



BYLAW NO. 25.13

BEING A BY-LAW TO ADOPT AN AREA STRUCTURE PLAN

WHEREAS, the Municipal Government Act, Being Chapter M-26, R.S.A., 2000, and amendments thereto, authorize a Council to adopt an area structure plan for the purpose of providing a framework for subsequent subdivision and development of an area of land;

AND WHEREAS, a public hearing was held in respect to the proposed amendments to the area structure plan on the date written below;

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

- 1) That the document entitled "River Ridge Area Structure Plan", dated August 2013 attached hereto as Schedule "A" is hereby adopted as an Area Structure Plan.
- 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.
- 3) And that Bylaw No. 30.05 is hereby rescinded.

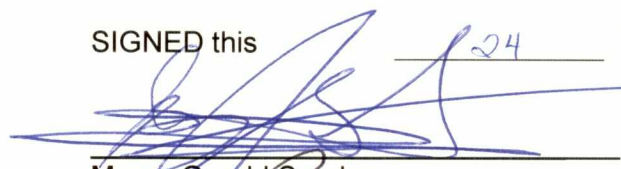
READ a first time this 27 Day of August A.D., 2013. 

PUBLIC HEARING held this 24 Day of September A.D., 2013.

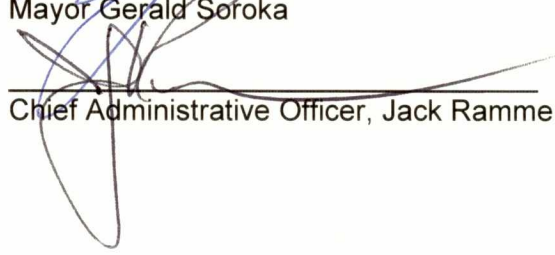
READ a second time this 24 Day of September A.D., 2013.

READ a third time this 24 Day of September A.D., 2013.

SIGNED this 24 Day of September A.D., 2013.



Mayor Gerald Soroka



Chief Administrative Officer, Jack Ramme



RIVER RIDGE
AREA STRUCTURE PLAN
AUGUST 2013



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1 INTRODUCTION

1.1 Purpose

This Area Structure Plan update has been prepared on behalf of River Ridge Properties Ltd. It will replace the existing River Ridge Area Structure Plan Bylaw No. 30.5 to allow for the subdivision of four additional lots for a total of 50 lots. The Plan area was subdivided in 2008 (Plan 082-1255) to create 46 lots as per Bylaw No. 30.5. The four new lots are as a result of subdivision of existing lots and the purchase by River Ridge Properties of the road allowance and Crown land located at the south tip of the original Plan area. The additional lands purchased comprise 3.05 hectares. The Plan area therefore has increased from some 88 hectares to 91 hectares.

Both the existing River Ridge Area Structure Plan and this updated Plan have been prepared in accordance with Section 633 of the Municipal Government Act, and Yellowhead County's Terms of Reference for the Preparation of Area Structure Plans. Much of the contents of the existing Area Structure Plan remain valid.

The Area Structure Plan document is to be considered in the context of engineering reports prepared by EXH Engineering Services Ltd. and others. These reports were submitted to the County at the time that the existing Area Structure Plan was adopted:

- Thurber Engineering Ltd., Jensen Property Near Edson, Alberta, Top of Bank Set-Back Assessment, July 2005
- EXH Engineering Service Ltd., Phase I Environmental Site Assessment, July 2005
- EXH Engineering Service Ltd., Review of Site Suitability for Establishment of Effluent Disposal Fields, Jensen Residential Subdivision, NE 18-53-16-W5M/Highway 16, September 2005
- EXH Engineering Services Ltd., Traffic Impact Assessment, December 2004
- Waterline Resources Inc., Well Evaluation Report, Proposed 42 Lot Residential Subdivision Development, NE-18-53-16-W5M, Near Edson, Alberta, July 2005
- EXH Engineering Services Ltd., Storm Water Management Plan, August 2005
- Genivar Inc., Traffic Impact Assessment, August 2008

The four new lots have been investigated to confirm suitability for effluent disposal fields. A new TIA is not required.

1.2 Policy Context and Background

The Plan Area is located about one mile southeast of the Town of Edson (see Figure 1) within the Edson Urban Fringe Intermunicipal Development Plan area. The Intermunicipal Development Plan recognizes the existing River Ridge country residential use. The site is zoned Country Residential District by the County's Land Use Bylaw.

Figure 1 - Location

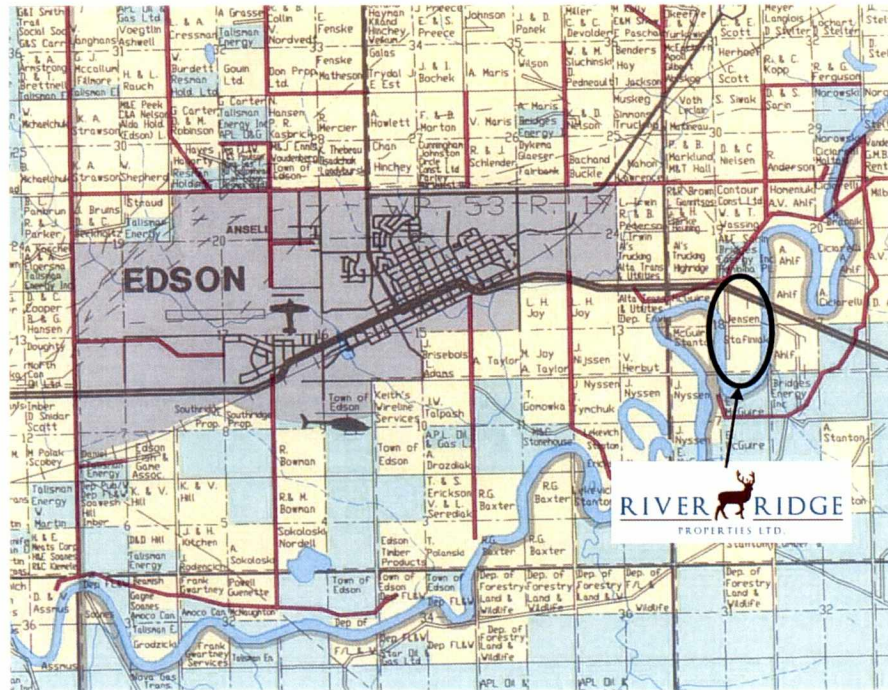
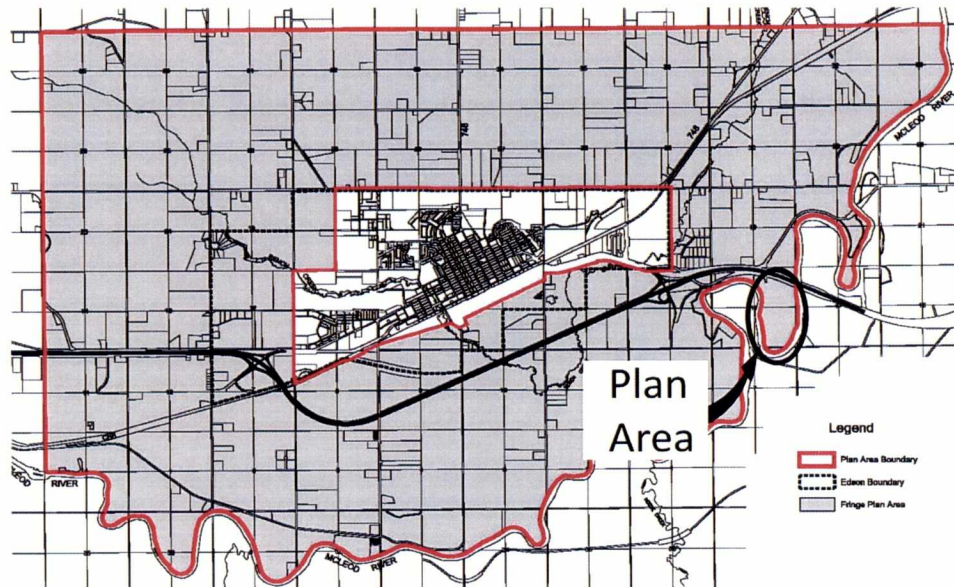


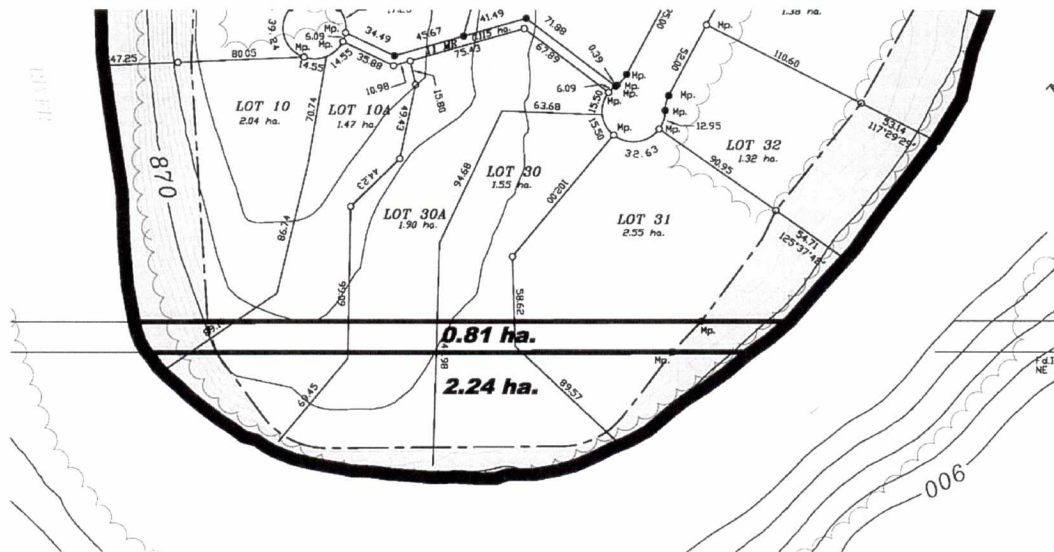
Figure 2 – Edson Urban Fringe Intermunicipal Development Plan Area



1.3 Land Ownership

The Plan Area is under multiple ownership with River Ridge Properties Ltd. owning 10 country residential lots that remain unsold. Also as is noted in Section 1.1, a 0.81 hectare segment of government road allowance and a 2.24 hectare fragment of Crown land located at the south tip of the Plan area (see Figure 3) were purchased in 2012 by River Ridge Properties. This purchase has created the opportunity to create an additional two lots.

Figure 3 – Lands Purchased in 2012



2 EXISTING CONDITIONS

2.1 Location and Surrounding Land Uses

The Plan Area is located just east of Edson and south of Highway 16 in a bend formed by the McLeod River (see Figure 4 - Aerial Photograph). The north boundary is defined by the Highway 16 right-of-way and the service road that provides access to the Plan Area. The boundaries of balance of the Plan area are defined by the McLeod River.

Because the River Ridge site is bounded on three sides by a major river, it provides a development opportunity that, in terms of natural amenities and aesthetics features, is unique and unparalleled in the Edson region. Views towards the Eastern Slopes and the Rocky Mountains, as well as river vistas, exist all along the entire west side of the Plan Area that rises sharply some 30 metres above the water's edge. The east and south sides slope more gently towards the McLeod River providing pedestrian access opportunities.

Surrounding land uses are predominantly agricultural and natural forested areas that are used for grazing. Some hay crop production is evident on parcels located directly south and west of the McLeod River, and an industrial park is located to the northwest across Highway 16, adjacent the Town of Edson. Further south, the lands are predominantly Crown owned.

The River Ridge site is well buffered from adjacent lands by the McLeod River and Highway 16 so that the country residential use of the site is compatible with adjacent land uses.

Figure 4 - Aerial Photo



2.2 Existing Land Use and Access

As is noted in Section 1.2, the Plan area has been subdivided into 43 country residential lots. All but 10 have been sold attesting to the desirability of the area for residential purposes. Twenty five lots are developed.

The area is accessed by an extension of the service road that connects to Highway 16 about ½ miles west of River Ridge. This internal access road has been extended into the Plan Area. A second road that intersects with the south extension has been built to access the east portion of the area. All roads have been constructed to County standard.

2.3 Natural Features and Topography

River Ridge is covered by natural forest comprising tree species such as Black Spruce, White Poplar and White Pine. A well developed under storey exists.

The Plan Area comprises two distinct topographic features including the westerly upland plateau and the easterly lower terrace. Three slopes define the two features that are shown on Figure 5. A top-of-bank setback and slope stability assessment for River Ridge has been completed by Thurber Environmental Ltd. As is noted in Section 1.1, this report was submitted along with the existing Area Structure Plan.

The assessment concludes, based on site inspection and examination of aerial photographs, that no change to the slopes has occurred over the 53 year period reviewed. The report further concludes that deep seated slope instability along the river slopes is not evident.

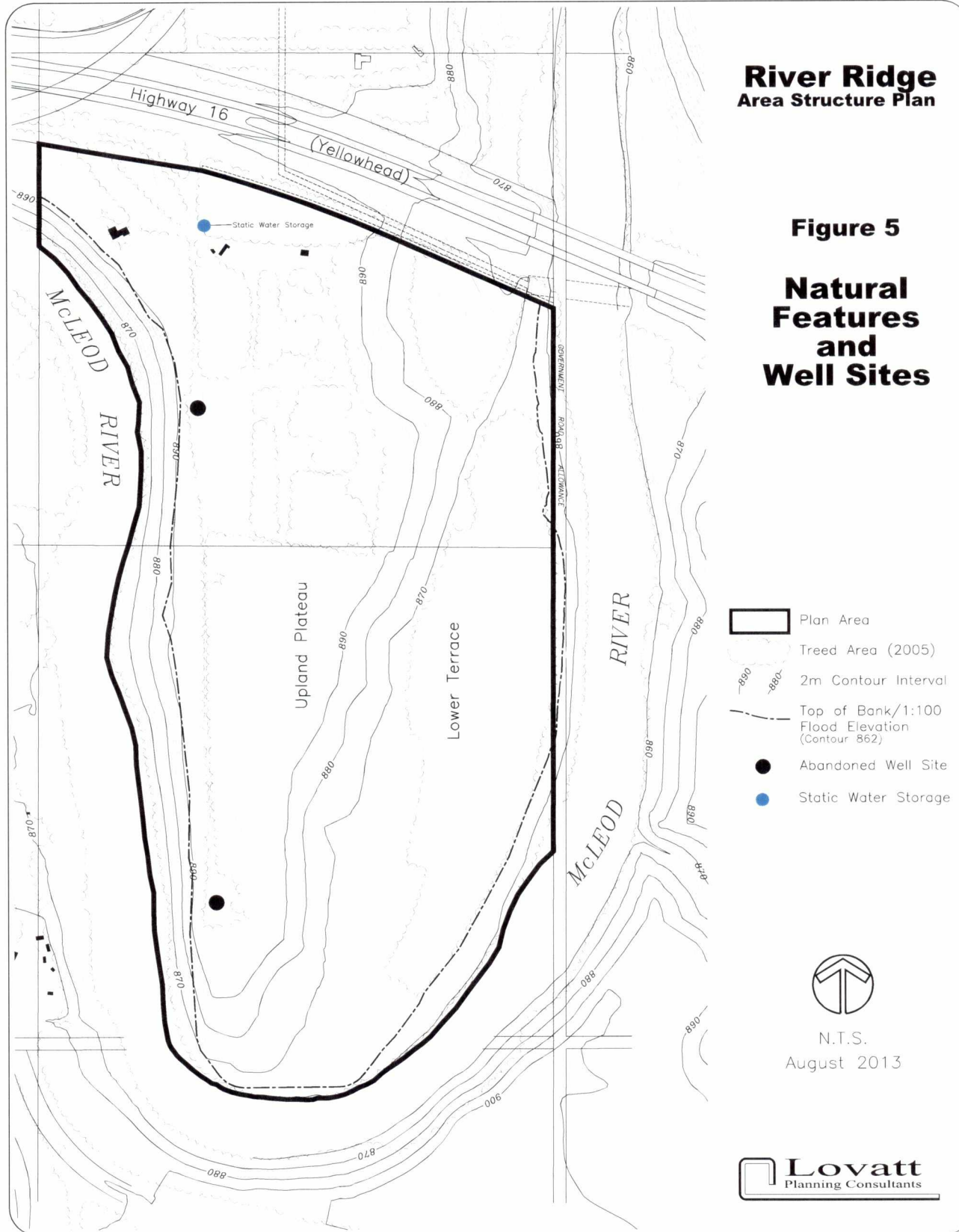
The significant results of the assessment are listed below.

1. The steep **western slope** bordering the upper plateau is about 30 metres high. The slope grade generally varies from 25 to 35 degrees. No sign of tree leaning was observed and the natural tree cover is undisturbed. One active slump was found that, based on surrounding vegetation, is not deep seated. Three inactive slumps were also found. No signs of active or ancient slumping exist on the balance of the western slope. Also, no sign of seepage was observed. Finally, no signs of active erosion were found although several well vegetated shallow water courses drain the plateau.
2. The **eastern slope** along the McLeod River is well vegetated and is three to four metres high between the floodplain and the top of the bank, with a grade of about 25 degrees. No signs of slope instability were observed.
3. The **intermediate slope** separating the upper plateau from the lower terrace is also well vegetated. This slope is about 20 metres high with a 15 to 25 degree grade. Once again, no slumping is evident.
4. The Thurber report concludes that the 20 metre setback from the top of the bank of all slopes, as required by the County's Land Use Bylaw, is suitable for the construction of permanent dwellings. The mature vegetation that covers all three slopes is considered a major contributor to slope stability. As such, no disturbance of the natural vegetation should occur on, or within, five metres of the tops of the bank.
5. Permanent structures may be acceptable in some locations within 20 metres of the top of the bank subject to a site specific geotechnical assessment.

River Ridge Area Structure Plan

Figure 5

Natural Features and Well Sites



6. Development guidelines are also provided by the Thurber report. The most significant of these guidelines in terms of the Area Structure Plan is that surface runoff be controlled. Control of stormwater draining off roofs and driveways on each proposed lot has been addressed through proper grading and orientation of downspouts. Additional surface water should not be directed towards the slopes. Storm water is being managed on site through ditches that direct flow to a single storm water management facility.

Anecdotal evidence suggests that flood waters have extended onto a small portion of the east terrace where a shallow dip in the slope is evident. However, extensive flooding has not been experienced and is not likely to occur given the height and grade of the slopes, even along the lower east terrace.

Alberta Transportation applied the 1954, 1:100 year flood elevation of 861.97 metres in designing for the High Water Level of the Highway 16 Bridge crossing of the McLeod River located at the northeast corner of the Plan Area. This elevation is accepted by Alberta Environment and Sustainable Resource Development (AESRD) as being *conservatively high* considering that Alberta Transportation includes a safety factor in designing permanent structures such as bridges. AESRD has indicated that the *Alberta Transportation flood information in the best available and can be used as a design criteria for the River Ridge subdivision design*. The 861.97 (862) metre contour corresponds to the surveyed top of the bank along the east side of the Plan Area as shown on Figure 5. AESRD recommends that a 0.5 metre *freeboard* be considered in determining suitable building sites.

2.4 Environmental Site Assessments

Two abandoned oil well sites linked by an abandoned pipeline exist on the upper plateau. The well sites are shown on Figures 4 and 5. A Phase I Environmental Site Assessment (ESA) prepared by EXH Engineering Service Ltd. in July 2005 in accordance with Canadian Standards Association Z768-01 guidelines determined that the two wells are being reclaimed under the provincial Orphan Well Program, and that any contamination issues are very localized and do not affect the suitability of the Plan Area for residential development. Specific comments, conclusions and recommendations of the Phase I Assessment report, which has been submitted to the County along with this Area Structure Plan, are as follows:

1. An historical review of the property indicates that there have been two oil wells and a pipeline on the property. The oil wells are being reclaimed under the Orphan Well Program. The abandoned pipeline may have been partially removed.
2. There have been no environmental charges laid against the current or past owners of the site pursuant to the Alberta Protection and Enhancement Act.
3. An Environmental Protection Order was issued on July 13, 1997 for the well sites on the property.
4. A spill of 1-2 litres of transformer oil was reported on the site, but was deemed a non-reportable incident by AESRD as PCB levels in the oil were below regulatory thresholds, and the amount of oil spilt was deemed to be minimal.
5. There are no known underground storage tanks on the site or in the immediate area.
6. The well sites were *handed over* to the Orphan Well Association (OWA) for reclamation.
7. Approximately 1,000 tonnes of contaminated soils were removed from the well sites by OWA and replaced with clean fill.

8. A Phase II Analysis done by Soils Solutions Environmental Consulting Ltd. found that there are several contaminants found in the soil on the well sites that exceed the assessment criteria.
9. An inspection of the site revealed no visual indicators of environmental concerns.
10. There have been no known leaks or spills from the abandoned oil pipeline on the property and surface land above the pipeline has been reclaimed.
11. Garbage has not been stored or buried on the site.

It is important to note that a site inspection in April of 2005 conducted as part of the Phase I Assessment found no evidence of oil seepage. Visual evidence of seepage includes surface staining, stress on vegetation, or discoloration or residue on standing water. Regardless, development on the well sites should not occur until remediation is complete and reclamation certificates have been issued.

Since the completion of the ESA in 2005, reclamation certificates have been issued for the well sites and the pipeline has been removed by lot owners.

2.5 Soils and Near Surface Groundwater Table

EXH Engineering Services Ltd. drilled three test holes on August 10th, 2005 in compliance with the Alberta Private Sewage Systems of Practice, January 1999. Two test holes were drilled on the Lower Terrace and the third was drilled on the Upper Plateau. The test hole locations are considered to be generally representative of the Plan Area. Percolation testing was undertaken and water table depths were measured.

At a depth of 2.7 metres to 3.8 metres, no water was encountered so that the groundwater table is lower than the AESRD standard of 1.8 metres for roadway and basement construction purposes. This depth is also lower than the 1.5 metre minimum separation between the lowest point where sewage effluent is discharged in a disposal field and the water table, as prescribed by Standard of Practice. The Plan Area is suitable for establishing wastewater disposal fields and fields have been constructed as part of on-site sewage disposal systems.

The four lots being proposed have been investigated by Genivar for suitability for wastewater disposal fields (see Appendix A). Test holes were dry at 3.0 metres.

2.6 Historical Resources

The Cultural Facilities and Historical Resources Division of Alberta Community Development require a Historical Resources Impact Assessment for archaeological resources be undertaken for the Plan Area pursuant to the Historical Resources Act. To that end, an Assessment has been undertaken and was filed with the Historical Resources Division. The assessment determined that the site contains no historically significant *finds*. Alberta Culture approved an Application for Historical Resources Act Clearance on May 30, 2013 (see Appendix C).

2.7 Public Input

Yellowhead County provided a list of landowners in 2005 who are located adjacent or near the Plan Area and, therefore, may potentially be affected by the country residential subdivision. The owner of the River Ridge Plan Area was successful in personally contacting 12 of the 14 landowners listed. Information regarding the Development Concept was provided, and comments solicited. No significant concerns were expressed.

2.8 Development Implications

1. In terms of natural amenities and aesthetics features, River Ridge provides a unique development opportunity in the Edson region. The site is bounded on three sides of the McLeod River so that views towards the Eastern Slopes, as well as river vistas, exist all along periphery of the Plan Area.
2. The east and south sides of the Plan Area slope gently towards the McLeod River providing pedestrian access opportunities to the river, particularly along the east side where public (Crown) owned land extends along much of the river frontage just beyond the Plan Area.
3. The River Ridge site is well buffered from adjacent lands by the McLeod River and Highway 16 so that the country residential use of the site is compatible with adjacent land uses.
4. The existing service road that connects to Highway 16 has been extended south into the Plan Area to provide access to the upper plateau. An internal subdivision road has been constructed to access the lower terrace.
5. The vegetation that covers much of the Plan Area, combined with the cleared meadow land located on the lower terrace, creates an attractive varied natural setting for accommodating low density residential uses.
6. The Thurber top-of-bank setback and slope stability assessment report concludes that the 20 metre setback from the top of the bank of all slopes, as required by the County's Land Use Bylaw, is suitable for the construction of permanent dwellings.
7. The Thurber report also recommends that the mature vegetation that covers all three slopes is considered a major contributor to slope stability and, therefore, no disturbance of the natural vegetation should occur on, or within, five metres of the tops of the bank. The residential lots are all a minimum of 1.0 hectare in size and are large enough to allow for the required setbacks.
8. Finally, the Thurber report recommends that no additional surface water be directed towards the slopes so storm water is being managed and stored on site.
9. The 1954, 1:100 year flood elevation of 861.97 metres can be used as a design criteria for the River Ridge subdivision based on feedback from AESRD. This 861.97 (862) metre contour corresponds to the surveyed top of the bank along the east side of the Plan Area. All lots located adjacent the east Plan Area boundary also allow for AESRD's recommendation for a 0.5 metre *freeboard* for a 1:100 year flood event.
10. The two well sites have been reclaimed under the OWP and reclamation certificates have been issued.
11. Percolation testing and near surface groundwater conditions indicate that the Plan Area is suitable for on-site sewage disposal systems.
12. An update of the Waterline Resources 2005 Report Well Evaluation Report concludes that the underlying aquifer will support the four new lots without impacting adjacent users.
13. No historically significant archaeological resources have been located on the site.
14. No significant concerns were expressed by adjacent or nearby landowners.

3 DEVELOPMENT CONCEPT

3.1 Development Objective

The primary development objective of the River Ridge Area Structure Plan remains unchanged. It is to create an attractive country residential community in a unique natural setting that protects the exceptional physical amenities of the Plan Area, while optimizing the superb view towards the Rocky Mountains and the McLeod River. The development concept shown on Figure 6 and the registered plan of subdivision reflect this objective while recognizing the implications listed in Section 2.8.

The major design elements of the concept which respond to the above noted objective are listed below.

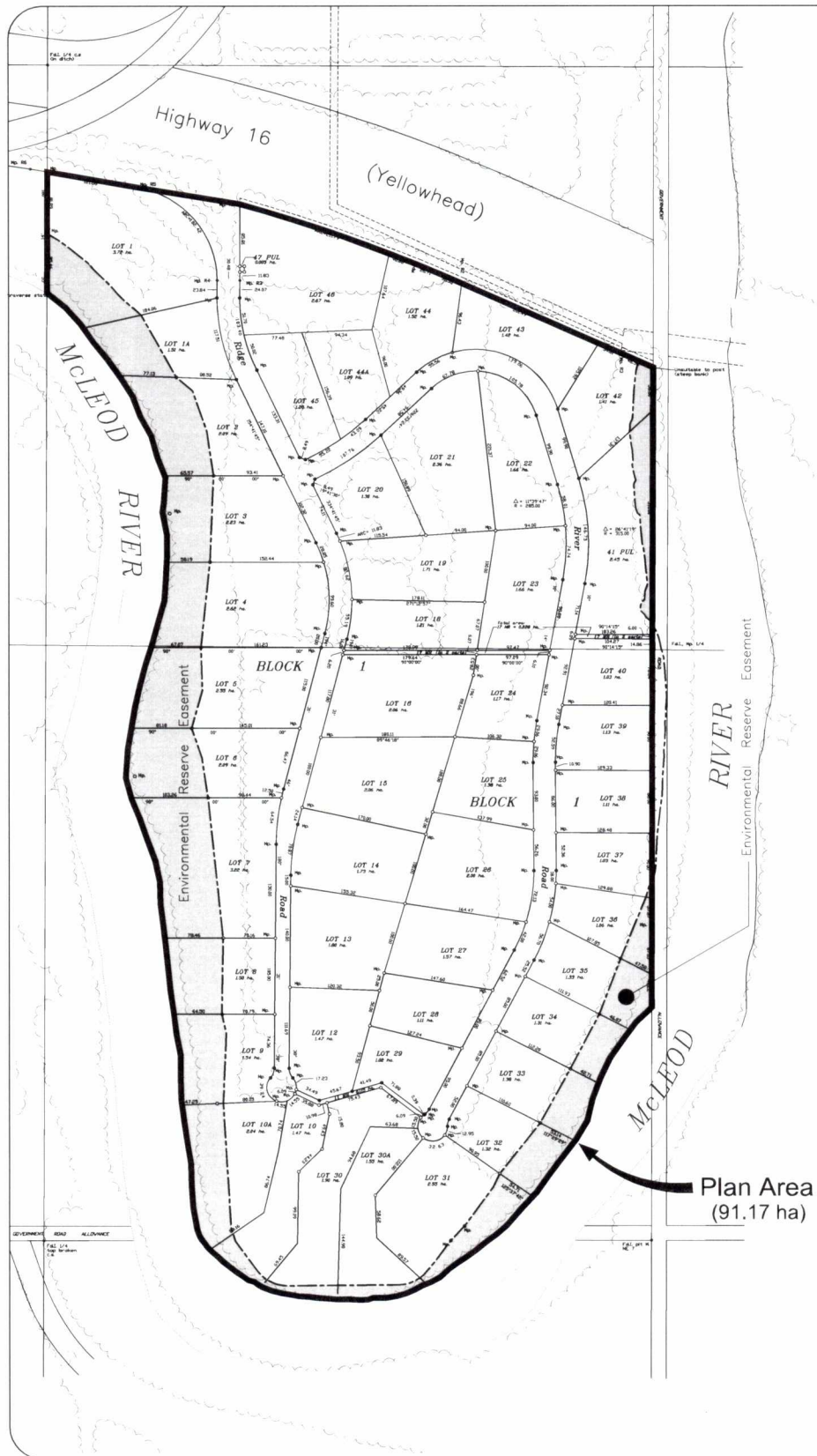
1. The two roads that extend into the Plan Area recognize the two significant topographic features that comprise River Ridge including the upper plateau and the lower terrace, and protect the integrity of the slopes that define these features, including the intermediate slope.
2. Because the roads follow the natural topography of the area, disturbance of the natural environment is minimized.
3. The number of view lots and river access lots is maximized while the length of road is minimized.
4. All proposed lots include an amenity feature, be it the western escarpment that provides for views, the gentle east slope that allows for river access, or the central spine lots that each contain a segment of the intermediate slope creating interest and topographic relief.
5. Excepting three lots located along the east side of the Plan Area, all lots encompass natural vegetation that is particularly well developed and attractive.
6. Most lots are well in excess of 1.0 hectare in size as required by the Land Use Bylaw. The size of lots will allow for the 15 to 20 metre building separation recommended by Fire Smart.
7. Each lot contains a 1.0 acre (0.4 hectare) developable area as per the County's Land Use Bylaw and AESRD's Standards for Unserved Subdivisions.
8. A Public Utility Lot is located in the northeast corner of the Plan Area and contains a storm water management facility.
9. Two trail linkages exist between the upper plateau and the lower terrace so that pedestrian access to the McLeod River is available to all residents.
10. An Environmental Reserve Easement provides for 6.0 metre setback from the top of the bank of the McLeod River to the water's edge so that the bank will be protected in perpetuity. The easement follows the top-of-bank contour and is of particular value in protecting the western escarpment. The vegetation along and below the top of the bank is also be protected so that slumping will be controlled.

River Ridge

Area Structure Plan

Figure 6

Development Concept



N.T.S.

August 2013

11. An attractive entrance feature has been provided at the entrance to River Ridge to promote a sense of community.
12. A high standard of residential development is promoted through architectural and other controls, such as dwelling size.

The four new lots being created include:

- Lot 1A that is the result of resubdividing Lot 1. Both lots are larger than 1.0 hectares.
- Lot 10 A that has been created as a result of the land purchase at the south end of the area.
- Lot 30 A that also has been created because of the additional land purchased.
- Lot 44A that has been created by reconfiguring lot lines

The two new lots at the south end of the Plan area offer privacy, are naturally treed and contain stunning river frontages.

The concept/plan of subdivision result in the following land area distribution:

Table 1 - Land Use Areas (The land area figures will be confirmed at the time of subdivision.)

Gross Developable Area	91.18ha	100%
Municipal Reserve	0.41 ha	0.47%
Public Utility Lots	2.10 ha	2.38%
Roads	7.88 ha	8.94%
Residential	80.79 ha	88.59%

The only Municipal Reserve being dedicated by this Area Structure Plan is the 0.41 hectares of trail. The balance of Municipal Reserve owing has been provided as cash in lieu.

3.2 Development Concept Description

The updated Development Concept results in 47 country residential lots and one Public Utility Lot, as well as two 6.0 metre wide Municipal Reserve trails linking the two internal subdivision roads. The natural trails provide pedestrian access to the river. As is noted above, the size and dimensions of all proposed residential lots comply with the Land Use Bylaw, and a 0.4 hectare developable building area is included in each lot. As is also noted above, the size of most lots is in excess of the 1.0 hectare (2.47 acres) prescribed by the Bylaw. The average lot size in River Ridge is about 1.80 hectares (4.45 acres).

The large lots proposed by this Area Structure Plan has allowed for implementation of a number of Fire Smart recommendations. A static water supply for firefighting purposes is located near the entrance of the subdivision (47 Public Utility Lot).

The relatively large lots located along the east side of the Plan Area also allow for the 0.5 metres of *free board* in regard to the 1:100 year flood elevation that corresponds to the top of the bank. This means that all permanent structures should be located above the 862.5 metre contour interval. However, AESRD does permit the use of fill material to raise the elevation of a lot for building foundation and footing purposes. Existing structures are above the 862.5 metre contour.

Although not part of this Area Structure Plan, architectural guidelines to ensure architectural control are registered as by caveat on all lot titles. The four new titles that are being proposed will be similarly caveated. Applicable Fire Smart standards are also applied. Examples of the types of guidelines include:

- Minimum dwelling size
- roofing (non-combustible) and type of siding material for dwellings and accessory structures
- restrictions on manufactured homes
- wood burning appliances and fireplaces require spark arrestors
- clearing of minimum 10 metre fire fuel buffer around each structure

In applying guidelines through the use of restrictive covenants, a high standard living environment can be promoted and maintained, and property values may be better protected.

3.3 Population and School Generation

Population and students generated by the plan area are summarized below. Population projections assume a density of 3.1 persons per dwelling unit, while school generation assumes 1.2 students per dwelling unit.

Table 2 – Population and School Generation

Population	146 persons
Projected Student Generation	57 students

Students will be integrated into the Grande Yellowhead Public School Division #77 and Living Waters Catholic Regional Division #42, and will be bussed to schools located in Edson.

All other community services such as police and fire protection are available through the County and/or the Town of Edson that is located just west of River Ridge. Any service provided by Edson will be in accordance with existing community service agreements between the County and the Town.

4 CIRCULATION AND MUNICIPAL SERVICES

4.1 Circulation

A Traffic Impact Assessment (TIA) prepared by Genivar (EXH Engineering Services Ltd.) in December of 2004 was submitted to Alberta Transportation and Yellowhead County. It is important to note that the TIA assumed 50 lots will be developed. Both acceleration and deceleration lanes are required on Highway 16 and River Ridge Properties will participate in the cost. Genivar has prepared a construction plan for the improvements. The internal subdivision roads and all approaches comply with County standards.

4.2 Municipal Services

Waterline Resources Inc. prepared a well evaluation report for the development in July 2005. The report concludes that, based on long term predictive calculations, the subdivision water requirement of 52,500 cubic metres per year (1,250 cubic metres per household) can be sustained by the aquifer systems underlying the Plan area, and that the managed diversion of groundwater will not negatively impact existing adjacent users. This means that the Plan Area can be serviced with on-site water wells. Waterline Resources in the addendum letter contained in Appendix B confirms that the underlying aquifers can support four additional lots without impacting adjacent users. The report also concludes that the quality of the groundwater for potable purposes is typical of the area, and generally meets the Canadian Drinking Water Quality Guidelines.

The EXH/Genivar Review of Site Suitability for Establishment of Effluent Disposal Fields report noted in Section 2.5 concludes that the Plan Area appears suitable for establishing wastewater disposal fields. The four additional lots are also suitable. All private sewage disposal systems will be required to comply with the Alberta Private Sewage Systems Standards of Practice.

To protect the integrity of the underlying groundwater table and aquifer, as well as the water quality of the McLeod River, a caveat is registered on title of all existing lots requiring the installation of the **Three Compartment Septic Tank**. This means the sewage is treated in three ways before it is pumped out into a septic field. In the first compartment, anaerobic cleaning of the sewage occurs. Gravity separates the anaerobic solids to the bottom of the chamber and sludge floats to the top. From there, effluent with suspended aerobic particles enters the second compartment where it is introduced to aerobic activity. The remaining effluent is then filtered through a biofilter and enters the third and final compartment where it is pumped out to a field. The effluent that is pumped into the field is referred to *grey water*, and is used in some jurisdiction for irrigation purposes. A caveat will be registered on the titles of the four additional lots requiring that the **Three Compartment Septic Tank** system be installed.

A 2.45 hectare Stormwater Management Facility has been constructed within a Public Utility Lot. The facility includes sufficient *free board* for a 1:100 year or 25 mm storm event. The location of the stormwater management pond is shown of Figure 7. Stormwater is being directed to the pond via roadside ditches.

Figure 7 also shows the location of the static water storage site for on-site fire fighting purposes. The river provides an alternate source.

Figure 7

Municipal Services



 **Lovatt**
Planning Consultants

4.3 Shallow Utilities

Privately operated shallow utility services have been extended into the Plan area from the existing regional systems. These services include buried power, gas from Yellowhead Gas Co-op Gas and Telus facilities. Internet service is available.

5 IMPLEMENTATION AND STAGING

The River Ridge subdivision has been developed in one stage. The addition of four lots will have minimal impact on the existing subdivision. The Country Residential District of the Land Use Bylaw applies to the entire Plan area so that the four lots are already zoned for this purpose.

APPENDIX A –

**ASSESSMENT OF SITE SUITABILITY FOR ESTABLISHMENT OF
EFFLUENT DISPOSAL FIELDS FOR THE PROPOSED SUB-DIVISION
WITHIN NE AND SE 18-53-16-W5**



River Ridge Subdivision Assessment of Site Suitability for Establishment of Effluent Disposal Fields

This document was prepared using the best information available at the time, and to the best of GENIVAR's knowledge it is in full compliance with all requirements, terms, and conditions set out by Yellowhead County.

ASSESSMENT OF SITE SUITABILITY FOR EFFLUENT DISPOSAL FIELDS

August 2013

131-19626-0000



July 31, 2013

GENIVAR File: 131-19626-00

Jim Jensen
Box 7807
Edson, Alberta T7E 1V9

Attention: Mr. Jim Jensen

Re: Assessment of Site Suitability for Establishment of Effluent Disposal Fields for the proposed Sub-Division within NE and SE 18-53-16-W5

GENIVAR was retained by Mr. Jim Jensen to assess the subject property with respect to its suitability for establishment of septic fields for wastewater disposal from proposed residential dwellings. The subject site was identified as **NE and SE 18-53-16-W5, lots 1A, 10A, 30A & 44A.**

The location and configuration of the proposed development is shown on the site sketch, contained in Appendix A.

In general, this review involved the following procedures:

- Observation holes were established at the proposed site locations in order to estimate the separation to the water table, and to classify the soil in accordance to the Canadian System of Soils Classification (CSSC).
- Measure and monitor existing water table elevations at the proposed site locations within the subdivision for the suitability of a residential dwelling.
- Samples of soil were taken at the observation hole to perform hydrometer tests to determine the analysis of the soil.

GENIVAR personnel conducted all tests and site measurements.

This review has been carried out based upon the "*Alberta Private Sewage Systems Standard of Practice, 2009*". The review did not extend to a full site evaluation.

Water Table

With respect to the water table, the Standards of Practice requires that a subsurface effluent disposal system, or other systems that use the absorption of effluent into the soil for treatment and disposal, shall maintain a minimum vertical separation of 1.5m between the lowest points where the effluent infiltrates into the soil. Since the effluent outlet will be placed approximately 0.9m below the ground surface, this means the depth to the water table below the ground surface should be approximately 2.4m.

Water table observation holes were established on July 4, 2013 (See Appendix A, Site Sketch). The holes were excavated to an average depth of 3.00 m. The approximate observation hole locations are shown on the site drawing in Appendix A.

A summary of results is provided in Table 1 below. Numbers have been rounded. The measurements of the water table observation holes can be found in Table 1.

Table 1 – Water Observation Hole Results

Water Table Observation Hole and Lot Number	Reading Number	Date of Initial Measurement	Water Depth Below Surface (m)	Total Hole Depth (m)
Hole 1 Lot 1A	1	July 4 , 2013	dry	3.00
Hole 1 Lot 1A	2	July 13, 2013	dry	
Hole 1 Lot 1A	3	August 1, 2013	dry	
Hole 1 Lot 10A	1	July 4 , 2013	dry	3.02
Hole 1 Lot 10A	2	July 13, 2013	dry	
Hole 1 Lot 10A	3	August 1, 2013	dry	
Hole 1 Lot 30A	1	July 4 , 2013	dry	3.00
Hole 1 Lot 30A	2	July 13, 2013	dry	
Hole1 Lot 30A	3	August 1, 2013	dry	
Hole 1 Lot 44A	1	July 4 , 2013	2.84	3.01
Hole 1 Lot 44A	2	July 13, 2013	2.81	
Hole 1 Lot 44A	3	August 1, 2013	2.79	

For all lots with respect to the observations on the water table measurements, none were measured with a depth below 2.4m from the ground surface. Therefore the water table appears to be sufficient to permit the establishment of standard effluent disposal fields.

Since the water table measurements were taken during the time of the year when the water table is usually at its highest, seasonal adjustments may not be required.

Soil Analysis

Hydrometer tests were conducted to obtain the particle or grain size analysis to establish a soil texture classification (See Appendix B) of the existing soil. A soil grain size analysis is used to determine a soil texture classification that can be related to the hydraulic conductivity of the soil or the rate that the soil will accept water.

As shown in the Table 2 below are the test results for the soil at each lot:

Table 2 – Lot Suitability Results

Location	Soil Type	Effluent Loading Rate (L/Day/Sq.M)		Hydraulic Linear Loading Rate (L/Day/M)
		Effluent Quality 30-150 mg/L	Effluent Quality <30mg/L	
Lot 1A Hole 1	Silty Clay	6.9	9.8	44.7
Lot 10A Hole 1	Clay Loam	13.2	22.0	50.7
Lot 30A Hole 1	Gravel	N/A	N/A	N/A
Lot 44A Hole 1	Heavy Clay	4.4	7.8	38.8

The soil profiles were classified as per “The Canadian System of Soil Classification”. Based on the soil analysis/classification results, Lot 1A, 10A and 44A have been determined to be suitable for a standard disposal field, subject to confirmation of the maximum daily effluent loading rate. Lot 30A has been determined to be unsuitable for a standard disposal field to accept the effluent loading rate.

Additional Considerations

It may be possible to dispose of effluent by creating a sufficient layer of suitable material between the disposal point and the water table, and disposing of the water through both downward movement and evaporation. This is usually done through the construction of mounds.

A mound is a seepage bed elevated by clean fill. The sand cap helps avoid undue soil compaction so that pore spaces within the underlying layers are maintained. A covering of 150mm of topsoil and vegetation helps draw moisture up for disposal by evaporation. The minimum vertical separation between the bottom of the mound rock bed and the restricting soil layer should be maintained. The location of a mound will depend upon the topography of the site. Refer to Section 8.4 of "*Alberta Private Sewage Standard of Practice 2009*".

The design of the mound system is based on expected daily wastewater, daily volume and natural soil characteristics. This information provided is very general. An enhanced mounding system is required to provide treatment of the wastewater constituents before discharge from the mound percolating directly into the in-situ soil. Mound system must be designed by a licensed professional engineer.

Sewage Lagoon

Sewage lagoon is shallow, artificial ponds that are lined to prevent downward movement of effluent into the soil and groundwater. This sewage system stabilizes effluent over time by providing an environment that allows for evaporation and breakdown of sewage components by bacteria and algae.

Grey Water Options

Grey water is wastewater from bathing, washing and laundry, but does not contain toilet wastes, food wastes, dirt or other contaminants (known as blackwater). It can be treated in a private septic system, and can be re-used for irrigation, but only on non-food plants. When it is separated from grey water, it reduces the storage capacity required for the black water which needs to be trucked to a proved facility for further treatment.

In general any solution would have to be specific to the site and the proposed development, and be in full compliance with the "*Alberta Private Sewage Systems Standards of Practice, 2009*".

The "*Alberta Private Sewage Systems Standard of Practice, 2009*" identifies a number of considerations with respect to placement of a disposal field. With respect to offset distance requirements, these include:

- 1.5 m from a property line,
- 90 m from a permanent body of water, such as a river, stream or creek,
- 15 m from a water source,
- 15 m from a water course,
- 9 m from a basement, cellar or crawl space,
- 5 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 layout or specific septic field / mound locations or percolation rates.

Conclusions and Recommendations

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

- Initial water table observations indicate sufficient separation between the bottom of the field and the water table.
- Soil conditions in the active treatment horizon appear to be silty clay for Lot 1A, clay loam for Lot 10A, gravel for Lot 30A, and heavy clay for Lot 44A.
- The Lot 1A, 10A and 44A appears to be suitable with respect to establishment of standard effluent disposal fields due to the material in the soil for the lots.
- The Lot 30A appears to be unsuitable with respect to establishment of standard effluent disposal fields due to the material in the soil for the lots.
- The location of a disposal field or treatment facility could be limited by site features, such as proximity to watercourses, existing dwellings, slopes and similar issues.
- If the site is considered sensitive, alternate methods of sewage treatment and disposal should be investigated.
- Percolation tests were not performed instead hydrometer tests (Grain or Particle Size Analysis) were done to establish a percentage of sand, silt and clay particles in the soil sample to determine (using the soil classification chart) how coarse (sandy) or fine (clayey) the soil is, affects the ability of the soil to transmit air and water or effluent.
- All work, and subsequent measurements, should conform to the requirements of the "*Alberta Private Sewage Systems Standard of Practice, 2009*".

Closure

This review is based upon the measurements and observations 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 GENIVAR.

River Ridge Subdivision
NE and SE 18-53-16-W5
July 31, 2013
Page 6 of 7

Prepared By:

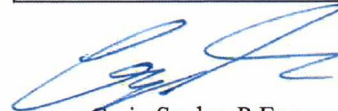


Aug 16, 2013

Yujing Li, P.Eng.
Doug Laboucane, GENIVAR

Reviewed By:

PERMIT TO PRACTICE
GENIVAR Inc.
PERMIT NUMBER: P07641
The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

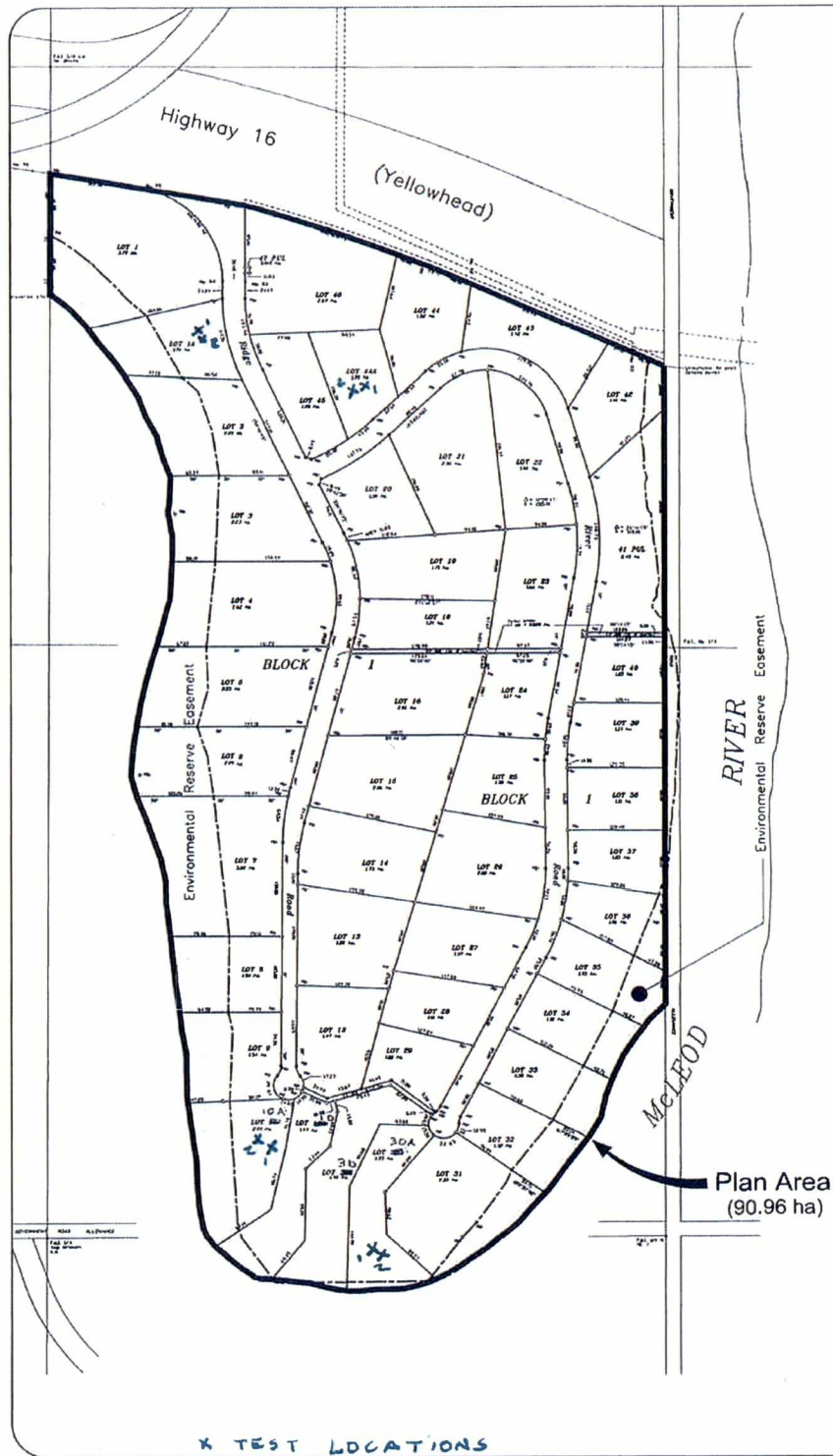


Craig Suchy, P.Eng.

Appendix A - Site Sketch

River Ridge Area Structure Plan

**Figure 6
Development
Concept**



N.T.S.
August 2013

Lovatt
Planning Consultants

APPENDIX B



**PARTICLE SIZE DISTRIBUTION
HYDROMETER ANALYSIS
ASTM D422**

General Information

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	0
SAMPLE LOCATION	Lot 1A - Sample 1	1-1.5 m	SAND (0.074mm-4.75mm)	%	1
DATE	July 12, 2013		SILT (0.074mm-0.005mm)	%	50
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	49

Raw Data

TOTAL SAMPLE WT.	(g)	3255.0
WT. RETAINED > 4.75mm	(g)	0.0

Hydrometer Info

Moisture Content

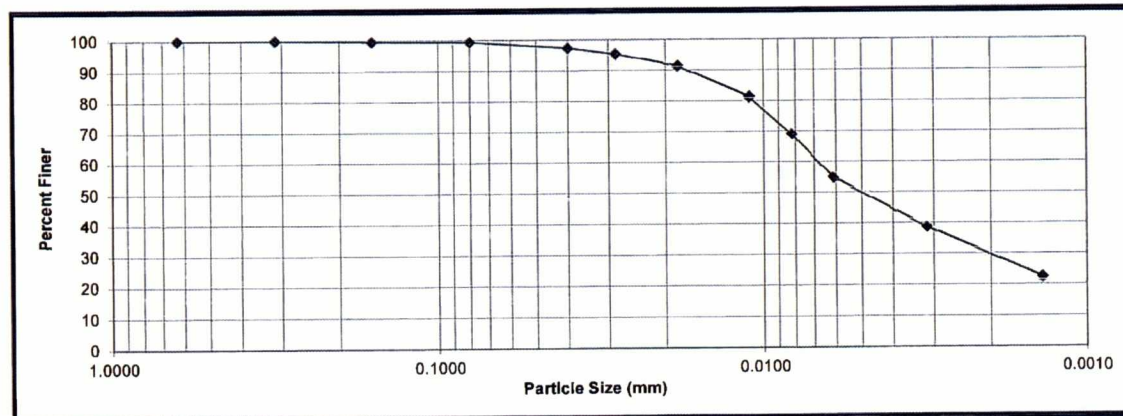
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.3
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	109.2
SPECIFIC GRAVITY (Gs)	(kg/m ³)	WT. OF PAN + OVEN DRIED SAMPLE	(g)	105.8
AIR DRY WT. OF TEST SPECIMEN	(g)	WT. OF WATER	(g)	3.4
k-FACTOR (from table)	0.01378	WT. OF OVEN DRIED	(g)	97.5
CORRECTED SAMPLE WT.	(g)	HYGROSCOPIC MOISTURE CONTENT	(%)	3.49

Sieve Analysis on Material from Hydrometer Test

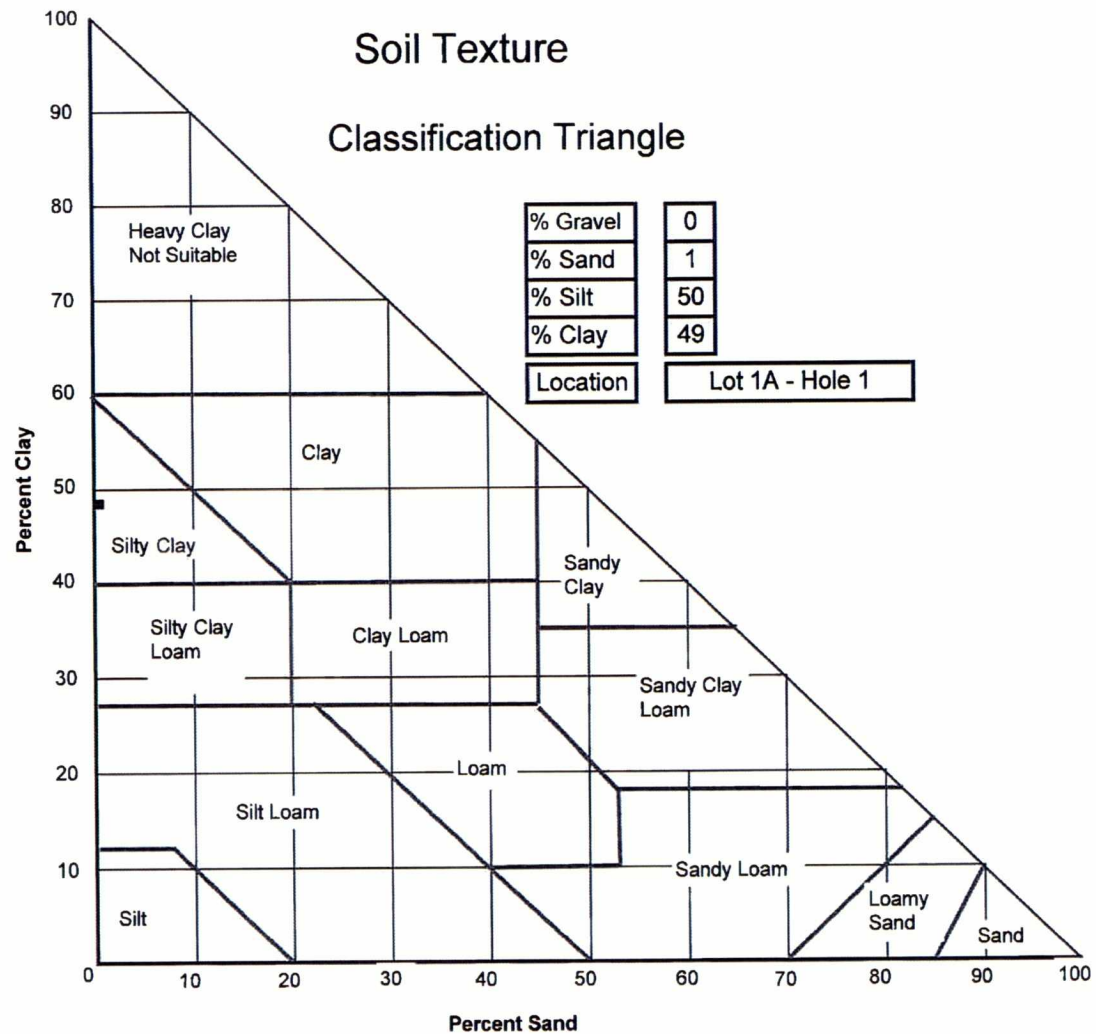
SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	48.3	100.00	1.2500
630	0.0	48.3	100.00	0.6300
315	0.0	48.3	100.00	0.3150
160	0.2	48.1	99.59	0.1600
80	0.1	48.0	99.38	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	55	48	8.4	97.36	0.0400
2	54	47	8.6	95.33	0.0285
5	52	45	8.9	91.28	0.0184
15	47	40	9.7	81.13	0.0111
30	41	34	10.7	68.96	0.0082
60	34	27	11.9	54.77	0.0061
250	26	19	13.2	38.54	0.0032
1440	N/A	n/a	14.5	22.31	0.0014



Soil Texture Classification Triangle





General Information

PARTICLE SIZE DISTRIBUTION HYDROMETER ANALYSIS ASTM D422

Test Results

CLIENT	River Ridge Estates	GRAVEL (>4.75mm)	%	0
SAMPLE LOCATION	Lot 1A - Sample 2 2m	SAND (0.074mm-4.75mm)	%	0
DATE	July 12, 2013	SILT (0.074mm-0.005mm)	%	46
LAB TECHNICIAN(S)	D. Nanowski	CLAY(<0.005mm)	%	54

Raw Data

TOTAL SAMPLE WT.	(g)	1987.6
WT. RETAINED > 4.75mm	(g)	0.0

Hydrometer Info

HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.6
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	109.1
SPECIFIC GRAVITY (Gs)	(kg/m ³) 2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	106.0
AIR DRY WT. OF TEST SPECIMEN	(g) 50.0	WT. OF WATER	(g)	3.1
k-FACTOR (from table)	0.01378	WT. OF OVEN DRIED	(g)	97.4
CORRECTED SAMPLE WT.	(g) 48.5	HYGROSCOPIC MOISTURE CONTENT	(%)	3.18

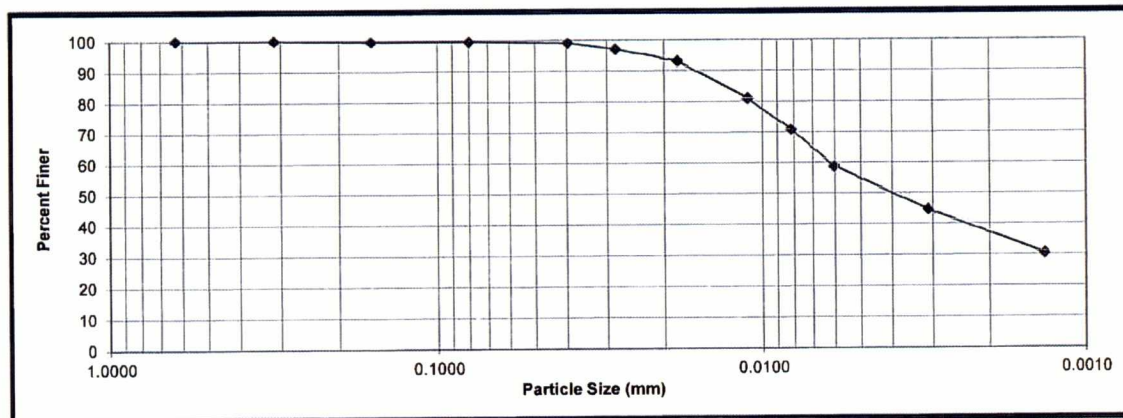
Moisture Content

Sieve Analysis on Material from Hydrometer Test

SIEVE SIZE (μm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	48.5	100.00	1.2500
630	0.0	48.5	100.00	0.6300
315	0.0	48.5	100.00	0.3150
160	0.2	48.3	99.59	0.1600
80	0.0	48.3	99.59	0.0800

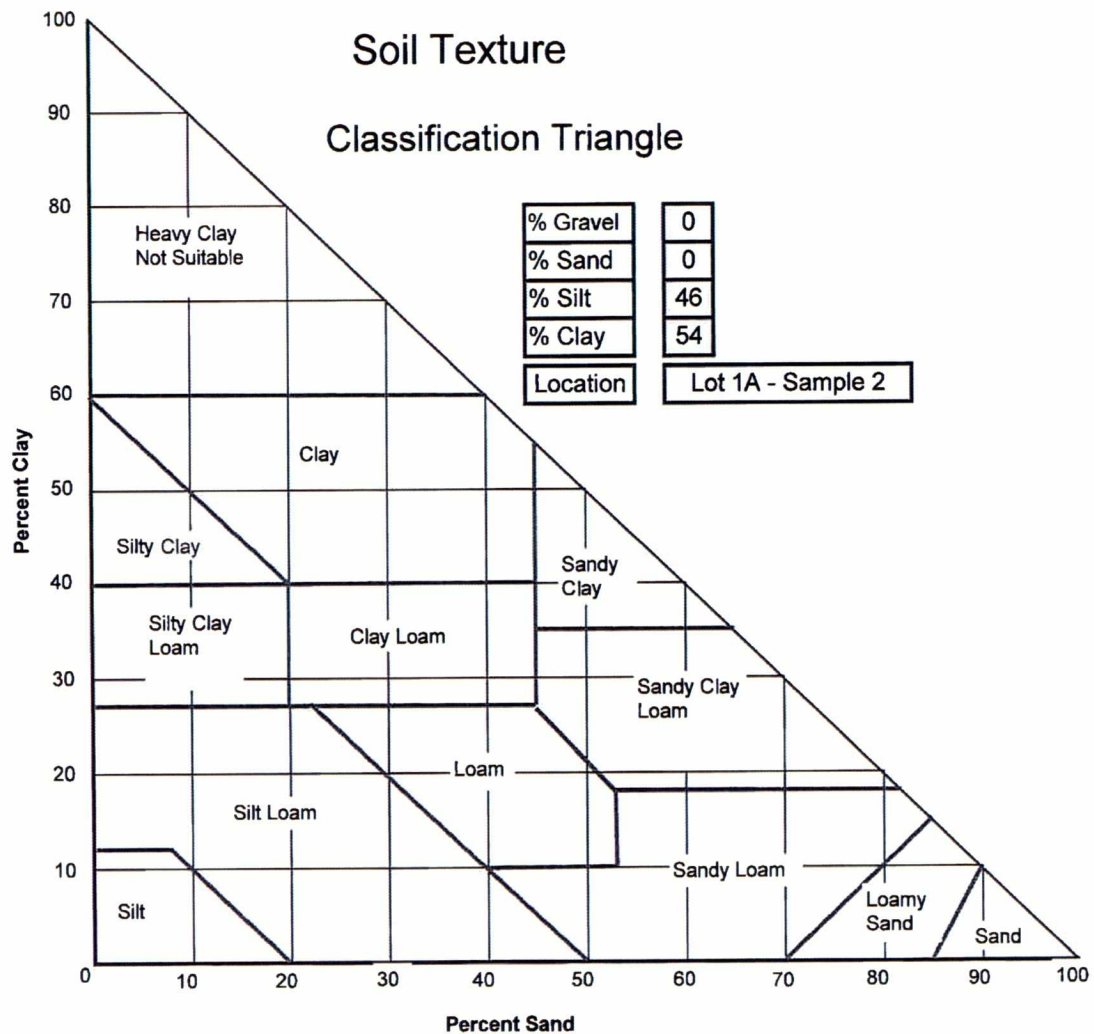
Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	56	49	8.3	99.10	0.0396
2	55	48	8.4	97.07	0.0283
5	53	46	8.7	93.03	0.0182
15	47	40	9.7	80.90	0.0111
30	42	35	10.6	70.78	0.0082
60	36	29	11.5	58.65	0.0060
250	29	22	12.7	44.49	0.0031
1440	N/A	n/a	13.8	30.34	0.0014



Soil Texture

Classification Triangle





**PARTICLE SIZE DISTRIBUTION
HYDROMETER ANALYSIS
ASTM D422**

General Information

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	2
SAMPLE LOCATION	Lot 10A - Sample 1	1-1.5 m Depth	SAND (0.074mm-4.75mm)	%	32
DATE	July 12, 2013		SILT (0.074mm-0.005mm)	%	31
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	35

Raw Data

TOTAL SAMPLE WT.	(g)	3049.4
WT. RETAINED > 4.75mm	(g)	49.6

Hydrometer Info

Moisture Content

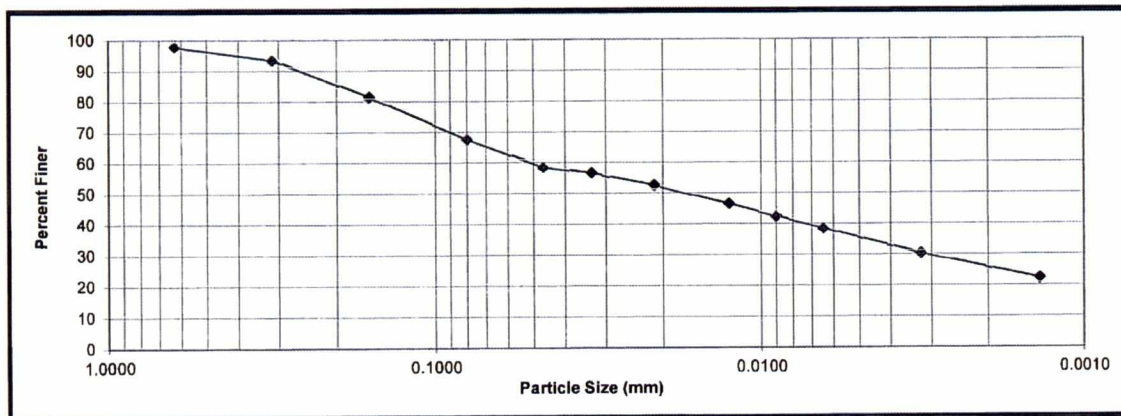
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.5
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	108.8
SPECIFIC GRAVITY (Gs)	(kg/m ³) 2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	104.5
AIR DRY WT. OF TEST SPECIMEN	(g) 50.0	WT. OF WATER	(g) 4.3	
k-FACTOR (from table)	0.01378	WT. OF OVEN DRIED	(g) 96	
CORRECTED SAMPLE WT.	(g) 47.9	HYGROSCOPIC MOISTURE CONTENT	(%) 4.48	

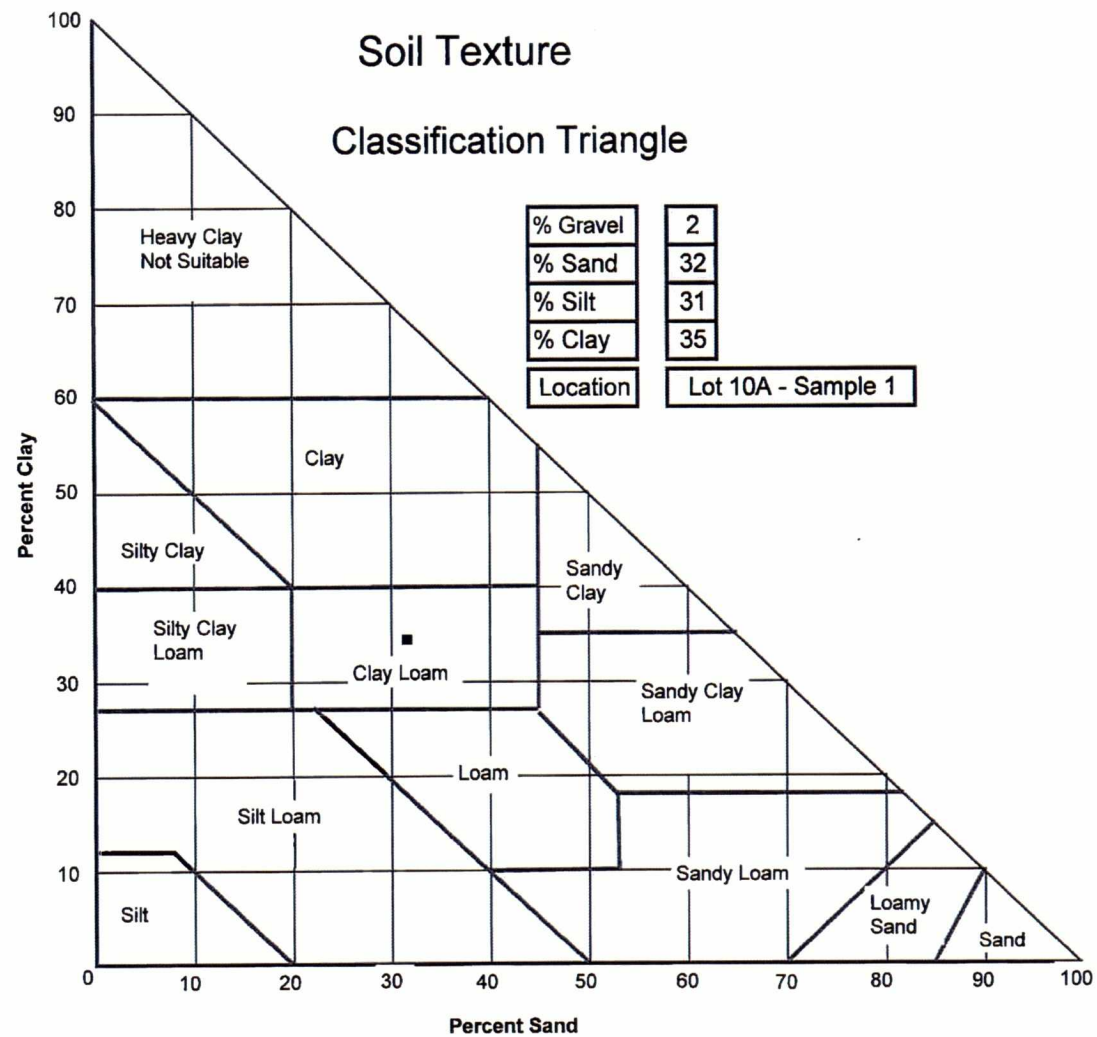
Sieve Analysis on Material from Hydrometer Test

SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	47.9	98.37	1.2500
630	0.3	47.6	97.76	0.6300
315	2.1	45.5	93.44	0.3150
160	5.9	39.6	81.31	0.1600
80	6.7	32.9	67.54	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	36	29	11.5	58.42	0.0468
2	35	28	11.7	56.41	0.0333
5	33	26	12.0	52.38	0.0214
15	30	23	12.5	46.33	0.0126
30	28	21	12.8	42.30	0.0090
60	26	19	13.2	38.28	0.0065
250	22	15	13.8	30.22	0.0032
1440	N/A	n/a	14.5	22.16	0.0014







**PARTICLE SIZE DISTRIBUTION
HYDROMETER ANALYSIS
ASTM D422**

General Information

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	2
SAMPLE LOCATION	Lot 10A - Sample 2	2m Depth	SAND (0.074mm-4.75mm)	%	32
DATE	July 12, 2013		SILT (0.074mm-0.005mm)	%	34
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	32

Raw Data

TOTAL SAMPLE WT.	(g)	2169.5
WT. RETAINED > 4.75mm	(g)	36.3

Hydrometer Info

Moisture Content

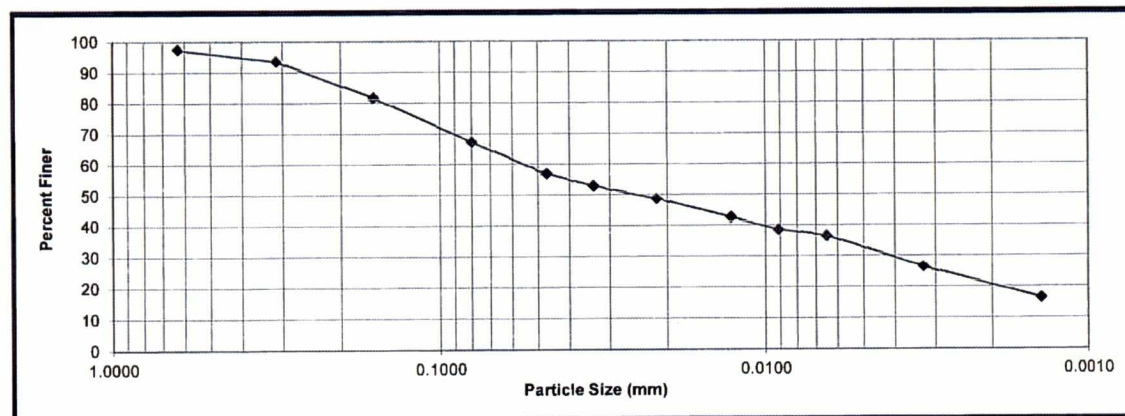
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.3
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	108.6
SPECIFIC GRAVITY (Gs)	(kg/m ³) 2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	103.7
AIR DRY WT. OF TEST SPECIMEN	(g) 50.0	WT. OF WATER	(g) 4.9	
k-FACTOR (from table)	0.01378	WT. OF OVEN DRIED	(g) 95.4	
CORRECTED SAMPLE WT.	(g) 47.6	HYGROSCOPIC MOISTURE CONTENT	(%) 5.14	

Sieve Analysis on Material from Hydrometer Test

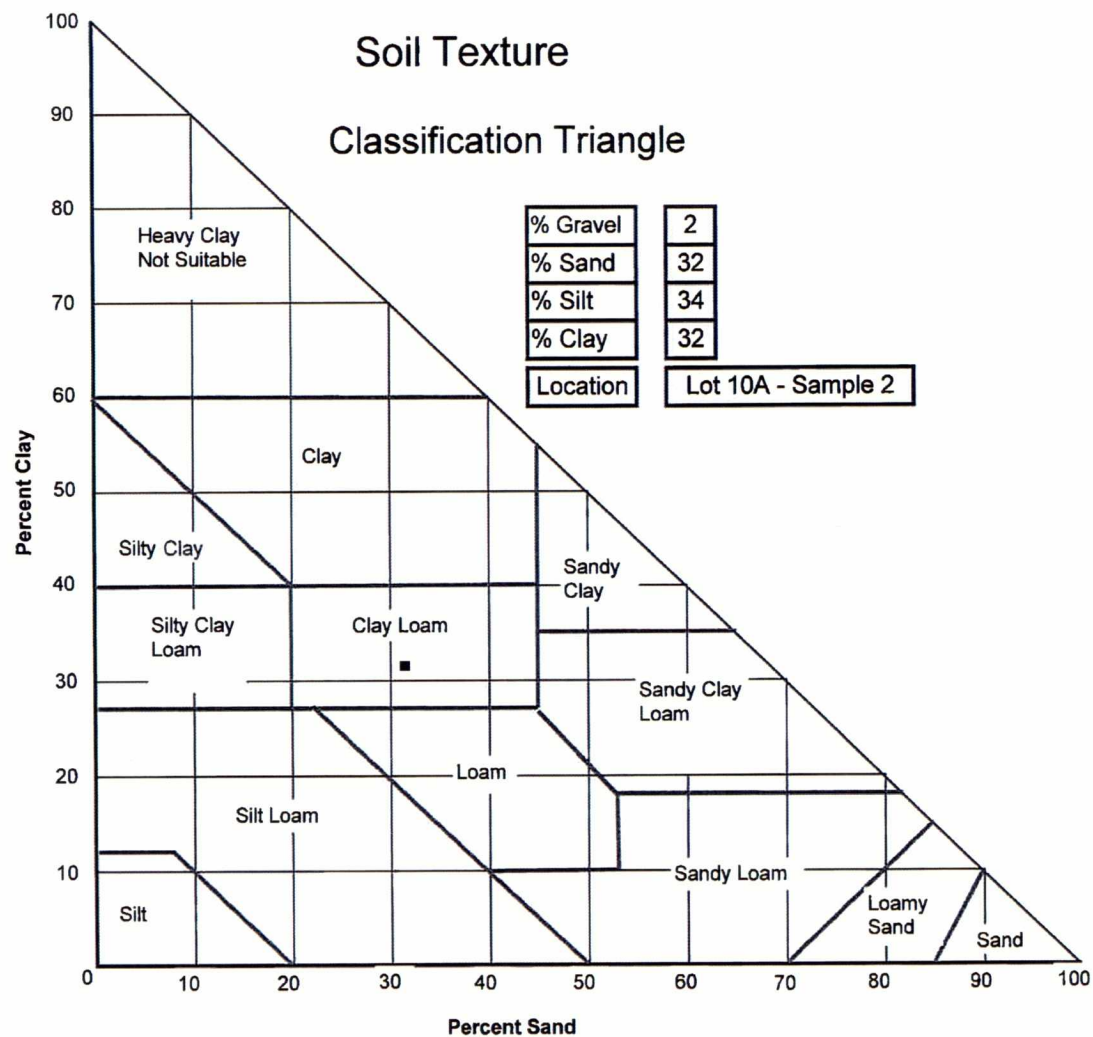
SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	47.6	98.33	1.2500
630	0.5	47.1	97.29	0.6300
315	1.8	45.3	93.57	0.3150
160	5.8	39.5	81.58	0.1600
80	6.9	32.6	67.31	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	35	28	11.7	56.73	0.0471
2	33	26	12.0	52.68	0.0338
5	31	24	12.4	48.63	0.0217
15	28	21	12.8	42.55	0.0128
30	26	19	13.2	38.50	0.0091
60	25	18	13.3	36.47	0.0065
250	20	13	14.2	26.34	0.0033
1440	N/A	n/a	15.0	16.21	0.0014



Soil Texture Classification Triangle





General Information

PARTICLE SIZE DISTRIBUTION HYDROMETER ANALYSIS ASTM D422

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	0
SAMPLE LOCATION	Lot 30A - Sample 1	1-1.5m Depth	SAND (0.074mm-4.75mm)	%	75
DATE	July 30, 2013		SILT (0.074mm-0.005mm)	%	16
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	9

Raw Data

TOTAL SAMPLE WT.	(g)	3699.0
WT. RETAINED > 4.75mm	(g)	0.0

Hydrometer Info

Moisture Content

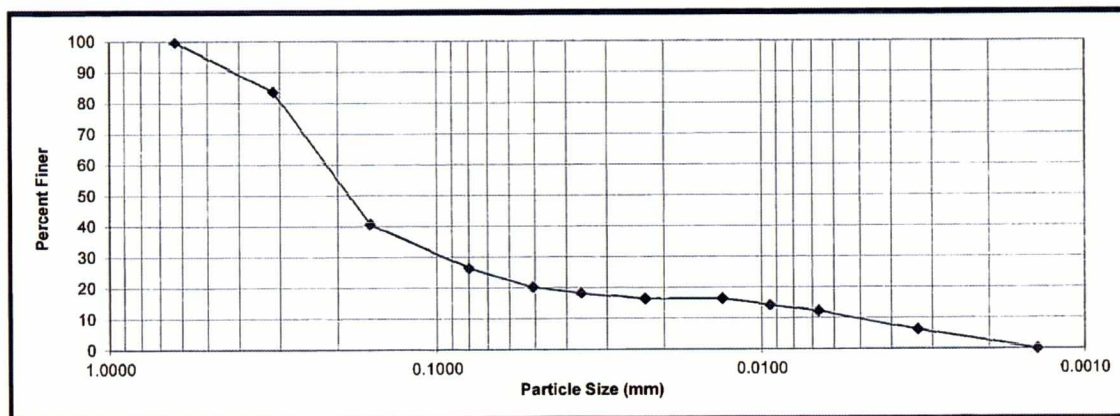
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.4
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	109.6
SPECIFIC GRAVITY (Gs)	(kg/m ³) 2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	106.5
AIR DRY WT. OF TEST SPECIMEN	(g) 50.0	WT. OF WATER	(g)	3.1
k-FACTOR (from table)	0.01328	WT. OF OVEN DRIED	(g)	98.1
CORRECTED SAMPLE WT.	(g) 48.5	HYGROSCOPIC MOISTURE CONTENT	(%)	3.16

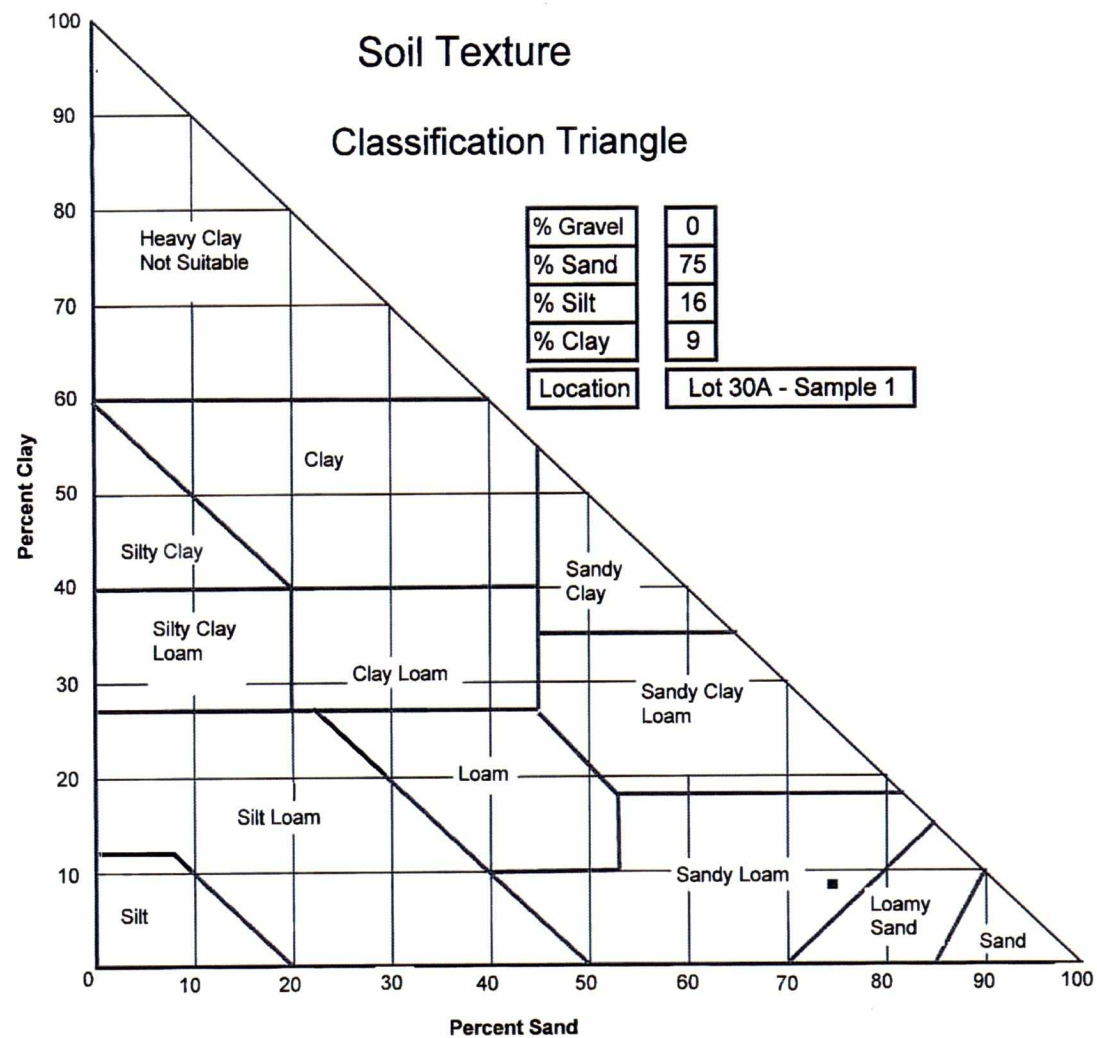
Sieve Analysis on Material from Hydrometer Test

SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	48.5	100.00	1.2500
630	0.2	48.3	99.59	0.6300
315	7.8	40.5	83.49	0.3150
160	20.8	19.7	40.58	0.1600
80	6.9	12.8	26.34	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	17	10	14.7	20.22	0.0508
2	16	9	14.8	18.20	0.0361
5	15	8	15.0	16.18	0.0230
15	15	8	15.0	16.18	0.0133
30	14	7	15.1	14.15	0.0094
60	13	6	15.3	12.13	0.0067
250	10	3	15.8	6.07	0.0033
1440	N/A	n/a	16.3	0.00	0.0014







**PARTICLE SIZE DISTRIBUTION
HYDROMETER ANALYSIS
ASTM D422**

General Information

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	42
SAMPLE LOCATION	Lot 30A - Sample 2	2m Depth	SAND (0.074mm-4.75mm)	%	29
DATE	July 30, 2013		SILT (0.074mm-0.005mm)	%	17
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	12

Raw Data

TOTAL SAMPLE WT.	(g)	2441.9
WT. RETAINED > 4.75mm	(g)	1013.6

Hydrometer Info

Moisture Content

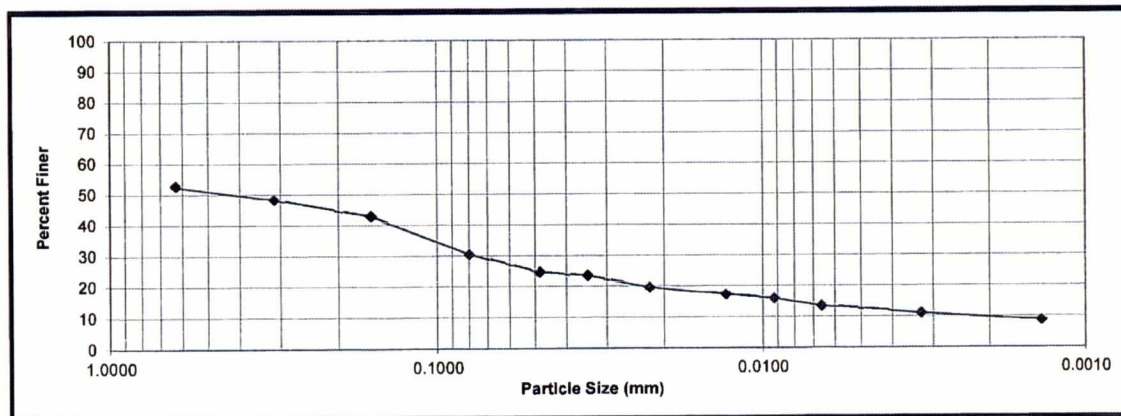
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.1
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	110.4
SPECIFIC GRAVITY (Gs) (kg/m ³)	2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	103.8
AIR DRY WT. OF TEST SPECIMEN (g)	50.0	WT. OF WATER	(g)	6.6
k-FACTOR (from table)	0.01345	WT. OF OVEN DRIED	(g)	95.7
CORRECTED SAMPLE WT. (g)	46.8	HYGROSCOPIC MOISTURE CONTENT (%)	(%)	6.90

Sieve Analysis on Material from Hydrometer Test

SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	1.8	45.0	56.24	1.2500
630	3.0	42.0	52.49	0.6300
315	3.4	38.6	48.24	0.3150
160	4.4	34.2	42.73	0.1600
80	9.8	24.4	30.48	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	27	20	13.0	24.51	0.0485
2	26	19	13.2	23.28	0.0345
5	23	16	13.7	19.61	0.0222
15	21	14	14.0	17.16	0.0130
30	20	13	14.2	15.93	0.0092
60	18	11	14.5	13.48	0.0066
250	16	9	14.8	11.03	0.0033
1440	N/A	n/a	15.1	8.58	0.0014





**PARTICLE SIZE DISTRIBUTION
HYDROMETER ANALYSIS
ASTM D422**

General Information

Test Results

CLIENT	River Ridge Estates		GRAVEL (>4.75mm)	%	0
SAMPLE LOCATION	Lot 44A - Sample 1	1-1.5m Depth	SAND (0.074mm-4.75mm)	%	1
DATE	July 30, 2013		SILT (0.074mm-0.005mm)	%	38
LAB TECHNICIAN(S)	D. Nanowski		CLAY(<0.005mm)	%	61

Raw Data

TOTAL SAMPLE WT.	(g)	3080.0
WT. RETAINED > 4.75mm	(g)	

Hydrometer Info

Moisture Content

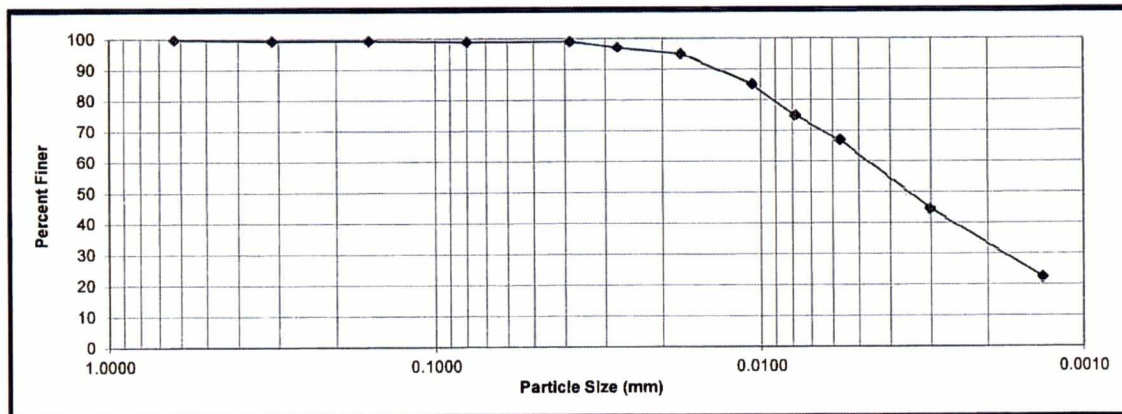
HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.3
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	110.6
SPECIFIC GRAVITY (Gs) (kg/m ³)	2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	107.5
AIR DRY WT. OF TEST SPECIMEN (g)	50.0	WT. OF WATER	(g)	3.1
k-FACTOR (from table)	0.01345	WT. OF OVEN DRIED	(g)	99.2
CORRECTED SAMPLE WT. (g)	48.5	HYGROSCOPIC MOISTURE CONTENT (%)	(%)	3.12

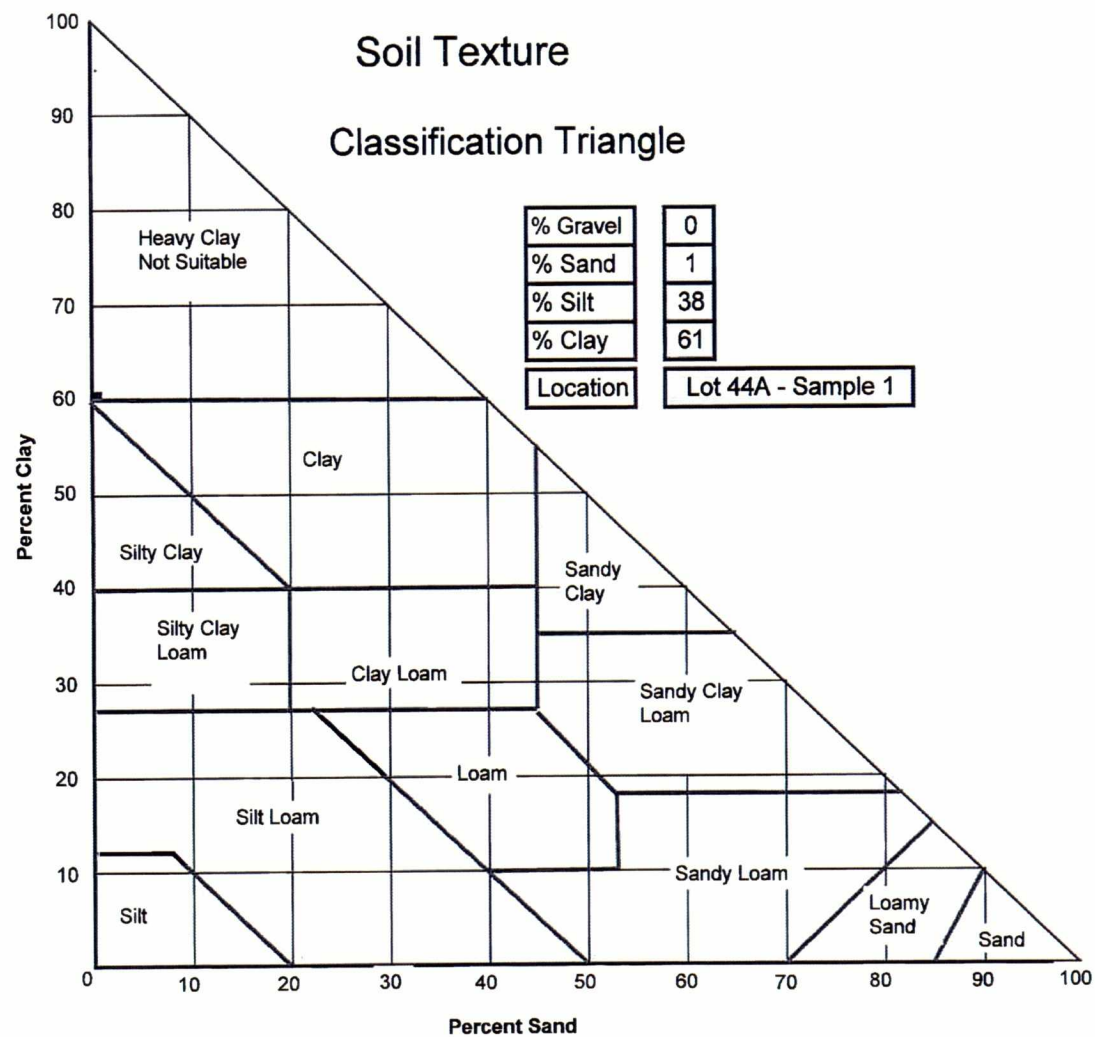
Sieve Analysis on Material from Hydrometer Test

SIEVE SIZE (µm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.1	48.4	99.79	1.2500
630	0.0	48.4	99.79	0.6300
315	0.2	48.2	99.38	0.3150
160	0.0	48.2	99.38	0.1600
80	0.2	48.0	98.97	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	56	49	8.3	99.04	0.0386
2	55	48	8.4	97.02	0.0276
5	54	47	8.6	95.00	0.0176
15	49	42	9.4	84.89	0.0106
30	44	37	10.2	74.79	0.0079
60	40	33	10.9	66.70	0.0057
250	29	22	12.7	44.47	0.0030
1440	N/A	n/a	14.5	22.23	0.0013







General Information

PARTICLE SIZE DISTRIBUTION HYDROMETER ANALYSIS ASTM D422

Test Results

CLIENT	River Ridge Estates	GRAVEL (>4.75mm)	%	0
SAMPLE LOCATION	Lot 44A - Sample 2	SAND (0.074mm-4.75mm)	%	1
DATE	July 30, 2013	SILT (0.074mm-0.005mm)	%	52
LAB TECHNICIAN(S)	D. Nanowski	CLAY(<0.005mm)	%	47

Raw Data

TOTAL SAMPLE WT.	(g)	1628.0
WT. RETAINED > 4.75mm	(g)	

Hydrometer Info

HYDROMETER TYPE	152 - H	WT. OF PAN	(g)	8.3
COMPOSITE CORRECTION	7	WT. OF PAN + AIR DRIED SAMPLE	(g)	111.4
SPECIFIC GRAVITY (Gs)	(kg/m ³) 2.75	WT. OF PAN + OVEN DRIED SAMPLE	(g)	104.9
AIR DRY WT. OF TEST SPECIMEN	(g) 50.0	WT. OF WATER	(g)	6.5
k-FACTOR (from table)	0.01328	WT. OF OVEN DRIED	(g)	96.6
CORRECTED SAMPLE WT.	(g) 46.8	HYGROSCOPIC MOISTURE CONTENT	(%)	6.73

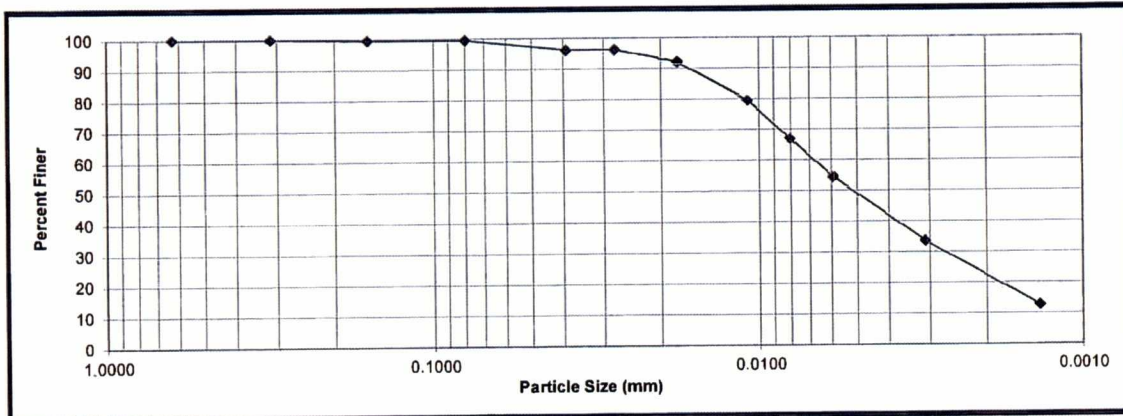
Moisture Content

Sieve Analysis on Material from Hydrometer Test

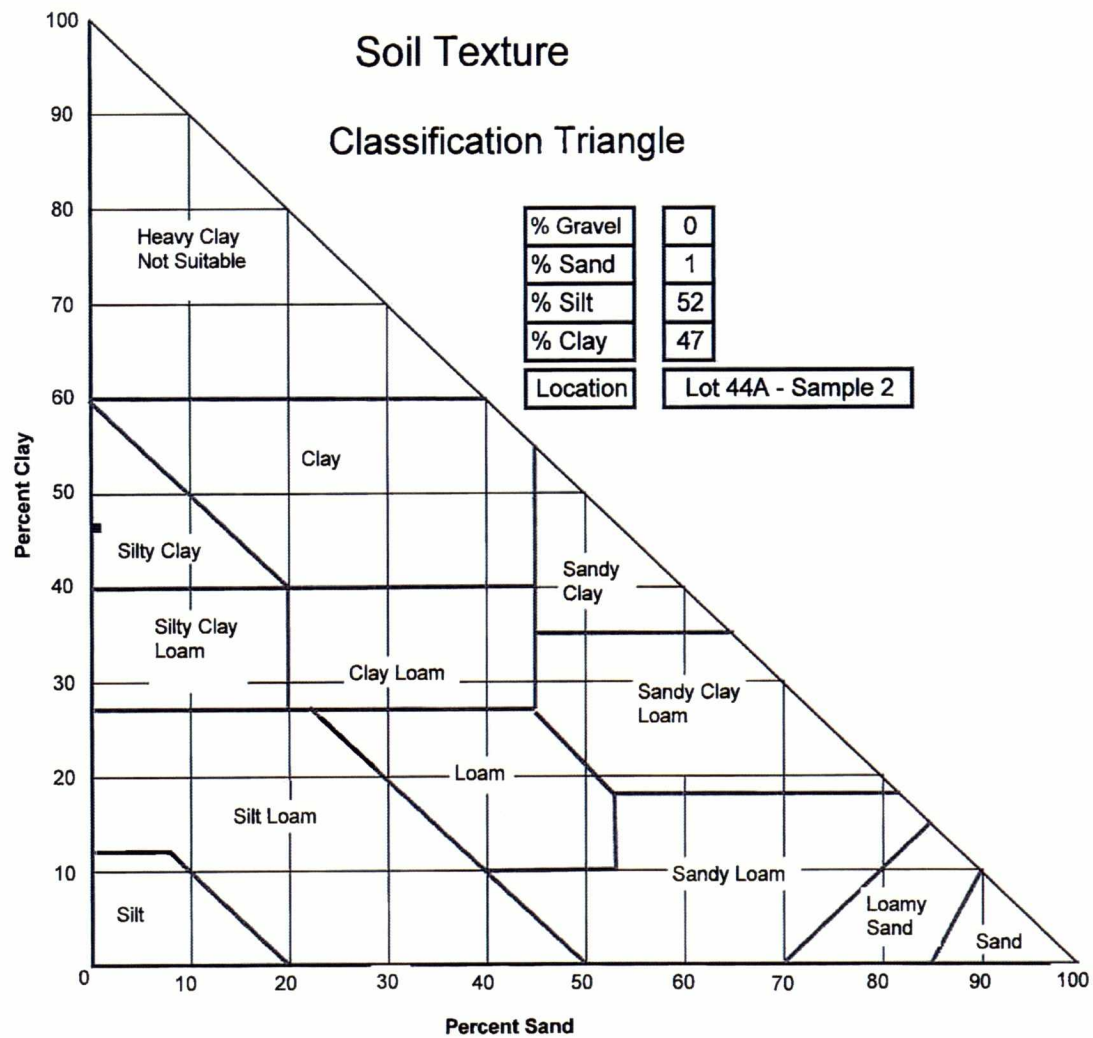
SIEVE SIZE (μm)	WT. RETAINED (g)	WT. PASSING (g)	PERCENT FINER	D (mm)
1250	0.0	46.8	100.00	1.2500
630	0.0	46.8	100.00	0.6300
315	0.0	46.8	100.00	0.3150
160	0.2	46.6	99.57	0.1600
80	0.0	46.6	99.57	0.0800

Hydrometer Test

TIME (min)	HYDROMETER READING	ADJ. HYDROMETER READING	EFFECTIVE DEPTH, L (cm)	PERCENT FINER	D (mm)
1	53	46	8.7	96.23	0.0393
2	53	46	8.7	96.23	0.0278
5	51	44	9.1	92.04	0.0179
15	45	38	10.1	79.49	0.0109
30	39	32	11.0	66.94	0.0081
60	33	26	12.0	54.39	0.0059
250	23	16	13.7	33.47	0.0031
1440	N/A	n/a	15.3	12.55	0.0014



Soil Texture Classification Triangle



Alberta Private Sewage Treatment System Soil Log Form									
Owner Name or Job ID					River Ridge Subdivision				
Legal Land Location					Lot	Block	Plan	GPS Coordinates	
LSD-1/4	Sec.	Twp.	Rg.	Mer.	1A			Easting	
NE	18	53	16	W5				Northing	
Aerial Photos:					Topography:			Very Gentle Slopes	
Vegetation notes: Grasses, Poplar and Spruce					Overall Site Slope %			0-2%	
					Slope position of system:			Slope	

Test Hole #		Soil Subgroup		Parent Material		Drainage	Depth of Sample #1		Depth of Sample #2		
1		Othic Grey Luvisol		Lacustrine		Well	1.2		2.0		
Horizon	Depth	Texture	Lab	Colour	Gleyed	Mottled	Structure	Grade	Consistence	Moisture	%CF
LFH	0.3										
Ae	0.5	Silty Clay		Brown	No	No	Loamy	Moderate	Slightly Sticky	Slightly Moist	
Bt	1.5	Silty Clay		Brown	No	No	Angular Body	Moderate	Slightly Sticky	Slightly Moist	
C	2.5	Clay		Brown	No	No	Coarse Sub Blocky	Moderate	Slightly Sticky	Slightly Moist	
C	3.0	Clay		Brown	No	No	Coarse Sub Blocky	Moderate	Slightly Sticky	Slightly Moist	

Depth to Groundwater	N/A	Limiting Soil Layer Characteristic describe	Clay
Depth to Seasonally Saturated Soil		Depth to Limiting Soil Layer	0.9
Limiting Topography		Depth to Highly Permeable Layer	
Key Limiting System Design Characteristic			
Comments:			
Use soil names, descriptions and particle size limits in the Canadian System of Soil Classification (CSCC)			

Alberta Private Sewage Treatment System Soil Log Form									
Owner Name or Job ID					River Ridge Subdivision				
Legal Land Location					Lot	Block	Plan	GPS Coordinates	
LSD-1/4	Sec.	Twp.	Rg.	Mer.	10A			Easting	
SE	18	53	16	W5				Northing	
Aerial Photos:					Topography:			Slight Grade	
Vegetation notes:					Grasses, Poplar and Spruce			Overall Site Slope %	
					Slope position of system:			Slope	

Test Hole #		Soil Subgroup		Parent Material		Drainage	Depth of Sample #1		Depth of Sample #2		
1		Orthic Grey Luvisol		Lacustrine		Well	1.2		2.0		
Horizon	Depth	Texture	Lab	Colour	Gleyed	Mottled	Structure	Grade	Consistence	Moisture	%CF
LFH	0.03										
Ae	0.5	Silty Clay		Brown	No	No	Loamy	Moderate	Slightly Sticky	Moist	
Bt	1.5	Silty Clay		Brown	No	No	Single Grain	Moderate	Slightly Sticky	Slightly Moist	
C	2.5	Silty Clay		Brown	No	No	Fine Sub Blocky	Moderate	Slightly Sticky	Slightly Moist	
C	3.0	Clay		Brown	No	No	Fine Sub Blocky	Moderate	Slightly Sticky	Slightly Moist	

Depth to Groundwater		Limiting Soil Layer Characteristic describe	Clay
Depth to Seasonally Saturated Soil		Depth to Limiting Soil Layer	1.2
Limiting Topography		Depth to Highly Permeable Layer	
Key Limiting System Design Characteristic			
Comments:			
Use soil names, descriptions and particle size limits in the Canadian System of Soil Classification (CSCC)			

Alberta Private Sewage Treatment System Soil Log Form									
Owner Name or Job ID					River Ridge Subdivision				
Legal Land Location					Lot	Block	Plan	GPS Coordinates	
LSD-1/4	Sec.	Twp.	Rg.	Mer.	30A			Easting	
SE	18	53	16	W5				Northing	
Aerial Photos:					Topography:			Nearly Level	
Vegetation notes:					Grasses, Poplar, Spruce and Pine			Overall Site Slope %	
								Slope position of system:	
								Slope	

Test Hole #		Soil Subgroup		Parent Material		Drainage	Depth of Sample #1		Depth of Sample #2		
1		Orthic Grey Luviscol		Lacustrine		Well	1.2				
Horizon	Depth	Texture	Lab	Colour	Gleyed	Mottled	Structure	Grade	Consistence	Moisture	%CF
LFH	0.1										
Ae	0.5	Silty Clay		Brown	No	No	Single Grain	Moderate	Slightly Sticky	Slightly Moist	
Bt	1.5	Sandy Clay		Brown	No	No	Loamy	Moderate	Slightly Sticky	Slightly Moist	
L	2.5	Sandy		Brown	No	No	Granular	Moderate	Non Sticky	Slightly Moist	
C	3.0	Sandy		Brown	No	No	Granular	Moderate	Non Sticky	Slightly Moist	

Depth to Groundwater		Limiting Soil Layer Characteristic describe	Silty Clay
Depth to Seasonally Saturated Soil		Depth to Limiting Soil Layer	0.6
Limiting Topography		Depth to Highly Permeable Layer	
Key Limiting System Design Characteristic			
Comments:			
Use soil names, descriptions and particle size limits in the Canadian System of Soil Classification (CSCS)			

Alberta Private Sewage Treatment System Soil Log Form									
Owner Name or Job ID					River Ridge Subdivision				
Legal Land Location					Lot	Block	Plan	GPS Coordinates	
LSD-1/4	Sec.	Twp.	Rg.	Mer.	44A			Easting	
NE	18	58	16	W5				Northing	
Aerial Photos:					Topography:			Gentle Slope	
Vegetation notes:					Grasses, Poplar and Spruce			Overall Site Slope %	
					Slope position of system:			Slope	

Test Hole #		Soil Subgroup		Parent Material		Drainage	Depth of Sample #1		Depth of Sample #2		
1		Othic Grey Luvisol		Lacustrine		Well	1.2				
Horizon	Depth	Texture	Lab	Colour	Gleyed	Mottled	Structure	Grade	Consistence	Moisture	%CF
LFH	0.1										
Ae	0.5	Clay		Brown	No	No	Loamy	Moderate	Sticky	Moderate	
Bt	1.5	Clay		Brown	No	No	Angular Body	Moderate	Sticky	Moderate	
C	2.5	Clay		Brown	No	No	Angular Body	Moderate	Very Sticky	Moderate	
D	3.0	Clay		Brown	No	No	Angular Body	Moderate	Very Sticky	Moderate	

Depth to Groundwater	2.8	Limiting Soil Layer Characteristic describe	Clay
Depth to Seasonally Saturated Soil		Depth to Limiting Soil Layer	0.5
Limiting Topography		Depth to Highly Permeable Layer	
Key Limiting System Design Characteristic			
Comments:			
Use soil names, descriptions and particle size limits in the Canadian System of Soil Classification (CSCC)			

APPENDIX B

**RIVER RIDGE PROPERTIES GROUNDWATER DEVELOPMENT
POTENTIAL ADDENDUM LETTER**



6415 - 10 Street SE
Calgary, AB
Canada, T2H 2Z9
Tel: 403.243.5611
Fax: 403.243.5613
Toll Free: 1.888.542.5611
www.waterlineresources.com

August 16, 2013
1064-13-001

River Ridge Properties Ltd.
#1 – 16511 – TWP RD 532A
Yellowhead County, Alberta
T7E 3A6

Attention: Jim Jensen

RE: River Ridge Properties Groundwater Development Potential Addendum Letter

Dear: Mr. Jensen

Waterline Resources Inc. (Waterline) was requested by Jim Jensen of River Ridge Properties Ltd. to review the historical hydrogeological investigations completed for the proposed River Ridge Development located in NE18-053-16 W5M, 5 km east of the Town of Edson, Alberta, and comment on whether the existing groundwater supply can support additional lot development.

BACKGROUND STUDIES

In 2003, Waterline completed a groundwater potential assessment^a for a proposed residential development to be located in NE18-053-16 W5M, adjacent to the McLeod River. Mr. Jensen of River Ridge Properties Ltd. proposed a subdivision consisting of 52 residential lots within the development site. The 2003 assessment concluded that the groundwater resource development potential appeared to be relatively high, and existing water well records supported the conclusion that aquifers underlying the proposed development in NE18-053-16 W5M could meet the groundwater diversion requirement of the proposed residential development (65,000 m³/yr; 27.2 Imperial gallons per minute (lgpm)) as specified in the *Water Act*, without impacting existing users. This conclusion was qualified given the size of the development, and in this regard, it was recommended that an aquifer test be completed in order to quantify potential impacts with existing users, and to determine aquifer hydraulic characteristics, which would help to better define the groundwater resource development potential in the area.

As a follow-up investigation for Mr. Jensen in 2005, Waterline completed a well evaluation assessment^b in support of a 42-lot residential subdivision, located in part of NE18-053-16 W5M;

^a Waterline Resources Inc., 2003. Groundwater Potential Assessment, Proposed Jim Jensen 52 Lot Residential Subdivision, NE18-053-16 W5M, Near Edson, Alberta. Submitted to EXH Engineering Services Ltd., Project Number WL03-972.

^b Waterline Resources Inc. 2005. Well Evaluation Report, Proposed 42 Lot Residential Subdivision Development, NE-18-053-16-W5M, Near Edson, Alberta. Submitted to R J Jensen & Associates Ltd. Project Number WL05-1064.

reduced from the originally proposed 52-lot residential subdivision. The well testing and analysis program was completed to support an application for subdivision under the *Municipal Government Act*. The 2005 assessment concluded that the proposed 42-lot subdivision water requirement of 52,500 m³/yr (approximately 22.0 lpgm), could be sustained by the aquifer systems underlying the study area, and that the managed diversion of that groundwater would not negatively impact existing, adjacent users. This conclusion was based on an aquifer testing program where the 20 year sustained production (Q_{20}) from a single water source well was estimated at approximately 607 m³/d (93 lpgm).

REVISED DEVELOPMENT PLAN

Waterline understands that Mr. Jensen of River Ridge Properties Ltd. is now proposing to increase the approved River Ridge development plan for NE18-053-16 W5M, from 43 lots (42 lots plus the existing residence) to 47 lots, to include an additional five lots relative to the Waterline 2005 assessment. This would place a further water demand on the aquifer under existing provincial guidelines of 17.1 m³/d (2.6 lpgm).

CONCLUSION

Based on a review of the previous studies completed by Waterline in support of the River Ridge development approvals, augmented by a review of the water well drilling reports for well completed within the subdivision since the original assessment was completed in 2005, Waterline has concluded:

- Aquifers underlying the development site can sustain an additional 17 m³/d of groundwater to support the development expansion, and that the managed diversion of that groundwater would not negatively impact existing, adjacent users.

CLOSURE

This groundwater development potential addendum letter 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 future 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.

River Ridge Properties Groundwater Development Potential Addendum Letter
NE18-053-16 W5M, 5 km east of the Town of Edsen, Alberta,
River Ridge Properties Ltd.

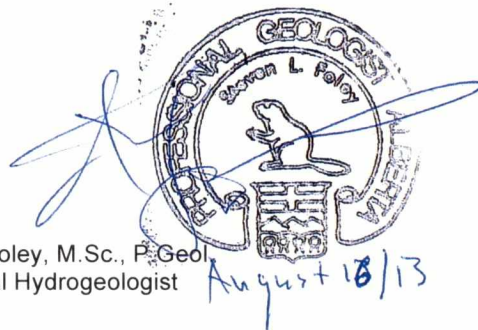
1064-13-001
August 16, 2013
Page 3

The conclusions are based on previous Waterline hydrogeological assessments, and a review of recent water well drilling reports, and no other warranty is intended or implied. 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.

Sincerely,

Waterline Resources Inc.

APEGA Permit To Practice No. P07329



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

August 18/13

APPENDIX C

APPLICATION FOR HISTORICAL RESOURCES ACT CLEARANCE



Application for *Historical Resources Act* Clearance

Activity Administration

Date Received: May 24, 2013

HRM File: 4835-05-0200

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

Project Category: Subdivisions (4835)

Project Type: ☒ Residential Subdivision ☒ Area Structure Plan / Outline Plan
ESRI Shapefiles are attached (yes/no) no
Approximate Project Area (ha) 3.327ha
Lot, Block, Plan Lot 10A, Lot 30A & Lot 31A, Blk 1, Plan 1320841

Project Identifier: River Ridge Area Structure Plan

Additional Identifier(s):

Key Contact: Mr Brent L Shepherd
Address: 2716 1st Avenue
Postal Code: T7E1N9
E-mail: bshepherd@yellowheadcounty.ab.ca
Affiliation: Yellowhead County
City / Province: Edson, AB
Phone: (780) 723-4800
Fax: (780) 723-5066
Your File Number:

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

Proponent:
Address:
Postal Code:
E-mail:
Contact Name:
City / Province:
Phone:
Fax:

Proposed Development Area					Land Ownership			
MER	RGE	TWP	SEC	LSD List	FRH	SA	CU	CT
5	16	53	7	15,16	☒	☐	☐	☐
5	16	53	18	1,2,7-10,15,16	☒	☐	☐	☐

Listed Lands Affected						
MER	RGE	TWP	SEC	LSD	HRV	Category
5	16	53	7	15	5	p
5	16	53	7	16	5	p
5	16	53	18	1	5	p
5	16	53	18	2	5	p
5	16	53	18	7	5	p

HRM File: 4835-05-0200

Page 1 of 2

5	16	53	18	8	5	p
5	16	53	18	9	5	p
5	16	53	18	10	5	p
5	16	53	18	16	5	p

Comments:

Historical Resources Impact Assessment:

For archaeological resources:

Has a HRIA been conducted? ☐ Yes ☒ No

Permit Number (if applicable):

For palaeontological resource:

Has a HRIA been conducted? ☐ Yes ☒ No

Historical Resources Act clearance is granted subject to Section 31 of the Resources Act, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the minister of the discovery". The chance discovery of historical resources is to be reported to the contacts identified within the listing.



May 30, 2013

Date