Based on the Tokarsky (1971) report, the regional groundwater quality in the area is mapped as having a total dissolved solids (TDS) concentration in the order of 500 to 1,000 mg/L, with anions dominated by bicarbonate, and cations dominated by sodium/potassium or calcium/magnesium. Four (4) water quality reports listed in the AENV database (AENV, 2005), for area water wells, were accessible for printing and review. Copies of the reports are provided for reference in Appendix A. In the reports, the TDS concentrations range from 500 to 907 mg/L, with the analysis indicating that sodium-bicarbonate water appears to prevail in the study area.

Based on the reviewed analysis, the groundwater is considered potable. However, the dissolved sodium concentration appears to exceed the 200 mg/L Aesthetic Objective of the Guidelines for Canadian Drinking Water Quality (GCDWQ, 1996). Elevated sodium in drinking water can pose a health concern, particularly for people who are on a sodium-restricted diet (GCDWQ, 1996). A full suite of chemistry would be required to confirm the water quality.

CONCLUSIONS AND RECOMENDATIONS

Waterline has reached the following conclusions regarding the groundwater potential assessment in the study area:

- Information available from published reports and from the AENV database indicates that the majority of wells constructed in the study area are likely completed in sandstone beds of the Paskapoo Formation.
- Based on Waterline's review of existing data, the groundwater resource development potential appears to be suitable to supply the demand of a single lot, and existing water well records support the conclusion that the aquifer(s) underlying the proposed development in NW-30-045-06-W5M should meet the groundwater diversion requirement of the proposed subdivision. Therefore, the additional diversion of 20,000 m³/year (1,250 m³/year/lot x 16 lots) of water for household purposes should not interfere with any existing household users, licensees or traditional agriculture users in the area.
- Waterline's conclusion is based on the assessment of potential impacts on local aquifers while only considering present resource utilization, and utilization proposed for the subject subdivision of land. Conclusions presented herein assume that existing and proposed users do not over-exploit the groundwater resource by excessive short-term use and maintain consumption within the statutory limits as presented in the Water Act.
- The TDS groundwater concentrations range from 500 to 907 mg/L, with the analysis indicating that sodium-bicarbonate water appears to prevail in the study area. Based on the reviewed analysis, the groundwater is considered potable. As the enclosed water quality evaluation is based on limited available groundwater chemistry data, a full suite of chemical analysis would be needed to further confirm the quality of groundwater at the Site.

CLOSURE

The enclosed report is intended for submission to regulatory authorities in partial fulfillment of application requirements for subdivision under the Municipal Government Act. The present study should be combined with the results of any aquifer tests that may be completed in order to gain a more complete understanding of the site-specific aquifer conditions underlying the study area. This will allow for the data presented in this report to be updated, as necessary, and will serve to promote groundwater resource management and protection in the area for current and future users. It should also be noted that Waterline does not employ health care professionals, and any health related questions with regards to water quality and chemical parameter exceedances should be discussed with the local health authority. The enclosed report should not be considered a "Water Management Plan" as defined in the Water Act, or a Phase 1 or 2 "Environmental Site Assessment" as defined in the Environmental Protection Act.

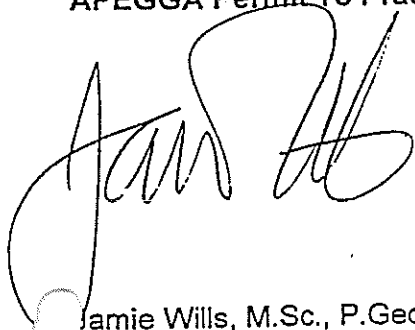
The findings presented in this report are based upon a review of published maps and reports, and information available from the AENV water well database. The work was carried out in accordance with generally accepted hydrogeological practices to meet the requirements set by the regulatory authority and the owners. No other warranty, expressed or implied, is made as to the professional services provided. Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties.

Waterline accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Should you require more information or have any questions or concerns, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted

Waterline Resources Inc.
APEGGA Permit To Practice No. P07329



Jamie Wills, M.Sc., P.Geol.
Principal Hydrogeologist



Reviewed by:



Steve Foley, M.Sc., P.Geol.
Principal Hydrogeologist

REFERENCES

Alberta Environment, June 27, 1994. Interim Guidelines For The Evaluation Of Groundwater Supply For Unserved Residential Subdivisions Using Privately Owned Domestic Water Wells. LUB FILE: 3000-G1-W1.

Alberta Environment Natural Resources Provincial Water Well Database, 2005.

Department of Energy, Mines and Resources. Provincial Topography Map 83 B/15. Map Scale 1:50 000. ETopo.

Guidelines for Canadian Drinking Water Quality, 1996, Sixth Edition. Published by authority of the Minister of Health, 1996, 96-EHD-196.

Shetsen, I. 1990. Quaternary Geology, Central Alberta. Scale 1:500,000, Alberta Research Council.

Tokarsky, O. 1971. Hydrogeology of the Rocky Mountain House Area, Alberta. Alberta Research Council Report 71-3.

GROUNDWATER POTENTIAL ASSESSMENT
Project 16 Lot Auclair Subdivision
NW-00-045-06-W5M, Near Buck Lake, Alberta
Submitted to EXH Engineering Services Ltd.

WL05-1045
March 23, 2005

Figures

Rge 07 Rge 06

8 km TO BUCK LAKE



TP 046

TP 045

475323

401707

381074

357861

A'

MAP REFERENCE: 1:50 000, 83-B/15 (ETOPO)

LEGEND:

357861

AENV WELL ID #



APPROXIMATE WELL LOCATION

A — A'

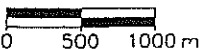
CROSS-SECTION LOCATION



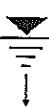
APPROXIMATE SITE LOCATION

SCALE

1:50 000



Waterline Resources Inc.



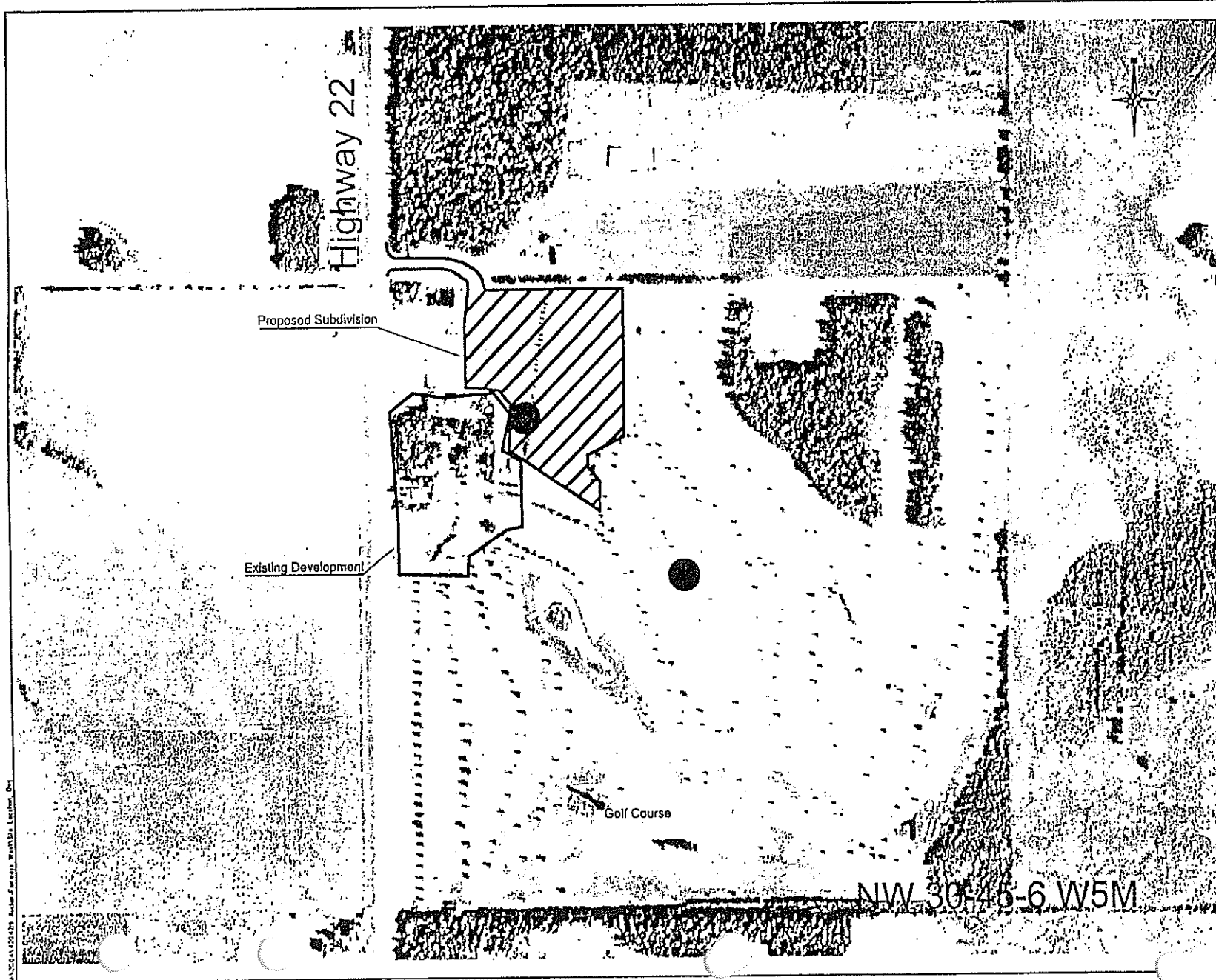
EXH Engineering Services Ltd.
Auclair Proposed 16 Lot Subdivision
NW-30-045-06-W5M

SITE LOCATION

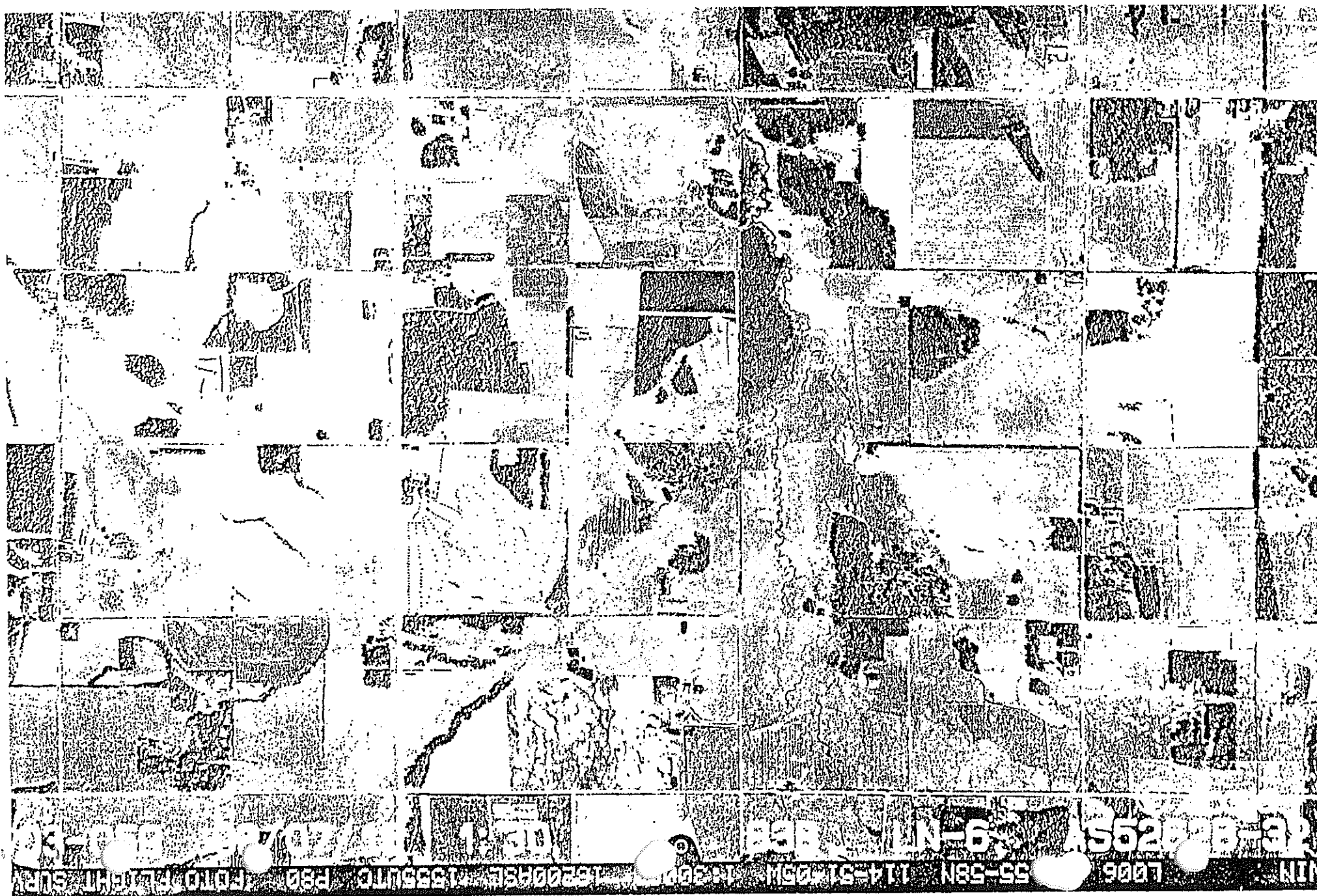
FIGURE
1

MAR. 2005

WL05-1045



Assigned	BY	DATE	11/1	July	7-04-2003
Approved	HC	Project No	420479	Contract No	
Checked	BY	204219-1			9
Appr. and					



GROUNDWATER POTENTIAL ASSESSMENT
osed 16 Lot Auclair Sybdivision
N.W-30-045-06-W5M, Near Buck Lake, Alberta
Submitted to EXH Engineering Services Ltd.

WL05-1045
March 23, 2005

APPENDIX A

Summary of AENV Database Well Records

Table 1 Reconnaissance Report for NW-30-045-06-W5M Lands Within Approximately a 2.5 km (1.5 mi) Radius

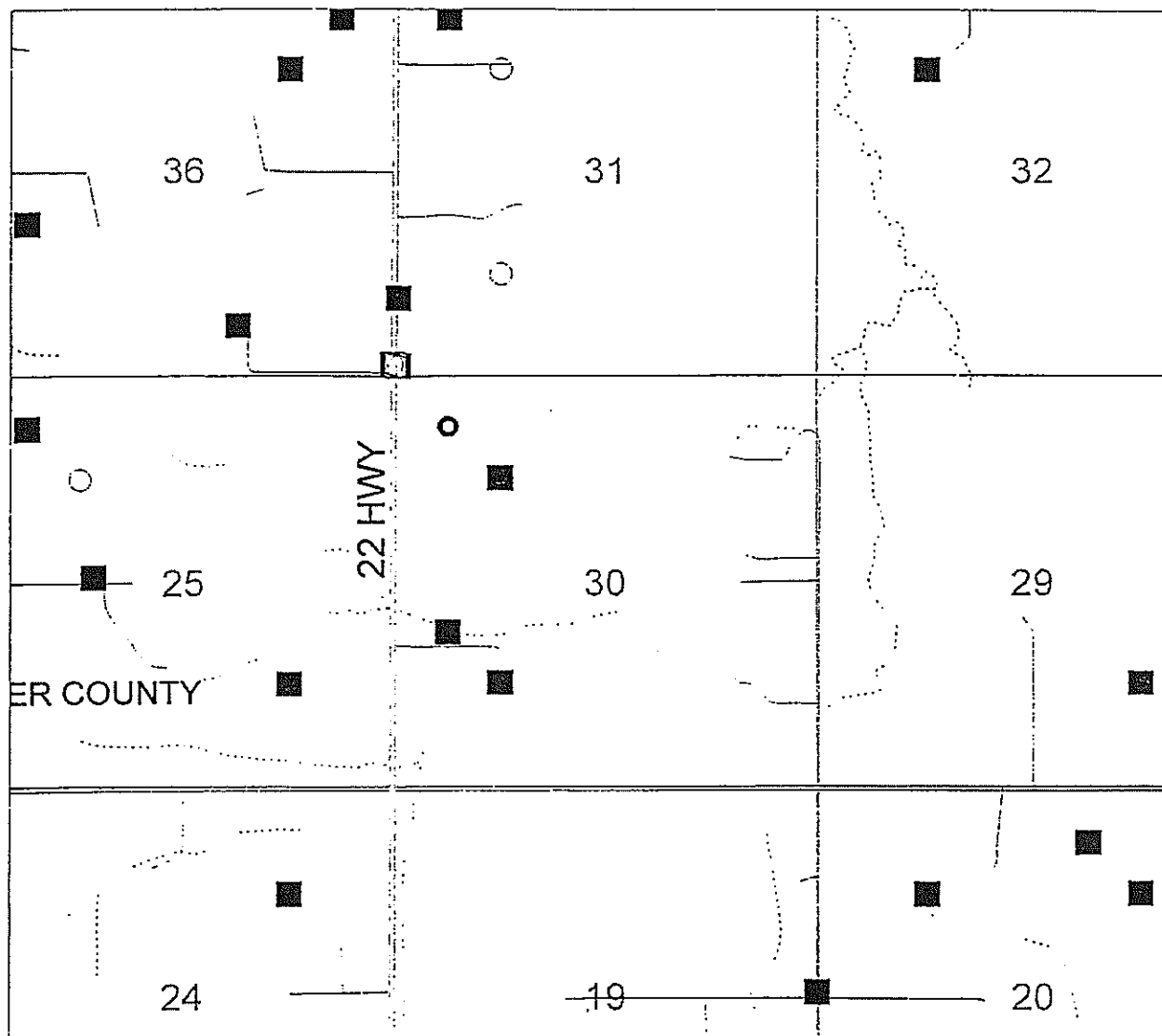
Well ID	W_M	TWP	RGE	SEC	LSD	DRILLING COMPANY	DATE COMPLETED M/D/YR	DEPTH (ft bGL)	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft bTOC)	TEST RATE (l/gpm)	CASING PERFS	
																FROM (ft bGL)	TO (ft bGL)
475282	5	45	6	19	9	OTHER	09/16/78	65	Industrial	0	0	0	TEXACO CAN#SP65135				
475286	5	45	6	20	15	SIEGEL DON	06/09/75	104	Domestic & Stock	0	2	0	MCKAY, RAY	10	3		
368931	5	45	6	20	NE	UNKNOWN DRILLER		200	Domestic	1	0	0	MCKAY, SHANNON				
475285	5	45	6	20	NW	UNKNOWN DRILLER		80	Domestic	1	0	0	POZSGAI, GEORGE				
474959	5	45	7	24	NE	SIEGEL H	03/03/64	33	Domestic	0	0	0	HAMMOND, DON				
484090	5	45	7	25	6	UNKNOWN DRILLER	10/16/52		Industrial	0	0	0	#SP A				
474961	5	45	7	25	13	SIEGEL H	07/07/58	50	Domestic	0	0	0	HANSON, W.	12	2		
354402	5	45	7	25	NW	BIG IRON DRILLING LTD.	09/04/90	100	Domestic	0	6	0	PARKER, GARTH	40	5	80	100
474960	5	45	7	25	NW	DARRAGH LEE	12/29/77	100	Domestic & Stock	0	6	0	PARKER, DALTON	30	5		
483851	5	45	7	25	SE	UNKNOWN DRILLER		45	Domestic	1	0	0	HAMMOND, LEROY				
475317	5	45	6	29	SE	UNKNOWN DRILLER		120	Domestic	1	0	0	PATTEN, RORY				
475320	5	45	6	30	5	UNKNOWN DRILLER	01/01/55		Unknown	1	0	0	HAMMOND, DALE				
475321	5	45	6	30	13	JOHNSON GLEN	09/20/68	110	Domestic	0	2	0	WENNERSTROM, ROBERT	64	12		
475322	5	45	6	30	13	ALDER W W DRLG LTD	07/20/84	60	Irrigation	0	9	0	FAIRWAYS WEST GOLF CLUB	0	4	41	60
475323	5	45	6	30	NW	FRASER, RON	05/27/88	135	Domestic	0	11	0	HOWAL HLDG LTD	87	11	90	135
357861	5	45	6	30	SW	MORRILL'S WATER WELL DRILLING LTD.	06/07/91	187	Domestic & Stock	1	12	0	HAMMOND, GRACE	54	20	170	187
475325	5	45	6	31	4	OWNER DRILLED	10/10/74	65	Industrial	0	0	0	CHEVRON CAN#SP348				
475326	5	45	6	31	4	OWNER DRILLED	10/10/74	60	Industrial	0	0	0	CHEVRON CAN#SP351				
475327	5	45	6	31	13	JOHNSON GLEN	11/01/76	113	Stock	0	2	0	CAPANUCK, JOHN	21	30		
401707	5	45	6	31	NW	FRASER, RON	09/19/94	120	Domestic	0	11	14	CHAPCHUCK, ROBERT	57.5	10	80	120
475328	5	45	6	31	NW	SCOTT, H.A. DRILLING	10/31/78	130	Domestic	1	5	0	CHAPCHUK, B.	50	20	110	130
381074	5	45	6	31	SW	FRASER, RON	11/06/95	120	Domestic	0	9	14	BECKER, BRIAN	74	10	80	120
386570	5	45	6	31	SW	JOHNSON, GLEN	07/03/93	190	Domestic & Stock	0	3	5	BECKER, BRIAN/420412 ALTA LTD	60	16		
401706	5	45	6	31	SW	FRASER, RON	09/21/94	85	Domestic	0	7	8	BECKER, BRIAN	79	10	65	85
475324	5	45	6	31	SW	UNKNOWN DRILLER		120	Domestic	1	0	0	WENNERSTROM, R.				

Well	N_M	TWP	RGE	SEC	LSD	DRILLING COMPANY	DATE COMPLETED M/D/YR	DEPTH (ft)	USE	CHM	LT	PT	WELL OWNER	STA- LEI (ft bTOC)	TEST RATE (l/gpm)	CASING PERFS	
																FROM (ft bGL)	TO (ft bGL)
385435	5	45	6	32	NW	ALKEN BASIN DRILLING LTD.	07/22/94	120	Domestic & Stock	0	7	4	BRZUS, RUDOLPH	20	30	100	120
475001	5	45	7	36	1	OWNER DRILLED	11/15/74	60	Industrial	0	0	0	CHEVRON CAN#SP444	0	5		
475000	5	45	7	36	2	ALBERTA ENVIRONMENT	08/10/84	28	Unknown	0	7	0	ALTA ENV			7	18
475002	5	45	7	36	5	JOHNSON GLEN	12/07/74	183	Stock	1	2	0	KELLGREN, ARNOLD	143	5		
475004	5	45	7	36	16	FRASER BROS	11/16/68	156	Domestic & Stock	0	5	0	POUDRIER, M.	85	6		
475003	5	45	7	36	NE	UNKNOWN DRILLER		200	Domestic	1	0	0	SEGARAC, JOHN				

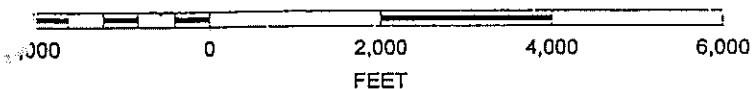
Minimum	28		0	2	7	18
Maximum	200		143	30	170	187
Average	108		49	11	82	108

ELUS Geomatics - Alberta Map

Waterwell
Water Wellsites



SCALE 1 : 27,518



N





Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0401707
Map Verified:	Not Verified
Date Report Received:	1994/11/02
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name:		Drilling Company Approval No.:
FRASER, RON		
Mailing Address:	City or Town:	Postal Code:
Well Owner's Name:	Well Location Identifier:	
CHAPCHUCK, ROBERT		
P.O. Box Number:	Mailing Address:	Postal Code:
	ALDER FLATS	
City:	Province:	Country:

2. Well Location

1/4 or Sec Twp Rge Westof				
LSD				M
NW 31 045 06 5				
Location in Quarter				
0 FT from				Boundary
0 FT from				Boundary
Lot	Block		Plan	
Well Elev: How Obtain:				
FT				Not Obtain

3. Drilling Information

Type of Work: New Well	Proposed well use:
Reclaimed Well	Domestic
Date Reclaimed(yyyy/mm/dd):	Anticipated Water
Materials Used:	Requirements/day
Method of Drilling: Rotary	500 Gallons
Flowing Well: No	Rate: Gallons
Gas Present: No	Oil Present: No

6. Well Yield

Test Date (yyyy/mm/dd): 1994/09/19	Start Time: 11:00 AM
Test Method: Bailer & Pump	
Non pumping static level:	57.5 FT

4. Formation Log

Depth from ground level (feet)	Lithology Description
30	Clay
31	Sandstone
47	Clay
74	Shale
85	Sandy Shale
96	Shale
97	Sandstone
107	Sandy Shale
108	Sandstone
118	Sandy Shale
120	Shale

5. Well Completion

Date Started (yyyy/mm/dd): 1994/09/19	Date Completed (yyyy/mm/dd): 1994/09/19
Well Depth: 120 FT	Borehole Diameter: 0 Inches
Casing Type:	Liner Type: Plastic
Size OD: 0 Inches	Size OD: 5 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0.28 Inches
Bottom at: 0 FT	Top: 0 FT Bottom: 120 FT
Perforations from: 80 FT to: 120 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.25 Inches x 6 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Saw	
Seal: Shale Trap & Bentonite	
from: 0 FT	to: 70 FT
Seal:	
from: 0 FT	to: 0 FT
Seal:	
from: 0 FT	to: 0 FT
Screen Type:	Screen ID: 0 Inches
from: 0 FT to: 0 FT	Slot Size: 0 Inches
Screen Type:	Screen ID: 0 Inches
from: 0 FT to: 0 FT	Slot Size: 0 Inches

Rate of water removal:	10 Gallons/Min
Depth of pump intake:	80 FT
Water level at end of pumping:	73 FT

Distance from top of Inches
casing to ground
level:

Depth To water level (feet)	Elapsed Time	Drawdown Minutes:Sec Recovery
57.5	0:00	73
69	1:00	62.42
71.17	2:00	60
72.08	3:00	59
72.58	4:00	58.5
73	5:00	58.17
73.25	6:00	58
73	7:00	57.67
73	8:00	57.5
73	9:00	57.5
73	10:00	57.5
73	30:00	57.5
73	60:00	57.5
73	120:00	57.5

Screen Installation Method:

Fittings
Top: Bottom:

Pack:	
Grain Size:	Amount:

Geophysical Log Taken:

Retained on Files:

Additional Test and/or Pump Data

Chemistries taken By Driller: No

Held: 0

Documents Held: 1

Pitless Adapter Type:

Drop Pipe Type:

Length: FT **Diameter:** Inches

Comments:

DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 20".

7. Contractor Certification

Driller's Name:	UNKNOWN DRILLER
Certification No.:	3422



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0381074
 Map Verified: Not Verified
 Date Report Received: 1995/12/15
 Measurements: Imperial

1. Contractor & Well Owner Information

Company Name: FRASER, RON Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: SEC, BRIAN Well Location Identifier:
 P.O. Box Number: Mailing Address: ALDER FLATS Postal Code: T0C 0A0
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 31 045 06 5
 Location in Quarter
 0 FT from Boundary
 0 FT from Boundary
 Lot Block Plan
 Well Elev: FT How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed(yyyy/mm/dd): Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present: No Rate: Gallons
 Oil Present: No

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Gallons

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd): 1995/11/06 11:00 AM
 Test Method: Bailor & Pump
 Non pumping 74 FT
 static level:

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Clay
21	Sand
45	Clay
52	Blue Shale
53	Sandstone
62	Shale
63	Sandstone
85	Gray Shale
120	Sandy Shale

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed(yyyy/mm/dd):
1995/11/05	1995/11/06
Well Depth: 120 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type: Plastic
Size OD: 5.56 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.188 Inches	Wall Thickness: 0.26 Inches
Bottom at: 60 FT	Top: 40 FT Bottom: 120 FT
Perforations from: 80 FT to: 120 FT	Perforations Size: 0.25 Inches x 6 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches

Perforated by: Saw
 Seal: Driven & Bentonite
 from: 0 FT to: 60 FT
 Seal:
 from: 0 FT to: 0 FT
 Seal:
 from: 0 FT to: 0 FT
 Screen Type: Screen ID: 0 Inches
 from: 0 FT to: 0 FT Slot Size: 0 Inches
 Screen Type: Screen ID: 0 Inches
 from: 0 FT to: 0 FT Slot Size: 0 Inches

Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount:

Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1

Pitless Adapter Type:
 Drop Pipe Type:
 Length: FT Diameter: Inches
 Comments:

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.: 2122

Total Drawdown: 6 FT
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 10 Gallons/Min
 Recommended pump intake: 100 FT

Type Pump Installed
 Pump Type: SUB
 Pump Model: 9DDST
 H.P.:
 Any further pump test information?



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0475323
 Map Verified: Not Verified
 Date Report: 1988/06/03
 Received:
 Measurements: Imperial

1. Contractor & Well Owner Information

Company Name: FRASER, RON
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: Well Location Identifier:
 HOV HLDG LTD
 P.O. Box Number: Mailing Address: ALDER FLATS Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 30 045 06 5
 Location in Quarter
 0 FT from Boundary
 0 FT from Boundary
 Lot Block Plan
 Well Elev: How Obtain:
 FT Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed(yyyy/mm/dd): Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present: No Rate: Gallons
 Oil Present: No

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Gallons

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd):
 1988/05/27 11:00 AM
 Test Method: Bailer & Pump
 Non pumping 87 FT
 static level:

4. Formation Log

Depth from ground level (feet)	Lithology Description
38	Clay
43	Shale
45	Sandstone
50	Shale
54	Coal
90	Shale
92	Sandstone
112	Shale
117	Sandy Shale
119	Sandstone
135	Sandy Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1988/05/26 Date Completed (yyyy/mm/dd): 1988/05/27
 Well Depth: 135 FT Borehole Diameter: 0 Inches
 Casing Type: Steel Liner Type: Galvanized Steel
 Size OD: 5.56 Inches Size OD: 4.5 Inches
 Wall Thickness: 0.156 Inches Wall Thickness: 0.156 Inches
 Bottom at: 63 FT Top: 51 FT Bottom: 135 FT
 Perforations from: 90 FT to: 135 FT Perforations Size: 0 Inches x 0 Inches
 from: 0 FT to: 0 FT 0 Inches x 0 Inches
 from: 0 FT to: 0 FT 0 Inches x 0 Inches
 Perforated by: Torch
 Seal: Driven from: 0 FT to: 63 FT
 Seal: from: 0 FT to: 0 FT
 Seal: from: 0 FT to: 0 FT
 Screen Type: Screen ID: 0 Inches from: 0 FT to: 0 FT Slot Size: 0 Inches
 Screen Type: Screen ID: 0 Inches from: 0 FT to: 0 FT Slot Size: 0 Inches
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack: Grain Size: Amount:
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type: Length: FT Diameter: Inches
 Comments:

Rate of water removal: 11 Gallons/Min
 Depth of pump intake: 96 FT
 Water level at end of pumping: 93 FT
 Distance from top of casing to ground level: Inches
 Depth To water level (feet) Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 6 FT
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 11 Gallons/Min
 Recommended pump intake: 120 FT
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0357861
Map Verified:	Map
Date Report Received:	1991/06/18
Measurements:	Imperial

1. Contractor & Well Owner Information				2. Well Location			
Company Name: MORRILL'S WATER WELL DRILLING LTD.		Drilling Company Approval No.: 38407		1/4 or Sec Twp Rge West of LSD SW 30 045 06 5			
Mailing Address: SITE 422, BOX 2, COMP. 3, RR 2		City or Town: DRAYTON VALLEY AB CA		Postal Code: T7A 2A2		Location in Quarter 0 FT from Boundary 0 FT from Boundary	
Well Owner's Name: HAMILL, AND, GRACE		Well Location Identifier:		Lot		Block Plan	
P.O. Box Number: 234		Mailing Address: ALDER FLATS		Postal Code: T0C 0A0		Well Elev: FT	
City:		Province:		Country:		How Obtain: Not Obtain	
3. Drilling Information				6. Well Yield			
Type of Work: New Well		Proposed well use: Domestic & Stock		Test Date (yyyy/mm/dd): 1991/06/07		Start Time: 11:00 AM	
Reclaimed Well		Anticipated Water		Test Method: Air			
Date Reclaimed(yyyy/mm/dd):		Materials Used:		Requirements/day 0 Gallons		Non pumping static level:	
Method of Drilling: Rotary		Rate: Gallons Oil Present: No		Non pumping static level:		54 FT	
Flowing Well: No				Rate of water removal:		20 Gallons/Min	
Gas Present: No				Depth of pump intake:		100 FT	
4. Formation Log		5. Well Completion		Water level at end of pumping:		100 FT	
Depth from ground level (feet)		Date Started(yyyy/mm/dd): 1991/06/07		Date Completed (yyyy/mm/dd): 1991/06/07		Distance from top of inches casing to ground level:	
Lithology Description		Well Depth: 187 FT		Borehole Diameter: 0 Inches		Depth To water level (feet) - Elapsed Time	
14 Brown Sandy Clay		Casing Type: Plastic		Liner Type: Plastic		Drawdown Minutes:Sec Recovery	
38 Gray Sandy Clay		Size OD: 5.5 Inches		Size OD: 4.5 Inches		Total Drawdown: 46 FT	
55 Gray Shale		Wall Thickness: 0.375 Inches		Wall Thickness: 0.25 Inches		If water removal was less than 2 hr duration, reason why:	
67 Gray Sandstone		Bottom at: 168 FT		Top: 167 FT Bottom: 187 FT		Recommended pumping rate: 0 Gallons/Min	
74 Gray Shale		Perforations		Perforations Size:		Recommended pump intake: 0 FT	
86 Brownish Gray Sandstone		from: 170 FT to: 187 FT		0.25 Inches x 12 Inches		Type Pump Installed	
116 Brown Sand		from: 0 FT to: 0 FT		0 Inches x 0 Inches		Pump Type:	
143 Brownish Gray Sand		from: 0 FT to: 0 FT		0 Inches x 0 Inches		Pump Model:	
164 Gray Sand		Perforated by: Machine				H.P.:	
166 Gray Sandstone		Seal: Driven				Any further pump test information?	
174 Gray Fine Grained Sand		from: 0 FT to: 168 FT					
187 Gray Coarse Grained Sand		Seal:					
		from: 0 FT to: 0 FT					
		Seal:					
		from: 0 FT to: 0 FT					
		Screen Type:		Screen ID: 0 Inches			
		from: 0 FT to: 0 FT		Slot Size: 0 Inches			
		Screen Type:		Screen ID: 0 Inches			
		from: 0 FT to: 0 FT		Slot Size: 0 Inches			
		Screen Installation Method:					
		Fittings					
		Top:		Bottom:			
		Pack:					
		Grain Size:		Amount: 0			
		Geophysical Log Taken:					
		Retained on Files:					
		Additional Test and/or Pump Data					
		Chemistries taken By Driller: No					
		Held: 1		Documents Held: 2			
		Pitless Adapter Type:					
		Drop Pipe Type:					
		Length: FT		Diameter: Inches			
		Comments:					
7. Contractor Certification							
Driller's Name:		UNKNOWN DRILLER					
State:		AB					



ALBERTA ENVIRONMENT CHEMICAL ANALYSIS REPORT

WELL NAME: SEGARAC, JOHN
LOCATION: LSD NE SEC 36 TWP 045 RG 07 M 5
WELL DEPTH: 200
AQUIFER:
SAMPLING DATE: 10/5/1978 TIME: 0

WELL ID No: 0475003
SAMPLE No: 10900
WATER LEVEL: -9
LABORATORY: AE
PRINT DATE: 3/9/2005

FIELD:	MG/L	FIELD:	MG/L
BICARBONATE	-9	CARBONATE	-9
CHLORIDE	-9	CONDUCTIVITY	-9
DISSOLVED OXYGEN	-9	EH	-9
IRON	-9	MANGANESE	-9
PH	-9	SULPHATE	-9
S2	-9	TEMPERATURE°C	-9
TOTAL ALKALINITY	-9	TOTAL HARDNESS	-9
LABORATORY: Analysis Date: 10/23/1978			
COD	-9	CONDUCTIVITY	1339
DIC	-9	FLUORIDE	0.2
ION BALANCE	1	PH	8.8
SAR	-9	SIO2	10
TOTAL ALKALINITY	581	TC	-9
TDS	845	TN	-9
DOC	-9		
AMMONIUM-N	-9	BICARBONATE	635.7908
CALCIUM	62.874	CARBONATE	36
CHLORIDE	35.04915	MAGNESIUM	20.016576
NITRATE-N	-9	NITRITE-N	0.0504*
PHOSPHATE	-9	POTASSIUM	1.9197
SULPHATE	241.9991	SULPHATE	123.9216
NO ₂ + NO ₃	0.7252	TOTAL HARDNESS	240
ALUMINUM	-9	ARSENIC	-9
BARIUM	-9	BERYLIUM	-9
CADMIUM	-9	CHROMIUM	-9
COBALT	-9	COPPER	-9
IRON	0.05*	LEAD	-9
MANGANESE	-9	MERCURY	-9
MOLYBDENUM	-9	NICKEL	-9
SELENIUM	-9	STRONTIUM	-9
VANADIUM	-9	ZINC	-9
HYDROCARBONS	-9	PESTICIDES	-9
PHENOLICS	-9	OTHER 3	0

Remarks:

-9 indicates that no analysis was done for this parameter

*Indicates concentrations less than.

Temperature reported in Degree Centigrade. Conductivity reported in microsiemens/cm, pH in pH units. Alkalinity and Hardness expressed as Calcium Carbonate. FE, VA, PB, AL, AG expressed as extractable. FE in field measurements and all remaining metals expressed as total.

EH - Oxidation-Reduction Potential

DIC - Dissolved Inorganic Carbon

DOC - Dissolved Organic Carbon

TDS - Total Dissolved Solids

SAR - Sodium Adsorption Ratio

COD - Chemical Oxygen Demand

TN - Total Particulate Nitrogen

TC - Total Particulate Carbon

NOTE: This data may not be fully checked.

The Province disclaims all responsibility for its accuracy

Report 1



ALBERTA ENVIRONMENT CHEMICAL ANALYSIS REPORT

WELL NAME: POZSGAI, GEORGE
LOCATION: LSD NW SEC 20 TWP 045 RG 06 M 5
WELL DEPTH: 80
AQUIFER:
SAMPLING DATE: 3/2/1983 TIME: 0

WELL ID No: 0475285
SAMPLE No: 2931
WATER LEVEL: -9
LABORATORY: AA
PRINT DATE: 3/9/2005

FIELD:	MG/L
BICARBONATE	-9
CHLORIDE	-9
DISSOLVED OXYGEN	-9
IRON	-9
PH	-9
S2	-9
TOTAL ALKALINITY	-9

FIELD:	MG/L
CARBONATE	-9
CONDUCTIVITY	-9
EH	-9
MANGANESE	-9
SULPHATE	-9
TEMPERATURE°C	-9
TOTAL HARDNESS	-9

LABORATORY: Analysis Date: 3/29/1983

COD	-9
DIC	-9
ION BALANCE	1
SAR	-9
TOTAL ALKALINITY	475
TDS	500
DOC	-9

CONDUCTIVITY	906
FLUORIDE	0.14
PH	7.3
SIO2	13.6
TC	-9
TN	-9

AMMONIUM-N	-9
CALCIUM	98.802
CHLORIDE	2.0022
NITRATE-N	-9
PHOSPHATE	-9
SODIUM	63.9998
NO ₂ + NO ₃	0.0144*

BICARBONATE	578.8107
CARBONATE	-9
MAGNESIUM	27.021952
NITRITE-N	0.0504*
POTASSIUM	3.2311
SULPHATE	19.9872
TOTAL HARDNESS	358

ALUMINUM	-9
BARIUM	-9
CADMIUM	-9
COBALT	-9
IRON	2.67
MANGANESE	-9
MOLYBDENUM	-9
SELENIUM	-9
VANADIUM	-9

ARSENIC	-9
BERYLIUM	-9
CHROMIUM	-9
COPPER	-9
LEAD	-9
MERCURY	-9
NICKEL	-9
STRONTIUM	-9
ZINC	-9

HYDROCARBONS	-9
PHENOLICS	-9

PESTICIDES	-9
OTHER 3	0

Remarks:

-9 indicates that no analysis was done for this parameter

*Indicates concentrations less than.

Temperature reported in Degree Centigrade. Conductivity reported in microsiemens/cm, pH in pH units. Alkalinity and Hardness expressed as Calcium Carbonate. FE, VA, PB, AL, AG expressed as extractable. FE in field measurements and all remaining parameters expressed as total.

EH - Oxidation-Reduction Potential

DIC - Dissolved Inorganic Carbon

DOC - Dissolved Organic Carbon

TDS - Total Dissolved Solids

SAR - Sodium Adsorption Ratio

COD - Chemical Oxygen Demand

TN - Total Particulate Nitrogen

TC - Total Particulate Carbon

NOTE: This data may not be fully checked.

The Province disclaims all responsibility for its accuracy

Report 1



ALBERTA ENVIRONMENT CHEMICAL ANALYSIS REPORT

WELL NAME: CHAPCHUK,B.
LOCATION: LSD NW SEC 31 TWP 045 RG 06 M 5
WELL DEPTH: 130
AQUIFER:
SAMPLING DATE: 1/3/1979 TIME: 0

WELL ID No:0475328
SAMPLE No: 693
WATER LEVEL: -9
LABORATORY: AE
PRINT DATE: 3/9/2005

FIELD:	MG/L
BICARBONATE	-9
CHLORIDE	-9
DISSOLVED OXYGEN	-9
IRON	-9
PH	-9
S2	-9
TOTAL ALKALINITY	-9

FIELD:	MG/L
CARBONATE	-9
CONDUCTIVITY	-9
EH	-9
MANGANESE	-9
SULPHATE	-9
TEMPERATURE°C	-9
TOTAL HARDNESS	-9

LABORATORY: Analysis Date: 1/30/1979

COD	-9
DIC	-9
ION BALANCE	1.01
SAR	-9
TOTAL ALKALINITY	560
TDS	907
DOC	-9

CONDUCTIVITY	1422
FLUORIDE	0.13
PH	8.5
SiO2	9.1
TC	-9
TN	-9

AMMONIUM-N	-9
CALCIUM	31.936
CHLORIDE	1.0011*
NITRATE-N	-9
PHOSPHATE	-9
SODIUM	311.9996
NO ₂ + NO ₃	0.0144*

BICARBONATE	673.7816
CARBONATE	5.001*
MAGNESIUM	8.006144
NITRITE-N	0.0504*
POTASSIUM	1.71825
SULPHATE	214.8672
TOTAL HARDNESS	114

ALUMINUM	-9
BARIUM	-9
CADMIUM	-9
COBALT	-9
IRON	0.02*
MANGANESE	-9
MOLYBDENUM	-9
SELENIUM	-9
VANADIUM	-9

ARSENIC	-9
BERYLIUM	-9
CHROMIUM	-9
COPPER	-9
LEAD	-9
MERCURY	-9
NICKEL	-9
STRONTIUM	-9
ZINC	-9

HYDROCARBONS	-9
PHENOLICS	-9

PESTICIDES	-9
OTHER 3	0

Remarks:

-9 indicates that no analysis was done for this parameter

*Indicates concentrations less than.

Temperature reported in Degree Centigrade. Conductivity reported in microsiemens/cm, pH in pH units. Alkalinity and Hardness expressed as Calcium Carbonate. FE, VA, PB, AL, AG expressed as extractable. FE in field measurements and all remaining metals expressed as total.

EH - Oxidation-Reduction Potential

DIC - Dissolved Inorganic Carbon

DOC - Dissolved Organic Carbon

TDS - Total Dissolved Solids

SAR - Sodium Adsorption Ratio

COD - Chemical Oxygen Demand

TN - Total Particulate Nitrogen

TC - Total Particulate Carbon

NOTE: This data may not be fully checked.

The Province disclaims all responsibility for its accuracy

Report 1



ALBERTA ENVIRONMENT CHEMICAL ANALYSIS REPORT

WELL NAME: HAMMOND, LEROY
LOCATION: LSD SE SEC 25 TWP 045 RG 07 M 5
WELL DEPTH: 45
AQUIFER:
SAMPLING DATE: 5/1/1984 TIME: 0

WELL ID No:0483851
SAMPLE No: 5311
WATER LEVEL: -9
LABORATORY: AE
PRINT DATE: 3/9/2005

FIELD:	MG/L	FIELD:	MG/L
BICARBONATE	-9	CARBONATE	-9
CHLORIDE	-9	CONDUCTIVITY	-9
DISSOLVED OXYGEN	-9	EH	-9
IRON	-9	MANGANESE	-9
PH	-9	SULPHATE	-9
S2	-9	TEMPERATURE°C	-9
TOTAL ALKALINITY	-9	TOTAL HARDNESS	-9
LABORATORY: Analysis Date: 5/24/1984			
COD	-9	CONDUCTIVITY	1182
DIC	-9	FLUORIDE	0.72
ION BALANCE	0.97	PH	8.4
SAR	-9	SIO2	7.5
TOTAL ALKALINITY	548	TC	-9
TDS	737	TN	-9
DOC	-9		
AMMONIUM-N	-9	BICARBONATE	658.7817
CALCIUM	10.978	CARBONATE	5.001
CHLORIDE	1.0011	MAGNESIUM	2.001536
NITRATE-N	-9	NITRITE-N	0.0504
PHOSPHATE	-9	POTASSIUM	1.5168
SODIUM	279.9997	SULPHATE	111.9312
NO ₂ + NO ₃	0.0144	TOTAL HARDNESS	36
ALUMINUM	-9	ARSENIC	-9
BARIUM	-9	BERYLIUM	-9
CADMIUM	-9	CHROMIUM	-9
COBALT	-9	COPPER	-9
IRON	0.03	LEAD	-9
MANGANESE	-9	MERCURY	-9
MOLYBDENUM	-9	NICKEL	-9
SELENIUM	-9	STRONTIUM	-9
VANADIUM	-9	ZINC	-9
HYDROCARBONS	-9	PESTICIDES	-9
PHENOLICS	-9	OTHER 3	0

Remarks:

-9 indicates that no analysis was done for this parameter
*Indicates concentrations less than.

Temperature reported in Degree Centigrade. Conductivity reported in microsiemens/cm, pH in pH units. Alkalinity and Hardness expressed as Calcium Carbonate. FE, VA, PB, AL, AG expressed as extractable. FE in field measurements and all remaining values expressed as total.

EH - Oxidation-Reduction Potential
DIC - Dissolved Inorganic Carbon
DOC - Dissolved Organic Carbon
TDS - Total Dissolved Solids

SAR - Sodium Adsorption Ratio
COD - Chemical Oxygen Demand
TN - Total Particulate Nitrogen
TC - Total Particulate Carbon

NOTE: This data may not be fully checked.
The Province disclaims all responsibility for its accuracy

Report 1

Appendix F
Traffic Impact Assessment

4204219 - 4
March 28, 2005

Alberta Transportation & Utilities
4th Floor, Provincial Building
404, 4920 - 51st Street
Red Deer, Alberta
T4N 6K8

Attention: Mr. Lee Bowman

Re: Proposed Subdivision Development – NW 30-45-6-W5M
Draft Traffic Impact Assessment

Enclosed you will find two copies of the draft Traffic Impact Assessment for a proposed subdivision development on Highway 22.

The assessment details the location of the proposed development, configuration of the anticipated access and the identified intersectional improvements resulting from the development.

Please review this assessment and advise of any comments or concerns you may have. Based upon your input, we will finalize and issue the report. It is the owner's intention to proceed with the development as soon as approvals can be secured from the County.

Yours Truly;


Blaine Newton, P. Eng.
EXH Engineering Services Ltd.

cc: D. Auclair

**TRAFFIC IMPACT ASSESSMENT
AUCLAIR RESIDENTIAL SUBDIVISION
(FAIRWAYS WEST)
NW 30-45-6-W5M
SOUTHWEST BUCK LAKE /HIGHWAY 22**

**DION AUCLAIR
March 23, 2005**

DRAFT

**Prepared By:
EXH Engineering Services Ltd.
Red Deer, Alberta
Project No. 4204219**

**TRAFFIC IMPACT ASSESSMENT
AUCLAIR RESIDENTIAL SUBDIVISION
(FAIRWAYS WEST)
NW 30-45-6-W5M
SOUTHWEST BUCK LAKE /HIGHWAY 22**

DION AUCLAIR
March 23, 2005

**Prepared By:
EXH Engineering Services Ltd.
Red Deer, Alberta
Project No. 4204219**

TRAFFIC IMPACT ASSESSMENT
AUCLAIR RESIDENTIAL SUBDIVISION
(FAIRWAYS WEST)
NW 30-45-6-W5M
SOUTHWEST BUCK LAKE /HIGHWAY 22

DRAFT

EXECUTIVE SUMMARY

EXH Engineering Services Ltd was retained to carry out a traffic impact assessment for Mr. Dion Auclair for the proposed 17 lot Wild Rose Residential Subdivision. The site is located on Highway 22 at NW ¼ 30-45-6 W5M, approximately 8 km southwest of the Town of Buck Lake.

Upon review of the estimated traffic generation associated with the 16 lot site development, and the corresponding impact on the intersection of Highway 22 and the site access, the following conclusions were reached:

- Highway 22 has sufficient capacity to accommodate the anticipated increase in traffic volume associated with the proposed development.
- The proposed subdivision site access with Highway 22 requires a Type IIa configuration under current Highway 22 conditions.
- Assessment of the access requirements to the 20-year design horizon suggest that the requirements are on the verge of requiring a Type IIIa configuration. Given the nature of the development traffic, a Type IIa configuration is recommended.
- There is no warrant for illumination of the proposed intersection or for accommodation of pedestrian traffic.

Dion Auclair
Traffic Impact Assessment
NW 30-45-6-WSM
Southwest Buck Lake /Highway 22
4204219
March 23, 2005
Page i

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APPENDICES

APPENDIX A PROJECT FIGURES

Drawing: 4204219-2 Site Layout

Figure D-7c: Intersection Treatment (Type IIa)

APPENDIX B TRAFFIC VOLUME ESTIMATES

APPENDIX C TRIP GENERATION ESTIMATES

APPENDIX D INTERSECTION ANALYSIS

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EXH Engineering Services Ltd was retained to carry out a traffic impact assessment for Mr. Dion Auclair for the proposed 16 lot Wild Rose Residential Subdivision. The site is located on Highway 22 at NW ¼ 30-45-6 W5M, approximately 8 km southwest of the Town of Buck Lake and 1.6 km south of Highway 13. There is a current operation beside the proposed subdivision that includes a golf course and a motel, accessed from a separate existing entrance road off of Highway 22.

This assessment is intended as a review of the following specific issues:

- The estimated traffic volume generated by the development at average and peak times.
- The estimated future left-turn and right-turn manoeuvres for the intersection between Highway 22 and the site access road, at peak times.
- Appropriate configuration for the existing Highway 22/access road intersection to accommodate the development.

This review is based upon Highway 22 traffic volume data from Alberta Transportation. No site traffic counts have been conducted. This review does not extend to the geometry of the Highway 22/access road intersection configuration, and therefore does not represent a detailed design of the subject intersection.

I. PROJECT INFORMATION

The proposed site is intended to contain 16 residential lots. The development access will utilize an existing residential driveway. The access, as shown on the attached drawing (4204219-2 Site Layout of Appendix A), will also serve an existing residence as well as an oil/gas well. The development will be adjacent to an existing operation, encompassing a golf course (Fairways West Golf Course) and a motel, accessed from a separate existing entrance road off of Highway 22.

Highway 22 is a two-lane undivided major roadway that runs on the west side of the development area. Both northbound and southbound traffic are one lane, with a posted speed limit of 100 km/h. Travel lanes are approximately 3.7 m wide, with a further paved 1.9 m shoulder on each side. The site access currently is a standard gravel driveway. The sight distances along Highway 22 at the access location were estimated based upon site observations, at approximate 1000 meters to the north and south.

According to the owner, the oil/ gas well, located to the east of the development, is accessed by twice per week.

II. ESTIMATED SITE TRAFFIC GENERATION

Estimates of development traffic volume contained herein are based upon the Institute of Transportation Engineers (ITE) Manual, 7th Edition. For the purpose of this review, we have used the following ITE average trip-end generation category:

Single-Family Detached Housing (Land Use: 210)

ITE estimates are based upon observed measurement. Data sheets are contained in Appendix C. ITE data provides a range of trip generation rates for the specific types of development, along with suggested averages. Estimates are categorized based on typical weekday and AM/PM Peak Hour traffic volumes for the adjacent roadway.

The average daily traffic generation was estimated using the average trip rate of 9.6 trips per house from the ITE manual, reduced to 8.6 trips per home to represent the rural nature of the development.

The total estimated average daily traffic generation from the site is summarized in Table 1. Total trips represent two-way vehicles trips. South and north estimates represent the volume of traffic entering the site from those directions. Some numbers have been rounded.

Within the entering traffic, the direction distribution was assumed as:

- 90% of the residential traffic will be from the north and 10% from the south;
- 90% of the oil field traffic will be from the north and 10% from the south;

Table 1: Total Estimated Development Traffic Volumes-Average Daily

Development Conditions					In/Out Distribution		Direction Distribution	
	Amount	Unit	Trip Rate	Total Trips	Entering the Site	Exiting the Site	South Bound	North Bound
Proposed Housing	16	lot	8.6	138	69	69	62	7
Oil Field	1	site	1	1	1	1	1	0
Existing Dwelling	1	lot	8.6	9	5	5	4	1
Total				147	74	74	67	8

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Table 2 summarizes the total AM and PM peak time traffic generation estimates. Total trips represent two-way vehicles trips. South and north estimates represent the volume of traffic entering the site from Hwy 22 from those directions.

Table 2: Total Estimated Development Traffic Volumes-AM peak and PM peak

Development Conditions					In/Out Distribution		Direction Distribution	
AM	Amount	Unit	Trip Rate	Total Trips	Entering the Site	Exiting the Site	South Bound	North Bound
Proposed Housing	16	lot	0.77	12	1	11	1	0
Oil Field	1	site	1	1	1	0	1	0
Existing Dwelling	1	lot	0.77	1	0	1	0	0
Total				14	2	12	2	0
Development Conditions					In / Out Distribution		Direction Distribution	
PM	Amount	Unit	Trip Rate	Total Trips	Entering the Site	Exiting the Site	South Bound	North Bound
Proposed Housing	16	lot	1.02	16	15	2	13	1
Oil Field	1	site	1	1	0	1	1	0
Existing Dwelling	1	lot	1.02	1	1	0	1	0
Total				18	16	3	15	1

In summary, it is estimated that the proposed development will result in approximately 138 trips per day on Highway 22 at full development, with an AM peak-hour volume of 12 and a PM Peak of 16. In whole, the site access will need to accommodate approximately 147 trips per day, with 14 during the AM peak and 18 during the PM peak.

III. HIGHWAY TRAFFIC VOLUMES

Published Alberta Transportation 2003 traffic volumes for the nearest intersection, Highway 22 and Highway 13, indicate the average annual daily traffic (AADT) on Highway 22 as 1820, and average summer daily traffic (ASDT) counts, at the same spot, as 2230 (Appendix C). For the purpose of this review, the AADT figure was used, as the site will operate on a year-round basis. It should be noted that the ASDT estimate is approximately 20% higher than the AADT volume.

The design period used for this analysis was 20 years. A growth rate of 2.5%, non-compounded for the design horizon, was assumed for Highway 22. The calculated, non-compound growth rate for AADT values from 1994 to 2003 was 3.3%. The 2.5% rate resulted in an estimated average daily traffic volume of

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1911 for 2005 and 2821 for 2025. This volume represents the base traffic volume along Highway 22 for the design year.

It has been assumed that traffic volumes from the new development will be in addition to this, resulting in an increase in Highway 22 volumes. This results in an estimated average daily traffic volume on Highway 22 for 2025 of approximately 2945 (north of the access) and 2835 (south of the access).

Highway traffic volumes and growth estimates are contained in Appendix B. Immediately after Development, and to the Projected Design Year, traffic has been attributed, south and north of the intersection, based upon the assumptions noted in Section II. Results are summarized in Table 3.

TABLE 3: ESTIMATED TRAFFIC VOLUME: HIGHWAY 22 AT SITE ACCESS

YEAR/DEVELOPMENT CONDITIONS	TWO-WAY VOLUME ESTIMATES	
	North of Intersection	South of Intersection
Base Traffic 2005	1911	1911
Immediately after Development 2005	2035	1925
Projected Design Year 2025	2945	2835

IV. LEFT TURN MANOEUVRES

Left turn warrants are based upon the level of probability that a vehicle in the advancing traffic stream, in the design hour, will not arrive at an intersection when another vehicle, travelling in the same direction, is stopped waiting to make a left turn. The associated hazard this represents decreases with decreased design speed. The analysis of left turn manoeuvres off Highway 22 was conducted based upon the proposed development plan.

Alberta Transportation typically utilizes the 100th highest hourly volume for design functions. For a rural situation, this will tend to be in the order of 12% of the average daily traffic volume in a rural setting. This results in approximately 229 for current conditions and 339 for the design year. AM and PM Peak Hour traffic volume generation from the development has been estimated at 14 and 18 trips respectively. Of this, 12 and 16 have been assumed as new vehicle trips.

PM figures have been used for intersection analysis, as this will result in a higher number of left-hand turns. With the new development, 2025 PM peak hour

Highway 22 volumes are estimated at 355. Volumes for turning manoeuvres are illustrated in Appendix D.

For the purpose of this review, it is necessary to make assumptions with respect to the direction from which the traffic is approaching the site during the design peak hour. The following assumptions were used, based on the location of likely user attractions:

- On average, during the day, the site entering traffic volume will be equal to the exiting volume.
- During the AM peak hour, 90% of the residential traffic will leave the site for the daily activities and 10% will enter the site. Conversely, during the PM peak, 90% will return to the site and 10% will exit.

The site development and Highway 22 volumes at the 20-year design horizon, and the AM and PM peak hour estimates, are summarized in Table 4. Left turn refers to the traffic on Highway 22 southbound then turning into the site. Some numbers have been rounded.

TABLE 4: PM PEAK HOUR TURNING ESTIMATES – HIGHWAY 22

PM PEAK	NORTHBOUND (OPPOSING)	SOUTHBOUND (ADVANCING)	LEFT TURNS	% LEFT TURN
2005	116	129	15	11.6
2025	171	184	15	8.2

Appendix D represents initial traffic volume warrants for the intersection, using the opposing and advancing traffic volumes during peak hour times. For the purpose of this review, the PM peak hour was analysed, as it creates a higher percentage of left-turning traffic.

The analysis was conducted using two methods. Initial assessment was conducted using the charts and graphs contained in the Alberta Transportation Design Guidelines. This review suggested a Type IIa configuration under current Highway 22 conditions.

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At the 20-year design horizon, the review suggested a Type IIIa configuration, although the analysis was close to the transition from a Type IIa. Further analysis was then conducted using Alberta Transportation Intersection Design System (IDS) software, version 1.01, with the result of a Type IIa configuration. Refer to Appendix D for the IDS output. Typical intersection configurations are shown in Appendix A.

Upon consideration, we recommend that a Type IIa intersection be established for the development as proposed. This is based upon a number of considerations:

- The proposed development is residential, resulting in a low percentage of truck traffic, and, therefore, a lower risk.
- Sight distances greatly exceed the requirement for a residential development.
- The rural nature of the development will likely result in an extended period for the peak traffic volume, reducing the potential for conflict.
- The trigger for the Type IIIa configuration, under manual calculations, is relatively late in the design horizon, perhaps 17 – 20 years.
- The IDS analysis recommends a Type IIa configuration.

Further up-grading of the intersection, from a Type IIa configuration to a minimum Type IIIa configuration, will be required for any subsequent development utilizing this access.

V. RIGHT TURN MANOEUVRES

The Alberta Transportation warrant for a right turn lane requires that the intersecting road have an average daily traffic volume in excess of 900 vehicles and a right turn volume in excess of 360 vehicles. Using the assumptions noted, the average daily right-turns onto the access road from Highway 22 would be in the order of 7 at full development, based upon 147 total vehicle trips on the access road.

A dedicated right-turn lane is not warranted.

DRAFT

VI. ADDITIONAL CONSIDERATIONS

This review is intended as a general overview of a number of site aspects. Some additional issues have been identified for consideration:

- There is currently no significant pedestrian traffic in the area that would require accommodation as a result of this proposed development.
- Currently, there is no illumination along Highway 22 in proximity to the subject site.
- The current Highway 22 access has no identified operational difficulties, based upon information provided by the owner.
- Access to the Fairway Golf Course is located approximately 300 m due south of the proposed new development access.

VII. CONCLUSIONS AND RECOMMENDATIONS

Based upon the information contained herein, we have the following comments, conclusions and recommendations:

- Highway 22 has sufficient capacity to accommodate the anticipated increase in traffic volume associated with the proposed development.
- A Type IIa intersection is warranted under present traffic volumes, and traffic volumes well into the design horizon.
- There is a discrepancy between analysis methods as to whether an increase in intersection configuration is warranted by the close of the 20-year design horizon. Given the nature of the development, and the associated low risk, a Type IIa configuration, consistent with the IDS analysis, appears to be appropriate.
- There is currently no pedestrian traffic requiring accommodation at the intersection.
- Illumination of the proposed intersection does not appear to be warranted.

VIII. CLOSURE

This report has been prepared based on the best information available at the time. It is intended to provide conceptual review of the specific issues. Numbers will change through detailed design or a more comprehensive site evaluation.

Dion Auclair
Traffic Impact Assessment
NW 30-45-6-W5M
Southwest Buck Lake /Highway 22
4204219
March 23, 2005
Page 8

DRAFT

This report has been prepared by EXH Engineering Services Ltd. for the use of the identified land Owner. Use by third parties, without the express written permission of EXH Engineering Services Ltd., is not permitted.

APPENDIX A

PROJECT FIGURES

Drawing: 4204219-2

Site Layout

Figure D-7c

Intersection Treatment (Type IIa)

Highway 22

Proposed Subdivision

Existing Development

EXISTING WETLAND
TO BE EXPANDED

Golf Course



LEGEND



WATER WELL

NOTES

1. Site limits as provided by owner. To be confirmed as part of detailed design.
2. Lots to accomodate single family dwellings.

No.	date	revision			by

Permit

Engineer's Stamp

EXH Engineering Services Ltd.

project
**Auclair Subdivision
Proposed Wild Rose Residential S**

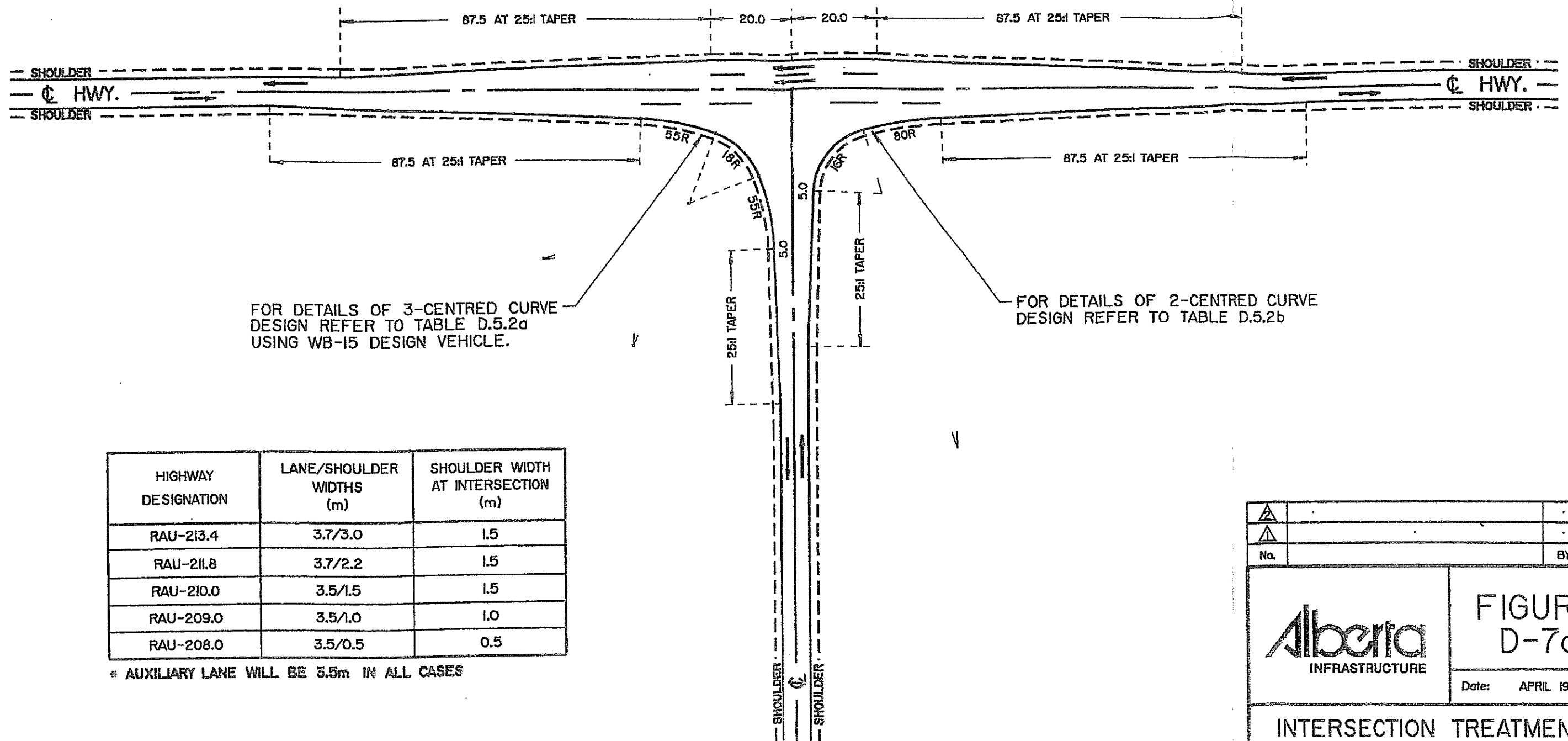
drawing
Site Layout

designed	code	date
	NTS	MAR. 2005
drawn	project No.	contract No.
HC	4204219	
checked	drawing No.	revision
BN	4204219-2	0
approved		

NW 30-45-6 W5M

\\ms0001\4204219 Auclair-Final.dwg

NOTES: DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS.
ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW
FOR DEPTH OF BASE COURSE AND PAVEMENT.



HIGHWAY DESIGNATION	LANE/SHOULDER WIDTHS (m)	SHOULDER WIDTH AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5

* AUXILIARY LANE WILL BE 3.5m IN ALL CASES

△			
△			
No.		BY	DATE
		FIGURE D-7c Date: APRIL 1995	
INTERSECTION TREATMENT (TYPE IIa) (TWO-LANE HIGHWAY)			
Prepared By: R.T.	Checked By: B.K.	Scale: N.T.S.	PAGE D-II7

APPENDIX B
TRAFFIC ESTIMATES

1.3 KM S OF HWY 22 & HWY 13 ALDER FLATS

Year	AADT	ASDT	Change	% Change	Peak Setting
1994	1370				
			90	6.57%	
1995	1460		10	0.68%	
1996	1470		200	13.61%	
1997	1670		90	5.39%	
1998	1760		-20	-1.14%	
1999	1740		-10	-0.57%	
2000	1730		120	6.94%	
2001	1850		-80	-4.32%	
2002	1770		50	<u>2.82%</u>	
2003	1820	2230		<u>29.97%</u>	
				3.33%	

2003 to 2024 @ 2.5% per year non-compounded AADT

2003	1820	218
2004	1866	224
2005	1911	229
2006	1957	235
2007	2002	240
2008	2048	246
2009	2093	251
2010	2139	257
2011	2184	262
2012	2230	268
2013	2275	273
2014	2321	278
2015	2366	284
2016	2412	289
2017	2457	295
2018	2503	300
2019	2548	306
2020	2594	311
2021	2639	317
2022	2685	322
2023	2730	328
2024	2776	333
2025	2821	339

APPENDIX C

TRIP GENERATION - ESTIMATES

Land Use: 210

Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents have a high correlation with average weekday vehicle trip ends. The use of these variables is limited, however, because the numbers of vehicles and residents was often difficult to obtain or predict. The number of dwelling units is generally used as the independent variable of choice because it is usually readily available, easy to project and has a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. As expected, dwelling units that were larger in size, more expensive, or farther away from the central business district (CBD) had a higher rate of trip generation per unit than those smaller in size, less expensive, or closer to the CBD. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses, because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas and other trip attractors than other residential land uses; and they generally had fewer alternate modes of transportation available, because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed from the late 1960s to the 2000s throughout the United States and Canada.

Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579

Single-Family Detached Housing (210)

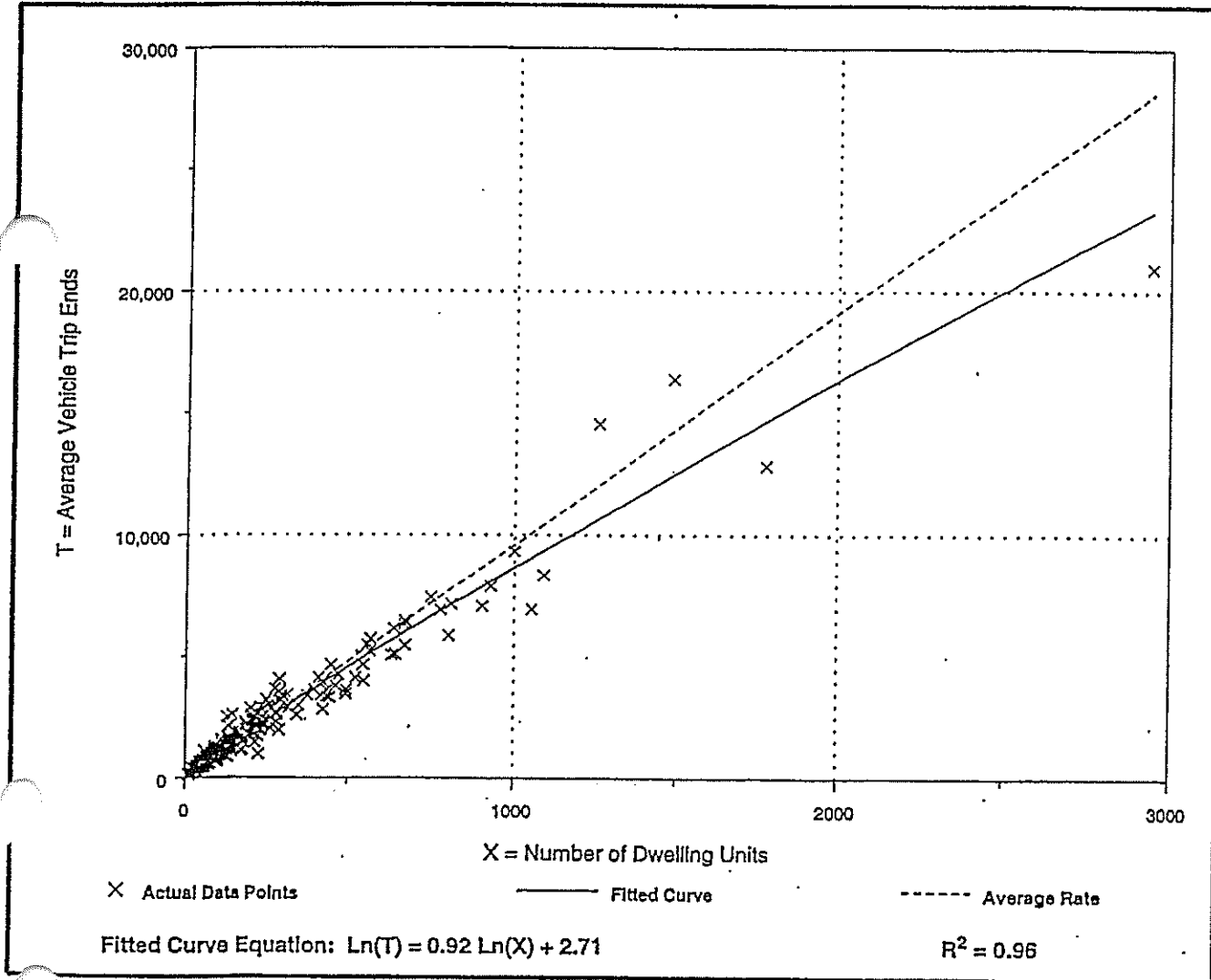
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Number of Studies: 350
Avg. Number of Dwelling Units: 197
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.57	4.31 - 21.85	3.69

Data Plot and Equation



Single-Family Detached Housing (210)

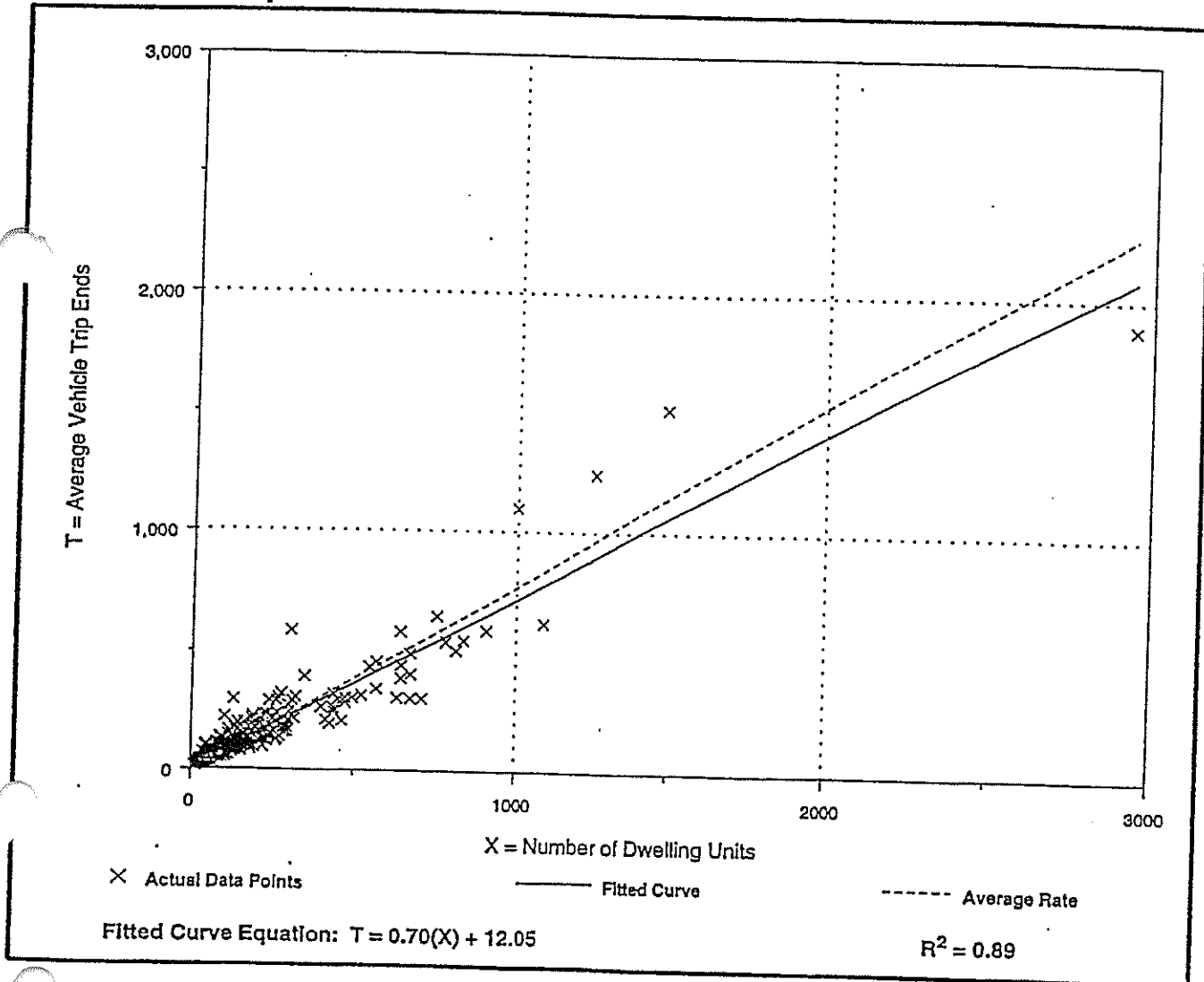
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
A.M. Peak Hour of Generator

Number of Studies: 335
Avg. Number of Dwelling Units: 183
Directional Distribution: 26% entering, 74% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.77	0.33 - 2.27	0.91

Data Plot and Equation



Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

P.M. Peak Hour of Generator

Number of Studies: 354

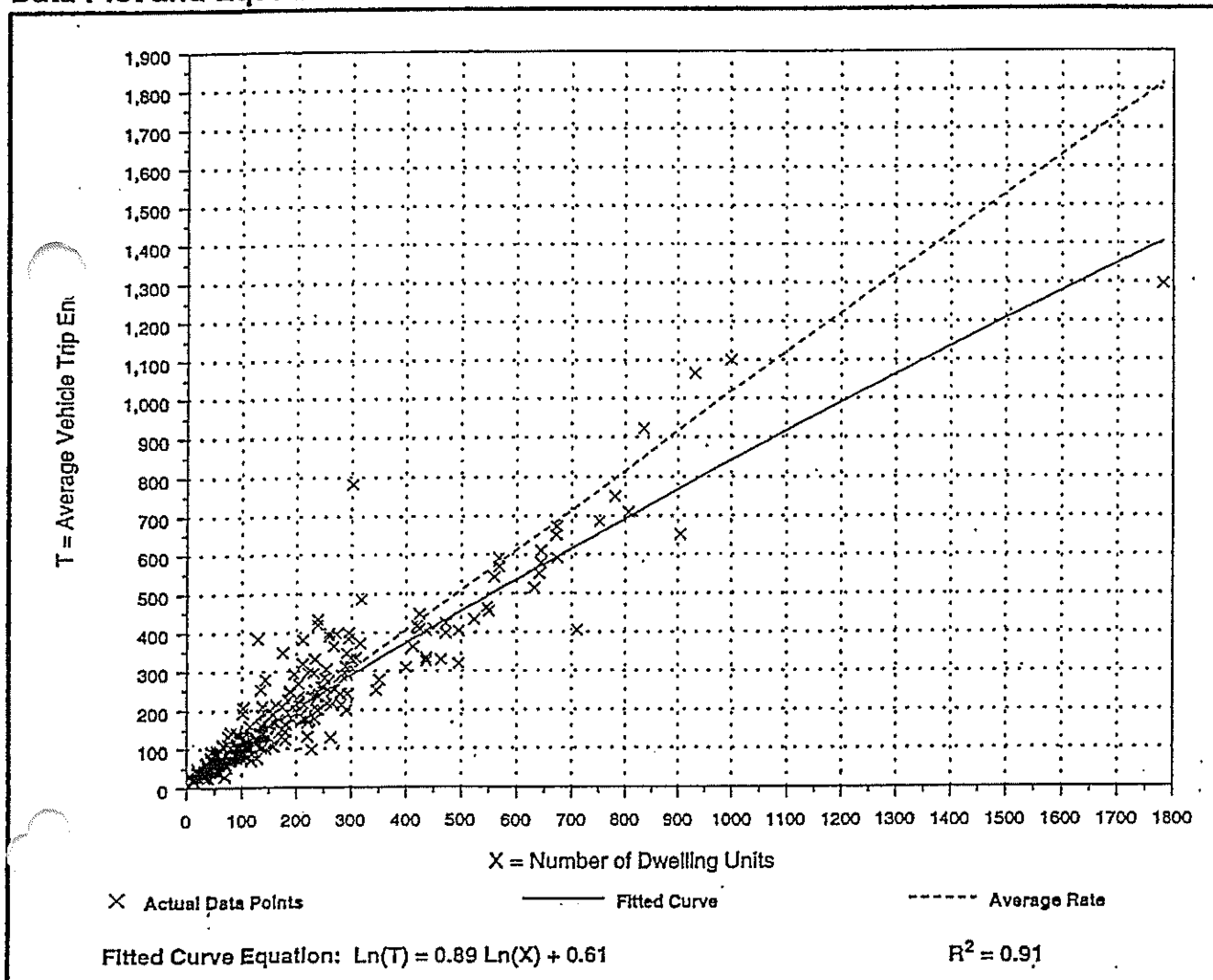
Avg. Number of Dwelling Units: 176

Directional Distribution: 64% entering, 36% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.02	0.42 - 2.98	1.05

Data Plot and Equation



Estimated Traffic - Average Daily (Weekday)

Development	Sum	Unit	Trip Rate	Total Trips	<u>In & Out Distribution</u>				<u>Direction distribution</u>			
					In %	In	Out %	Out	From North %	Into Site	From south %	Into Site
Existing Residence	1	lot	8.61	9	50%	4	50%	4	90%	4	10%	0
Single Detached Housing	16	lot	8.61	138	50%	69	50%	69	90%	62	10%	7
Oil Field	1	site	1	1	50%	1	50%	1	90%	1	10%	0
Total				147		74		74		67		7

Estimated Traffic - AM Peak (Weekday)

Development	Sum	Unit	Trip Rate	Total Trips	<u>In & Out Distribution</u>				<u>Direction distribution</u>			
					In %	In	Out %	Out	From North %	Into Site	From south %	Into Site
Existing Residence	1	lot	0.77	1	10%	0	90%	1	90%	0	10%	0
Single Detached Housing	16	lot	0.77	12	10%	1	90%	11	90%	1	10%	0
Oil Field	1	site	1	1	90%	1	10%	0	90%	1	10%	0
Total				14		2		12		2		0

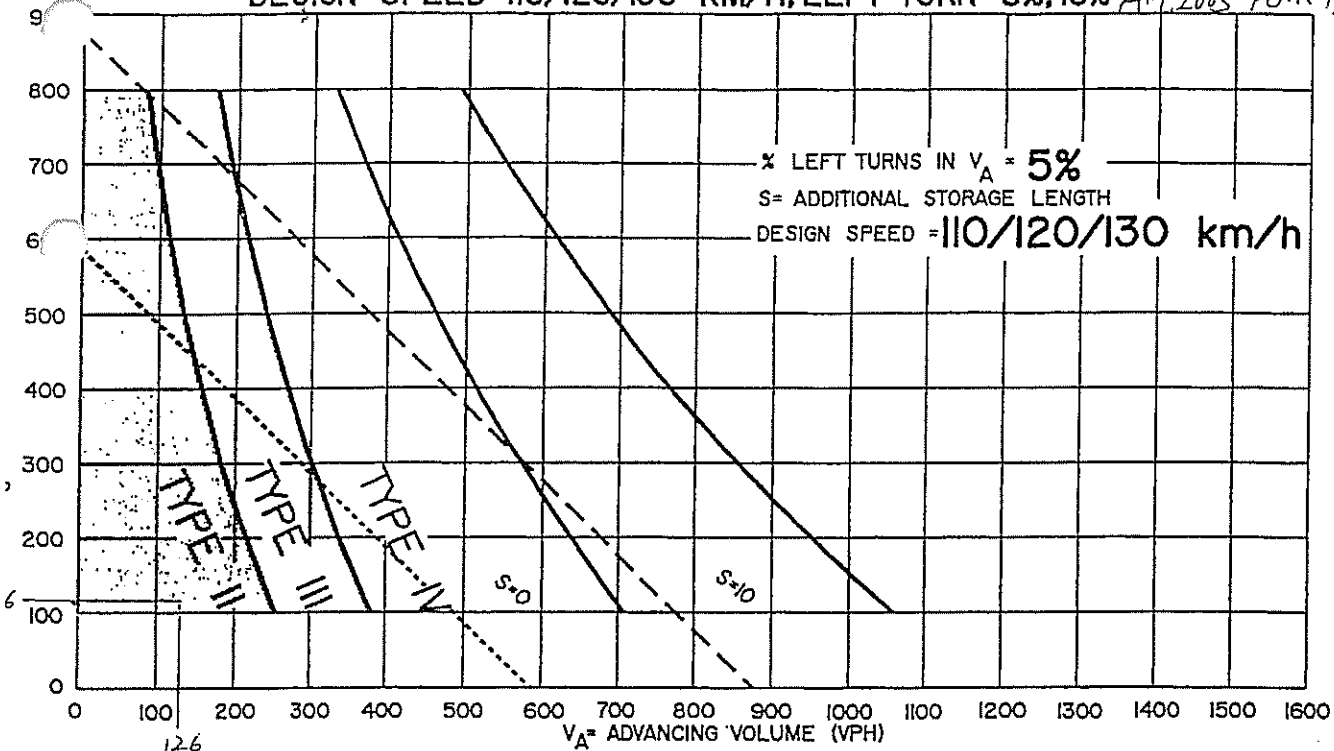
Estimated Traffic - PM Peak (Weekday)

Development	Sum	Unit	Trip Rate	Total Trips	<u>In & Out Distribution</u>				<u>Direction distribution</u>			
					In %	In	Out %	Out	From North %	Into Site	From south %	Into Site
Existing Residence	1	lot	1.02	1	90%	1	10%	0	90%	1	10%	0
Single Detached Housing	16	lot	1.02	16	90%	15	10%	2	90%	13	10%	1
Oil Field	1	site	1	1	10%	0	90%	1	90%	1	10%	0
Total				18		16		3		15		1

APPENDIX D

INTERSECTION ANALYSIS

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10% *AM 2025 PEAK TYPE II*



12.6
 S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

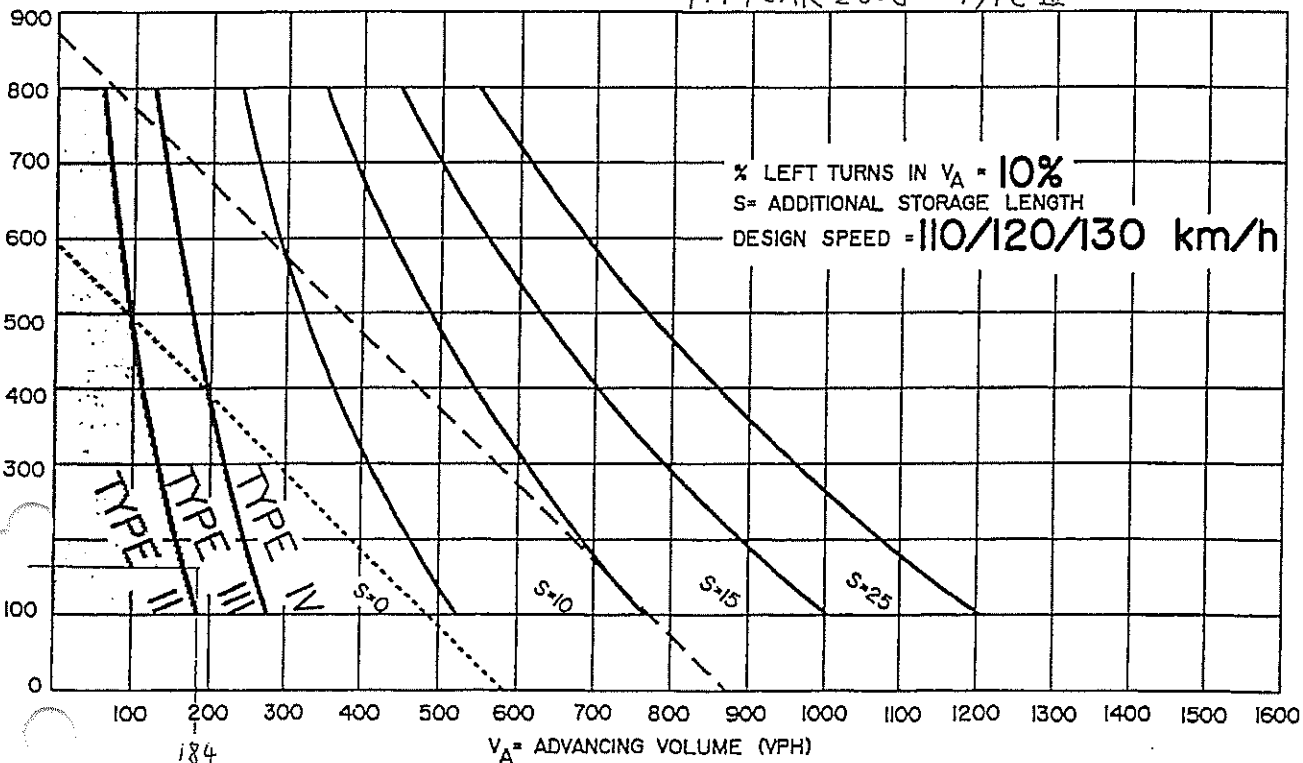
----- Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

--- Traffic signals may be warranted in "free flow" urban areas.

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

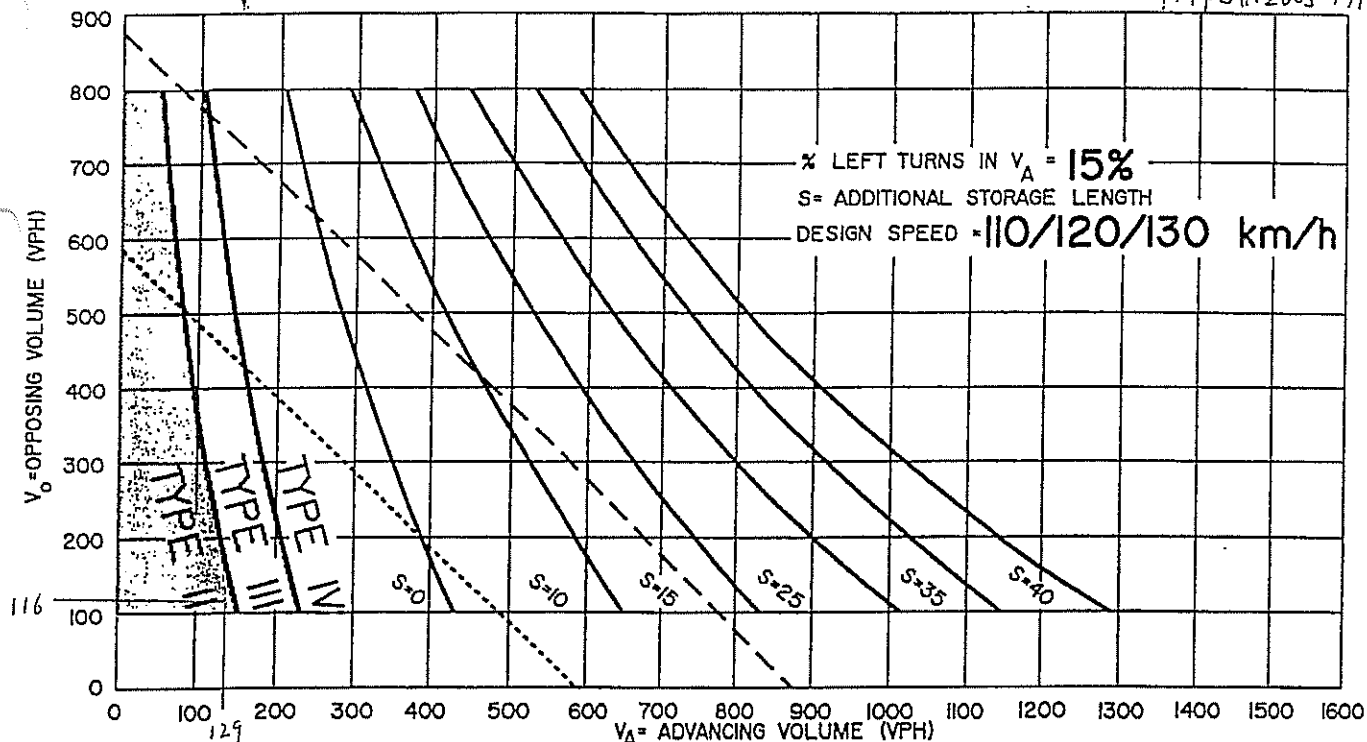
2. Warrant for Type I treatment is shown in Figure D-7.4.

PM PEAK 2025 TYPE III



184

FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20% *PM PEAK 2005 TYPE II*



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

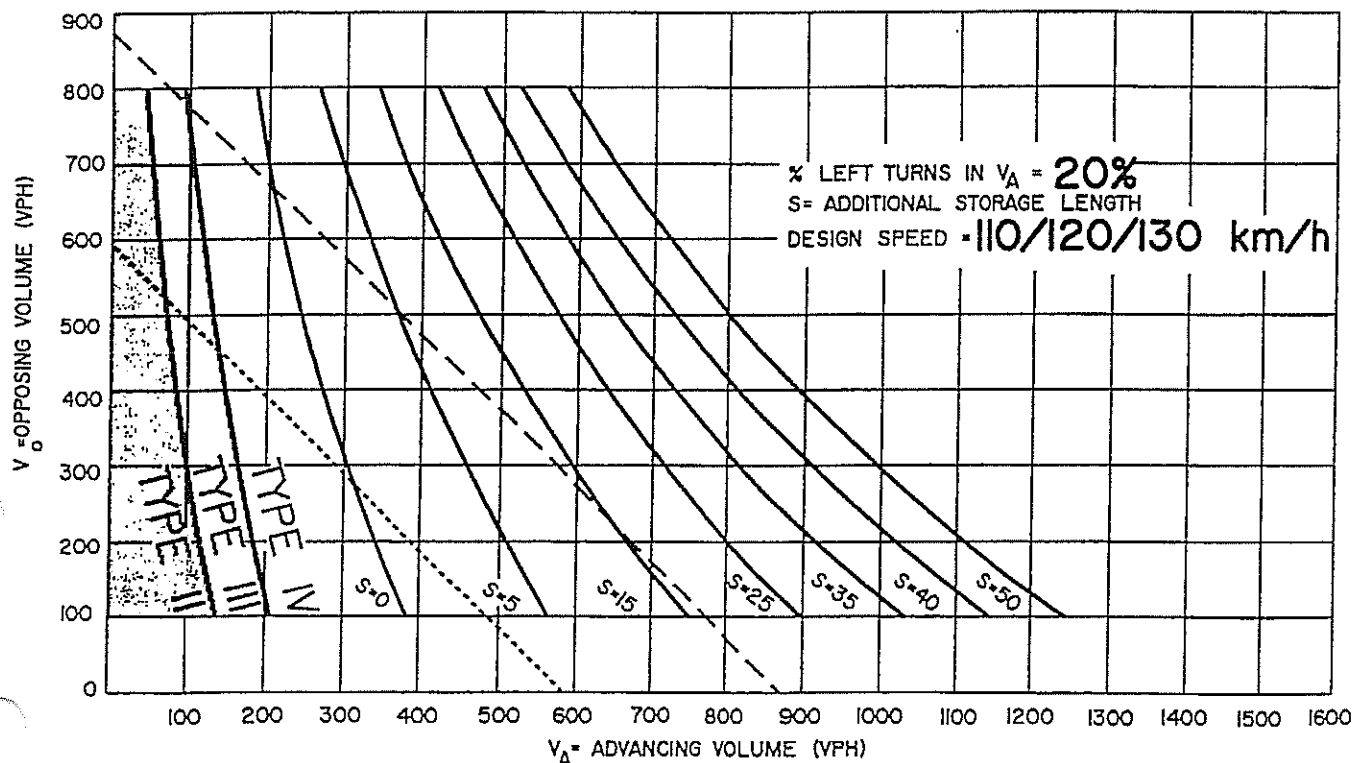
----- Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

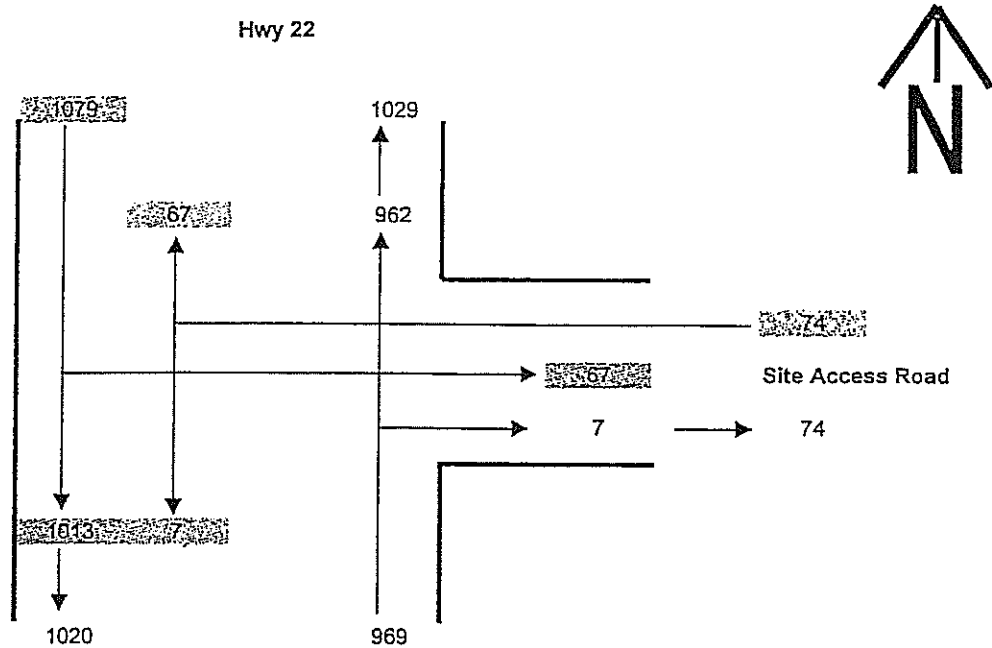
———— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

2. Warrant for Type I treatment is shown in Figure D-7.4.

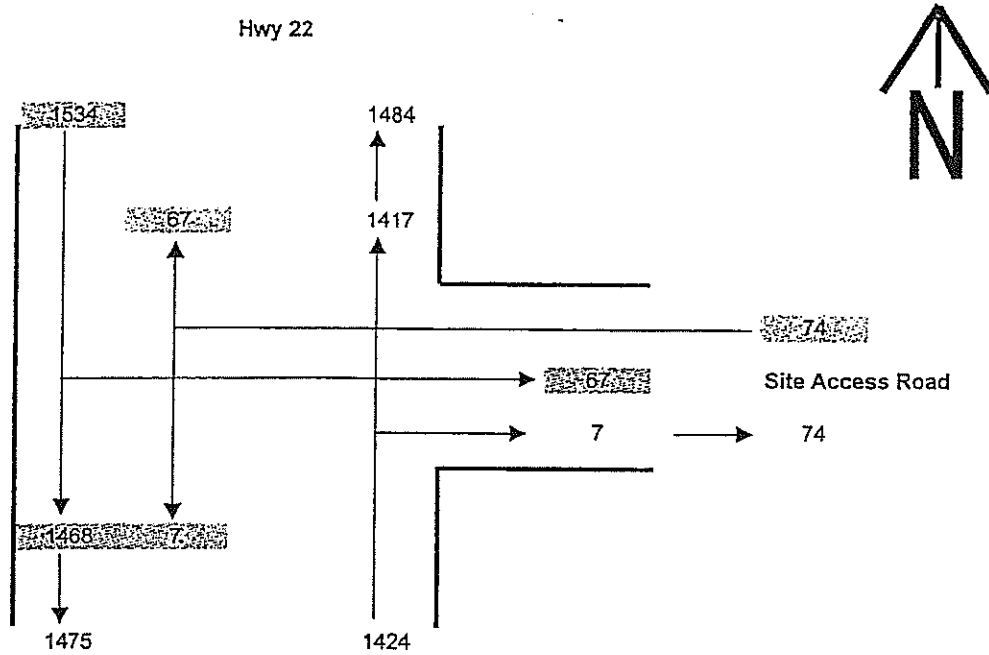




VI = 67
 Va = 1079
 L = 6.2%
 Vo = 969

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

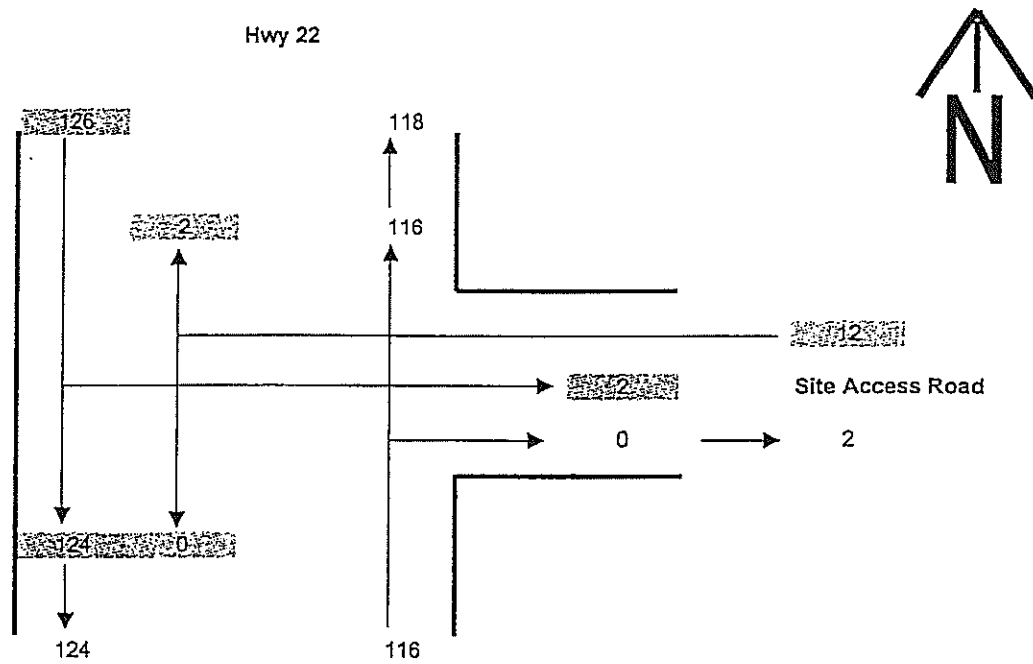
Fig 1: Traffic (2005)
Immediately after Development
Highway 22 & Access Road
Average Annual Daily



VI = 67
 Va = 1534
 L = 4.4%
 Vo = 1424

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

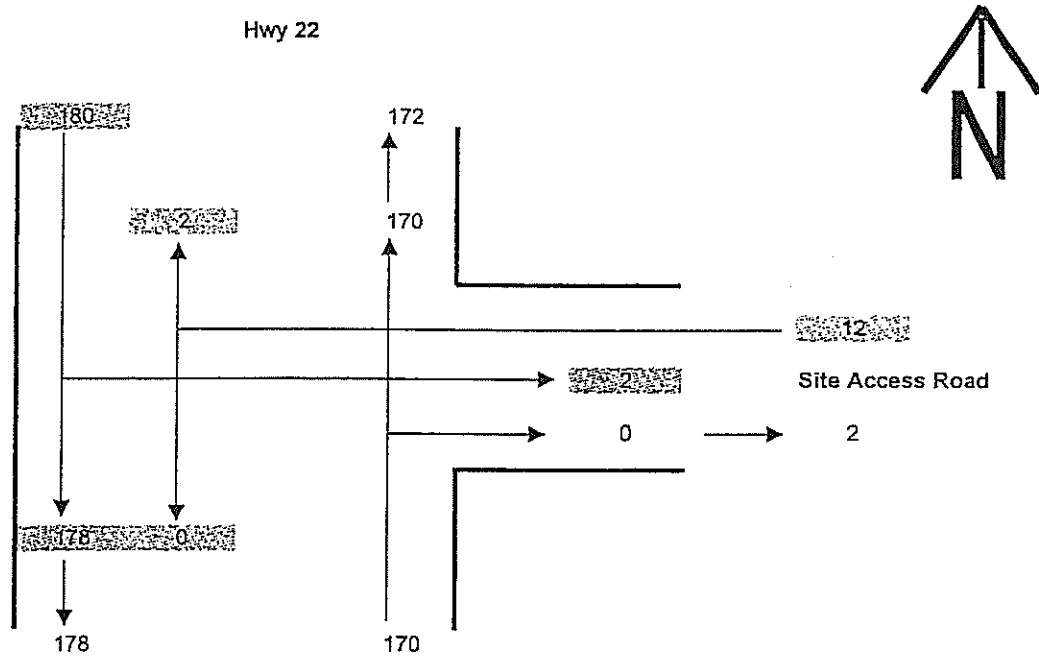
**Fig 2: Projected Traffic 20-Year
 Design Horizon(2025)
 Highway 22 & Access Road
 Average Annual Daily**



VI = 2
 Va = 126
 L = 1.7%
 Vo = 116

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

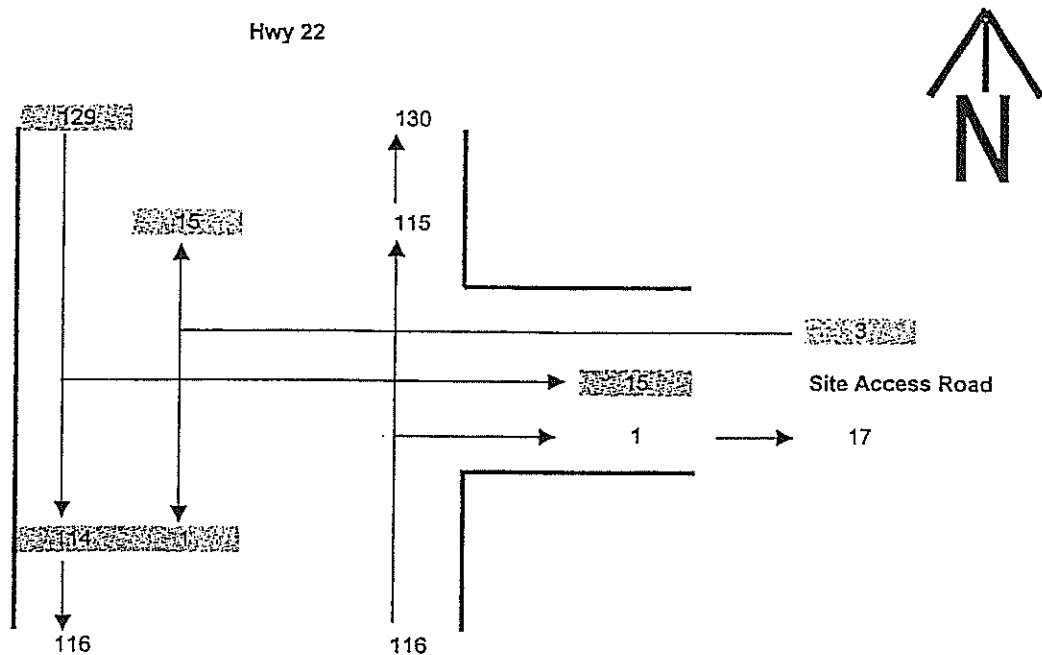
Fig 3: Traffic (2005)
Immediately after Development
Highway 22 & Access Road
AM Peak



VI = 2
 Va = 180
 L = 1.2%
 Vo = 170

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

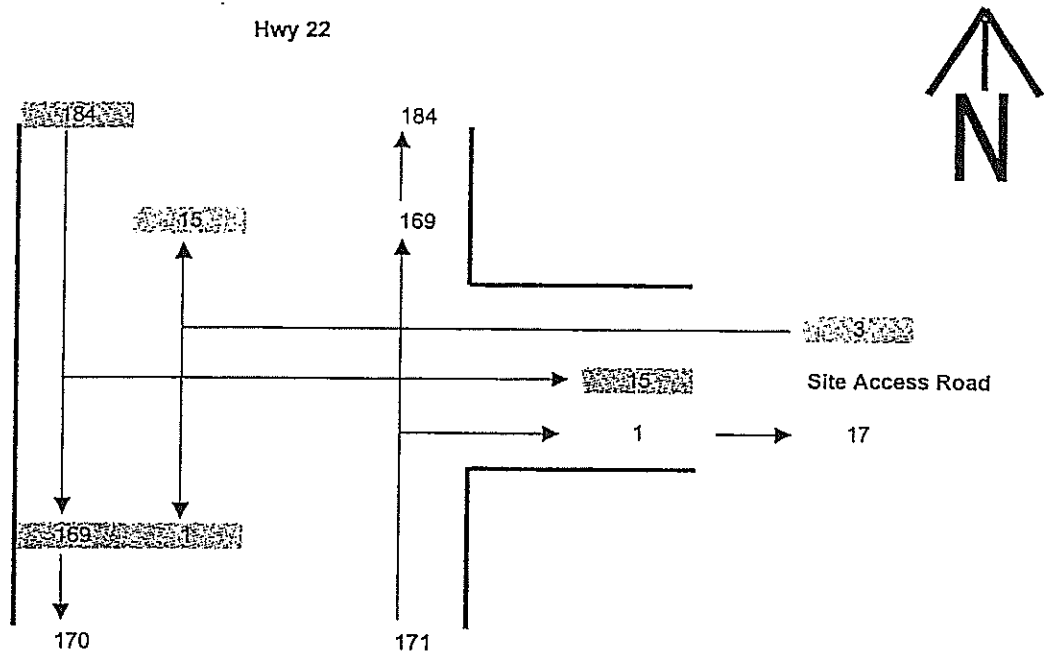
Fig 4: Projected Traffic 20-Year
 Design Horizon(2025)
 Highway 22 & Access Road
 AM Peak



VI = 15
 Va = 129
 L = 11.6%
 Vo = 116

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

Fig 5: Traffic (2005)
Immediately after Development
Highway 22 & Access Road
PM Peak



VI = 15
 Va = 184
 L = 8.2%
 Vo = 171

VI = Number of Left Turning Vehicles per Hour in the Advancing Volume
 Va = Advancing Volume
 L = Proportion of Left Turns in Advancing Volume
 Vo = Opposing Volume

Fig 6: Projected Traffic 20-Year
 Design Horizon(2025)
 Highway 22 & Access Road
 PM Peak

F..e: 4204219-PM 2005

Date: 03/24/2005

Intersection Design System (IDS) ver 1.01
Final Report

This design/evaluation was prepared by: HC
Reason for the analysis: Development permit request.

Design Characteristics Considered: Functional aspects only.

Intersection Name: Hwy 22 & Access Rd
Intersection Plan Number: 4204219
Location on Main Road (km): 0
Legal Land Description: NW 30-45-6 W5M

The year of the traffic data for the main road is not the same as the year of the traffic data for the intersecting road.

MAIN ROAD:

- Name: Highway 22
- Design Classification: RAU-210.0-110
- AADT: 1911 ASDT: 0 AWDT: 0
- Traffic Volume Information from: 2005
- Volume Used in Design: 1911 v.p.d. (AADT)
- Design Period: 20 year(s)
- Annual Growth Rate: 0 % (actual)
- Future Design Volume: 1911 v.p.d. (AADT)
- 'K' Factor: 12.9 % (actual)
- Future Design Hourly Volume: 247 v.p.h.
- Design Speed: 110 km/h
- Posted Speed: 100 km/h

INTERSECTING ROAD:

- Name: Access Road
- Design Classification: RLU-207G-50
- AADT: 156 ASDT: 0 AWDT: 0
- Traffic Volume Information from: 2005
- Volume Used in Design: 156 v.p.d. (AADT)
- Design Period: 20 year(s)
- Annual Growth Rate: 0 % (actual)
- Future Design Volume: 156 v.p.d. (AADT)
- 'K' Factor: 12.8 % (actual)
- Future Design Hourly Volume: 20 v.p.h.

TWINNING REQUIREMENT met before design period finished? n/a

If yes, and details required:

- Functional Classification:
- Percent Passing Zones: % ()
- Twinning Required at: v.p.d.
- Year Twinning Volume Met:

INTERSECTION TYPE: three-legged
Main Roadway Orientation: north-south
Intersecting Roadway Orientation: east

TURNING MOVEMENT INFORMATION:

2025 AADT traffic volume on the main road:

	Daily Vol. (v.p.d.)	Design Vol. (v.p.d.)	Design Hour Vol. (v.p.h.)
From the north to the south	1016	1016	131
From the north to the east	71	71	9
From the south to the north	962	962	124
From the south to the east	8	8	1

2005 AADT traffic volume on the intersecting road:

	Daily Vol. (v.p.d.)	Design Vol. (v.p.d.)	Design Hour Vol. (v.p.h.)
From the east to the north	71	71	9
From the east to the south	8	8	1

Percent of left-turning vehicles in the advancing stream:

- from the north: 6.5 %

North/South Split: 53 / 47
South/North Split: 47 / 53

For traffic from the North:

Advancing Volume: 140 v.p.h.
Opposing Volume: 125 v.p.h.

For traffic from the South:

Advancing Volume: 125 v.p.h.
Opposing Volume: 140 v.p.h.

LEFT-TURN STORAGE LANE REQUIREMENTS:

Because the advancing volume from the north (140) is less than the "70% line" (214) a type 2 treatment is required on the north side of the intersection.

A left-hand storage lane is not required on the south side of the intersection because there is no intersecting roadway on the west leg of the intersection.

RIGHT-TURN LANE REQUIREMENTS:

A right turn lane, for vehicles heading from north to west, is not required.

A right turn lane, for vehicles heading from south to east, is not required.

INTERSECTION LAYOUT:

Based on the above information:

This intersection requires a Type 2a intersection treatment as indicated on Dwg. No. DEB-FIG C-24 (CB6-2.3C24B for design designation RAU-211.8-110 or CB6-2.3C24D for design designation RAU-209.0-110).

Because the intersecting road is to the east, the orientation of the intersection is 270 degrees from that of the drawing.

DIMENSIONS for the type of intersection treatment mentioned above:

The following dimensions are the requirements for the finished surface pavement widths at this intersection. Additional subgrade width must be provided to allow for the basecourse and pavement depth.

Design classification of the main roadway: RAU-210.0-110
 Lane width (m): 3.5
 Bypass lane width (m): 3.5
 Auxilliary lane width (m): 3.50
 Shoulder width for roadway (m): 1.5
 Shoulder width at intersection, w (m): 1.5

Design speed of the main roadway (km/h): 110
 Prior to the intersecting road
 - Right-turn taper length (m): 87.50
 - Right-turn taper ratio: 25:1
 Past the intersecting road
 - Recovery taper length (m): 87.50
 - Recovery taper ratio: 25:1

ADDITIONAL FUNCTIONAL CHARACTERISTICS:

Intersection considered to be collision prone? no
 Need for access within vicinity of intersection? no
 Access can be physically accomodated? n/a
 Any future development which could significantly impact the traffic volume at this intersection? no
 Any proposed improvements to other roadways which might impact the traffic movement at this intersection? no

IDS is not designed as, nor does it establish, a legal standard. IDS is not intended to be used as a substitute for sound, professional judgement.

Approved by:_____

Date:_____

0

File: 4204219-PM 2025

Date: 03/24/2005

Intersection Design System (IDS) ver 1.01
Final Report

This design/evaluation was prepared by: HC
Reason for the analysis: Development permit request.

Design Characteristics Considered: Functional aspects only.

Intersection Name: Hwy 22 & Access Rd
Intersection Plan Number: 4204219
Location on Main Road (km): 0
Legal Land Description: NW 30-45-6 W5M

MAIN ROAD:

- Name: Highway 22
- Design Classification: RAU-210.0-110
- AADT: 2821 ASDT: 0 AWDT: 0
- Traffic Volume Information from: 2025
- Volume Used in Design: 2821 v.p.d. (AADT)
- Design Period: 20 year(s)
- Annual Growth Rate: 0 % (actual)
- Future Design Volume: 2821 v.p.d. (AADT)
- 'K' Factor: 12.6 % (actual)
- Future Design Hourly Volume: 355 v.p.h.
- Design Speed: 110 km/h
- Posted Speed: 0 km/h

INTERSECTING ROAD:

- Name: Access Road
- Design Classification: RLU-207G-50
- AADT: 156 ASDT: 0 AWDT: 0
- Traffic Volume Information from: 2025
- Volume Used in Design: 156 v.p.d. (AADT)
- Design Period: 20 year(s)
- Annual Growth Rate: 0 % (actual)
- Future Design Volume: 156 v.p.d. (AADT)
- 'K' Factor: 12.8 % (actual)
- Future Design Hourly Volume: 20 v.p.h.

TWINNING REQUIREMENT met before design period finished? n/a

If yes, and details required:

- Functional Classification: % ()
- Percent Passing Zones: v.p.d.
- Twinning Required at: v.p.d.
- Year Twinning Volume Met:

INTERSECTION TYPE: three-legged
Main Roadway Orientation: north-south
Intersecting Roadway Orientation: east

TURNING MOVEMENT INFORMATION:

2025 AADT traffic volume on the main road:

I.D.S.- PM 2025 UPD.txt

	Daily Vol. (v.p.d.)	Design Vol. (v.p.d.)	Design Hour Vol. (v.p.h.)
From the north to the south	1471	1471	185
From the north to the east	71	71	9
From the south to the north	1417	1417	179
From the south to the east	8	8	1

2025 AADT traffic volume on the intersecting road:

	Daily Vol. (v.p.d.)	Design vol. (v.p.d.)	Design Hour Vol. (v.p.h.)
From the east to the north	71	71	9
From the east to the south	8	8	1

Percent of left-turning vehicles in the advancing stream:

- from the north: 4.6 %

North/South Split: 52 / 48
 South/North Split: 48 / 52

For traffic from the North:

Advancing Volume: 194 v.p.h.
 Opposing Volume: 180 v.p.h.

For traffic from the South:

Advancing Volume: 180 v.p.h.
 Opposing Volume: 194 v.p.h.

TURN STORAGE LANE REQUIREMENTS:

Because the advancing volume from the north (194) is less than the "70% line" (230) a type 2 treatment is required on the north side of the intersection.

A left-hand storage lane is not required on the south side of the intersection because there is no intersecting roadway on the west leg of the intersection.

RIGHT-TURN LANE REQUIREMENTS:

A right turn lane, for vehicles heading from north to west, is not required.

A right turn lane, for vehicles heading from south to east, is not required.

INTERSECTION LAYOUT:

Based on the above information:

This intersection requires a Type 2a intersection treatment as indicated on Dwg. No. DEB-FIG C-24 (CB6-2.3C24B for design designation RAU-211.8-110 or CB6-2.3C24D for design designation RAU-209.0-110).

Because the intersecting road is to the east, the orientation of the intersection is 270 degrees from that of the drawing.

DIMENSIONS for the type of intersection treatment mentioned above:

The following dimensions are the requirements for the finished surface pavement widths at this intersection. Additional subgrade width must be provided to allow for the basecourse and pavement depth.

Design classification of the main roadway: RAU-210.0-110
Lane width (m): 3.5
Bypass lane width (m): 3.5
Auxilliary lane width (m): 3.50
Shoulder width for roadway (m): 1.5
Shoulder width at intersection, W (m): 1.5

Design speed of the main roadway (km/h): 110
Prior to the intersecting road
- Right-turn taper length (m): 87.50
- Right-turn taper ratio: 25:1
Past the intersecting road
- Recovery taper length (m): 87.50
- Recovery taper ratio: 25:1

ADDITIONAL FUNCTIONAL CHARACTERISTICS:

Intersection considered to be collision prone? no
Need for access within vicinity of intersection? no
Access can be physically accomodated? n/a
Any future development which could significantly impact
the traffic volume at this intersection? no
Any proposed improvements to other roadways which might
impact the traffic movement at this intersection? no

IDS is not designed as, nor does it establish, a legal standard. IDS
is not intended to be used as a substitute for sound, professional
judgement.

Approved by:_____

Date:_____

□