YELLOWHEAD COUNTY

BYLAW NO. 15.06

BEING A BYLAW TO AMEND LAND USE BYLAW NO. 2.06

WHEREAS, the Municipal Government Act, Being Chapter M-26, R.S.A., 2000, authorizes a Council to amend a land use bylaw;

AND WHEREAS a public hearing was held in respect to the proposed amendment pursuant to the Municipal Government Act, Being Chapter M-26, R.S.A., 2000;

NOW THEREFORE, the Council for Yellowhead County, in the Province of Alberta, duly assembled, hereby enacts as follows:

1) That the land use designation for a portion of the Southwest Quarter, Section Eleven (11), Township Fifty-One(51), Range Twenty-Six (26), West of the Fifth (5th) Meridian, Plan 032-5285, Block 1, Lot 1 be changed from RD – Rural District to CR – Country Residential in the Yellowhead County Land Use Bylaw No. 2.06 as per Schedule "A" attached.

2) This bylaw comes into force at the beginning of the day that it is passed in accordance with Section 189 of the Municipal Government Act, Being Chapter M-26, R.S.A., 2000.

READ a first time this 9 day of MAY, A.D., 2006.

PUBLIC HEARING held this 13 day of JUNE, A.D., 2006.

READ a second time this 13 day of JUNE, A.D., 2006.

READ a third time this 13 day of JUNE, A.D., 2006.

SIGNED this 13 day of JUNE, A.D., 2006.

Reeve

Chief Administrative Officer

Juniper Ridge

(SW 11-51-26-W5M)

- Proposed Land Use Bylaw Amendment
- Proposed Subdivision
- Conceptual Scheme/Supporting Documentation
- Review of Site Suitability (EXH Engineering Ltd.)
- Groundwater Potential & Aquifer Test Study (Waterline Resources Inc.)

Prepared for:

Rahel Baumann, Mark Deagle, Connie Bresnahan, Bill Bresnahan

Prepared/Compiled by:

G.T. Hofmann & Associates

Submitted to:

Yellowhead County

(March 2006)

TABLE OF CONTENTS

1) INTRODUCTION

The following is submitted in support of two applications. The first is an application to amend the Yellowhead County Land Use Bylaw No. 7.98 to redistrict approx. 9.0 ha. of the SW ¼ of Section 11-51-26-W5M from the RD - Rural District to the CR - Country Residential District. The remainder of the quarter section, approx. 56.2 ha., is to remain with in the RD - District. The second is a corresponding subdivision application to create a 7-unit residential bareland condominium to be known as "Juniper Ridge". Immediately below is Figure 1 which provides a location map. Figure 2 is on Page 2 which indicates the proposed Land Use Bylaw amendment being sought. Page 3 contains the proposed subdivision illustrated in Figure 3. Page 4 shows an enlargement of the subdivision area. Figure 4, which follows on Page 5, shows that as part of this subdivision, the remainder of the SW of 11-51-26-W5M is to be consolidated with SE 11-51-26-W5M immediately to the east so that it would have built public road access via the existing, approved approach onto Highway 40, not just the legal access by way of the west bounding road allowance.

FIGURE 1 - LOCATION MAP

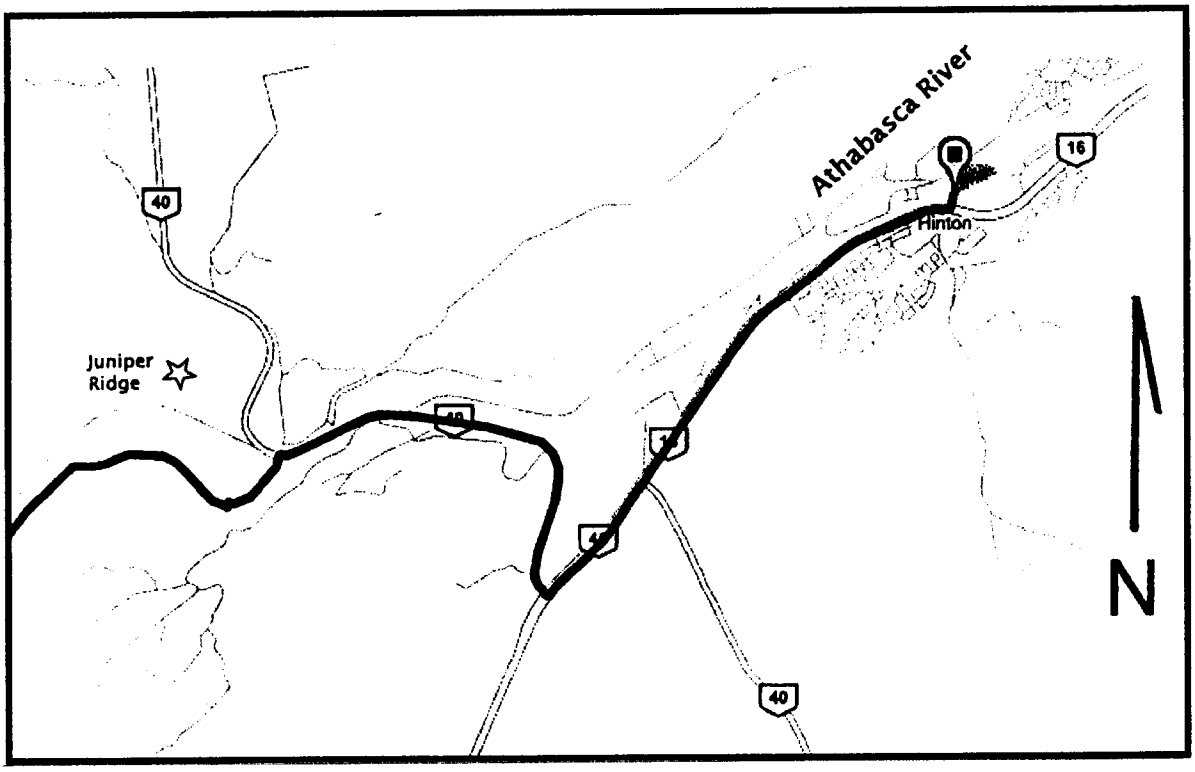


FIGURE 2 - PROPOSED LAND USE BYLAW AMENDMENT

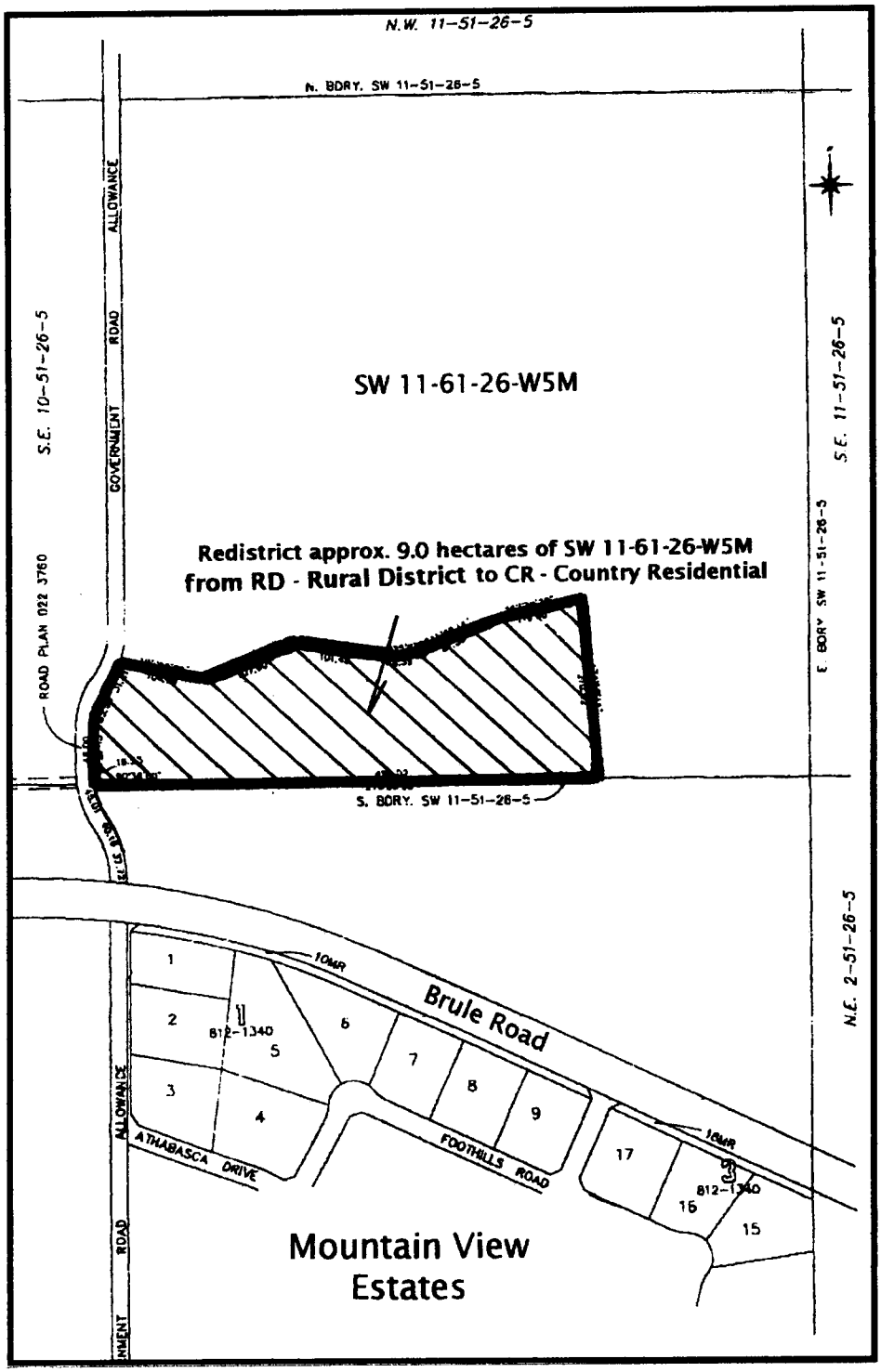
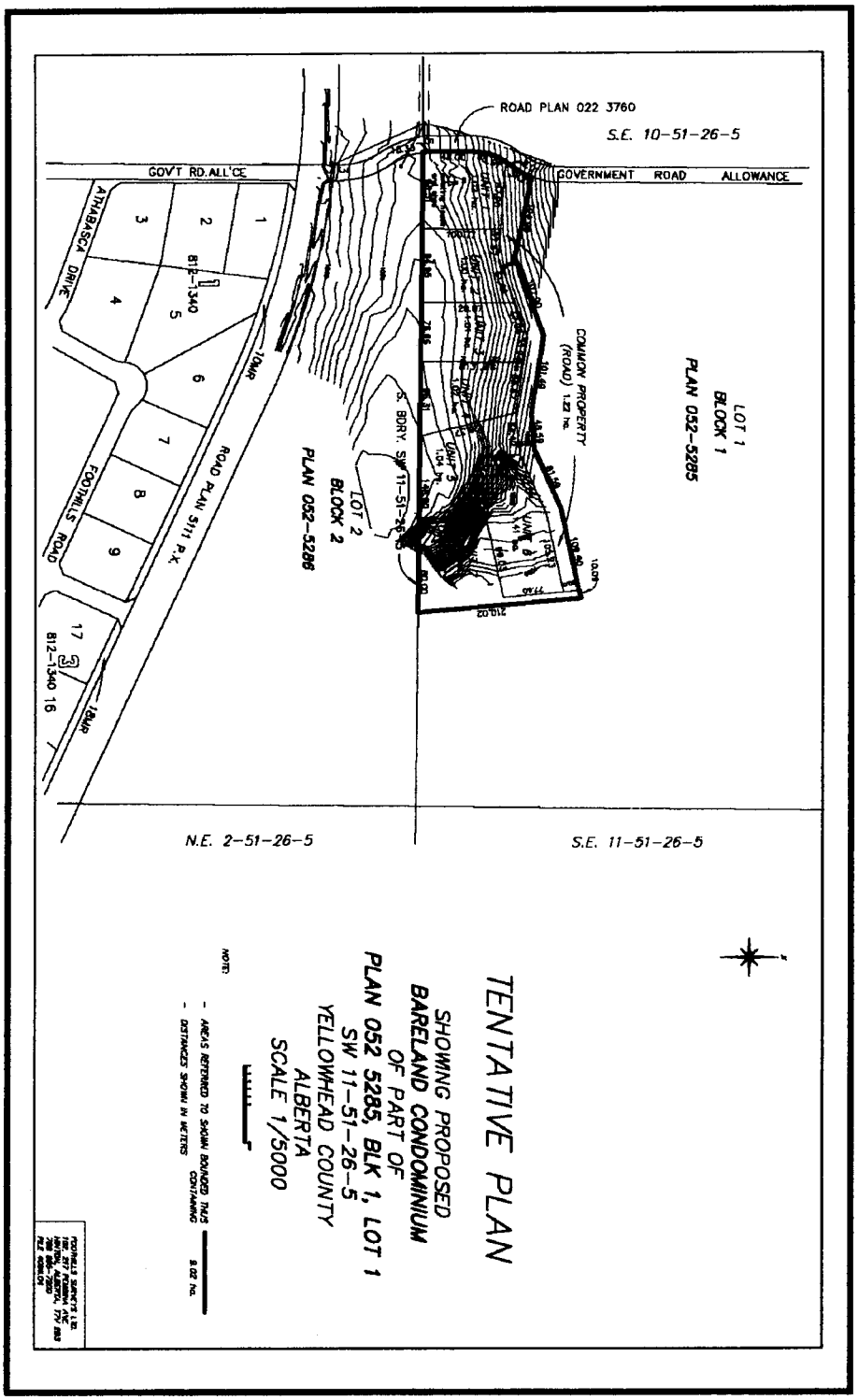


FIGURE 3 - PROPOSED SUBDIVISION



ENLARGEMENT OF SUBDIVISION AREA

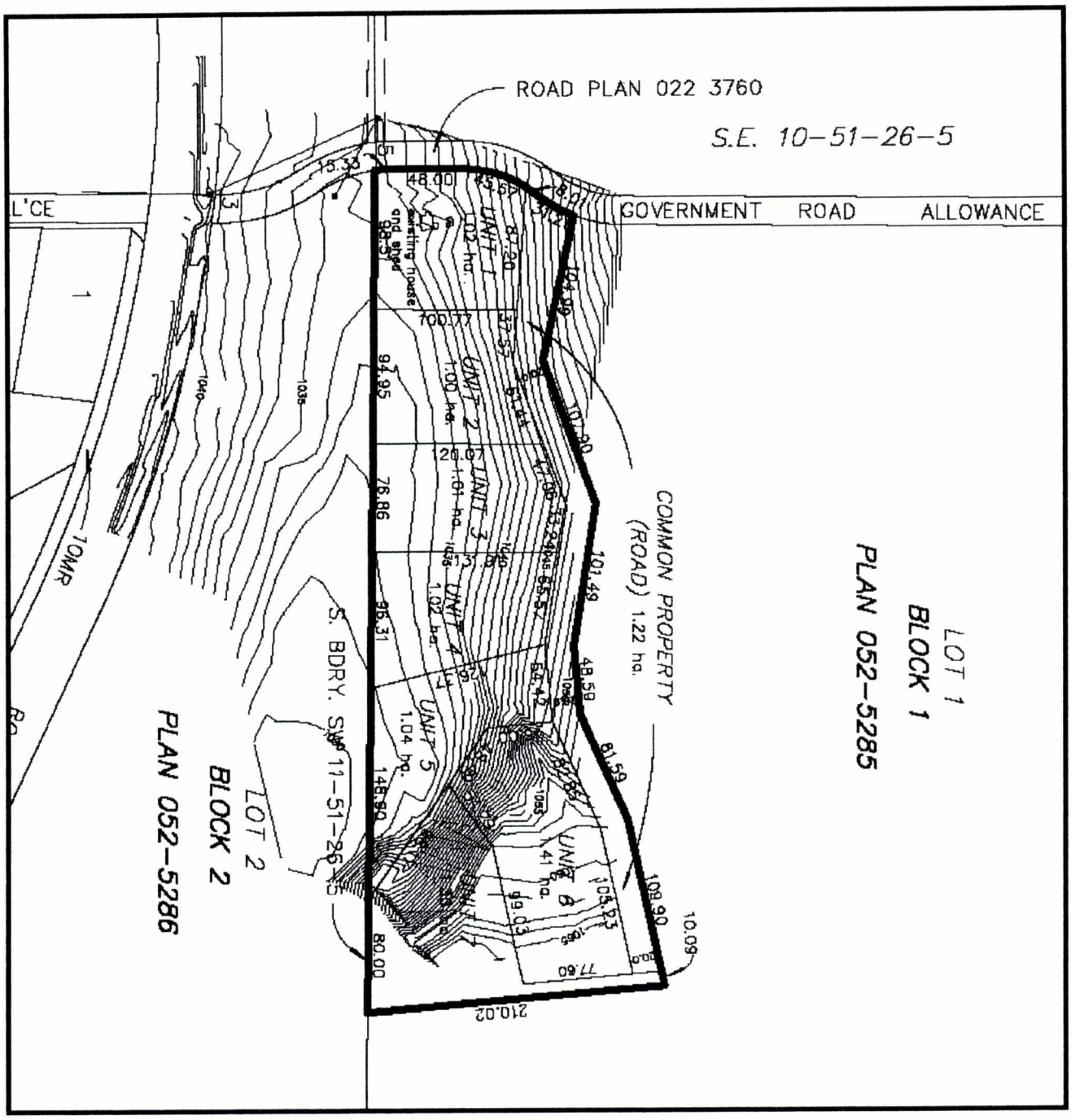
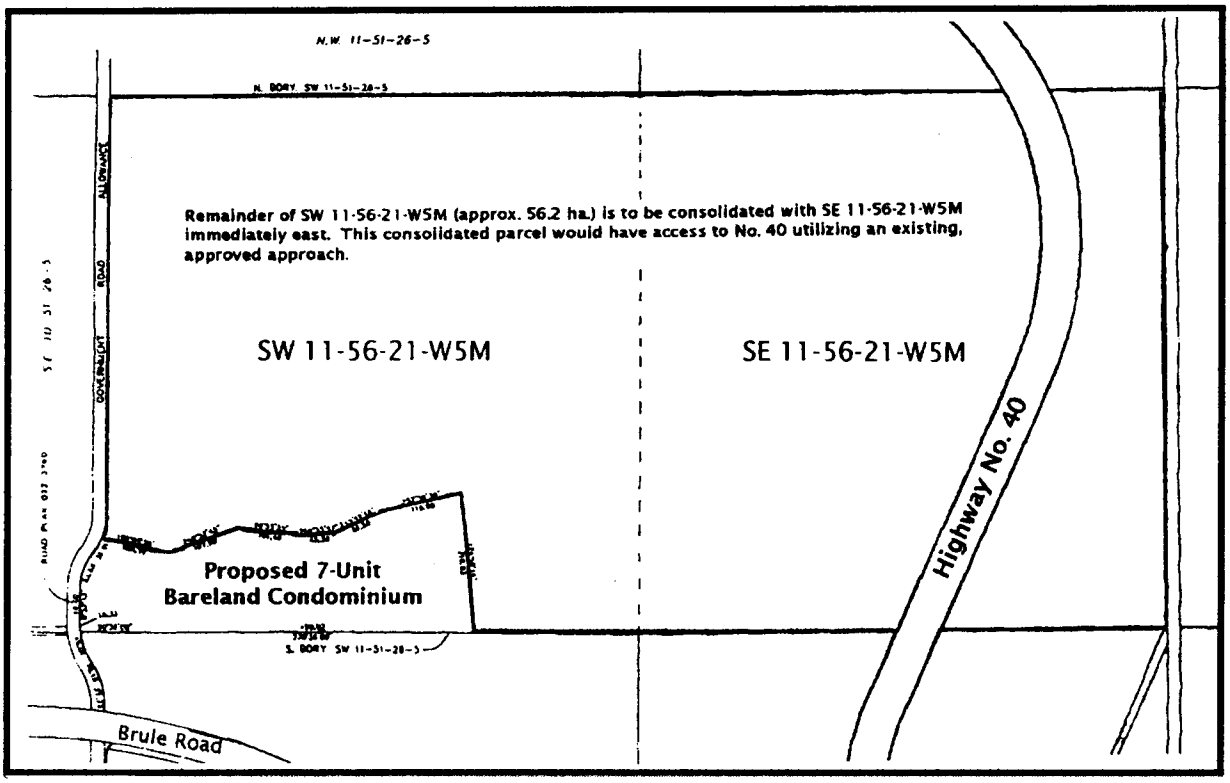


FIGURE 4 - CONSOLIDATION OF REMNANT OF SW 11 WITH SE 11



2) SETTING AND ADJACENT LAND USES

The subject quarter section is located just a few minutes west of the Town of Hinton via Highway No. 16, then briefly north along Highway No. 40 across the Athabasca River and then briefly west along the road to the Hamlet of Brule. Mountain View Estates, a multi-parcel country residential subdivision created in the early 1980's, is located immediately south, across Brule Road. The subdivision will be accessed where the road allowance running along the west boundary of the section intersects with Brule Road.

The proposed subdivision area itself consists of four relatively distinct areas in terms of slope. As you move northward and reach the southern boundary of the subdivision area, the terrain is comparatively flat. In fact, the southern portion of the first five bareland units is gently sloped. This is the area within which the only existing dwelling is located (Proposed Unit 1).

The slope increases to a modest level as you move northward (upslope). This area of modest slope is quite uniform as you move from west to east until an area of steeply sloped land is encountered approximately 400 metres east of the west boundary. This small area of steeply sloped land, mainly within Proposed Unit 7, is easily seen in Figure 3 (ie: where the contour lines are very close together). The land atop the slope on the west side is again flat. The vista available in this location (Proposed Units 6 and 7) is both panoramic and breathtaking with the splendor of the Roche Miette entrance to Jasper National Park framing the view.

A power line runs along the southern boundary of the subdivision area. Southward from this boundary (within the adjacent quarter - NW of 2-51-26-W5M) lies a flat and, it appears, poorly drained area.

3) LAND USE POLICY/BYLAW CONTEXT

The proposed subdivision area is currently within the RD – Rural District of the Land Use Bylaw. Though the subject quarter section is currently unsubdivided, the RD – District does not allow for this density of residential subdivision. Thus, the creation of this proposed 7-unit residential bareland condominium requires redistricting the subdivision area to the CR - District. In terms of compatibility with adjacent lands, again, it is important to note that Mountain View Estates is located immediately across Brule Road to the south. It is also worth noting that very little privately held land exists in the Hinton area and, by in large, where it does exist, it has been subdivided to create country residential parcels.

Support for redistricting the subdivision area to the CR – District is found in the Urban Fringe policies, under Section 10.7, of the County's Municipal Development Plan (MDP). The subject land falls within Policy Area 5, aptly named the "Mountain View" area. Policy Area 5 stipulates that country residential and small scale resort development is considered suitable.

The CR – District requires a minimum parcel size of 1.0 hectare (~2.5 acres) and does not specify a maximum parcel size. Proposed Units 1 though 5 are at the prescribed 1.0 hectare minimum size while Proposed Units 6 and 7 are larger than the prescribed minimum at 1.35 ha. $\pm$ and 1.5 ha. $\pm$ respectively. Each of the proposed units has a developable area of at least 0.4 ha. in accordance with County policy and Alberta Environment's Guidelines. This component is discussed further under Section 5 below, particularly with respect to sewage treatment and availability of potable water.

Reference is made to percolation/near-surface water table testing conducting by EXH Engineering Ltd. and a Groundwater Potential and Aquifer Test Study conducted by Waterline Resources Inc. Section 4, immediately following, addresses the steeply sloped lands within Proposed Units 6 and 7, primarily Unit 7.

4) LAND USE, SUBDIVISION DESIGN, DEVELOPMENT STANDARDS AND DENSITY

The Land Use Bylaw amendment and proposed bareland condominium are intended to provide a supply of residential lots in an area strategically located just west of Hinton where privately held land is scarce. Though an easy commute to Hinton on high quality roads, the setting offers extraordinary natural beauty including both seclusion and magnificent vista. It is expected that the units being proposed here will become fully occupied very quickly.

As mentioned, the proposal will take advantage of an existing road allowance along the west boundary. As such, this proposal will not require any additional access point onto the Brule Road. The bareland condominium area will be accessed via public road which runs north-south. All units within the plan will be accessed via an internal road (common property) running east-west along the northern boundary of the plan.

While the road allowance itself cuts across gently and then modestly sloped land, moving from the Brule Road northward, the internal road follows/runs with the slope as it heads eastward. The internal (common property) road is located at the northern boundary of the subdivision in order to achieve elevation at the west end so as to avoid having to deal with the area of steeply sloped land toward the eastern end.

The internal road, which terminates at the northeast corner of the plan, will be built to the standards and satisfaction of Yellowhead County. Approximately 275 m of the road allowance will need to be built along with approximately 575 m of internal (common property) road. In pre-application discussions with County staff, 20.0 m wide ROW and 6.0 m wide road top has been agreed to partly because of the terrain but primarily due to the small number of units being served. It has also been discussed and agreed that the remainder of the SW of 11 needs to be consolidated with the SE of 11 so that it has built public road access via the existing, approved approach onto Highway 40, not just the legal access by way of the west bounding road allowance. The landowner is aware of the need to do this and is in agreement.

The subdivision has been designed to best deal with the terrain and existing features, to provide as much spacing as possible between building sites as well as provide the two premium lots atop the ridge. The slopes within the subdivision area have been dealt with by having the internal road above the building sites in Proposed Units 1 through 5 and traversing the slope at as gentle an angle as possible. The steeply sloped portion of the subdivision area at the eastern end had to be dealt with as well. As Figure 3 indicates, the toe of the steeply sloped area, in Proposed Units 6 and 7 (primarily 7), coincides with the lower boundary. In these two cases, compared to the other five, the internal road reaches the building site located atop the slope where the panoramic vista can be best enjoyed. Sufficient land within Proposed Units 6 and 7 is available within the eastern portions to site dwellings safely back from the top of the slope.

Though, for the most part, the slopes within the subdivision do not preclude development, clearly, development needs to be kept away from the steeply sloped area in Proposed Units 6 and 7. Several options have been considered to address this natural feature/potential hazard.

The first option, a Conservation Easement (CE), was dismissed as a CE is not normally used simply to protect development from steep slopes: more suitable means are available. The second option was to establish Environmental Reserve, either in the form of a lot (ER) or an easement (ERE). Having an ER lot inside a bareland condominium is not practical, which leaves the ERE option. The difficulty with utilizing an ERE to deal with this situation is that the Municipal Government Act (MGA) requires that land taken as ER or ERE must remain in its natural state. Given the factors of slope, aspect and wind in this particular location, it may be that this sloped area would possibly benefit over time from selective, careful fuel modification in keeping with FireSmart principles. Such activity may be odds with the premise of "natural state" embedded in the ERE provisions of the MGA.

For these reasons, a third option is proposed: a Restrictive Covenant (RC), running with the land, that will stipulate "no-build due to steep slopes". This would be registered against the titles created for Proposed Units 6 and 7 and apply to lands where slope exceeds 45% (primarily within Unit 7) making it very clear to any purchaser, builder or homeowner (and serve as a reminder to the County as Development Authority) that while these areas can be enjoyed, building/development within the portions of the lots covered by the RC is prohibited.

Up to 10% of the subdivision area is owing for municipal reserve (MR). Cash-in-lieu of reserve land is proposed to be paid to the County as a condition of approval.

Circulation of these applications and supporting material to the AEUB will reveal if any sour gas or high pressure sweet gas facilities are present within adjacent lands that will have to be accounted for in the design and/or approval of the subdivision.

The current proposal will result in a low population density of approximately 2.5 persons per gross hectare (approx. 23 people within the subdivision area - 9.0 ha. - using an average household size of 3.25 persons). Even with a household size of four persons, the subdivision would still result in a low 3.0 persons per gross hectare.

5) SERVICES

The results of the percolation and near-surface water table testing conducted by EXH Engineering Ltd. are presented in Appendix 1. As their Report indicates, percolation rates were highly variable throughout the site and generally poor, which in this case, meant too rapid - close to or below 5 minutes per inch. Near-surface water table conditions, however, were found to be favourable within the study area.

What this means is that non-standard, alternative methods of sewage disposal will be required. Given the soils in question and their associated percolation qualities, an NSF (National Sanitation Foundation) approved Package Sewage Treatment Plant with shallow bury or an at-grade disposal field or a sand mound utilizing between 60 and 100 cm of organically imported soil as a base will be needed. As it has done in other similar situations within the Hinton area, it is proposed here that the County use Section 651 to impose that a Restrictive Covenant be registered against the titles issued for all of the bareland condominium units, as a condition of subdivision approval, requiring that only these specified options for sewage treatment be used. The RC should further require that confirmation be provided to the County that the systems specified in the RC are, in fact, being utilized and that they comply with all Provincial standards/regulations.

As far as groundwater is concerned, the Groundwater Potential and Aquifer Test Study prepared by Waterline Resources Inc. (see summary of Report in Appendix 2) concludes that underlying aquifers will provide the potable groundwater diversion required for the subdivision in accordance with the Water Act.

Should the owner/developer be responsible for developing a storm water management plan as part of the development agreement, it should be noted that the design of the

subdivision, the low density proposed and the comparatively porous soils within the subdivision area will provide for maximum on-parcel stormwater absorption/drainage. Moreover, the terrain will direct whatever overland storm water run off there would be, which is expected to very minimal, toward the existing low and wet area down slope, where is drains currently. The internal road can/will be designed to both account for naturally occurring (intermittent) storm courses (e.g. at least one culvert will be required) and to control flow.

It is understood that the owner/developer will be responsible for all utilities including electric power, natural gas, telephone, etc. As noted earlier, a power line already exists along the southern boundary.

6) MUNICIPAL/SCHOOL AUTHORITY IMPACT

Yellowhead County will be in the position of being able to acquire a tax base (as compared to the existing, limited use) at comparatively little cost. Because of on-site servicing, the County would not be responsible for the maintenance of any municipal services. There will be no County owned land or on-going responsibility for lands within this proposed subdivision since there is no municipal reserve land proposed , the subdivision is a bareland condominium, any development on Proposed Units 6 and 7 is protected from steep slopes (exceeding 45%) by way of a "no-build" RC and an RC will be in place intended to ensure proper on-site sewage disposal occurs on all 7 units.

Of course the County will become responsible for maintenance of the 275 m or so of public road to be constructed along the west boundary, providing emergency services to the residents, and so forth. However, the low density of the subdivision itself should present little appreciable impact. In addition, the County already incurs the costs of maintaining the existing roads in the area and providing service to Mountain View Estates and the Hamlet of Brule. This subdivision will provide 7 additional properties contributing to the tax base for maintenance and service provision.

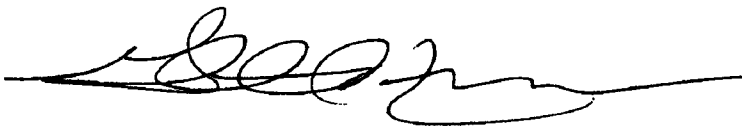
In terms of impact on schools, the subdivision will result in an estimated maximum of 14 school-aged children (assuming a maximum hhld. size of four - ie: 28 people in total - with two school-aged children in each hhld.). In reality, the number of school-aged children may be less. Regardless, the effect on the two school systems is arguably negligible. In fact, the school bus service already provided to the existing residents in the area could be made more economic by increasing the number of children in the area.

7) CONCLUSION

The foregoing, in our opinion, provides sufficient information with which to evaluate and decide upon the LUB amendment and proposed subdivision. It also our position that it fully satisfies the need to undertake conceptual, advance planning in support of redistricting and subdivision applications.

In conclusion, we ask that the Council of Yellowhead County find this Conceptual Scheme and supporting documentation acceptable and proceed with the approvals we seek.

Respectfully submitted,



Greg Hofmann, M.A., ACP MCIP

APPENDIX 1) Review of Site Suitability for Establishment of Effluent Disposal Fields Prepared by EXH Engineering Ltd. {Note: Full Report Included}

EXH Engineering Services Ltd.

EDSON OFFICE:
4730 - 3rd Avenue
Edson, Alberta T7E 1C2
Telephone: (780) 712-5000
Fax: (780) 712-4339
E-mail: edson@exheng.com

1204547
September 8, 2005

Juniper Ridge Development
Box 6345
Hinton, AB
T7V 1X7

Attention: Ms. Rahel Baumann

Re: Review of Site Suitability for Establishment of Effluent Disposal Fields
Juniper Ridge Development: SW 11-51-26-W5M

EXH Engineering Services Ltd was retained by Ms. R. Baumann to assess the subject property with respect to its suitability for establishment of septic fields for wastewater disposal for residential dwellings. The subject site was identified as SW 11-51-26-W5M. The location and configuration of the proposed development are shown on the site sketches provided by the Developer, contained in Appendix A.

In general, this review involved the following procedures:

- Test locations were established by the Developer.
- Soil conditions were examined at each test location.
- Percolation tests were conducted.
- Observation holes were established at the percolation test locations in order to estimate the separation to the water table.

All tests and site measurements were conducted by the Developer. Our review is based upon the accuracy of these results.

This review has been carried out based upon the *Alberta Private Sewage Systems Standard of Practice*, January, 1999. The review did not extend to an assessment of the environmental suitability of the site.

Percolation Tests

A cursory soil texture classification was carried out to identify the nature of the material at the test sites. In general, the soil, being largely a sand or sand/gravel mix, when compared to the soil texture classification of the Standard of Practice, suggests that the suitability for establishment of a disposal field cannot be confirmed without further testing (see Soil Texture Classification Triangle, Appendix B).

On September 10, 2003, four percolation tests were conducted on site by the Developer. Four additional tests were conducted on September 19, 2003, with a further four on September 25, 2003. At the request of EXH, some of the holes were re-tested on April 28 and 29, 2005.

The approximate locations of the tests are a shown on the project sketches. The detailed results of the tests are attached as Appendix B. A summary of the results are provided in Table 1 below. Numbers have been rounded.

Table 1 – Percolation Test Results

Test Hole	Soil Type	Date of Test	Percolation Rate Min/inch
1	sand	Sept 10, 2003	2.5*
2	sand	Sept 10, 2003	4.4*
3	sand/gravel	Sept 10, 2003	10.0†
		April 28, 2005	3.2*
4	sand/gravel	Sept 10, 2003	12.5†
		April 28, 2005	7.6#
5		Sept 19, 2003	4.0*
6	gravel	Sept 19, 2003	17.9†
7	gravel	Sept 19, 2003	9.6†
8	gravel	Sept 19, 2003	7.8†
9	clay/sand	Sept 25, 2003	5.0#
10	gravel	Sept 25, 2003	50.0†
10a	sandy clay/rock	April 29, 2005	38.1
11	sand	Sept 25, 2003	5.0#
12	sand	Sept 25, 2003	3.0*
12a	clay/coarse rock	April 29, 2005	15.2

Review of percolation rates is based upon the *Alberta Private Sewage Systems Standard of Practice*, January, 1999, assuming a disposal field supplied with effluent from a septic tank, for residential effluent, with no other pre-treatment. The standard of practice requires a percolation rate no faster than 5 minutes per inch and no slower than 60 minutes per inch.

With respect to the test results, we have the following comments:

- Some tests do not appear to have stabilized. For a completed test, the results of the last three readings should not vary more than 10%.

- Assuming the data is valid, Tests 1, 2, 3, 5 and 12 (denoted in Table 1 with "*") fail due to percolation rates lower than the acceptable range (lower than 5 min/inch). This means that the soil is more permeable than allowable, consistent with the log readings of sand and gravel.
- Tests 4, 9 and 11 (denoted in Table 1 with "#") should be considered marginal.
- The soil classifications for holes 3, 4, 6, 7, 8 and 10 (denoted in Table 1 with "+") are inconsistent with the test results. Further investigation of the underlying soils is warranted.

Water Table

With respect to the water table, the Standards of Practice requires that there be a minimum separation of 1.5 m between the lowest point where the effluent will be discharged and the water table, and that this separating soil have an appropriate rate of percolation.

Water table observation holes were established at four locations on March 12, 2004, by Wilfs Landscaping. The holes were drilled to a depth of 3 m, with a 6 inch diameter perforated casing installed. Installation of the holes were observed by EXH. The approximate hole locations are shown on the site drawing. The detailed results of the observations are attached as Appendix B. A summary of the results are provided in Table 2 below. Numbers have been rounded.

Table 2 – Water Observation Hole Results

Hole Number	Soil Log	Date of Initial Measurement	Water Depth Below Surface
1	0 – 0.3m: topsoil 0.3 - 0.5m: transition soil 0.5 – 3.0m: sandy silt	March 12/04	n/a
2	0 – 0.2m: topsoil 0.2 - 0.7m: transition soil 0.7 – 2.3m: silt 2.3 – 3.0m: sand/silt/gravel	March 12/04	n/a
3	0 – 0.3m: topsoil 0.3 - 0.6m: transition soil 0.6 – 2.1m: silty clay 2.1 – 3.0m: silt/coarse rock	March 12/04	3.0 m
4	0 – 0.2m: topsoil 0.2 - 0.6m: transition soil 0.6 – 1.2m: sandy silt 1.2 – 3.0m: heavy rock/silt	March 12/04	3.0 m

Hole 4 is described as being "wet"; this may indicate water. Follow-up measurements taken April 18, 2004 indicated all holes were dry. Periodic measurements through to May 16, 2005 indicate the holes remained dry, although some holes are described as being wet. This may be due to the introduction of surface water due to rainfall.

With respect to the observation results, EXH has the following comments:

- Water table observation holes are not clearly associated with percolation test results.
- Surface elevations are not provided for water table observation holes or for percolation test locations.
- No water table was directly encountered to a depth exceeding the required separation. Follow-up measurements should be taken; water table elevations fluctuate seasonally.

Additional Considerations

The *Alberta Private Sewage Systems Standard of Practice* identifies a number of considerations with respect to placement of a disposal field. With respect to off-set distance requirements, these include:

- 1.5 m from a property line,
- 90 m from a permanent body of water, such as a river, stream of creek,
- 15 m from a water source,
- 15 m from a water course,
- 9 m from a basement, cellar or crawl space,
- 1 m from a dwelling without a basement, cellar or crawl space.

Additional restrictions and details are contained in the standards. The scope of this review did not extend to confirming the suitability of lot lay-out or specific septic field locations.

Conclusions and Recommendations

Based upon the review of site information provided by the Developer, we have the following conclusions and recommendations:

- Soil conditions appear to be highly variable through-out the site, with a predominance of sands and gravels.
- Percolation test results are generally poor, suggesting the site is unlikely to consistently provide suitable locations for the establishment of sewage disposal fields.

- Additional tests must be carried out at a precise field location in order to confirm suitability and to obtain more accurate information for field sizing.
- The location of a disposal field could be limited by site features, such as proximity to water courses, existing dwellings, slopes and similar issues.
- The water table observations suggest the possibility that there will be sufficient separation between the bottom of the field and the water table. Water table depth must be confirmed at the specific field location prior to development of the field.
- If the site is considered sensitive, alternate methods of sewage treatment and disposal should be investigated.
- All work, and subsequent measurements, should conform to the requirements of the *Alberta Private Sewage Systems Standard of Practice.*

Closure

This review is based upon the measurements and observation noted herein. Additional measurements may result in variations. This review does not represent a design of the disposal system nor does it negate the requirement for specific additional on-site tests at the proposed field locations.

This review has been prepared for the sole use of the Owner. Use of this information, in whole or in part, by third parties, or use by any persons or organizations whatsoever for any purposes other than those specifically stated herein, is not permitted without the express written permission of EXH Engineering Services Ltd.

We hope you will find this review satisfactory.

Yours truly;

PROFESSIONAL ENGINEER ALBERTA B. R. NEWTON

PERMIT TO PRACTICE
EXH ENGINEERING SERVICES LTD.
Signature
Date
PERMIT NUMBER: P 5347
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

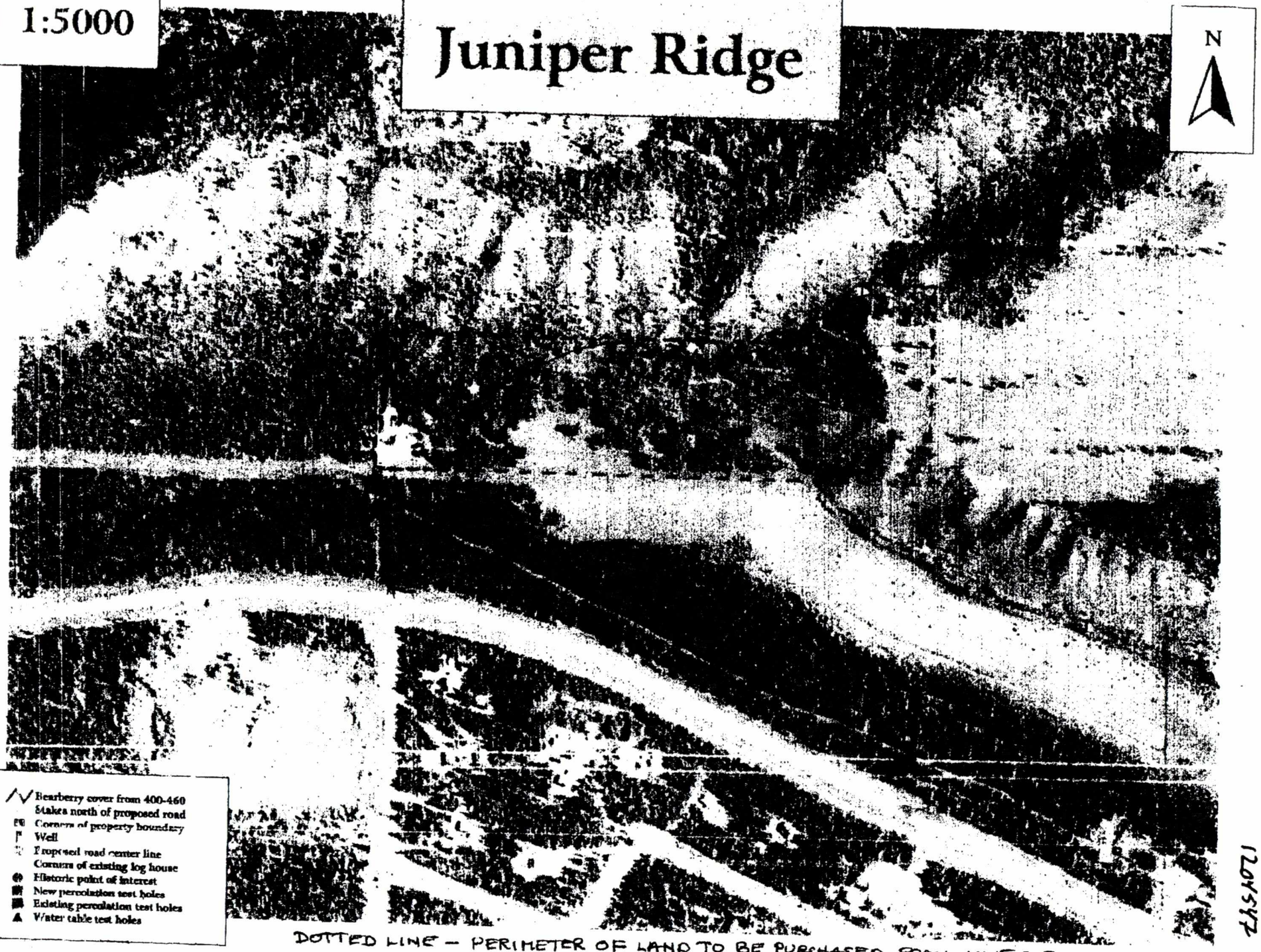
Blaine R. Newton, P. Eng.
EXH Engineering Services Ltd.

Appendix A

Site Sketches

1:5000

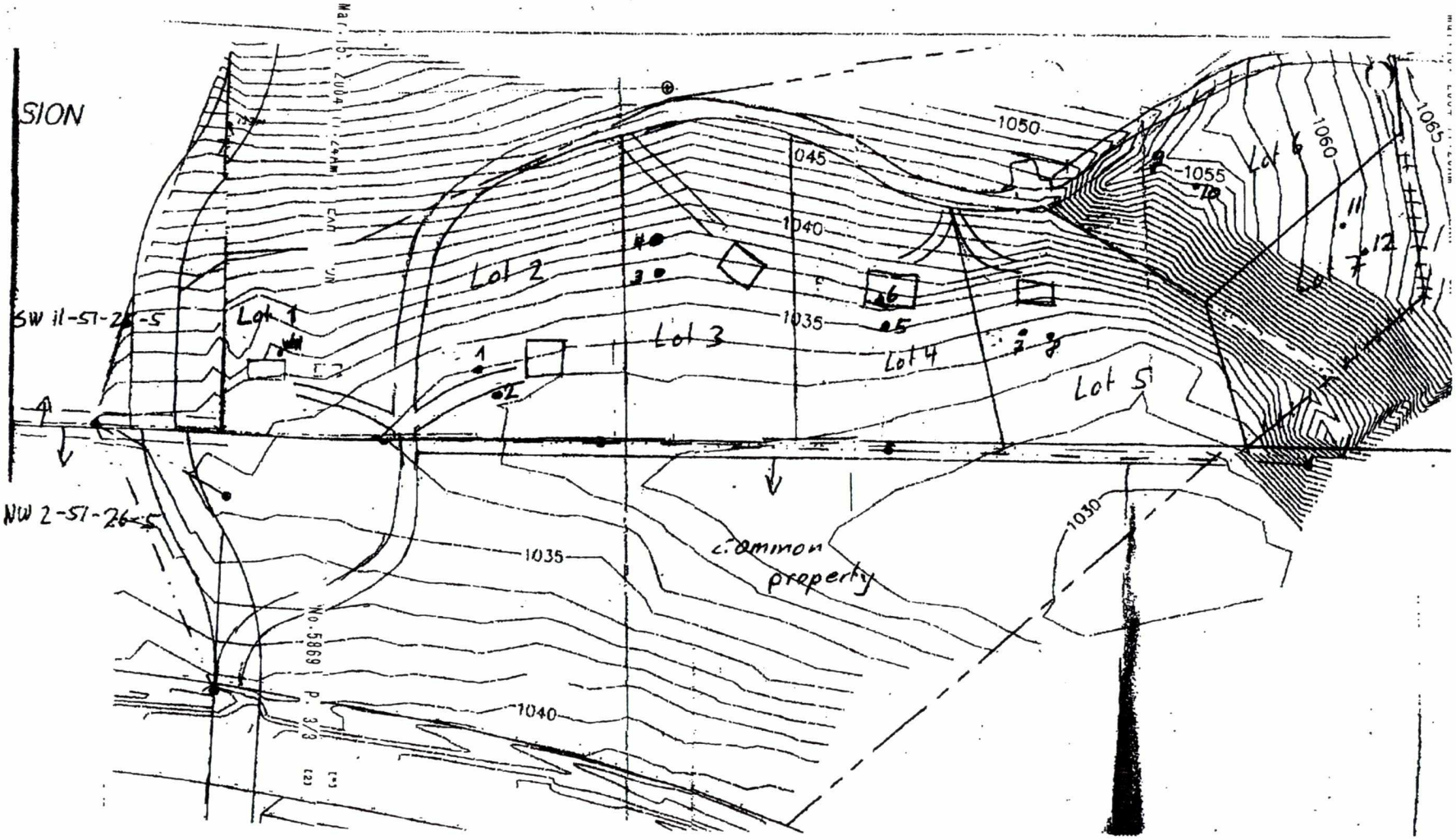
Juniper Ridge



- Bearberry cover from 400-460 Makes north of proposed road
- Corners of property boundary
- Well
- Proposed road center line
- Corners of existing log house
- Historic point of interest
- New percolation test holes
- Existing percolation test holes
- Water table test holes

DOTTED LINE – PERIMETER OF LAND TO BE PURCHASED FROM ANNE D RO[illegible]

12/15/97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SW 11-57-26-5
NW 2-57-26-5
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Lot 2
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1060
1065
1030
common property
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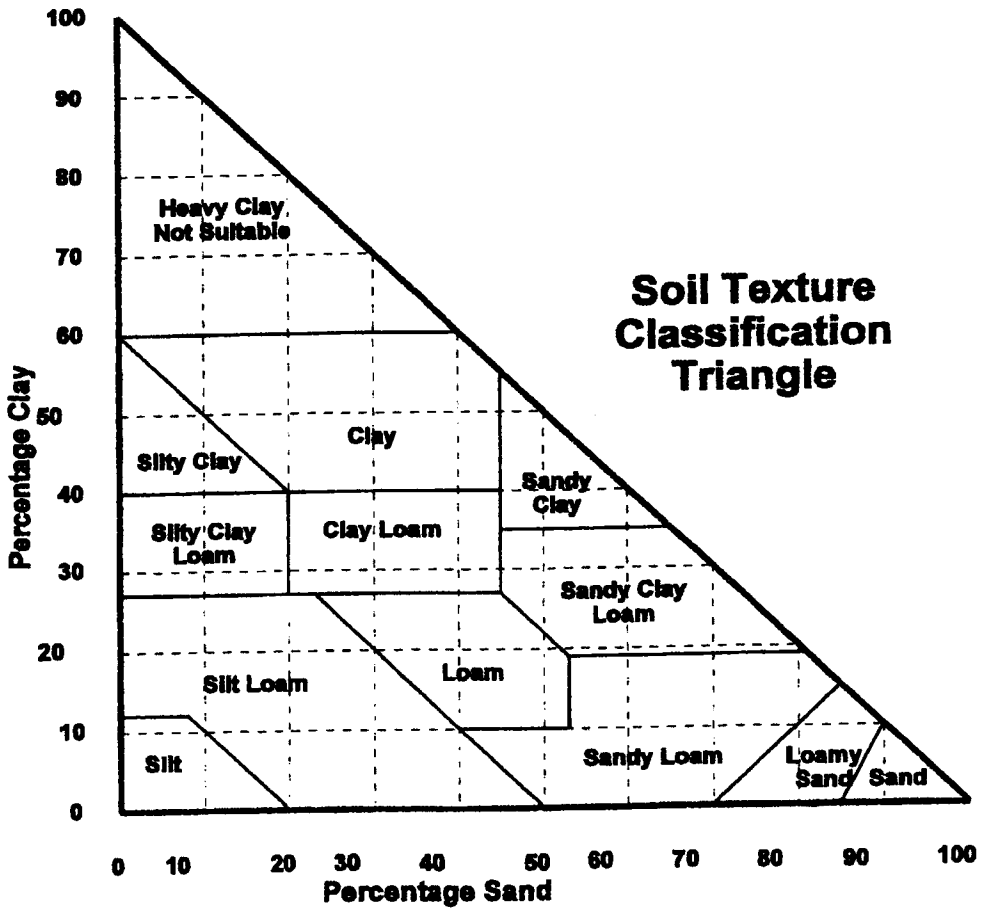
Appendix B

Percolation Test Results

Figure 7A.1.5.A. Soil Texture Classification Triangle



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

7A.1.5. When using the results of a *soil texture 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 7A.1.5.A. 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,	10.78 L per square metre (0.22 gal per sq. ft.),
(f)	Silt,	12.25 L per square metre (0.25 gal per sq. ft.),
(g)	Sandy Clay Loam,	13.72 L per square metre (0.28 gal per sq. ft.),
(h)	Silt Loam,	13.72 L per square metre (0.28 gal per sq. ft.),
(i)	Loam,	17.15 L per square metre (0.35 gal per sq. ft.),
(j)	Sandy Loam,	22.05 L per square metre (0.45 gal per sq. ft.),
(k)	Loamy Sand,	30.87 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.***

Rahel Baumann - **Percolation Test Results** - September 10, 2003

Test Hole	Log	Trial	Time (min.)	Drop (cm) start	Drop (cm) end	Drop (cm) diff.	Perc. Rate (min./cm) (8")	Perc. Rate (min./25mm) (8")
1	topsoil	1	20.0	55.0	76.0	21.0	1.0	2.4
	sand	2	15.0	55.0	69.5	14.5	1.0	2.6
		3	20.0	55.0	71.0	16.0	1.3	3.1
		4	27.0	55.0	76.0	21.0	1.3	3.2
		5	10.0	55.0	65.0	10.0	1.0	2.5
		Average Perc rate					**1.2**	**2.9**
2	topsoil	1	20.0	50.0	61.0	11.0	1.8	4.5
	sand	2	15.0	50.0	60.0	10.0	1.5	3.8
		3	20.0	50.0	62.5	12.5	1.6	4.0
		4	25.0	50.0	65.0	15.0	1.7	4.2
		5	10.0	50.0	55.0	5.0	2.0	5.0
		Average Perc rate					**1.8**	**4.4**
3	topsoil	1	20.0	40.0	49.0	9.0	2.2	5.6
	sand	2	15.0	40.0	44.0	4.0	3.8	9.4
	gravel	3	20.0	40.0	45.0	5.0	4.0	10.0
		4	10.0	40.0	42.5	2.5	4.0	10.0
		Average Perc rate					**4.0**	**10.0**
4	topsoil	1	20.0	40.0	44.0	4.0	5.0	12.5
	sand	2	15.0	40.0	42.5	2.5	6.0	15.0
	gravel	3	20.0	40.0	43.0	3.0	6.7	16.7
		4	10.0	40.0	42.0	2.0	5.0	12.5
		Average Perc rate					**5.9**	**14.7**

Rahel Baumann - **Percolation Test Results** - September 19, 2003

Test Hole	Log	Trial	Time (min.)	Drop (cm) start	Drop (cm) end	Drop (cm) diff.	Perc. Rate (min./cm) (8")	Perc. Rate (min./25mm) (8")
5	n/a	1	10.0	45.0	57.0	12.0	0.8	2.1
		2	15.0	45.0	59.0	14.0	1.1	2.7
		3	20.0	45.0	60.5	15.5	1.3	3.2
		4	20.0	45.0	59.5	14.5	1.4	3.4
		5	15.0	45.0	56.0	11.0	1.4	3.4
		6	25.0	45.0	60.5	15.5	1.6	4.0
		Average Perc rate					**1.5**	**3.6**
6	topsoil gravel	1	10.0	45.0	48.0	3.0	3.3	8.3
		2	15.0	45.0	48.0	3.0	5.0	12.5
		3	20.0	45.0	49.0	4.0	5.0	12.5
		4	25.0	45.0	49.0	4.0	6.3	15.6
		5	15.0	45.0	46.5	1.5	10.0	25.0
		6	25.0	45.0	48.5	3.5	7.1	17.9
		Average Perc rate					**6.7**	**16.7**
7	soil gravel	1	10.0	45.0	48.0	3.0	3.3	8.3
		2	15.0	45.0	50.0	5.0	3.0	7.5
		3	20.0	45.0	51.0	6.0	3.3	8.3
		4	20.0	45.0	50.0	5.0	4.0	10.0
		5	15.0	45.0	50.0	5.0	3.0	7.5
		6	25.0	45.0	51.5	6.5	3.8	9.6
		Average Perc rate					**3.9**	**9.8**
8	soil gravel	1	10.0	45.0	50.0	5.0	2.0	5.0
		2	15.0	45.0	51.0	6.0	2.5	6.3
		3	20.0	45.0	52.0	7.0	2.9	7.1
		4	20.0	45.0	52.0	7.0	2.9	7.1
		5	15.0	45.0	50.5	5.5	2.7	6.8
		6	25.0	45.0	53.0	8.0	3.1	7.8
		Average Perc rate					**3.0**	**7.5**

Rahel Baumann - **Percolation Test Results** - September 25, 2003

Test Hole	Log	Trial	Time (min.)	Drop (cm) start	Drop (cm) end	Drop (cm) diff.	Perc. Rate (min./cm) (8")	Perc. Rate (min./25mm) (8")
9	sand	1	20.0	45.0	59.0	14.0	1.4	3.6
	clay	2	20.0	45.0	59.0	14.0	1.4	3.6
		3	15.0	45.0	56.0	11.0	1.4	3.4
		4	26.0	45.0	59.0	14.0	1.9	4.6
		5	30.0	45.0	60.0	15.0	2.0	5.0
		6	20.0	45.0	56.0	11.0	1.8	4.5
		7	20.0	45.0	55.0	10.0	2.0	5.0
		Average Perc rate					**1.9**	**4.8**
10	soil	1	20.0	45.0	47.0	2.0	10.0	25.0
	gravel	2	20.0	45.0	46.0	1.0	20.0	50.0
		3	15.0	45.0	46.0	1.0	15.0	37.5
		4	25.0	45.0	46.0	1.0	25.0	62.5
		5	30.0	45.0	46.5	1.5	20.0	50.0
		6	20.0	45.0	46.0	1.0	20.0	50.0
		7	20.0	45.0	46.0	1.0	20.0	50.0
		Average Perc rate					**20.0**	**50.0**
11	sand	1	20.0	60.0	76.0	16.0	1.3	3.1
	soil	2	20.0	60.0	73.0	13.0	1.5	3.8
		3	16.0	60.0	70.0	10.0	1.6	4.0
		4	25.0	60.0	73.0	13.0	1.9	4.8
		5	30.0	60.0	74.5	14.5	2.1	5.2
		6	20.0	60.0	70.0	10.0	2.0	5.0
		7	20.0	60.0	70.0	10.0	2.0	5.0
		Average Perc rate					**2.0**	**5.0**
12	sand	1	20.0	60.0	80.0	20.0	1.0	2.5
		2	20.0	60.0	80.0	20.0	1.0	2.5
		3	14.0	60.0	74.0	14.0	1.0	2.5
		4	25.0	60.0	81.0	21.0	1.2	3.0
		5	30.0	60.0	83.0	23.0	1.3	3.3
		6	20.0	60.0	76.5	16.5	1.2	3.0
		7	20.0	60.0	76.5	16.5	1.2	3.0
		Average Perc rate					**1.2**	**3.0**

PERCULATION TESTS FOR THE PROPOSED SUBDIVISION
SW 11-51-26 W5M

We tested the holes 3 and 4 again and had them drilled out to the required depth.

The holes were soaked April 27/05 for 4 hours from 11.00 a.m. to 3.10 p.m.

The percolation test was performed April 28 starting at 11.15 a.m.

Test Hole 3 – first 25 cm sandy loam
10 cm rock and gravel
rest clay loam
- depth of hole 100 cm
- waterlevel 55 cm

Trial	Time increment In minutes	Increment of drop in cm	Percolation rate (min/cm of drop)
1	30 min.	31 cm	0.96
2	30 min.	28 cm	1.07
3	30 min.	25,5 cm	1.17
4	30 min.	25 cm	1.20
5	30 min.	24 cm	1.25
6	30 min.	24 cm	1.25
7	30 min.	23,5 cm	1.27

Test hole 4 - first 24 cm sandy loam
15 cm clay
rest clay loam
- depth of hole 95 cm
- waterlevel 50 cm

Trial	Time increment In minutes	Increment of drop in cm	Percolation rate (min/cm of drop)
1	30 min.	11 cm	2.72
2	30 min.	12 cm	2.50
3	30 min.	9.5 cm	3.15
4	30 min.	10 cm	3.00
5	30 min.	10 cn	3.00
6	30 min.	9.5 cm	3.15
7	30 min.	10 cm	3.00

Test holes10a and 12a were soaked April 28 for 4 hrs. from 12.30 a.m. to 4.30 p.m.

The percolation test was performed April 29 starting at 10.40 a.m.

Test hole 10a – first 20 cm loam
30 cm sandy clay
10 cm coarse rock
rest sandy clay
- depth of hole 100 cm
- waterlevel 55 cm

Trial	Time increment In minutes	Increment of drop in cm	Percolation rate (min/cm of drop)
1	30 min.	2.5 cm	12
2	30 min.	2.5 cm	12
3	30 min.	2.0 cm	15
4	30 min.	2.5 cm	12
5	30 min.	2.0 cm	15
6	30 min.	2.0 cm	15

Test hole 12a – first 40 cm sandy loam
25 cm lay with coarse rock
rest sandy clay
- depth of hole 100 cm
- waterlevel 55 cm

Trial	Time increment In minutes	Increment of drop in cm	Percolation rate (min/cm of drop)
1	30 min.	6.5 cm	4.61
2	30 min.	5.5 cm	5.45
3	30 min.	5.5 cm	5.45
4	30 min.	6.0 cm	5.00
5	30 min.	5.0 cm	6.00
6	30 min.	5.5 cm	5.45
7	30 min.	5.0 cm	6.00

Groundwork for percolation tests April 2005 for holes 3, 4, 10a, and 12a

Holes 3 and 4 soaked April 27/05 from 11.00 – 15.10

Hole 3 – depth 100 cm, waterlevel 55 cm

Time increment In minutes	Time	Waterlevels	Increments in cm / drop
30	11.17	55	
	11.47	24	31
30	11.51	55	
	12.21	27	28
30	12.23	55	
	12.53	29,5	25,5
30	12.55	55	
	1.25	30	25
30	1.29	55	
	1.59	31	24
30	2.00	55	
	2.30	31	24
30	2.32	55	
	3.02	31.5	23.5

Hole 4 – depth 95 cm, waterlevel 50 cm

Time increment In minutes	Time	Waterlevels	Increments in cm / drop
30	11.26	50	
	11.56	39	11
30	11.57	50	
	12.27	38	12
30	12.28	50	
	12.58	40.5	9.5
30	12.59	50	
	1.29	40	10
30	1.36	50	
	2.06	40	10
30	2.08	50	
	2.38	40.5	9.5
30	2.39	50	
	3.09	40	10

Holes 10a and 12a were soaked April 28/05 from 12.30 to 4.30

Percolation test performed April 29 starting at 10.40

Hole 10a – depth 100 cm, waterlevel 55 cm

Time increment In minutes	Time	Waterlevels	Increments in cm / drop
30 min	11.01	55	
	11.31	52,5	2.5
30 min	11.33	55	
	12.03	52.5	2.5
30 min	12.08	55	
	12.38	53	2.0
30 min	12.40	55	
	1.10	52.5	2.5
30 min	1.10	55	
	1.40	53	2.0
30 min	1.40	55	
	2.10	53	2.0

Hole 12a – depts. 100 cm – waterleve 55 cm

Time increment In minutes	Time	Waterlevels	Increments in cm / drop
30	10.41	55	
	11.11	48.5	6.5
30	11.13	55	
	11.43	49.5	5.5
30	11.44	55	
	12.14	49.5	5.5
30	12.17	55	
	12.47	49	6.0
30	12.48	55	
	1.18	50	5.0
30	1.18	55	
	1.48	49.5	5.5
30	1.49	55	
	2.19	50	5.00

R04547

Juniper Hill - Watertable Holes - Soil Report

Holes were dug out March 12/04 by Wilfs Landscaping
3 m deep, inserted perforated pipe 6" diam.

Hole 1

0 - 12"	topsoil
12" – 20"	subsoil
20" – bottom	sand and silt mixed

Hole 2

0 – 10"	topsoil
10" – 26"	subsoil
26" – 92"	silt
92" – bottom	sand, silt and gravel mixed

Hole 3

0 – 12"	topsoil
12" – 22"	subsoil
22" – 82"	silt and clay
82" – bottom	silt and coarse rock moisture at the bottom

Hole 4

0 – 10"	topsoil
10" – 24"	subsoil
24" – 48"	sand and silt
48" – bottom	heavy rock and silt

last 8 feet wet

March 26/04

1L04447

Rahel Baumann/Connie Bresnahan – JUNIPER RIDGE DEVELOPMENT
Box 6345, Hinton AB, T7V 1X7
TEL. 780-865 1100 / FAX 780-865 1100

Water table holes – check list

April 18/04	All dry	after a snowfall
May 03/04	All dry	
May 10/04	All dry	2-3" snowfall
May 13/04	All dry	
June 2/04	All dry	rained on the weekend
June 9/04	all dry	rain
June 18/04	all dry	
August 27/04	all dry	
Feb 22/05	all dry	
March 24/05	all dry	10 cm of snow on the ground
April 1/05	all dry	hole at the top of ridge the soil seems wet – but No water
April 20/05	all dry	
May 16/05	all dry	rained previous night and during the day

APPENDIX 2) Groundwater Potential and
Aquifer Test Study
Prepared by Waterline Resources Inc.
{Note: Summary of Full Report}

GROUNDWATER POTENTIAL AND AQUIFER TEST STUDY PROPOSED 7 LOT COUNTRY RESIDENTIAL SUBDIVISION SW-11-051-26-W5M NEAR HINTON, ALBERTA

Submitted To:

Rahel Baumann and Mark Deagle
and
Connie and Bill Bresnahan

Hinton, Alberta

Submitted By:

Waterline Resources Inc.

Calgary, Alberta

February 20, 2004

WL04-982

EXECUTIVE SUMMARY

Waterline Resources Inc. (Waterline) was retained by Rahel Baumann/Mark Deagle and Connie and Bill Bresnahan (Baumann-Bresnahan) to prepare a groundwater potential and aquifer analysis study to support a develop permit for a 7-lot country residential subdivision (the Site) proposed by Baumann-Bresnahan in SW-11-051-26-W5M. The Site is located approximately 2 km north of the Athabasca River, and approximately 10 km southwest of the Town of Hinton, Alberta.

Under the Water Act, the water requirement of residents who will occupy the proposed development is considered to be 8,750 m^3/year (1,250 m^3/year/lot x 7 lots). Baumann-Bresnahan retained Henderson's Rural Waterworks (Henderson) to complete a 24-hour test at a constant rate of 8,750 m^3/year (3.5 lgpm), equal to the water requirement of the proposed development. Waterline completed a review and analysis of the Henderson aquifer test data along with a review of available water well records, reports and references required to assess the expected geology, hydrogeology and groundwater use in the area. Based on an analysis of the data set, it is Waterline's professional opinion that the 7-lot subdivision water requirement of 8,750 m^3/year, can be sustained by the aquifer systems underlying the Site area, and that the managed diversion of that groundwater will not negatively impact existing, adjacent users.

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1.0 INTRODUCTION AND BACKGROUND

Waterline Resources Inc. (Waterline) was retained by Rahel Baumann/Mark Deagle and Connie and Bill Bresnahan (Baumann-Bresnahan) to prepare a groundwater potential and aquifer analysis study to support a develop permit for a 7-lot country residential subdivision (the Site) in SW-11-051-26-W5M. The Site is located approximately 2 km north of the Athabasca River, and approximately 10 km southwest of the Town of Hinton, Alberta, as shown on Figure 1. Information sources included the Alberta Environment (AENV) Provincial Water Well Database (February, 2004), relevant and readily attainable published geology and hydrogeology maps and reports and water level data collected during an aquifer test completed on a Bresnahan well located within the Site.

This study was completed in general accordance with the 1994 AENV publication "interim Guidelines For The Evaluation Of Groundwater Supply For Unserviced Residential Subdivisions Using Privately Owned Domestic Water Wells". These guidelines are recommended for use for unserviced 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 decreasing water levels. A regional assessment would have to be completed by/for 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 Water Act, which came into force January 1, 1999. The Water Act sets up 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.

Section 23 (3) of the Water Act 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 m^3/year per household (household use as defined in the Act) for the proposed new undeveloped lot 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 7 undeveloped lots in the subject area can sustain production of 8,750 m^3/year (1,250 m^3/year/lot x 7 lots), equivalent to continuous production of approximately 3.5 imperial gallons per minute (Igpm), 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 m^3/year/lot obtained at a daily rate of less than or equal to (1,250 m^3/year/lot ÷ 365 days) 3.43 m^3/day/lot, or 753 imperial gallons per day per lot. The 1994 AENV publication "Interim Guidelines For The Evaluation Of Groundwater Supply For Unserviced Residential Subdivisions Using Privately Owned Domestic Water Wells" indicates that residential water needs are estimated to be 0.23 - 0.68 m^3/day/person (50 - 150 imperial gallons per day per person). Therefore, a water consumption limit of 3.43 m^3/day/lot is considered conservative for an average family.

2.0 SCOPE OF WORK

Waterline's scope of work included the following components:

- Review available water well records, reports and references required to assess the expected geology, hydrogeology and groundwater use in the area;
- Review the water well drilling report for a water well (Bresnahan well) constructed on Lot 1 of the Site (see Site sketch, Appendix A);
- Assist in the coordination of an aquifer test completed on the Bresnahan water well by Henderson's Rural Waterworks (Henderson);
- Review and analyze water level data obtained from Henderson for the Bresnahan water well, and use these data to estimate the expected long-term sustainable yield of the Bresnahan water well;
- Assess the expected impact of the proposed groundwater use at the Site on current water users in the area;
- Review and present water quality analysis for the Bresnahan water well, provided to Waterline by Henderson;
- Complete a summary report.

3.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

3.1 QUATERNARY AND BEDROCK GEOLOGY

The overburden geology in the general Site area is mapped as including glacio-fluvial sand and gravel deposits, as well as a stony, sandy clay till (Roed, 1969). Bedrock beneath the site is within the thrust belt, and is mapped as steeply dipping sandstones, siltstones and shales of the Brazeau Formation (Vogwill, 1983).

Although the well record information is limited to the north and west of the Site, the geology listed on area water well completion records (AENV, 2004) is consistent with the regional geologic mapping (Vogwill, 1983), and is logged as a variable thickness of sand, with/or gravel, with/or clay, underlain by layers of shale and sandstone. In the immediate Site area, the overburden deposits appear to be dominated by sand and/or sand and gravel, which in places directly overlie bedrock (NW-02-051-26-W5M, see Figure 2). The overburden appears to thicken from the Site area towards the Athabasca River Valley. As an example, at NE-02-051-26-W5M the overburden thickness is at least 36.6 m (AENV Well record # 354901, see Figure 2), which is equal to the depth to the top of the sandstone aquifer in the Bresnahan well. Figure 2 presents a hydrogeological cross-section orientated approximately northwest-southeast, passing through the Site. The approximate location of the axial trace of the cross-section is shown on Figure 1. The cross-section includes soil and bedrock stratigraphy data obtained from four water wells; Bresnahan (not in AENV database), 361692 (Huot), 354901 (Lyons) and 484986 (Watt), completed in close proximity to the Site.

3.2 HYDROGEOLOGY

3.2.1 AENV Water Well Database

The AENV database lists sixty-five (65) water well records within a 2.5 km (1.5 mile) radius of the Bresnahan well, which includes sections 01 to 03, and 10 to 15-051-26-W5M. Of these well records, most are located in 01 and 02-051-26-W5M, with one (1) record listed for SW-11-051-26-W5M, and five (5) records listed for SW-11-051-26-W5M. Information for all records is summarized, in tabular format, in Appendix A, which includes the records used to construct the geological cross-section presented on Figure 2. The records indicate that present groundwater use in the area is for domestic purposes.

Field verification of aquifer use was not carried out as part of the present study. Waterline assumes that any cumulative drawdown effects on the aquifer in the greater area would be reflected in present hydraulic conditions observed at the time of testing. Based on the Provincial guidelines that estimate household water demand at 1.15 to 3.40 m^3/day, the current demand for groundwater within a 2.5 km (1.5 mile) radius of the Bresnahan well is calculated at 77 to 228 m^3/day (12 to 35 lgpm).

3.2.2 Well Completion Depth and Static Water Level

The wells listed in the AENV database, located within a 2.5 km (1.5 mile) radius of the Site, for all intended water uses, are completed within 4.3 to 122.5 m (14 to 402 ft) below ground level (bGL), with a calculated average depth of 42.1 m (138 ft) bGL, in either sand and gravel overburden deposits or in sandstone units of the Brazeau Formation (AENV 2004). Static water levels, measured in area wells following construction, were commonly in the 0 (flowing) to 57.9 m (0 to 190 ft) bGL, with a calculated average static water level of 18.3 m (60 ft) bGL. Based on mapping by Vogwill (1983), groundwater under the subject property is expected to generally flow from upland areas north of the Site, towards the south-southeast prior to discharging to the Athabasca River, which forms the principal topographic low in the region. It is recognized that the steeply dipping nature of the bedrock may disrupt this flow pattern to some degree.

3.2.3 Aquifer Depth and Well Yield

The main water bearing unit beneath the Site is mapped as fractured siltstones and sandstones in the Brazeau Formation, with the range of the average expected yield mapped as 5 to 23 Liters (L)/min (1 to 5 lgpm), based on qualitative information, such as flow regime and lithology (Vogwill, 1983). The relatively low expected well yield of bedrock wells might be attributed to the steeply dipping nature of the bedrock underlying the Site, which may disrupt the lateral continuity of bedrock groundwater flow. South of the Site, in 02-051-26-W5M and in areas along the Athabasca River valley, the main water bearing unit is mapped as sand and gravel deposits with the range of the average expected yield of wells mapped as 23 to 114 Liters (L)/min (5 to 25 lgpm), based on qualitative information, such as flow regime and lithology (Vogwill, 1983). The existing hydrogeology data at, and adjacent to the Site suggests that domestic groundwater supplies in the general Site area have been developed from either coarse-grained overburden sediments, or from fractured siltstone/sandstone aquifers in the Brazeau Formation.

The AENV database (AENV, February 2004) indicates that limited duration well tests completed by the well drillers, following well construction, for wells located within a 2.5 km (1.5 mile) radius of the subject property, have been conducted in the range of 5 to 114 L/min (1 to 25 lgpm), with a calculated average test rate of 36 L/min (8 lgpm). The well tests indicate that the average single well yields fall within the range mapped for the combined overburden-shallow bedrock aquifers in the Site area. To some degree, wells tests completed in the higher end of the of 5 to 114 Liters (L)/min (1 to 25 lgpm) range appear to be associated with well completed in overburden, whereas well tests completed in the lower end of the of 5 to 114 Liters (L)/min (1 to 25 lgpm) range appear to be more closely associated with wells completed in bedrock. The Bresnahan well contrasts this trend in that although the well is completed in shallow bedrock, it was tested at a rate of 137 L/min (30 lgpm) following its construction in 1992 (see Appendix A). Baumann also indicates that a bedrock well recently drilled for Bresnahan at a location approximately 250 m east of the proposed development was tested in the range of 91 to 137 L/min (20 to 30 lgpm) (R. Baumann, per. commun). The higher relative yield from the Bresnahan bedrock wells, relative to other bedrock wells in the general area, may be attributed

to either increased fracture permeability of the sandstone aquifers in the Site area, and/or to enhanced recharge of the shallow bedrock in the Site area by thick, sand and gravel deposits (partially saturated unconfined aquifer) which may directly overlying the bedrock.

3.2.4 Regional Groundwater Quality

Based on Vogwill (1983), the regional overburden and bedrock groundwater quality in the area is mapped as having a total dissolved solids (TDS) concentration in the order of 500 milligrams (mg)/L, which is considered potable in Alberta. Based on the limited well control, Vogwill (1983) does not map information on the type of overburden groundwater in the Site area. However, Vogwill (1983) indicates that shallow bedrock groundwater in the Site area may consist of either a calcium/magnesium-bicarbonate type water, or a sodium/potassium-bicarbonate type water.

Waterline reviewed four (4) water well chemistry records available in the AENV database (AENV, 2004) for 07-037-28-W4M, copies of which are provided for reference in Appendix A. Although the data provided on the records is limited, it supports the regional mapping and indicates that bicarbonate-type groundwater predominates in the area. In 07-037-28-W4M, the recorded TDS concentration in groundwater ranges from 512 to 1,200 mg/L.

4.0 FIELD PROGRAM

4.1 BRESNAHAN WELL (SUBJECT WELL)

T-Car Water Wells (T-Car), of Edson, Alberta constructed the Bresnahan well on July 11, 2002. Based on a review of the well completion record obtained from T-Car (well not listed in AENV database, 2004), the subject well was drilled to a total depth of 43.3 m (142 ft) and completed in bedrock. The well was constructed using 140 mm (5.5 in) OD steel casing that was driven, and set with bentonite to the top of bedrock, at 36.6 m bGL, to form an annular seal. The surface casing stick-up was recorded at 0.6 m (2 ft) above GL. The well was completed open-hole from 36.6 to 43.3 m (120 to 142 ft) bGL, and intersected a sandstone unit identified from 36.6 to 42.7 m (120 to 140 ft) bGL, and a shale unit identified from 42.7 to 43.3 m (140 to 142 ft) bGL. Shales are considered as aquitards and do not generally yield useable quantities of groundwater. Therefore, the aquifer is likely defined by the sandstone unit with an effective thickness of 6.1 m.

4.2 AQUIFER TESTING

Henderson initiated production testing on January 20, 2004. The pitless adapter was bypassed and flow was directed to surface through a 23.0 m^3/d (3.5 Igpm) flow-control valve, for completion of a 24 hour constant rate test. During the test, Henderson checked the flow rate using a bucket and stopwatch method. After 24 hours of continuous pumping, production was shut down and water level recovery was monitored for an additional 2.5 hours.

The pre-pumping water level was measured at 14.33 m (47.02 ft) below top of casing (bTOC) in the Bresnahan well. At the end of the pumping interval the water level had declined to 17.25 m

(56.60 ft) bTOC, representing drawdown of 2.92 m (9.58 ft). Once pumping was discontinued, the water level recovered approximately 69 percent in 150 minutes (2.5 hours). A plot of water levels measured in the Bresnahan well during the pumping and recovery intervals is provided as Figure 3. The water level data is also provided in tabular format in Appendix B.

4.3 WATER QUALITY TESTING

Henderson collected water samples from the Bresnahan Well immediately prior to shutting off the pump. The water samples were submitted for potability analysis to Kaizen Laboratories (Kaizen), of Calgary, Alberta.

5.0 RESULTS

5.1 AQUIFER TEST EVALUATION

The pumping test analysis was completed using AQTESOLV, Version 3.01-Professional, Aquifer Test Design and Analysis Computer Software (1996-2000 HydroSOLVE Inc.). This aquifer test solver provides analytical solutions for evaluating hydraulic parameters in confined, unconfined, leaky, or fractured aquifer systems. In this analysis, Waterline was able to evaluate the aquifer test data by visual curve matching to determine the "best fit", and in turn, select the most appropriate interpretation to represent aquifer conditions at the site.

In regards to the Bresnahan and House well water level data, the confined aquifer, Theis (1935) solution was used for analysis of the combined pumping and recovery data, the Cooper-Jacob (1946) straight-line solution was used for analysis of the pumping cycle data set and the Theis (1935) recovery solution was used for analysis of the recovery cycle data set. Although specific assumptions are made with regard to aquifer characteristics using the data evaluation methods, the following assumptions are implicit with the use of all parametric solutions:

- Aquifer has infinite aerial extent;
- Aquifer is homogeneous, isotropic, and of uniform thickness;
- Aquifer potentiometric surface is initially horizontal;
- Pumping well is fully penetrating; and
- Aquifer has no recharge.

The results of the pumping and recovery test analysis are presented in Table 2.

Table 1: Summary of Pumping and Recovery Test Analysis

Well	Confined Solution	Pumping or Recovery Cycle	Time Interval Analyzed	Transmissivity (m^2/min)	Storativity
Bresnahan Well	Cooper-Jacob	Pumping	Early	0.004129	NA
	Cooper-Jacob	Pumping	Mid	0.005645	NA
	Cooper-Jacob	Pumping	Late	**0.003859**	NA
	Theis	All	All	**0.003859**	NA
	Theis Recovery	Recovery	Late	**0.005376**	NA

Notes
NA denotes not applicable.
Bold face data denotes values used to calculate arithmetic average used in predictive drawdown calculations.

As summarized in Table 2, the analytical solutions yield estimates of the aquifer transmissivity in the vicinity of the Bresnahan well ranging from 0.003859 to 0.005645 m^2/min. For the predictive drawdown calculations presented in Section 5.2, Waterline applied an aquifer transmissivity of 0.004365 m^2/min (6.3 m^2/day), which represents the arithmetic average of the the Theis (1935) solution applied to the combined pumping and recovery data sets, The Theis (1935) solution applied to the recovery data set, and the Cooper-Jacob (1946) straight-line solution applied to the late time pumping data set. These values were selected based on interpreted best fit. An aquifer storativity of 0.0001 was applied to the predictive calculation, which is within the range listed for confined aquifers (Freeze and Cheery, 1979), and is representative of similar bedrock formations, such as the Paskapoo Formation, in central Alberta, based on Waterline experience . The aquifer model plots are presented in Appendix C, along with the raw data.

5.2 Q_{20} CALCULATIONS

The theoretical 20-year safe yield (Q_{20}) of the well can be determined by applying the following formula: Q_{20} = (0.68) (T) (H) (0.7) (Farvolden 1959, referenced in AENV, December 5, 2002);

Where:

T = Coefficient of transmissivity (m^2/day) of the aquifer;
H = Distance, m, between the top of the aquifer, or the top of the production interval, whichever is less, and the static pre-pumping water level in the well;
0.7 = Arbitrary safety factor to allow for well losses, etc.

A Q_{20} of 68.6 m^3/day (10.5 lgpm) is calculated for the Bresnahan well using a T of 6.3 m^2/day and an H of 22.87 m. The Farvolden (1959) Q_{20} calculation has added safety factors that account for conditions such as well loss and limited recharge capacity. The theoretical Q_{20} of

68.6 m^3/day (10.5 Igpm) for the Bresnahan well is 3 times the combined water requirement of the proposed 7-lot subdivision.

5.3 PREDICTED DRAWDOWN AFTER 1, 5 AND 20 YEARS OF PUMPING

The Theis non-equilibrium well equation was applied to predict the theoretical response of an ideal aquifer over 1, 5, and 20 years of pumping. The analytical solution employed Equations 1 and 2, as follows:

$$u = \frac{r^2 S}{4Tt} \quad \textit{Theis, 1935} \qquad (1)$$

$$s = \frac{QW(u)}{4\pi T} \quad \textit{Theis, 1935} \qquad (2)$$

The variables are described as follows:

r	=	distance from the pumping well
S	=	assumed storativity
T	=	estimated transmissivity
t	=	elapsed time since pumping started
s	=	drawdown at the distance r
Q	=	pumping rate
W(u)	=	well function of u

Table 3 summarizes the results of the theoretical drawdown calculations based on continually pumping the Bresnahan well at a constant production rate of 23.0 m^3/day (3.5 Igpm), for 1, 5, and 20 years, ignoring recharge. The calculated distances include 0.1 m (predicted drawdown in the production well), 150 m, 200 m (estimated distance between the Bresnahan well and the nearest well, located south of the proposed Baumann-Bresnahan residential development), 300 m (estimated distance between the Bresnahan well and the next nearest well), 500 m (0.5 km radius from the Bresnahan well), 1000 m, (1 km radius from the Bresnahan well) and 1600 m (1 mile radius from the Bresnahan well). Drawdown and cone of depression calculations for 1, 5, and 20 years are presented in Appendix C. The results of the well interference calculations are also presented graphically in Figure 4.

Table 2: Summary of Expected Drawdown - Theis Non-Equilibrium Estimate

Production Well Hydraulic Parameters	Elapsed Time	Distance from Well; r (m)	Predicted Drawdown (m)
Bresnahan Well $T = 6.3\ m^2/day$ **S = 0.0001** $Q = 23.0\ m^3/day$	1 year	0.1	6.49
		150	2.25
		200	2.08
		300	1.85
		500	1.55
		1000	1.15
		1600	0.88
	5 years	0.1	6.96
		150	2.72
		200	2.55
		300	2.31
		500	2.02
		1000	1.61
		1600	1.34
	20 years	0.1	7.37
		150	3.12
		200	2.95
		300	2.72
		500	2.41
		1000	2.02
		1600	1.74
Bresnahan Well Aquifer Test $T = 6.3\ m^2/day$ **S = = 0.0001** $Q = 23.0\ m^3/day$	1.0 day	0.10	4.78 calc /2.92 obs

Notes: calc denotes calculated drawdown, obs denotes observed (measured) drawdown

As shown in Table 3, after 1 day of pumping the Bresnahan well at a rate of 23.0 m^3/day (3.5 Igpm), the predicted drawdown of 4.78 m in the aquifer in the area of the Bresnahan well is greater than the measured drawdown (2.92 m) by a factor of approximately 1.6. The difference between the predicted and observed water level decline is likely due to recharge to the aquifer not otherwise accounted for by the Theis predictive calculations.

The drawdown in the aquifer, assuming continuous pumping of the Bresnahan well at a rate of 23.0 m^3/day (3.5 Igpm) for 20 years, is predicted to be 2.95 m at a radius of 200 m, which is the estimated distance to the nearest existing well located to the south of the proposed Baumann-Bresnahan subdivision. The 20-year predicted drawdowns are estimated at 2.41 m and 1.74 m, at distances of 500 m and 1600 m, respectively, from the Bresnahan well.

5.4 HYDROGEOLOGICAL DISCUSSION

The Alberta Government has developed a groundwater allocation policy for oilfield injection purposes (AENV 1990) with the intention to manage the groundwater resources of the Province of Alberta in such a manner as to provide continued protection to the existing and future domestic, municipal, agricultural and industrial water users, while maintaining the important principle of multi-purpose use of water. Although this policy is not directly applicable to residential developments, the guideline establishes quantity limitations that can also be applied to other groundwater uses. The policy restricts groundwater use to a maximum of one half of the long-term yield of a given aquifer in the immediate vicinity of the water source well. The policy is enforced by limiting drawdown, as measured 150 m from the water source well, to 35 percent during the first year of operation and no more than 50 percent over the life of the project (e.g., 20 years). Based on the hydraulic parameters determined from the 24-hour pumping test, the 20-year drawdown at a distance of 150 m from the Bresnahan well pumping at 23 m^3/day (3.5 lgpm), is predicted to be 3.12 m. A 20-year predicted drawdown of 3.12 m at a radius of 150 m represents approximately 14 percent of the 22.87 m of available drawdown in the bedrock aquifer in which the Bresnahan is constructed.

The Bresnahan aquifer test data indicate that the sandstone aquifer in the vicinity of the Bresnahan well is likely characterized by appreciable fracture-controlled heterogeneity, which ultimately controls the amount of recharge reaching a given well. The bedrock recharge may be enhanced in the general Site area where thick, partially saturated sand and/or gravel deposits may be in direct contact with bedrock. For these reasons, the actual drawdown measured in future wells drilled at the Site may be less than predicted herein owing to recharge to the aquifer not otherwise accounted for by the Theis predictive calculations.

Based on the results of the Bresnahan well aquifer test, and on the predictive drawdown estimations, the fractured sandstone aquifer that underlies the Site development area appears to have sufficient capacity to meet the water requirements of the proposed Baumann-Bresnahan development, without adversely impacting current water users.

5.5 GROUNDWATER CHEMISTRY

Table 4 presents the dominant laboratory tested parameter concentrations analyzed from a groundwater sample collected from the Bresnahan well. The complete laboratory chemistry reports are presented in Appendix B.

Table 3: Laboratory Tested Dominant Chemical Parameters

PARAMETER	BRESNAHAN WELL SW-11-051-26-W5M	Guidelines for Canadian Drinking Water Quality
Date Sampled	January 21, 2004	NA
PH	7.0	6.6-8.5
Hardness (mg/L)	301 mg/L	NA
Electrical Conductivity	710 µS/cm	NA
Total Dissolved Solids (TDS)	400 mg/L	≤ 500 mg/L
Bicarbonate (HCO_3)	455 mg/L	NA
Sulphate (SO_4)	18.4 mg/L	≤ 500 mg/L
Chloride (Cl)	2.7 mg/L	≤ 250 mg/L
Fluoride (F)	0.3 mg/L	1.5 mg/L
Calcium (Ca)	69.3 mg/L	NA
Magnesium (Mg)	31.0 mg/L	NA
Sodium (Na)	50.1 mg/L	≤ 200 mg/L
Iron (Fe)	0.09 mg/L	≤ 0.3 mg/L
Nitrate	<0.15 mg/L	45 mg/L
Coliform (fecal)	<1 CFU/100 ml	0 CFU/100 ml
Coliform (total)	<1 CFU/100 ml	0 CFU/100 ml

The groundwater chemistry of the shallow aquifer is characterized as calcium-bicarbonate water, with a reported TDS concentration listed as 400 mg/L.

The Guidelines for Canadian Drinking Water Quality (GCDWQ, 1996) set standards based on *Aesthetic Objectives (AOs)*, and on *acceptable concentrations, either maximum (MACs) or interim (IMACs)*. Aesthetic objectives apply to certain substances or characteristics of drinking water that can affect its acceptance by consumers or interfere with practices for supplying good-quality water. For certain parameters, both AOs and health-related guidelines (e.g., MACs) have been derived. Where only AOs are specified, these values are below those considered to constitute a health hazard. However, if concentrations in drinking water are well above an AO, there is a possibility of a health hazard. Maximum Acceptable Concentrations (MAC) were established for certain substances that are known or suspected to cause adverse effects on health. Each MAC has been derived to safeguard health, assuming life-long consumption of drinking water containing the substance at that concentration (GCDWQ, 1996).

Based on the results of the water quality analysis the water is considered potable in Alberta, with no measured parameters exceed drinking water guidelines.

6.0 SUMMARY OF THE BRESNAHAN WELL COMPLETION DETAILS

- **Location:** SW-11-051-26-W5M
- **Construction Date**: July 11, 2002
- **Well Site Elevation:** 103.7 m aMSL estimated from 1:50,000
- **Well Depth:** 43.3 m bGL
- **Production Interval:** fractured sandstone unit from 36.6 to 42.7 m bGL
- **Surface Casing Material:** Steel
- **Total Depth of Surface Casing:** 36.6 m
- **Surface Casing Inside Diameter:** 127 mm
- **Surface Casing stick-up:** 0.6 m
- **Liner Material:** None
- **Liner Inside Diameter:** NA
- **Open Hole Interval:** 36.6 to 42.7 m bGL
- **Static Water Level:** 14.33 m bTOC (January 20, 2004)
- **Available Drawdown (static water level to top of aquifer):** 22.87 m (January 20, 2004)
- **Tested rate**: 23.0 m^3/day (3.5 lgpm)
- **Test duration:** 24 hours
- **Drawdown at End of Test:** 2.92 m
- **Recovery:** 69 percent in 2.5 hours

7.0 CONCLUSIONS AND RECOMMENDATIONS

Waterline has reached the following conclusions with respect to the Bresnahan water supply well:

- The Bresnahan well is completed in the Brazeau Formation; a heterogeneous, fractured, bedrock aquifer system.

- Based on the aquifer test analysis, the average aquifer transmissivity was estimated to be 6.3 m^2/day. Applying this transmissivity and an assumed storativity of 0.0001, predicted 1, 5, and 20-year drawdown were calculated using the Theis non-equilibrium equation. The drawdown in the aquifer, assuming continuous pumping of the Bresnahan well at a rate of 23.0 m^3/day (3.5 lgpm) for 20 years, is predicted to be 2.95 m at a radius of 200 m, which is the estimated distance to the nearest existing well located to the south of the proposed Baumann-Bresnahan subdivision. The 20-year predicted drawdowns are estimated at 2.41 m and 1.74 m, at distances of 500 m and 1600 m, respectively, from the Bresnahan well.

- The Theis theoretical drawdown calculations ignore recharge. This assumption is not likely valid under these aquifer conditions where the drawdown appears to be influenced by significant recharge. As such, Site and surrounding wells may experience less drawdown than predicted by the theoretical simulations because these calculations ignore recharge.

- A Q_{20} of 68.6 m^3/day (10.5 lgpm) is calculated for the Bresnahan well, which 3 times the combined water requirement of the proposed Baumann- Bresnahan 7-lot subdivision.

- Assuming that the aquifer conditions observed at Lot 1 are representative of the Site, it is Waterline's professional opinion that the 7-lot subdivision water requirement of 8,750 m^3/year, can be sustained by the aquifer systems underlying the Site area, and that the managed diversion of that groundwater will not negatively impact existing, adjacent users.

- The groundwater chemistry of the shallow bedrock aquifer is characterized as a calcium-bicarbonate bicarbonate water, with a TDS concentration of 400 mg/L, and with no measured parameters exceeds drinking water guidelines.

8.0 CLOSURE

The findings presented in this report are based upon a review of published maps and reports, information available from the AENV water well database, and analysis of the pumping test data provided to Waterline by Henderson.

Consideration should be given to a community water supply for the proposed development to facilitate improved management of peak water consumption and contaminant related issues. The present study should be combined with the results of any future regional or site-specific hydrogeological investigations, should they be completed, to gain a more complete understanding of the site-specific aquifer conditions underlying the study area. This will allow for the results of the present study to be updated, as necessary, and will serve to promote groundwater resource management and protection in the area for current and future users.

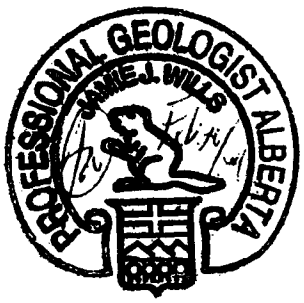
It should be noted that Waterline does not employ health care professionals, and any health related questions with regards to chemical parameter exceedances should be discussed with the local health authority.

This report is intended for use in support of the application for subdivision under the Municipal Government Act, and should not be considered as a Water Management Plan or as a Phase 1 Environmental Site Assessment. The enclosed study has been carried out in accordance with generally accepted hydrogeological practices. No other warranty is intended or implied.

Respectfully submitted,

Waterline Resources Inc.
APEGGA Permit To Practice No. P07329

Reviewed by:



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

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

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APPENDIX 3) Application Forms and Existing Certificate of Title

REGISTERED OWNER'S AUTHORIZATION

I, Anne Bronson Nolnes, being the registered owner of Section 11-51-26-W5M, less Road Plan 5165 PX, as described in Certificate of Title 832 009 583, do hereby authorize Greg Hofmann, ACP MCIP, Principal Consultant, G.T. Hofmann & Associates, to act on my behalf to make all necessary applications and to provide all required support information to Yellowhead County in order to secure subdivision approval of a portion of the SW of 11-51-26-W5M for residential purposes pursuant to an agreement I have entered into with purchasers Rahel Baumann, Mark Deagle, Connie Bresnahan and Bill Bresnahan to this end.

x Anne Bronson Nolnes Date: 23/2/06

Anne Bronson Nolnes, Registered Owner

To GREG HOFMANN
ACP MCIP
Principal Consultant
G.T. HOFFMANN + Assoc.

FAX: 780-460-0895

FROM: Anne Bronson
4103 Kays Rd.
Nelson, BC
V1L 6V9

YELLOWHEAD COUNTY

Application No._____

APPLICATION FOR AMENDMENT TO THE

YELLOWHEAD COUNTY
LAND USE BYLAW NO. 7.98

I/WE hereby make application to amend the Yellowhead County Land Use Bylaw No. 7.98.

Applicant: Name Greg Hofmann Telephone 780-460-0894

Address 5 Portman Place, St. Albert, AB, T8N5L5

Owner of Land: Name Anne Bronson Notnes Telephone 250-352-7773

Address 4103 Kays Rd., Nelson, B.C. V1L6V9

Land Description: Certificate of Title 832 009 583

SW 1/4 Section 11 Twp. 51 Range 26 West of 5 Meridian

Lot _____, Block _____, Reg. Plan No. _____

Area of above-described parcel of land to be redistricted ± 9.02 ha.

Amendment Proposed

FROM ~~RD~~ RD – Rural Dist. TO CR – Country Residential

Reasons in support of Application for Amendment

– see attached Conceptual Scheme and supporting documentation

I/We enclose $200.00 being the application fee, payable to Yellowhead County.

March 15/06 — [signature]
DATE — SIGNATURE OF APPLICANT(S)

_____ — See landowner authorization form
DATE — SIGNATURE OF LANDOWNER(S)

This personal information is being collected under the authority of Municipal Government Act, Being Chapter M-26 R.S.A., 2000 and will be used to process amendments to the Land Use Bylaw No. 7.98. It is protected by the privacy provisions of the Freedom of Information and Protection of Privacy Act, Chapter F-18.5 R.S.A., 2000. If you have any questions about the collection of this personal information, please contact the Director of Planning, Yellowhead County, 2716-1 Ave., Edson AB T7E 1N9, (780) 723-4800.

RETURN COMPLETED APPLICATION FORM TO:

Yellowhead County

2716 - 1st. Avenue, Edson, Alberta T7E 1N9
Ph. (780) 723-4800
Fax (780) 723-5066
Email info@yellowheadcounty.ab.ca

APPLICATION FOR SUBDIVISION APPROVAL (Check which applies) ___ By plan of subdivision ___ By other instrument	For Office Use Only	
	Date of receipt of Form A as complete	File No.
	Fees Submitted:	

THIS FORM IS TO BE COMPLETED IN FULL WHEREVER APPLICABLE BY THE REGISTERED OWNER OF THE LAND THAT IS THE SUBJECT OF THIS APPLICATION OR BY AN AUTHORIZED PERSON ACTING ON HIS/HER BEHALF

1. **Name(s) of registered owner(s) of land to be subdivided** Anne Bronson Notnes
   Address and phone no. 4103 Kays Rd. Nelson B.C. V1L 6V9 250-352-7773

2. **Authorized person(s) acting on behalf of registered owner(s)** Greg Hofmann, ACP MCIP
   Address and phone no. G.T. Hofmann & Associates, 5 Portman Place St. Albert, AB T8N 5L5 780-460-0894

This personal information is being collected under the authority of Section 653 of the Municipal Government Act, Being Chapter M-26.1 R.S.A., 2000 and will be used to process the subdivision application. It is protected by the privacy provisions of the Freedom of Information and Protection of Privacy Act, Chapter F-18.5 R.S.A., 2000. If you have any questions about the collection of this personal information, please contact the Director of Planning, Yellowhead County, 2716-1 Ave., Edson AB T7E 1N9, (780) 723-4800.

3. **LEGAL DESCRIPTION AND AREA OF LAND TO BE SUBDIVIDED (ie: existing titled area)**

All/part of the SW 1/4 Section 11 twp. 51 range 26 west of 5 meridian

Being all/part of lot ____ block ____ Reg. Plan No. ____ Certificate of Title No. 832 009 583

Municipal Address (if applicable) ____

Area of above-described parcel of land to be subdivided (ie: existing titled area) 64 ha ±

4. **LOCATION OF LAND TO BE SUBDIVIDED**

a. Is the land situated immediately adjacent to the municipal boundary? Yes ____ No X
   If "Yes", the adjoining municipality is ____

b. Is the land situated within 0.5 miles of the right-of-way of a Highway? Yes ✓ No ____
   If "Yes", the Highway is No. 40, the Secondary Road is No. ____

c. Is the land situated within 0.5 miles of a river, watercourse, lake or other permanent body of water, or a canal or drainage ditch? Yes ____
   No X If "Yes", state its name ____

d. Is the proposed parcel within 1.5 km of a sour gas facility? Yes ____ No X

5. **EXISTING AND PROPOSED USE OF LAND TO BE SUBDIVIDED**

a. Existing use of land Bush, some pasture, recreational use

b. Proposed use of land **PLEASE INDICATE THE SIZE AND EXACT USE(S) OF:**

   (a) The parcel(s) being created: 7-unit Bareland Condo.

   (b) The remainder (remnant) of the existing titled area: as is

c. The land use district ("zoning") applied to the existing titled area under the Land Use Bylaw concurrent appl. to redistrict to CRP

6. PHYSICAL CHARACTERISTICS OF LAND TO BE SUBDIVIDED

a. Describe the nature of the topography of the land (e.g. flat, rolling, steep, mixed, etc.) mixture of flat and slopes

b. Describe the nature of the vegetation and water on the land (e.g. brush, tree stands, etc. - sloughs, creeks, etc.)
mixed forest

c. Describe the kind of soil on the land (e.g. sandy, loam, clay, etc.) moraine

7. EXISTING BUILDINGS ON THE LAND PROPOSED TO BE SUBDIVIDED

Describe any buildings, historical or otherwise, and any structures on the land and whether they are to be demolished or moved
an existing cabin, on site services

8. WATER SERVICES

a) Existing Source of Water: groundwater

b) If the application will result in six or more lots on the quarter section in total, according to Section 23(3)(a) and (b) of the Water Act (Provincial Statutes) an application for subdivision is considered incomplete until one of the following requirements regarding water supply for the proposed subdivision is submitted. Please check one (or more) of the following:

1. ___ Proposed water supply to new lots by a licensed (surface) water distribution system
2. ✓ Proposed water supply to new lots by individual water wells, and
   i. ✓ Attached to the application is a report certified by a Professional Engineer, Hydrologist or Geophysicist which states that there is sufficient water to supply 1250 cubic metres of water per year to each proposed lot, and that the proposed diversion will not interfere with any existing household user, licensees, or traditional agricultural users who currently exist, or
   ii. ___ The diversion of water by water wells for each proposed lot conforms with an applicable, approved water management plan.

9. SEWER SERVICES

a) Existing sewage disposal: on-site
b) Proposed sewage disposal: on-site

10. REGISTERED OWNER OR PERSON ACTING ON HIS/ HER BEHALF

I(we) Greg Hofmann being the registered owner(s) ____, OR authorized to act on behalf of the registered owner(s) ✓, do hereby certify that the information given on this form is full and complete and is, to the best of my(our) knowledge, a true statement of the facts relating to this application for subdivision approval.

Signature(s) [signature] — See landowner authorization form

Date March 15/06

THE FOLLOWING INFORMATION MUST ALSO BE INCLUDED IN SUPPORT OF YOUR APPLICATION WHICH WILL NOT BE CONSIDERED COMPLETE AND PROCESSED UNTIL SUPPLIED:

a) A complete application form.

b) An accurate sketch of the proposed subdivision area to include:
   i) An approximate location, dimensions, areas and boundaries of the proposed subdivision.
   ii) North arrow.
   iii) An approximate location of all existing buildings (temporary and permanent), driveways and road approaches on the property with their distances to existing and proposed property lines.
   iv) An approximate location of existing wells, septic fields, fences, trees and any permanent bodies of water on the land.
   v) The sketch is to be drawn with a straight edge as accurately as possible.

c) Application Fee.

d) A complete Authorization/ Right of Entry form.

ALBERTA REGISTRIES

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON OCTOBER 21,2003

S

LINC	SHORT LEGAL	TITLE NUMBER
0019 937 333	5;26;51;11;NW	832 009 583
0019 937 341	5;26;51;11;NE	
0019 937 359	5;26;51;11;SW	
0019 937 366	5;26;51;11;SE	

LEGAL DESCRIPTION

FIRST

THE NORTH WEST QUARTER OF SECTION ELEVEN (11)
TOWNSHIP FIFTY ONE (51)
RANGE TWENTY SIX (26)
WEST OF THE FIFTH MERIDIAN
CONTAINING 65.2 HECTARES (161 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
4.20 HECTARES (10.58 ACRES) MORE OR LESS AS SHOWN ON ROAD PLAN 5165PX
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

SECOND

THE NORTH EAST QUARTER OF SECTION ELEVEN (11)
TOWNSHIP FIFTY ONE (51)
RANGE TWENTY SIX (26)
WEST OF THE FIFTH MERIDIAN
CONTAINING 65.2 HECTARES (161 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
4.35 HECTARES (11.24 ACRES) MORE OR LESS
AS SHOWN ON ROAD PLANA 5165PX
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

THIRD
MERIDIAN 5 RANGE 26 TOWNSHIP 51
SECTION 11
QUARTER SOUTH WEST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME
AREA: 65.2 HECTARES (161 ACRES) MORE OR LESS

FOURTH

THE SOUTH EAST QUARTER OF SECTION ELEVEN (11)
TOWNSHIP FIFTY ONE (51)
RANGE TWENTY SIX (26)
WEST OF THE FIFTH MERIDIAN
CONTAINING 65.2 HECTARES (161 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
5.24 HECTARES (12.94 ACRES) MORE OR LESS
AS SHOWN ON ROAD PLAN 5165PX
EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: YELLOWHEAD COUNTY

REGISTRATION	DATE(DMY)	REGISTERED OWNER(S) DOCUMENT TYPE	VALUE	CONSIDERATION
832 009 583	14/01/1983		$24,000	

OWNERS

ANNE D BRONSON NOTNES
OF ENTRANCE
ALBERTA

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
9150K	17/06/1965	UTILITY RIGHT OF WAY GRANTEE - UTILICORP NETWORKS CANADA (ALBERTA) LTD.. AFFECTED LAND: 5;26;51;11;SW 5;26;51;11;SE (DATA UPDATED BY: TRANSFER OF UTILITY RIGHT OF WAY 002303140)
1038UT	07/05/1974	UTILITY RIGHT OF WAY GRANTEE - UTILICORP NETWORKS CANADA (ALBERTA) LTD.. AFFECTED LAND: 5;26;51;11;NE (DATA UPDATED BY: TRANSFER OF UTILITY RIGHT OF WAY 002303140)
762 028 715	19/02/1976	CAVEAT CAVEATOR - ST. REGIS (ALBERTA) LTD..
772 188 512	27/09/1977	UTILITY RIGHT OF WAY GRANTEE - YELLOWHEAD GAS CO-OP LTD. AFFECTED LAND: 5;26;51;11;SE
842 035 091	16/02/1984	CAVEAT RE : ROADWAY CAVEATOR - IONIC ENERGY INC.. 1400,340-12 AVE. S.W CALGARY ALBERTA T2P1L5 AGENT - BRUCE ROBERTSON. AFFECTED LAND: 5;26;51;11;NW (DATA UPDATED BY: CHANGE OF NAME 922015844) (DATA UPDATED BY: CHANGE OF NAME 942009273) (DATA UPDATED BY: TRANSFER OF CAVEAT 982323723)
862 066 258	01/04/1986	CAVEAT RE : EASEMENT CAVEATOR - CANADIAN NATIONAL RAILWAY COMPANY. CAVEATOR - CANADIAN PACIFIC LIMITED. BOTH OF: C/O CLAIRE J. IRWIN CNCP TELECOMMUNICATIONS 10004-104 AVE EDMONTON ALBERTA T5J0K2 AGENT - MYER RABIN AFFECTED PLAN: 8220422
872 048 352	06/03/1987	CAVEAT RE : EASEMENT CAVEATOR - CANADIAN BROADCASTING CORPORATION. C/O LOUIS-PAUL GERMAIN CBC, 1500 BRONSON AVE OTTAWA ONTARIO K1G3J5 AFFECTED LAND: 5;26;51;11;NW AFFECTED PLAN: 8220422
922 015 844	20/01/1992	CHANGE OF NAME RE: WESTCOAST PETROLEUM LTD.. 421-7 AVE SW CALGARY ALBERTA T2P4K9 AFFECTS INSTRUMENT: 842035091 CHANGE OF NAME NO. 882069576
942 009 273	12/01/1994	CHANGE OF NAME RE: NUMAC ENERGY INC.. 321-6 AVE SW CALGARY ALBERTA T2P3H3 AFFECTS INSTRUMENT: 842035091
982 323 723	21/10/1998	TRANSFER OF CAVEAT 842035091 TRANSFEREE - IONIC ENERGY INC.. 1400,340-12 AVE. S.W CALGARY ALBERTA T2P1L5 AGENT - BRUCE ROBERTSON.
002 303 140	16/10/2000	TRANSFER OF UTILITY RIGHT OF WAY 1038UT AND UTILITY RIGHT OF WAY 9150K TRANSFEREE - UTILICORP NETWORKS CANADA (ALBERTA) LTD..

032 302 321	18/08/2003	EASEMENT	
		AFFECTED LAND:	5;26;51;11;SW
			5;26;51;11;SE
		AS TO PORTION OR PLAN:	PORTION
		"FOR BENEFIT OF NW1/4 SEC 2-51-26-5"	
032 401 657	21/10/2003	DESCRIPTIVE PLAN	
		AFFECTED LAND:	5;26;51;11;SW CANCELLED IN FULL
		NEW TITLE ISSUED FOR THE REMAINDER	
		AFFECTED PLAN:	0325285

TOTAL INSTRUMENTS: 013

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 23 DAY OF DECEMBER, 2005 AT 08:41 A.M.

ORDER NUMBER:4281641

CUSTOMER FILE NUMBER: 5786

REGISTRAR OF LAND TITLES

END OF CERTIFICATE
