

Meadow Ridge Estates

Comprehensive Development Review

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
0	AECOM	January 22, 2016	Draft Report
1	AECOM	March 10, 2016	Revised Draft Report-OGD Update
2	AECOM	April 27, 2016	Revised Draft Report-RM Comments
3	AECOM	June 21, 2016	Revised Draft Report-Layout Change, Public Consultation Round 2
4	AECOM	November 2, 2016	Revised Draft Report-Layout Changes, Public comments received

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1. Background

1.1 Introduction

1.1.1 CDR Background

This Comprehensive Development Review (CDR) provides the supporting documentation for approval consideration of a proposed Multi-Parcel Country Residential (MPCR) development in the Rural Municipality of Corman Park (RMCP), and is submitted in accordance with the procedural requirements of the municipality with respect to MPCR subdivision development. This document provides a compilation of information relevant to the subdivision and development of a country residential subdivision on SE 14-36-04-W3. In addition, this CDR outlines the design rationale and development objectives that will ensure this is a high quality development for the RMCP.

The initial development proposal was submitted in response to the RMCP 'Call for Proposals' in August 2013. The conceptual plan development proposal, originally titled "Ridgewood Estates", received a successful score from council, ranking in the 'High Category' and was selected from the 31 submissions to proceed to the CDR stage in April 2014. Additional studies, design, community consultation, engineering, research and review has taken place to meet the content required by the CDR Information Package, Checklist and Worksheets. Final layout plan is the Plan of Proposed Subdivision at Appendix X.

The first section of this CDR summarizes the proposed development and draws conclusions from the technical reports, consultations and comments that are all included in full as appendices in the second section of the report. The appendices include all the technical reports, the Plan of Proposed Subdivision, servicing worksheets, rezoning applications, a civil engineering Servicing Report and the Traffic Impact Assessment for the site.

AECOM was retained by Mr. Dan Beaulac to provide full planning, design, transportation and engineering assistance for this development project. This CDR has been prepared by AECOM professional staff with input and direction at periodic decision points by Mr. Beaulac. Additional and supporting information is provided by Golder Associates, Imagine Contracting Inc. and Webb Surveys. RMCP planning staff has been consulted periodically throughout the application process for clarification and further direction when needed.

The developer has a very strong knowledge of the land development process. Mr. Beaulac currently has two other existing land development projects in Saskatchewan that are successfully underway. Southshore Estates at Emma Lake (www.southshoreestates.ca) is a 66 lot recreational subdivision and Westpark Village in the City of Moose Jaw (www.westparkvillage.ca) is a large urban scale development. As well, the developer has sound knowledge of the local area and has existing relationships with many of the neighbouring property owners. Mr. Beaulac is a University of Saskatchewan Bachelor of Commerce graduate having a Major in Finance and a Minor in Marketing. By applying this educational and practical background with direct experience, he is well suited for this type and scale of land development project.

1.1.2 Development Purpose and Summary

The original conceptual layout design from the August 2013 *MPCR-R.M. Corman Park Call for Proposals* is included at Appendix A Figure 8 & 9. The original layout is now outdated and the current and accurate plan to reference is the Plan of Proposed Subdivision (PPS) at Appendix X. In the time between completion of the original Conceptual Layout Plan and finalization of the current Plan of Proposed Subdivision, various design changes have taken place to accommodate efficiencies for infrastructure, public comments and developer objectives. There have been adjustments to the original road alignment, lot layout, total lot count, and the elimination of some ER parcels. While this CDR report supports the final PPS, there are some discrepancies in the appended reports that are based off the

original design. The developer feels that the amendments have been minor and that the final PPS reflects the intent of the original design.

The **purpose** of this development is to provide **55** high quality and desirable residential estate lots to supply buyers who are seeking a more compact CR lot at an attainable market price level. The intent is to provide a variety of lot sizes less than 2 acres with approximately 25% overall being larger lots in a range of 2.0-10 acres.

The proposed Landuse Designation is "**Country Residential**" more specifically as "Multi Parcel Country Residential Subdivision" as described in Section 5.2.3 of the Consolidated Official Community Plan October 26, 2015. The requested zoning is "**CR 1 – Country Residential 1 District-Low Density**" as described by the Consolidated Zoning Bylaw October 26, 2015.

As a **general summary**, Meadow Ridge Estates is proposed to be an attractive MPCR development that suits market demand for residential housing in a natural setting. Meadow Ridge Estates recognizes the benefit of being adjacent well-established and maintained roads on two sides of the parcel. This takes advantage of the comfortable and short commute to services and/or employment in Saskatoon or other commercial centers in the area. The development site caters to the proximity of other compatible property owners, and addresses the market demand for larger lot rural housing in a quiet natural atmosphere.

1.1.3 Brief Aspects Pertinent for Review

Meadow Ridge Estates will appeal to buyers who prefer to live away from the commotion of an urban centre. Many people migrating from rural areas, towns, and small cities are dissatisfied with the lifestyle imposed by the inherent activity in urban areas. This development will provide an attainable **realistic alternative** for those with a desire to live in a natural and open rural setting, close to the services of urban centers, while also not directly participating in an agricultural operation on their property.

The natural combination of open space, tree stands and ponds is a primary beneficial design characteristic creating a **unique feel** and theme for Meadow Ridge Estates. The conceptual design has aligned the internal road system to showcase the natural topography and attractive features such as: meaningful end-point vistas; feature views of ponds; pleasurable sensations from sight distance and natural vegetation; and, enclosures with tree lined flankage along portions of the roadway. A very efficient road layout has also minimized the construction length and thereby has reduced the overall cost and amount of required future maintenance.

Lot lines (boundaries) have been carefully selected to provide **attractive building envelopes** which accommodate easements and the valuable character of natural vegetation. The majority of lots include one, or more, forms of natural amenity and views. Lot boundaries have been adjusted to create attractive building sites using the natural landscape as a contiguous backdrop.

Larger-lot product has been purposely located to **address easement restrictions**, i.e. the south boundary along Patience Lake Road and an existing TransGas easement. This minimizes the chance for any disturbance while also providing a desirable large-lot option for some of the market demand.

An existing 5 acre site "**Parcel A**" located in the southeast of the quarter section has been previously sold and is not within the boundary of this application. Of course, Parcel A has been accommodated through the concept planning phase to position compatible adjacent lots and have a minimal level of housing surrounding it, as was discussed with the new owner. At the owner's request, an approximately equal sized lot is placed to the west of their parcel with a minimal amount of lots to the north and east.

The southwest Meadow Ridge Trail connection is purposely located to utilize the same **pre-existing access**/egress to Patience Lake Road in order to minimize construction upgrades and disruption to existing traffic patterns.

The site has an appealing and **desirable proximity** to many required services available approximately 7km west along the well-established and paved Patience Lake Road to the Stonebridge business park, Lakewood Suburban Centre and Rosewood commercial developments in Saskatoon. Other services and amenities are available in nearby towns. While being far enough to be considered a rural setting, the site is still reasonably near urban centers, reducing travel time, cost, and emissions.

This development is **well integrated** within the region and is adjacent two currently existing MPCR developments.

The developer has conducted ongoing **market analysis** and he is confident that Meadow Ridge Estates will offer a desirable product for new homes. There is strong market support for these sites and some of the lots have already been pre-selected and reserved for future buyers indicating they will purchase and build as soon as lots are available.

1.2 Land Use Context

1.2.1 Site Location & Significance

Refer to Appendix I for ISC Surface Parcel data and Land Title Registry.

Refer to Appendix T for the existing Survey Base Plan.

Refer to Appendix A for site location and context images Figures 1, 2, 3 & 4.

Table 1 Legal Parcel Descriptions

Land Description	Surface Parcel Number	Owner	Parcel Size (Approx.)
SE 14-Twp 36-Rge 04-W3M	165160458	Mr. Dan Beulac	74.53 ac (30.163 ha)
SE 14-Twp 36-Rge 04-W3M	153820830	Mr. Dwayne Pitka	79.53 ac (32.183 ha)

The proposed Meadow Ridge Estates site is located in the south-east corner of the RMCP. The site is 2 kilometers from the RMCP east boundary with RM of Blucher; approximately 3 kilometres east of Saskatoon city limits; and directly north of, and adjacent to, the Patience Lake Road.

The site location is **significant** to the development for numerous reasons. The proximity to Saskatoon and Clavet place the property in a 'sweet spot' of good geographic separation while still having a low commute distance. It benefits from the existing paved road network, water supply line, power, gas and is close to many other services. The natural rolling topography is well suited for large lot residential development that has sufficient open space for a building footprint, yard, and will mostly include other natural amenities on each lot. The site fits directly with the developer's concept to meet a demand for this type of residential property.

1.2.2 Existing Landuses

Existing landuses within a 1.6 kilometer (1 mile) radius of the proposed development site:

Landuse:	Distance:
Intensive Livestock Operation	None
Existing Residences or Farmsteads	15
Existing Country Residential Development	Hidden Ridge (West) is adjacent the north boundary and includes 13 residences.
	Hidden Ridge (East) is north-east of Ridgewood Estates and includes 16 residences.
	Applewood Estates is adjacent the east side of Meadow Ridge and currently under construction to include 39 lots at full build out.
	Total within 1mile=68 CR residences.
Landfill or Waste Disposal Site	None
Urban Municipality	None
Airport	None
Existing Industrial or Commercial Development	None
Mineral Extraction (Gravel Deposits)	None

The development site is outside the Planning District Boundary, outside the Future Urban Growth Overlay area, outside the P4G Study Area boundary and beyond the Perimeter Highway Corridor Overlay.

The conceptual layout plan has been designed to integrate well with adjacent MPCR lots. Traffic is dispersed to Range Road 3041 and Patience Lake Road by having an access/egress at each. RR 3041 is not solely used for all traffic, thereby reducing the level of road usage.

Hidden Ridge Estates MPCR is adjacent the north boundary of the proposed development site. Only 2 houses from 4 lots total are adjacent the north boundary of Meadow Ridge Estates. One house is visually screened by the drop in elevation across their property and the other is very well screen by well-established trees and bush cover.

Applewood Estates MPCR is across RR 3041 to the east of this proposed development site. There are 5 lots that are adjacent RR 3041. There is also a buffer strip placed on each side of RR 3041. Housing units in Applewood Estates will generally be closer to their side neighbours that they will be to Meadow Ridge lots across the buffers and road.

Only the west border is adjacent an agricultural landuse and the stability of open views to western sunsets is considered a benefit for these lots. Negative attitude towards the agricultural landuse is not expected from the potential owners of these lots as the adjacent operation provides open views and rural feel which is an attraction to the area, not a constraint. It would be correctly justified that a purchaser of these lots would have rationally accepted the agricultural operation’s presence and not be concerned with its company. The existing landowner and farm operator on property to the west also leads the Lost River Water Utility and has given his support during general consultation discussions and negotiations for water supply. His general support for this development is attached in Appendix M.

Municipal servicing has been considered by implementing an efficient road alignment for snow clearing and maintenance. As well, the use of an existing local water line concentrates infrastructure and reduces level of required construction time.

1.3 Policy Context

1.3.1 Official Community Plan

The RMCP Official Community Plan (OCP) establishes objectives and policies to accommodate high quality country residential developments in a planned manner in locations that minimize disruption to the agricultural sector, and where infrastructure readily supports this level of development.

This section identifies and summarises how the current proposed design satisfies the intent of RMCP OCP within: Sections 5.1 *Country Residential Objectives*; Section 5.2.1 *General Country Residential Policies*; and, Section 5.2.3 *Multi Parcel Country Residential Subdivision Policies*.

In response to requirements of Section 5.1.1:

For the entire development, only the west border is adjacent agricultural landuse. Remaining lots are abutting exiting MPCR to the north, Patience Lake Road to the south, and RR 3041 with further MPCR across the road to the east. Lot locations at the west boundary are presented as a valuable benefit to potential owners. The vast view, sunsets and rural landscape are seen to be an attractive feature for future owners. The adjacent landowner and farm operator of the 3 parcels directly to the west leads the Lost River Water Utility and has given his support for this development during discussions and contract to supply water and support for this development in general, describing it as “A well thought out development”. see Appendix M.

Similar to other CR developments to this area, this development will have minimal potential conflicts with the adjacent agricultural use. The surrounding areas have been selected by the RMCP in 2007 for CR development specifically based on the favourable geographic position within the landuse framework of the RM land base. This development site is contiguous with 2 other MPCR developments and will not fragment agricultural lands.

The development will not significantly reduce the amount of available productive agricultural land within the RM. The Canada Land Inventory classifications for this site are Class 3 and Class 5 with limitations on both soil and water. (see Appendix A, Figure4) There is minimal tilled crop on the site with the majority used as pasture for grazing cattle, producing small amount of privately used hay and natural areas. The Terrestrial Report (see Appendix E) also notes that the land is characterised as knob and kettle moraine, with an undulating topography and numerous pothole sloughs surrounded by natural tree stands of shrubs and aspen.

Developing the land as a MPCR site will provide far greater potential for grasses, wildlife habitats and vegetation to continue in the existing form than if it were to be used for tilled agricultural purposes.

The developer will make potential buyers aware of the perceived negative implications of living in a CR setting and provide them with a copy of “Acreage Living: A Conservation Guide for Owners and Developers of Natural Habitats”.

In response to requirements of Section 5.1.2:

This residential development will take place in a planned manner. The general location of this site has been determined in 2007 to have the correct features for CR development within the RMCP land base. Specifically for Meadow Ridge Estates, the developer has retained the professional services of environmental (P.Eng, P.Ag.), geotechnical (P.Eng., FCSCE), planning (RPP, MCIP), civil engineering (P.Eng.), transportation engineering

(P.Eng., PTOE), and land surveyors (S.L.S.) to ensure the development is constructed in an efficient and proper manner. This application has proceeded through the Phase 2 of the application process successfully and with high score.

The conceptual plan took many forms and had multiple revisions before being accepted in its current design. Throughout the design planning process attention was paid to natural topographic features, plant material, low areas, among other physical opportunities and constraints. As well, thought was directed to provide a layout which compliments the existing landowner requirements and market demand.

The CDR report was structured to follow the 'MPCR Call for Proposal' and CDR Checklist.

In response to requirements of Section 5.1.3

This development will not reduce the amount of available productive agricultural land within the RMCP. The land is classified as Class 3 and Class 5 with limitations to soil, water, and stoniness, by the Canada Land Inventory Classification system. The Terrestrial Report (see Appendix E) also notes that the land is characterised as knob and kettle moraine, with an undulating topography and numerous pothole sloughs surrounded by natural tree stands of shrubs and aspen. With mostly grassland and treed sites, the only agricultural activity is minimal for grazing and some hay production for limited use.

There are no expectations that this development would hinder the adjacent agricultural operation. Any issue related to the interaction between the landuses is anticipated to be no different from those already experienced by the numerous CR parcels in the area.

The neighbouring landowner and farm operator has expressed his support for the development.

See similar comments responding to 5.1.1

In response to requirements of Section 5.1.4

This MPCR development will not have significant negative impacts to other landuses in the Municipality or on the environment.

The development site is surrounded on 3 sides by CR development and there is no concern from owners to west. There are no other landuses within a mile radius and it is anticipated that a residential subdivision of this scale will not pose any negative implications to other landuse sites in the RMCP.

The Saskatoon Health Region's Environmental Public Health Inspector has indicated further comments will be provided during the provincial subdivision review process. The conceptual layout is designed to maintain natural areas as much as possible as an amenity for home owners and excessive alteration of the environment is not conducive to the marketing intent for the project.

The Phase 1 Environmental Site Assessment (see Appendix F) includes correspondence from RM Corman Park, City of Saskatoon, and Ministry of the Environment that no environmental concerns are on file for this site.

With close proximity to Saskatoon there will be a low commute time along a paved road which will require less carbon emissions than most other subdivisions whose residents commute to Saskatoon each daily.

As described in the Terrestrial Report (see Appendix E). No federal or listed wildlife species were observed and the habitat suitability for these species is low to moderate. While collectively the site has moderate non-listed wildlife

potential, the landscape surrounding has been heavily modified by agriculture, infrastructure development and acreage development, along with well-developed roads which all reduce the quality of habitat in the area.

Only favourable areas of the lots are intended for house placement taking into account topography, water catchment areas, drainage runs and established treed areas. The natural water drainage will only have minimal alterations to direct flow through road ditches and culverts where required.

The *Heritage Resources Impact Assessment* (see Appendix G) states that “no new heritage sites were observed... therefore this office has no further concerns with this project proceeding as planned. This Final Report fulfils the permitting requirements necessary for the completion of the HRIA”.

In response to requirements of Section 5.1.5

A “high quality of living environment” is subjective to individual preferences. Meadow Ridge Estates is purposely designed to appeal to buyers seeking a large lot rural setting near Saskatoon and region. The baseline for development control is through the RMCP bylaws and applicable provincial regulations.

The conceptual design provides for a tranquil, non-congested sub-division with high potential for new houses to be situated amongst natural features in a discrete manner. This is accomplished through the lot layout taking into account treed areas and low areas. With 2 access/egress points the traffic is dispersed and will remain at low levels. The curvilinear alignment of the internal road has no indication of monotony as it traverses the rolling natural topography. The internal road meanders through existing trees, and open areas to create quality sightlines and enjoyable views of the landscape. Meadow Ridge Place offers an area of further solitude where only local residents would typically enter. The tree stands provide a unique landscape for the surrounding houses.

The proposed density meets the requirement of the RMCP OCP and Zoning Bylaw. The smallest lot is 1.01 acres with an average overall lot size of 2.47 acres. Larger lots are placed at the southern area of the property to accommodate the existing owner’s requests, the Patience Lake Road setback, and a TransGas easement. While at the same time the smaller sized lots allow more owners to build further from the roads, and into the more naturally secluded sites to the north.

Based on the neighbouring landuses, natural features and proximity to Saskatoon, the location of this development accommodates a high quality country residential development in a planned manner. Because of its geographic positioning next to roads and other residential sites, there is very low, if any, disruption to the agricultural sector and existing infrastructure readily supports this level of development.

The proximity to Saskatoon and Clavet place the property in a ‘sweet spot’ of good mental geographic separation while still having a low commute distance. It benefits from the existing paved road network, water supply line, power, gas and is close to many services. The natural rolling topography is well suited for large lot residential development that has sufficient open space for a building footprint, yard, and will mostly include other natural amenities on each lot. The site fits directly with the developer’s concept that meets a demand for this type of residential property.

In response to requirements of Section 5.1.6

Meadow Ridge Estates is directly adjacent and accessed by an existing paved highway, Patience Lake Road. This by itself minimizes any maintenance costs for much of the traffic to and from the site. RR 3041 to the east is also a pre-existing established road. Only the internal road will be added to the RMCP inventory. The conceptual design proposes a very efficient internal road design of **one continuous loop and one continuous surface** bay. This is

efficient because lots in all parts of the property can be accessed with the loop and there is only one internal intersection required for the Meadow Ridge Place extension.

By developing this site for MPCR the RMCP will obtain greater tax revenues that if it remained with only the existing 2 residences, or be developed under the AG designation. As this land is not well suited for agricultural operations, it is very appropriate to develop it to a much better and higher use.

A servicing agreement will be negotiated at a later time to determine the exact short and long term costs accrued by the Municipality. Further information on servicing can be seen at Appendix B the Serviceability Review.

In response to requirements of Section 5.2.1.1

The current zoning is AG-Agricultural District, the proposed zoning is for CR1 – Country Residential 1 District – Low Density.

In response to requirements of Section 5.2.1.2

Not applicable as this application is for MPCR.

In response to requirements of Section 5.2.1.3

Not applicable as this application is for an area other than 80 acres.

In response to requirements of Section 5.2.1.4

Not applicable as this application is for an area other than 40 acres and not under Crown lease.

In response to requirements of Section 5.2.1.5

There are no established ILOs within 1 mile, the highest restriction for “Multi-Parcel CR developments less than a quarter section in size”. Further content of the Terrestrial Assessment and Phase 1 ESA indicates the separation from ILOs and no records from Ministry of Environment of Hazardous spills. (See Appendix E and F)

In response to requirements of Section 5.2.1.6

This development will not reduce the amount of available productive agricultural land within the RMCP. The land is classified as Class 3 and Class 5 with further limitations to soil, water, and stoniness, by the Canada Land Inventory Classification system. The Terrestrial Report (see Appendix E) also notes that the land is characterised as knob and kettle moraine, with an undulating topography and numerous pothole sloughs surrounded by natural tree stands of shrubs and aspen. With mostly grassland and treed sites, the only agricultural activity is minimal for grazing and limited hay production for the owners use.

This development site is located contiguous to two existing MPCR and single parcel CR developments across the third boundary. This development will not fragment agricultural land and could be considered to actually remove the existing fragmentation that exists by this property.

The development site is located with one access/egress along existing municipally maintained road RR 3041 and the other along the maintained Patience Lake Road.

In response to requirements of Section 5.2.2

Not applicable as the proposed application is for MPCR development.

In response to requirements of Section 5.2.3.1

This CDR has been completed with consultation and review by RMCP planning staff, use of the CDR Report Checklist, and reference to the RMCP OCP. Within the sections of this report and Appendices, information and correspondence is redacted and compiled as applicable to represent the landuse integration, environmental sustainability, public involvement and potential conflict mitigation referred to in this section.

In response to requirements of Section 5.2.3.2

The Saskatoon city and region has recently experienced high levels of growth. While this trend may not continue at the same pace for all future years, migration to and within the area is expected to remain at reasonable levels. This area appeals to buyers from outside the region and also to those in the urban centers looking to transition to a large lot rural setting. There is already market interest in Meadow Ridge Estates and the owner has 'reserved' some lots for serious requests. The area will likely see home construction over 2 seasons which will aide in market awareness and absorption as other product on the market is sold.

This development appeals to owners who prefer to live away from the bustle of urban centres. Common to Saskatchewan, many baby-boomers, people from rural areas, towns, and small cities are dissatisfied with the lifestyle imposed by the inherent activity in urban areas. This development will appeal to those having a desire to live in the natural and open rural setting while also not directly participating in an agricultural operation.

The developer has conducted private analysis of current market information and continues to focus on the residential land development industry as his primary centre of attention. Mr. Beaulac has sound knowledge and professional skill for appropriate residential marketing of this site. Please refer to existing marketing material for separate project at the following websites; www.southshoreestates.ca and www.westparkvillage.ca.

In response to requirements of Section 5.2.3.3

This development provides no MR dedicated lands thereby reducing any future maintenance cost and other social issues arising from rural so called 'park' space. There are still however significant natural amenities that appeal to residents. The design is conscious to minimize the removal of trees or bush areas. Almost a fifth of the total lots back to the west, which is a considerable attraction for the scenic views of sunsets and the city glow. Beyond this, many building envelopes can take advantage of the raised landscapes to obtain great views of the surrounding natural environment. As well the proximity to Saskatoon and Clavet is considered a great aspect of the overall quality of living.

As previously described, the proximity to Saskatoon and others centers in the region is a very attractive feature for residents and will cater to their desire to live in the country setting with access to urban amenities. Commute time to Saskatoon is not only lower than many other MPCR and other cities north of Saskatoon, but it also along a paved highway, and into the south east corner of the city giving quick access to the Rosewood and Stonebridge commercial districts, Lakewood Suburban Centre, 8th Street commercial, Circle Drive and use of the planned perimeter highway and Brighton Neighbourhood within the Holmwood Suburban Development Area.

This development promotes reasonable environmental design innovation with typically accepted methods. There is design rationale to reduce road construction and maintenance, low commute times, and a low environmental footprint as there are no industrial, commercial or agricultural uses proposed; only low density residential housing.

Meadow Ridge Estates will increase the housing options available to people wishing to live in the RMCP. This plan was designed to create a spectrum of lot product sizes for the market. Approximately 60% are lots under 2 Acres attainable to buyers at a lower price level and those who want a lot that can be reasonably maintained. Approximately 20% of lots are between 2-4 acres for those seeking a larger lot with more open space, and the remaining 20% are designated for larger lots along the south road and easement for buyers looking for a larger lot over 4 acres.

In response to requirements of Section 5.2.3.4

Not applicable as this is not an application responding to a “specific documented need” as described in the OCP.

In response to requirements of Section 5.2.3.5

The layout design has received favorable preliminary comments from various departments and utility providers (see Appendices). There were no concerns raised by the Terrestrial Assessment (see Appendix E), or from the Heritage Branch (see Appendix G). The Hydrogeological Report indicates Type II mounds will be appropriate for the carrying capacity of the land (see Appendix D). The Saskatoon Health Region has provided no further comments regarding the site at this time (see Appendix N).

All services are available for this development. See information summaries in section 2.3 and the civil infrastructure *Serviceability Review* (see Appendix B).

Similar to other CR developments to this area, this development is compatible with minimal potential conflicts with the surrounding area. The surrounding areas have been selected by the RMCP in 2007 for CR development specifically based on the favourable geographic position within the landuse framework of the RMCP land base. This development site is contiguous with 2 other MPCR developments. One has only 2 houses adjacent the site and the other is across RR 3041. The primary intent of this subdivision is to create a quiet, calm low density residential area. Future activities on the properties will be regulated by the RMCP OCP, relevant Bylaws and National Building Code.

In response to requirements of Section 5.2.3.6

The conceptual design provides for a tranquil, non-congested sub-division with high potential for new houses to be situated amongst natural features in a discrete manner. This is accomplished through the lot layout taking into account treed areas and low areas, as well, identifying of potential building envelope sites that maintain one or more natural amenities on the lot. With 2 access/egress points the traffic is dispersed and will remain at low levels. The curvilinear alignment of the internal road minimizes any feel of monotony to feature the rolling natural topography.

The conceptual layout was designed to maintain natural areas as much as possible as an amenity for home owners and excessive alteration of the environment is not conducive to the marketing intent for the project.

No federal or listed plant species were observed on the site during the environmental field reviews. The Terrestrial Report states that most listed species have unique habitat that are not present on this site. As described in the Terrestrial Report (see Appendix E). No federal or listed wildlife species were observed and the habitat suitability for these species is low to moderate. While collectively the site has moderate non-listed wildlife potential, the landscape surrounding has been heavily modified by agriculture, infrastructure development and acreage development, along with well-developed roads which all reduce the quality of habitat in the area.

In response to requirements of Section 5.2.3.7

The total size of the proposed development is 62.346 ha (154.06 acres).

In response to requirements of Section 5.2.3.8

Not applicable as no substantive active public recreational amenity is proposed.

In response to requirements of Section 5.2.3.9

Not applicable as no substantive active public recreational amenity is proposed.

In response to requirements of Section 5.2.3.10

Public consultation involved a circulation of the developer's business intent and development informational package, a complete package mail-out by the RM staff during public consultation phase, and individual personal meetings with owners to provide comments and discuss the project one-on-one with the developer. Mr. Beulac has consistently made himself available throughout the process to meet with and discuss comments regarding the plan for this site, by mail, phone, text, email, and personal meetings.

A second round of Public Consultation took place in June-July of 2016. This included a second mail-out package summarizing the development, a comment response form, and the existing CDR was made available as hardcopy or digital download for public viewing. As well, Mr. Beulac has always been available for discussions with other landowners through email, telephone, and in person meetings if requested.

Public comment summaries at Section 3.0 of this report and Appendices U all describe the substantial public consultation regarding concept development and public review.

If any further comments of concern arise from the Bylaw public hearing the developer is also available to respond at that time.

In response to requirements of Section 5.2.3.11

The level of public consultation was deemed appropriate for the MPCR application 'Public Consultation Phase'. Further, RMCP staff has indicated that the ongoing availability and access to information, and Mr. Beulac himself, is viewed to be consistent with the intent of the OCP requirements.

A second round of public consultation has taken place at the municipality's request in order to provide local landowners an opportunity to view the completed CDR document prior to final submission. The Public Consultation Mailout package is available at Appendix H.

In response to requirements of Section 5.2.3.12

A servicing agreement with the RMCP has not yet been created, but as subdivision is involved with this application, it will be negotiated at a future time prior to development taking place.

In response to requirements of Section 5.2.3.13

Sufficient potable water supply is confirmed with the Lost River Water Utility. Throughout the process the Utility has offered support and approval for this water supply. The Supply line is deemed sufficient for the development as described in AECOM engineer's Serviceability Review (see Section 2.3, Serviceability Review Appendix B, Utility Contract and correspondence Appendix M, and the worksheets provided Appendix Y).

In response to requirements of Section 5.2.3.14

The wastewater management practice is described in Section 2.3 of this report, and in Appendix B. A septic system utility can be created in a legal form that is acceptable to the Municipality and Saskatoon District Health Region. No comments have been made available by Saskatoon Health Region at this time (see Appendix N). The Hydrogeological Assessment indicates that Type II mound systems will be appropriate for the density and sub-surface characteristics of the site (see Appendix D) and this has been applied to the wastewater servicing assessment conducted. The Septic System Feasibility Report completed in June 2016 is available at Appendix W.

In response to requirements of Section 5.2.3.15

Hidden Ridge Estates MPCR is adjacent the north boundary of the proposed development site. Only 2 houses from 4 lots total are adjacent the north boundary. One house screened visually by the drop in elevation across their property and the other is very well screen by well-established trees and bush cover.

Applewood Estates MPCR is across Range Road 3041 to the east of the proposed development site. There are 5 lots that are adjacent RR 3041. There are also buffer strips on each side of the road right of way. Housing in Applewood will be closer to their side neighbours that they will to Meadow Ridge lots across the buffers and road.

In response to requirements of Section 5.2.3.16

Not applicable as this proposal does not involve any Hamlet expansion.

In response to requirements of Section 5.2.3.17

The location of this proposed development site conforms to requirements of this OCP section.

In response to requirements of Section 5.2.3.18

This MPCR development will not have any significant negative impacts to other landuses in the Municipality or on the environment. The conceptual layout was designed to maintain natural areas as much as possible as an amenity for home owners and excessive alteration of the environment is not conducive to the marketing intent for the project.

No federal or listed plant species were observed on the site during the environmental field reviews. The Terrestrial Report states that most listed species have unique habitat that are not present on this site. (See Appendix E)

No federal or listed wildlife species were observed and the habitat suitability for these species is low to moderate. While collectively the site has moderate non-listed wildlife potential, the landscape surrounding has been heavily modified by agriculture, infrastructure development and acreage development, along with well-developed roads which all reduce the quality of habitat in the area. (See Appendix E)

The *Heritage Resources Impact Assessment* states that “no new heritage sites were observe therefore this office has no further concerns with this project proceeding as planned. This Final Report fulfils the permitting requirements necessary for the completion of the HRIA”. (See Appendix G).

In response to requirements of Section 5.2.3.19

The Canada Lands Inventory system describes the land classified as Class 3, and Class 5 with limitations to soil, water and stoniness. (see Appendix A- Figure 4 referencing the Canada land Inventory data, and the Terrestrial Report at Appendix E),

In response to requirements of Section 5.2.3.20

The conceptual layout purposely provides the south access/egress point using the same existing location as the current farm access. It meets separation distance from other intersections and no new intersections are required.

Traffic Impact Assessment is complete and can be reviewed at Appendix C. The key findings of the TIA support the development of this site and that no concerns are raised for the immediate road system or relevant intersections in the area. There are minimal traffic volume impacts generated at peak hours for this site. The development of Rosewood plan amendments and the perimeter highway will be considerably greater than this 55 lot residential subdivision.

The Traffic Impact Assessment and related Figures have been submitted to Ministry of Highways and Infrastructure for their preliminary review and to request any comments on the development. At time of submission to RMCP, preliminary comments have not been received from the Ministry of Highways and infrastructure.

In response to requirements of Section 5.2.3.21

Using the Statistics Canada average household size and average student per household there could potentially be approximately 28 students generated by the development at full build-out. Options for educational facilities include; Clavet elementary and High School, the Saskatoon Catholic School, and other facilities in the City of Saskatoon if desired.

Comments provided by the Prairie Spirit School Division indicate that "Prairie Spirit School Division will provide capacity to accommodate student enrolment for the proposed development" see correspondence at Appendix V.

In response to requirements of Section 5.2.3.22

This development is planned for design, tender and construction with only one phase of development.

The conceptual planning and preliminary engineering components of this CDR process have been conducted so as to provide a seamless transition into civil infrastructure detail design and detail engineering for tender documents and construction. The developer has access to the full services of AECOM to provide tender documents and construction services for the site. AECOM has substantial experience and staff specifically dedicated to the land development industry. As well Mr. Beaulac is an experienced and successful land developer with a strong drive to have this project be done properly and efficiently to provide a high quality product for the market.

In response to requirements of Section 11

The infrastructure servicing plan is summarized in section 2.3 of this report and attached at Appendix B, and worksheets are provided separately at Appendix Y.

2. Inventory and Analysis

2.1 Existing Land Use

The total land area intended for development is 62.346 ha (154.06 ac).

The property proposed for development is located on lands characterized as knob and kettle moraine, with an undulating topography and numerous low areas and potholes surrounded by shrubs and aspen. The land is mostly undeveloped. There is one existing residence with a shop and yard which is intended to remain as part of the subdivision on a new lot. There is some use for grazing and limited private hay production. Other areas not used for grazing contain shrubs and brush. The land is classified as Class 3 and Class 5 with limitations on soil, water, and stoniness under the Canada Land Inventory Classification system. (See Appendix E -Terrestrial Assessment).

The Lost River Water supply line runs along the east boundary of the site.

A TransGas line crosses the property east-west. TransGas has been contacted for preliminary comments. At this time it is anticipated that the subdivision application may result in a required inspection of the line. The developer plans to conduct this inspection if required as soon as possible so as not to delay development. TransGas representatives have been helpful and specific comments regarding building setbacks have been accommodated in the layout design. More comments are expected to when they have completed the subdivision review. They have indicated that they support Mr. Beaulac's proactive attitude regarding their line. Lot layout has been designed to allow a 30 m building envelope distance from the TransGas line to accommodate the *Safety Corridor Guidelines*.

During the MPCR call for proposal stage, the RMCP staff indicated that there may be requirements due to a "known PotashCorp lease". Discussions with PCS Patience Lake General Manager have indicated that there is believed to be no lease area on this site. Correspondence is attached at Appendix R.

2.2 Description of Proposed Development

The Plan of Proposed Subdivision is included at Appendix X. Meadow Ridge Estates is intended to be developed all in one phase.

The original conceptual layout design from August 2013 is included at Appendix A. It is outdated and the current and accurate plan to reference is the Plan of Proposed Subdivision at Appendix X. Between the completion of the Conceptual Layout Plan and creation of the final Plan of Proposed Subdivision, various design changes have taken place. There have been adjustments to the original road alignment, lot layout, total lot count, and the elimination of some ER parcels.

The PPS proposes development of 55 lots. No formalized public gathering spaces, or facilities are proposed and MR requirements will be met with a Cash-in-Lieu payment.

The Hydro-Geotechnical Investigation is included at Appendix D. Conclusions regarding soil absorption and seepage have been taken into account for the wastewater planning. The Servicing Review outlines plans for septic systems and further collaboration will take place with Saskatoon Health Region at the subdivision review stage, as required.

Similar to other CR developments to this area, this development is compatible with minimal potential conflicts with the surrounding area. The surrounding areas have been selected by the RMCP in 2007 for CR development specifically based on the favourable geographic position within the landuse framework of the RMCP land base. This development site is contiguous with 2 other MPCR developments. One has only 2 houses adjacent the site and the

other is across RR 3041. The primary intent of this subdivision is to create a quiet, calm low density residential area. Future activities on the properties will be regulated by the RMCP OCP, relevant Bylaws and National Building Code.

Table 2 Landuse Calculations

Development Consideration	Rural Municipality Zoning Bylaw Requirements	Meadow Ridge Estates
Total Site Area	Maximum – 64.8 ha 160 acres	62.346 ha 154.06 acres
Total Lot Area – Residential Development		55.07 ha 136.05 acres
Lot Size	Minimum – 1 acre, Maximum - 10 acres	Minimum – 1.04 acres, Maximum – 10.0 acres
Total Lots		55 lots
Average Lot Size	Minimum 1 residential lot per acre	1.0 acres
Overall average lot size	Minimum 2.47 acres	2.47 acres
Total Area – Municipal Reserve	10 %	Cash in Lieu

2.3 Servicing

2.3.1 Transportation

As part of the design and information gathering process, Mr. Beaulac has completed a Traffic Impact Assessment for this development. The purpose of the TIA was to identify the impact of the development on the adjacent roadways and intersections. Existing PM peak traffic volumes at the key intersections were collected and analyzed.

The trips generated from the development was calculated based on the Ridgewood Estate's concept plan and using the most recent version (9th edition) of the Trip Generation Manual, published by the Institute of Transportation Engineers (ITE). The concept plan incorporated a total of 51 single family dwelling units. Considering the ITE trip generation rate for single family dwelling units, a total of 39 a.m. peak hour trips and 51 p.m. peak hour trips were estimated to be generated from the proposed Ridgewood Estates. The new trips generated by the development were combined with the background traffic. Background traffic growth considered both natural growth of the existing traffic, and traffic generated by other planned developments in the vicinity of the study area. The combined trip were distributed and assigned to the adjacent road network. A capacity and Level of Service (LOS) analysis was performed using the traffic analysis software Synchro 8. The traffic analysis investigated both existing and future operating conditions during afternoon peak hour traffic conditions. The analysis provided the following key findings:

- Under existing traffic condition, all the three key intersections operate at a good level of service during afternoon peak hour. The existing turning traffic volume at the Patience Lake Road and Range Road 3041 Intersection is very low. The two-way stop controlled NB and SB movements of this intersection currently operate at a LOS "A".
- With the existing geometry and lane configuration, all the three key intersections will operated at a good level of service during 2020 afternoon peak hour traffic condition. The full build-out of Ridgewood Estate will generate substantial turning traffic movements at the Patience Lake Road and Range Road 3041 Intersection. However, the two-way stop controlled NB and SB movements will operate at a LOS "A".

The traffic generated from Ridgewood Estates will not have any significant impact on adjacent roadways and at the key intersections at full-build out. All the three studied intersections will operate at a good level of service and have surplus capacity to accommodate additional traffic. The existing geometry and lane configuration of the intersections do not require any changes in order to accommodate traffic generated from Ridgewood Estate development. However, two intersections on Zimmerman Road i.e. Highway No. 16 and Zimmerman Road Intersection and

Patience Lake Road and Zimmerman Road Intersection will have several improvements in the future with the progression of Rosewood Neighbourhood development in the east of Zimmerman Road.

The Rosewood Neighbourhood Concept Plan Amendment Area (CPAA) study prepared by Stantec Consulting Ltd. identified that the existing un-signalized Highway No.16 and Zimmerman Road intersection will be signalized in the near future with the advancement of Rosewood neighbourhood development and a grade-separated interchange will be constructed at this location at some point in the future. Two at-grade intersections along Zimmerman Road i.e. Zimmerman Road/Rosewood Boulevard and Zimmerman Road/ Connector Road will provide access to the residential, commercial and industrial areas to the east and west of Zimmerman Road. Existing Patience Lake Road will be realigned to connect to Zimmerman Road at the Zimmerman Road/Rosewood Boulevard intersection.

2.3.1.1 Municipal Roadways - Traffic Impact Assessment Results

1. Highway No. 16 and Zimmerman Road Intersection:
This intersection provides primary access onto Highway No. 16 for commuting traffic between Meadow Ridge Estates and Saskatoon.
2. Patience Lake Road and Zimmerman Road Intersection:
It is expected most traffic commuting between the Meadow Ridge Estates and Saskatoon will utilize this intersection to access onto Highway No. 16.
3. Patience Lake Road and Freeborn Road Intersection:
It is expected most traffic generated by the development will drive through this intersection, therefore increase the east-west through movements as commuters travel to Saskatoon.
4. Patience Lake Road and Range Road 3041 Intersection:
The development is located in the northwest quadrant of this intersection. Approximately half of site traffic will use this intersection.
5. Meadow Ridge Estates Access on Range Road 3041(i.e. East Access):
This is one of the two accesses for the development and is located to the north of the Patience Lake Road and Range Road 3041 intersection.
6. Meadow Ridge Estates Access on Patience Lake Road (i.e. South Access):
This is one of the two accesses for the development and is located to the west of the Patience Lake Road and Range Road 3041 intersection at the existing farm access.

This TIA has been forwarded to MHI for their review and preliminary comment.

See further content of Traffic Impact Assessment at Appendix C.

In addition, MHI has general design specifications that include a requirement that no development be established within a triangle formed by measuring the following distances from the intersection of the roadway centrelines and joining the points so obtained:

- 290 metres (951 feet) along the highway centreline
- 80 metres (263 feet) along the centreline of the intersection grid road.

The concept plan provides for the required sight lines at the southeast and southwest corners of the subdivision development, where the existing RR 3041 at the proposed Meadow Ridge intersect with the Patience Lake Road.

2.3.1.2 Internal Road Network

The road cross section is based on a road right-of-way width of 30 m. The 2,200 m long road will have an 8 m wide crowned double seal coat driving surface with a minimum cross slope of 3.0%. The sideslope will be 4H:1V over 3 m followed by a 3 m wide ditch bottom with a 30H:1V gradient to provide a low flow swale. The backslope will be 4H:1V over the remaining 4 m of the right-of-way, resulting in a typical ditch depth of 1 m as measured from the ditch bottom to the road centreline and property line. The ditches will be loamed and seeded and culverts will be provided with flared ends and appropriate armouring to prevent soil erosion. The anticipated road structure includes a minimum of 100 mm subgrade preparation, below 150 mm soil stabilized granular base course, below a prime coat and 25 mm double seal coat road surface treatment.

2.3.2 Potable Water Supply

The nearest available potable water supply with sufficient capacity to service a new subdivision is owned and operated by Lost River Water Corporation (LRWU). A 100 mm diameter high density polyethylene (HDPE) potable water line was installed adjacent to the subject lands in 2012 along the east property line parallel to Range Road 3041. This is the water supply servicing the Hidden Ridge and Tuscan Ridge developments and is the primary alternative for a water supply to Meadow Ridge Estates. A user agreement between LRWU and the developer is currently underway.

SaskWater is currently providing 20 gal/min of water to LRWU at a pressure of 80 psi. Upon full build-out of the Hidden Ridge, Applewood and Tuscan Ridge subdivisions, there will still be adequate capacity in the system to service the Meadow Ridge Estates subdivision. LRWU has informed AECOM that the system is capable of increasing flows up to 60 gal/min prior to full build-out of the subdivisions. LRWU will install a lead-free, RF meter on each residence to monitor consumption and invoice each user individually.

Correspondence regarding the water supply agreement is included at Appendix M.

2.3.3 Wastewater Collection

Domestic wastewater collection will consist of onsite private sewage disposal systems administered by the homeowner and designed and constructed in accordance with the applicable building/plumbing codes, Ministry of the Health, Ministry of Environment, Saskatoon Health Region, Water Security Agency and the RM of Corman Park regulations, guidelines, bylaws and recommendations.

As outlined in the Ridgewood Estates Hydro-Geotechnical Investigation prepared by Golder Associates Ltd. dated August 2015, a sewage wastewater system such as the MicroFAST Wastewater Treatment system or similar is recommended for use at each dwelling. The hydro-geological investigation, as provided in Appendix D, will be registered on the title of each parcel to ensure the information is available to any purchaser through ISC. (See Appendix B)

A site specific septic analysis is attached as *Septic System Feasibility Report* at Appendix W.

2.3.4 Drainage

Stormwater runoff will be conveyed via overland surface drainage routes using roadside ditches, swales and culverts. No minor piped stormwater sewer collection systems are proposed. Existing low areas will be incorporated into the drainage plan and expanded where necessary to provide sufficient stormwater runoff storage. Drainage runs will be incorporated along road right-of-way's following the existing patterns with minimal adjustments for development.

The pre-development imperviousness of the existing site is estimated to be 5%. The post-development imperviousness of the entire site is estimated to be 12% upon full build-out of the subdivision, therefore, an overall increase in the runoff volume is anticipated. The additional runoff produced by the development will be contained in the natural and constructed low areas. Final sizing of the storage areas will be completed during detailed design of the subdivision.

The XPSWMM stormwater computer modeling program will be utilized to determine the temporary storage required to attenuate the peak flow during a 1:100 storm event. The storage areas will be sized to contain the additional volume of runoff produced during a 1:100 year rainfall event at the HWL. Any overland flows originating from offsite will continue to flow around the property and will not be considered for storage onsite.

The pre-development volume of runoff produced during the 1:100 year storm (producing 90 mm depth of rainfall over 24 hours) from the total parcel size of 62.346 ha is 17,300 m³. The volume of post-development runoff produced from this area is approximately 21,300 m³, resulting in additional storage requirements of 4,000 m³. To account for no stormwater capacity downstream during extreme events, an additional 25% storage volume has been included, so the total volume of additional runoff to be contained onsite is 5,000 m³. Since the existing storage areas can accommodate this excess volume of runoff, additional storage areas are not required. (See Appendix B)

2.3.5 Solid Waste Management

Owners will remove solid waste on an as required basis independently or contract service out for their lot. Correspondence with Loraas Disposal Services have confirmed they have capacity to service this development and are available for this service. See confirmation letter in Appendix Q.

2.3.6 General Servicing

Summary of Property Servicing Forms are attached in Appendix Y. Infrastructure servicing values described in Appendix B and Y will be expanded in further detail as part of the final design quantities.

2.3.6.1 Shallow Utilities

A review of the proposed development by **SaskTel** determined that existing copper and fibre optic cables in the area can be routed to the new subdivision from numerous locations, however, SaskTel will not install communication infrastructure to each lot during the initial subdivision construction. Individual applicants will be required to call the SaskTel business office to make the request for a new service and pay the service connection fee (2015 rate \$475.00). There will be no charge to the developer for this work. SaskTel will register a joint use easement with SaskPower for a minimum 4.5 m wide easement. Cables will be trenched as service is requested on an individual basis. (See Appendix L)

SaskPower has an existing overhead three phase 25 kVA distribution line running east-west along the south property line in the Patience Lake Road ROW and a 25 kVA underground line running north-south along the west side of Range Road 3041. In order to adequately service all 51 lots onsite, the new service lines will connect to each boundary distribution line in accordance with SaskPower Notification # 301579999, Quotation #96802 dated November 2, 2015. (See Appendix J)

SaskPower has designed the underground power distribution network to provide each lot with a 200-amp, 120/240-volt, single phase, three-wire service at a freestanding pedestal complete with a metering/splitter box located within 5m of the property line. It is the responsibility of each individual lot owner to install the underground service cables from the metering pedestal to the future house and buildings on each lot

SaskEnergy owns and operates a 168.3 mm diameter Polyethylene (PE) natural gas distribution pipeline located along the south boundary of the property (SE14-36-04-W3M), on the north side of Township Road 362. In order to service each new lot of the proposed development, SaskEnergy will tie into the existing pipeline in three separate locations and install a 60.3 mm diameter PE pipe within a registered easement along the roadway and private lots. (See Appendix K)

TransGas owns and operates a 323.9 mm diameter high pressure steel natural gas transmission line located within a 15 m wide right-of-way in an east-west orientation approximately 130 m inside the south boundary of the site. The lot layout design allows for a 30 m distance between the existing gasline and potential house construction sites. This is to provide adequate building envelopes while accommodating requirements of the Encroachment Permitting Area as described in the TransGas Safety Corridor Guidelines. (See Appendix P)

2.3.6.2 Public Facilities

No public facilities are proposed for this development.

2.3.6.3 Landscape Plan

The landscaping and buffering has been included through use of existing natural tree stands and elevations. Further landscaping and entry signage may be developed as entry features to theme the development. A guiding design principle was to retain natural vegetation and maximize vistas for housing and roads, for instance entry to Meadow Ridge Place, views of ER, vista to west etc. Building site locations have been considered by applying the natural and regulated setbacks.

2.3.6.4 Lighting

Through discussions with developer and RM it has been determined that no lighting is desired for this project. There is no interest in establishing any non-compulsory lighting. Any lighting that is deemed required will adhere to the RMCP Landscape Guidelines.

2.3.6.5 Schools

Using the Statistics Canada average household size and average student per household there could potentially be approximately 28 students generated by the development at full build-out. Options for educational facilities include; Clavet elementary and High School, the Saskatoon Catholic School, and other facilities in the City of Saskatoon if desired.

Comments provided by the Prairie Spirit School Division indicate that "Prairie Spirit School Division will provide capacity to accommodate student enrolment for the proposed development" see correspondence at Appendix V.

2.3.6.6 Fire and Protective Services

Fire and protective services are readily available to the proposed subdivision. Corman Park Police Services provide and deal with both provincial law and Corman Park bylaws. In addition, policing services are provided by the Royal Canadian Mounted Police who are typically responsible for matters pertaining to the criminal code and provincial laws.

Fire services are provided by the Saskatoon Fire Department. The Saskatoon Fire Department was contacted and they indicated service is provided to this site through the standing agreement contract with RMCP. Their recommendations were to also encourage fixed systems such as sprinklers as to best reduce damage and the installation of early detection systems (alarms and off site monitoring systems) is the next best method to maximize response time. These comments will be passed on to buyers. General comments are included in Appendix O.

2.4 Natural and Heritage Resources

2.4.1 Environment

A Terrestrial Assessment was completed by Golder Associates in October 2014. This report is attached as Appendix E.

This report indicates that subject lands are characterized by “knob and kettle” moraine comprised of moderately to strongly sloped areas, with interspersed low-lying depressions. The soils are classified as moderately to very stony, with low potential susceptibility to wind and water erosion.

No federal or listed plant species or wildlife were observed on the site during the environmental field reviews. The Terrestrial Report states that most listed species have unique habitat that are not present on this site. As described in the Terrestrial Report (see Appendix E). No federal or listed wildlife species were observed and the habitat suitability for these species is low to moderate. While collectively the site has moderate non-listed wildlife potential, the landscape surrounding has been heavily modified by agriculture, infrastructure development and acreage development, along with well-developed roads which all reduce the quality of habitat in the area.

Property owners will be encouraged to review a document entitled “Acreage Living: A Conservation Guide for Owners and Developers of Natural Habitats” which is available online on the Native Plant Society of Saskatchewan website.

The document can be accessed through the following link:

http://www.npss.sk.ca/docs/2_pdf/NPSS_AcreageLiving.pdf

2.4.2 Heritage Resources

The *Heritage Resources Impact Assessment* states that “no new heritage sites were observed therefore this office has no further concerns with this project proceeding as planned. This Final Report fulfils the permitting requirements necessary for the completion of the HRIA”. (See Appendix G).

3. Public Consultation

3.1 Consultation Process

Mr. Beaulac, as an experienced developer understands the importance of thorough consultations. The consultation process involved for this application included multiple opportunities for nearby landowners to respond with concerns.

1. Informational Development Package made available
2. Public Consultation Mail-out Package by RMCP staff, supplied by Mr. Beaulac at the scoring stage.
3. One-on-one personal interview meetings with property owners.
4. Ongoing availability through Phone-Text-Email-in person to discuss the project.
5. A second complete Public Consultation Mail-out Package circulation
6. Public Hearing at approval phase (still pending).

Public consultation involved a circulation of the developer's business intent and a development informational package, a complete package mail-out by the RM staff during public consultation phase, and individual personal meetings with owners to provide comments and discuss the project one-on-one with the developer. Mr. Beaulac has consistently made himself available throughout the process to meet with and discuss comments regarding the plan for this site, by mail, phone, text, email, and personal meetings.

Both mailout packages are available at Appendix H.

If any further comments of concern arise from the Bylaw public hearing the developer is also available to respond at that time. (See Appendix U – Consultation Comment Forms)

3.2 Comments/Response/Mitigation Summary

3.2.1 Summary of the concerns from the Public Consultation

35 - Written responses via mail or email which are included in Appendix U.

4 - Phone call discussion with Meadow Ridge Estates

- Neil Friske – homeowner directly south of Applewood Estates
 - Fully supports the project.
- Shawn Luhnig
 - I sold him his acreage and he was aware that I will be developing the land around him.
 - I will give a first right of refusal one the lots that touch his property.
 - He “conceptually” supports the project.
- Colin Allan – Homeowner southwest of Meadow Ridge Estates.
 - No comment positive or negative.
- Anthony Tataryn – Homeowner directly south Meadow Ridge Estates
 - Would appreciate that the entrance to Meadow Ridge Estates would not be directly in front of his house.

- o We agreed with his request.

3 - Phones calls were received asking for clarification regarding the mail-out package. Mr. Beaulac provided timely response to their questions.

26 - Individual land owners who returned a written response requesting further clarification of the development proposal. Mr. Beaulac responded to most by emailed and proposed a phone call discussion to reply to their questions and concerns about the project.

3.2.2 Response to the concerns from the Public Consultation

Adjacent land owners with dwellings:

Concern: The project will share the same property lines with 4 landowners that have dwellings.

Response: The developer has committed to all of these landowners that they will have the first right of refusal on the lots that are adjacent their property line. The individuals appreciated the offer and were “conceptually” in support of the project.

Density of development too high:

The Plan of Proposed Subdivision lot layout design meets the RM's requirements for minimum, maximum and average lot size and density.

Market demand for more acreage lots:

Concern: Status of existing lot inventory in the RM appeared was a concern to some respondents.

Response: The developer's response is that this development offers a residential product at a price level that differentiates this project from what is on the market today. The developer is prepared to make a multi-million dollar investment in this site and has confidence there is a demand and market for acreage lots ideally located with an attainable price. Mr. Beaulac has been in the land development business for many years and is confident of the market demand based on experience. He believes that the Saskatoon area's economic climate is still very strong with high population and income growth.

Water Supply:

Concern: Supply of water will have a negative impact on other areas and may cause a possible lack of supply and pressure.

Response: Mr. Beaulac has personally met with Mr. Rob Risling, Vice President of Lost River Water Utility. He has provided assurance that there is necessary capacity for the Meadow Ridge Estates project and that supply to new lots will not affect the current customer base. Correspondence letters confirming the supply of water are included at Appendix M.

Mr. Risling has provided further support to Mr. Beaulac to the effect that: supply / line capacity has never been an issue for their current customers. The flow rate and pressure for the water line is tested daily and is increased or decreased based on consumption. All tests are logged on a daily basis and can be reviewed if required. Currently their customers have a ½ gallon per minute flow rate per house which will be maintained as more houses are added. This flowrate exceeds the industry standard.

Traffic and Excess Wear and Tear on Range Road 3041:

Concern: New traffic will cause excessive wear on Range Road 3041.

Response: This development is designed to have a primary access point from Patience Lake Highway 394 with a secondary access point on RR 3041. The site is specifically designed for the secondary entrance to be close (approximately 200 meters) to the Patience Lake Highway 394. The TIA shows there will not be significant traffic onto RR 3041 from this development.

Further details of Traffic characteristics have been made available through the CDR and the Traffic Impact Assessment at Appendix C.

Future land use understanding:

Concern: Hidden Ridge residents were told there would be no further development within 1 mile radius.

Response: Difficult to form a response to unknown discussions. Effort has been made to explain the project and show Mr. Beaulac's desire to have this project done in a proper manner with minimal disruption to neighbours, which in turn, is also in his best interest for marketing and sales perspective as well.

Appearance during construction:

Concern: The development will turn into an eye sore and dust bowl:

Response: Mr. Beaulac can supply references that all his previous projects have been constructed in a professionally way and are completed in a timely manner.

Natural Landscape:

Concern: The natural landscape will be destroyed.

Response: The layout design intends to maximize the preservation of the trees and natural vegetation as much as possible. It is a benefit to the developer to keep the area in a natural state so that it is seen as an attractive and desirable estate character. The natural appeal is part of the marketing plan and overall feel for the development. Damage to the natural landscape is intended to be minimal. The natural rolling hills, treed areas and bluffs are assets for selling lots and will be maintained as much as possible. (See Appendix X - PPS)

Drainage:

AECOM has completed a comprehensive design review of drainage for the development. No adverse effects will occur to neighboring developments or residents. A summary of the design review is included in the CDR and further detail is available in the *Servicing Report* and *Supplemental Design Basis Narrative* in Appendix B. A summary of the drainage plan has been made available to anyone requesting it.

Septic/Waste Water Systems:

Each lot owner will be required to apply for a Building Permit and a Private Sewage System Permit. In order to get Private Sewage System permit a site evaluation on lot by lot basis will need to be done and the design will need to meet or exceed Saskatchewan Health's requirement.

Further information is available at Appendix W within the *Septic System Feasibility Report*

4. Mapping Checklist

Reference Figures are included in Appendix A. Other figures and imagery are included in supporting reports.

Context Map: See Appendix A – Figure 1,2,3,4

Plan of Proposed Subdivision: See Appendix X

Pre-development drainage: See Appendix A – Figure 5,6,7;

Post development drainage: See Appendix A – Figure 10; also at Appendix B – Figure 10

Utilities Plan (where provided with cost quote): See Appendix J for SaskPower, Appendix K for SaskEnergy, Appendix L for SasTel.

Landscape Plan: no additional landscaping is proposed for this development.

Other useful independent reference images are contained within the relevant reports in the appendices.

5. Technical Reports/Agency Responses

Preliminary Geotechnical: See Appendix D – Hydro-Geotechnical Investigation, Golder Associates, August 2015

Wildlife Habitat Inventory: See Appendix E – Terrestrial Assessment, Golder Associates, October 2014

Archeological Survey: See Appendix G – Heritage Resources Impact Assessment, Golder Associates, October 2014

Engineered Drainage Report: See Appendix B – Serviceability Review, AECOM, March 2016 and Supplemental Narrative September 2016.

Ground & Surface water Evaluation: See Appendix D – Hydro-Geotechnical Investigation, Golder Associates, August 2015

Traffic Impact Assessment: See Appendix C – Traffic Impact Assessment, AECOM, September 2015

Wastewater System: See Appendix B – Serviceability Review, AECOM, March 2016 and Supplemental Narrative September 2016

Utilities: See Appendix J for SaskPower, Appendix K for SaskEnergy, Appendix L for SaskTel.

Local Services: See Appendix V for Prairie Spirit School Division, Appendix O for Fire Protection Services

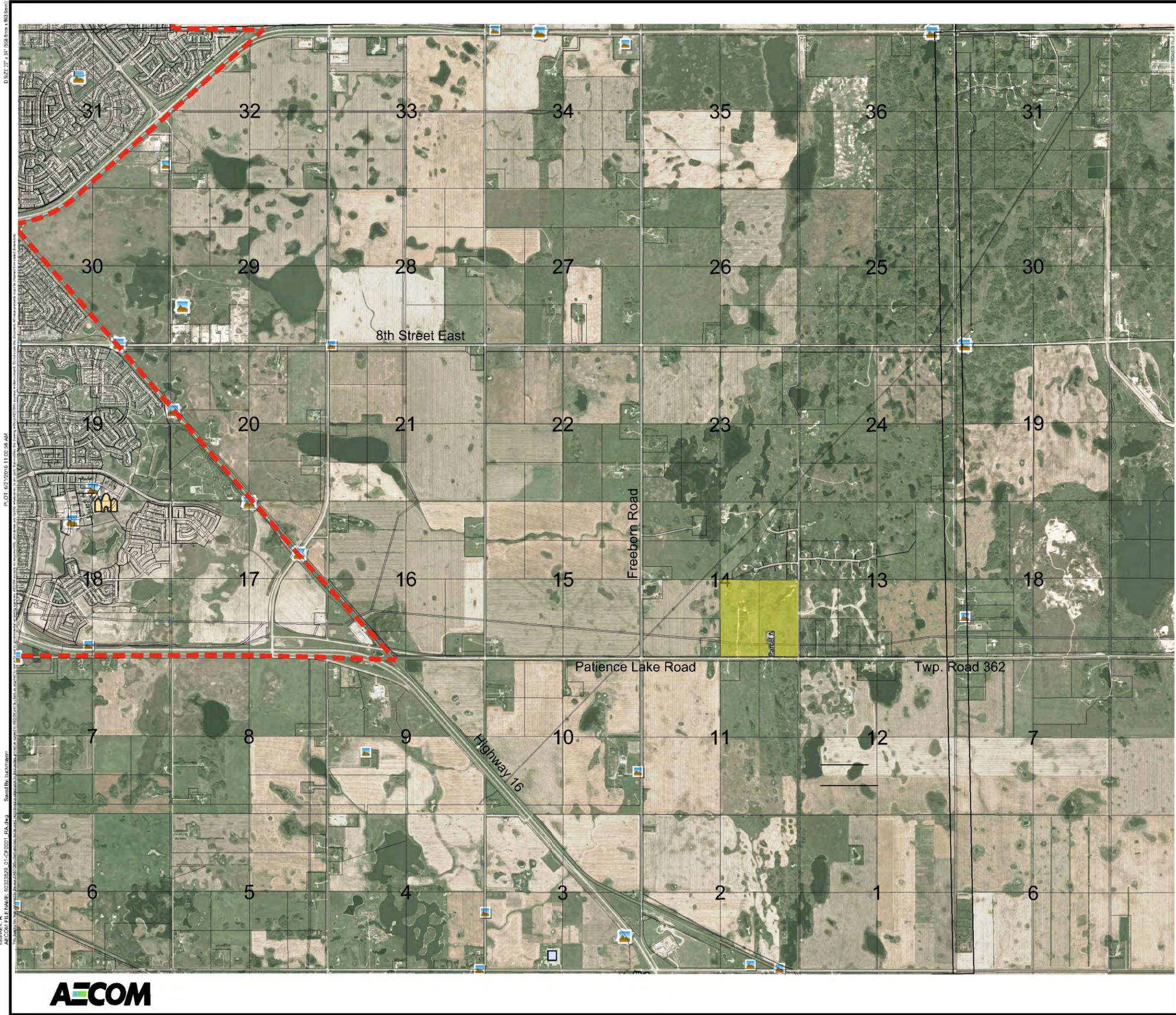
MHI: See Appendix S for EM request and response.

Phase 1 Environmental Site Assessment: See Appendix F, Phase 1 ESA, Golder Associates, September 2014

Septic System Feasibility Report, Imagine Contracting, June 2016, See Appendix W

Appendix A

Reference Figures



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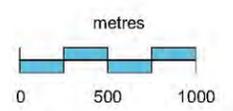
LEGEND



Meadow Ridge Estates
SE14-Twp.36-Rge04-W3M



Saskatoon City Limits



SCALE 1:40,000

Regional Context

Meadow Ridge Estates

Figure **1**



Local Context

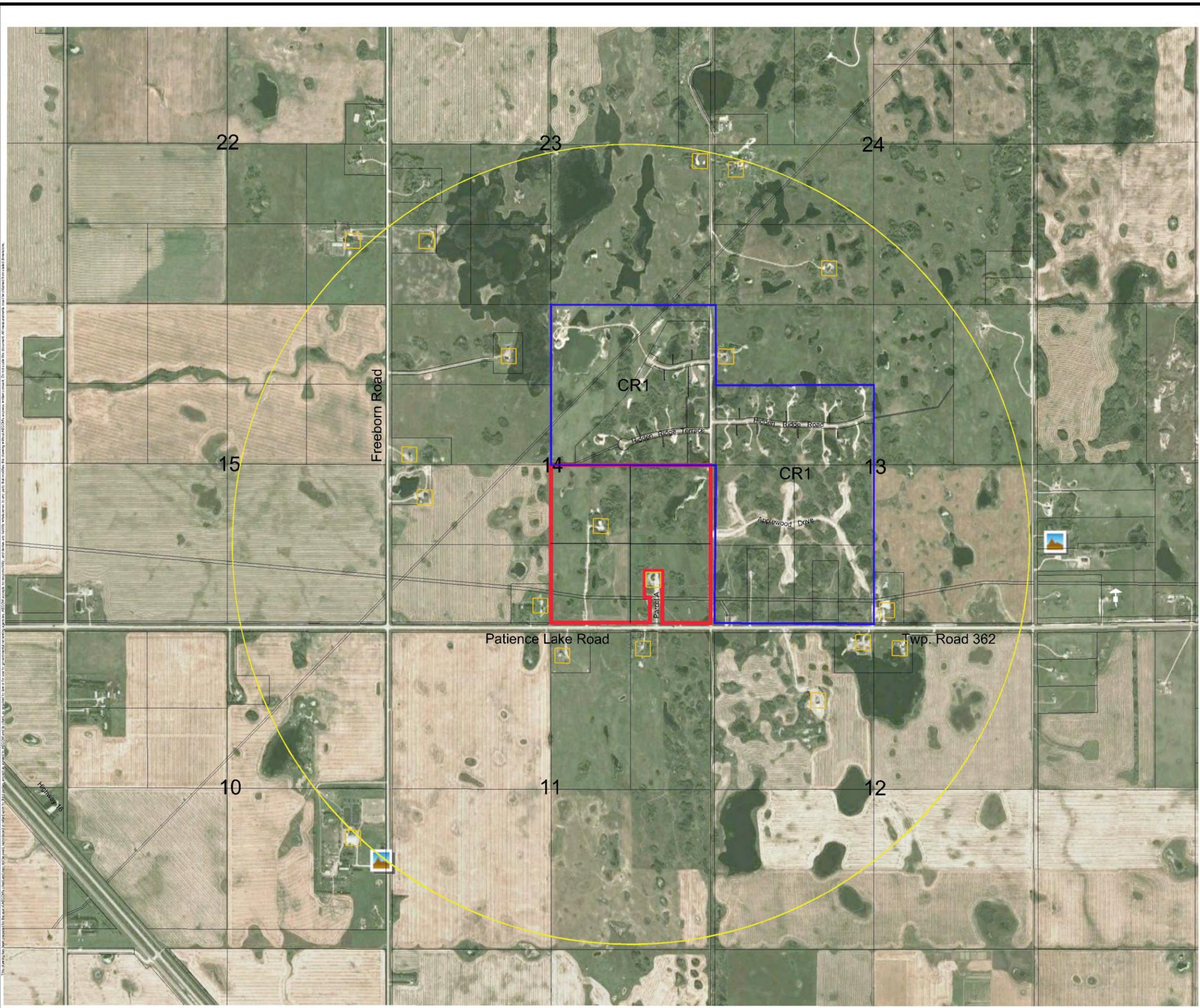
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— Study Area Boundary

— Meadow Ridge Estates

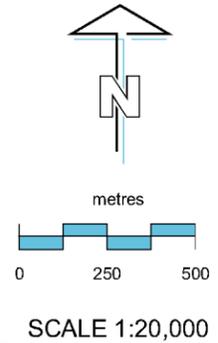
Figure 2

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-  Country Residential Area
-  Radius = 1 mile
-  Residences and Farmsteads

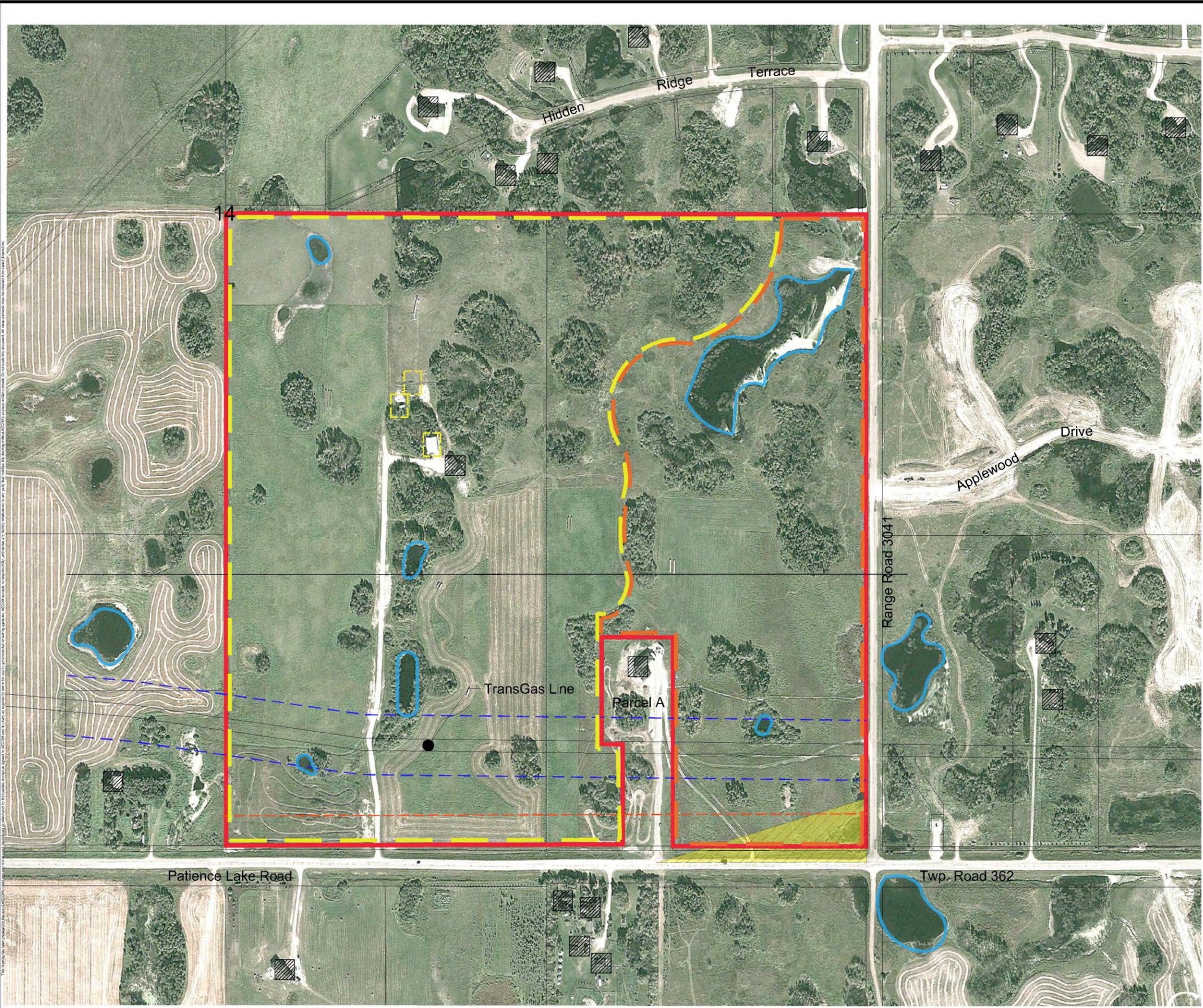


Existing Landuse & Labeled Location Map

Meadow Ridge Estates

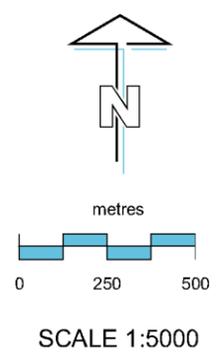
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LEGEND

- Study Area Boundary
SE14-Twp.36-Rge04-W3M
- TransGas Easement
High Pressure Gas Line
- MHI Construction Setback
- West: CLI Soil Class
3s
- East: CLI Soil Class
3_{5w}
- MHI Site Line Setback
- Existing Buildings
- Existing Residence
- Water Features
- Natural Vegetation

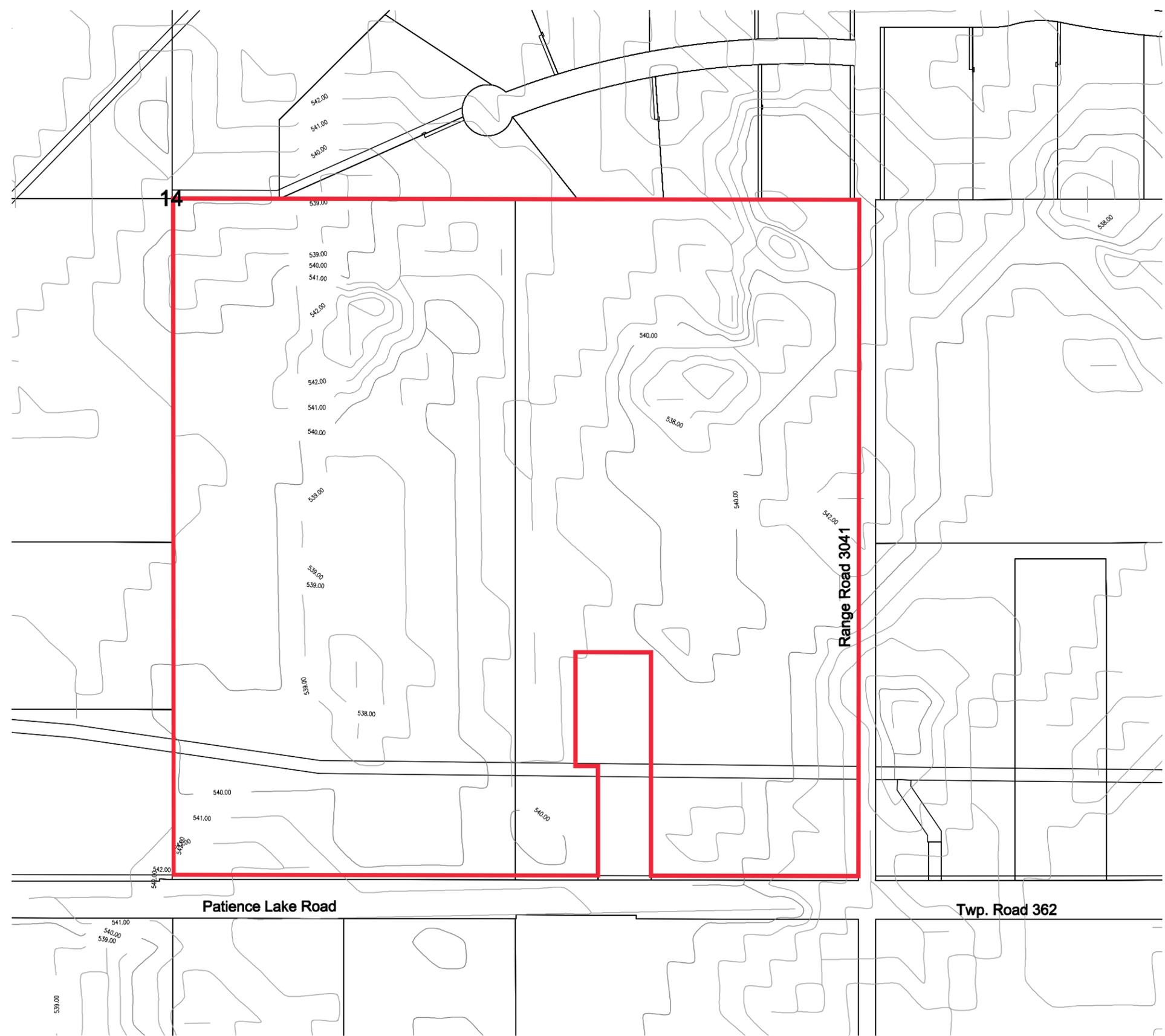


Existing Conditions & Site Plan

Meadow Ridge Estates

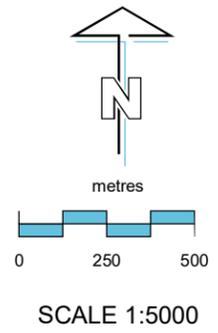
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-  Study Area Boundary
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-  Contour Interval 1.0m



Topographic Contour Plan

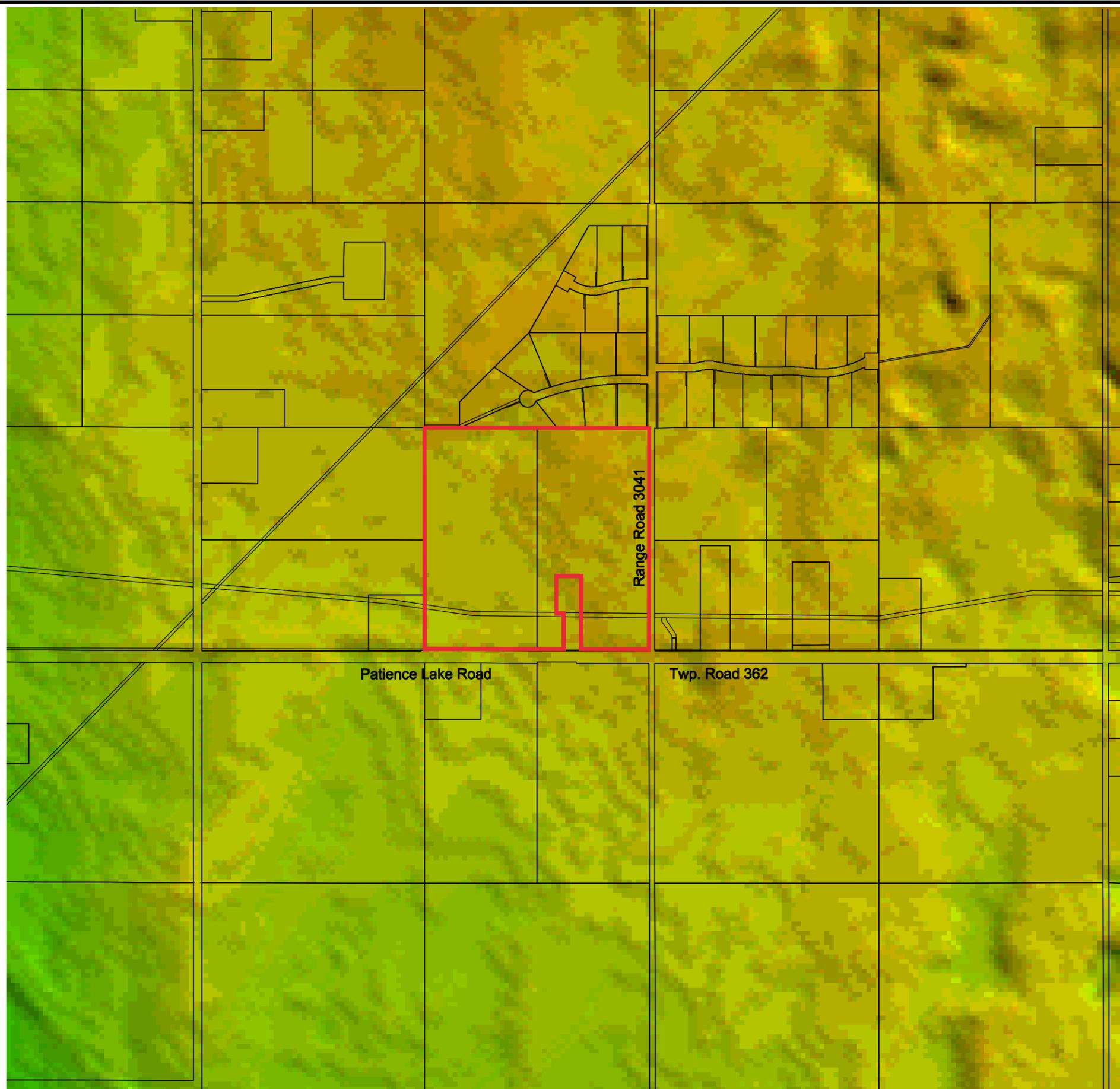
Meadow Ridge Estates



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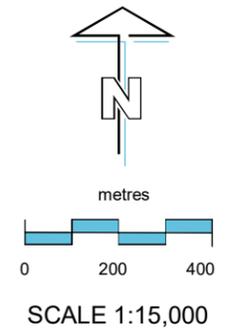
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- Elevation Ranges**
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Topographic Colour Contour Plan

Meadow Ridge Estates

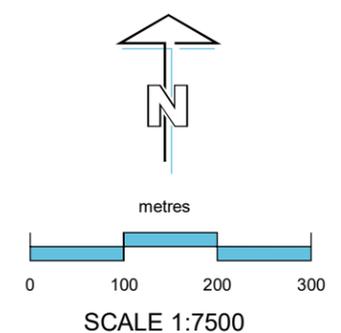
Figure 6





LEGEND

-  Study Area Boundary
-  High Point
-  Low Point
-  Ridge
-  Drainage Direction
-  Existing Low Area
-  Surface Drainage Route
-  North West Catchment Area
-  West Catchment Area
-  East Catchment Area
-  South East Catchment Area



Existing Catchment & Drainage Analysis

Meadow Ridge Estates

Figure 7

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LEGEND

- Proposed Development Area
62.346 ha (154.06 ac)
- Legal Description :
SE14-Twp. 36-Rge04-W3M
- - - - TransGas High Pressure Gas
Line- 30 m Setback

Residential- Acreage Lots

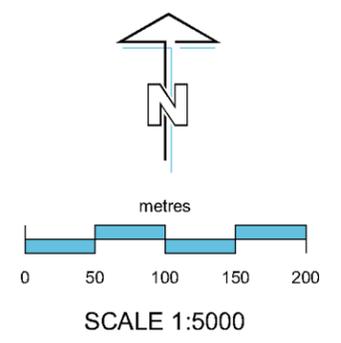
- 5 Lot Size Range (1.01 ac - 8.90 ac)
Average Lot Size (2.6 ac)
DUGA - 0.33

Land Use Summary

Roads (including widening)	6.67 ha (16.49 ac)
Municipal Reserve	n/a
Municipal Buffer	0.75 ha (1.84 ac)
Lot Area	53.26 ha (132.45 ac)
Total	62.346 ha (154.06 ac)

Open Space

- Drainage Easement - (1.89 ha / 4.67 ac)
- Municipal Buffer (0.75 ha / 1.84 ac)



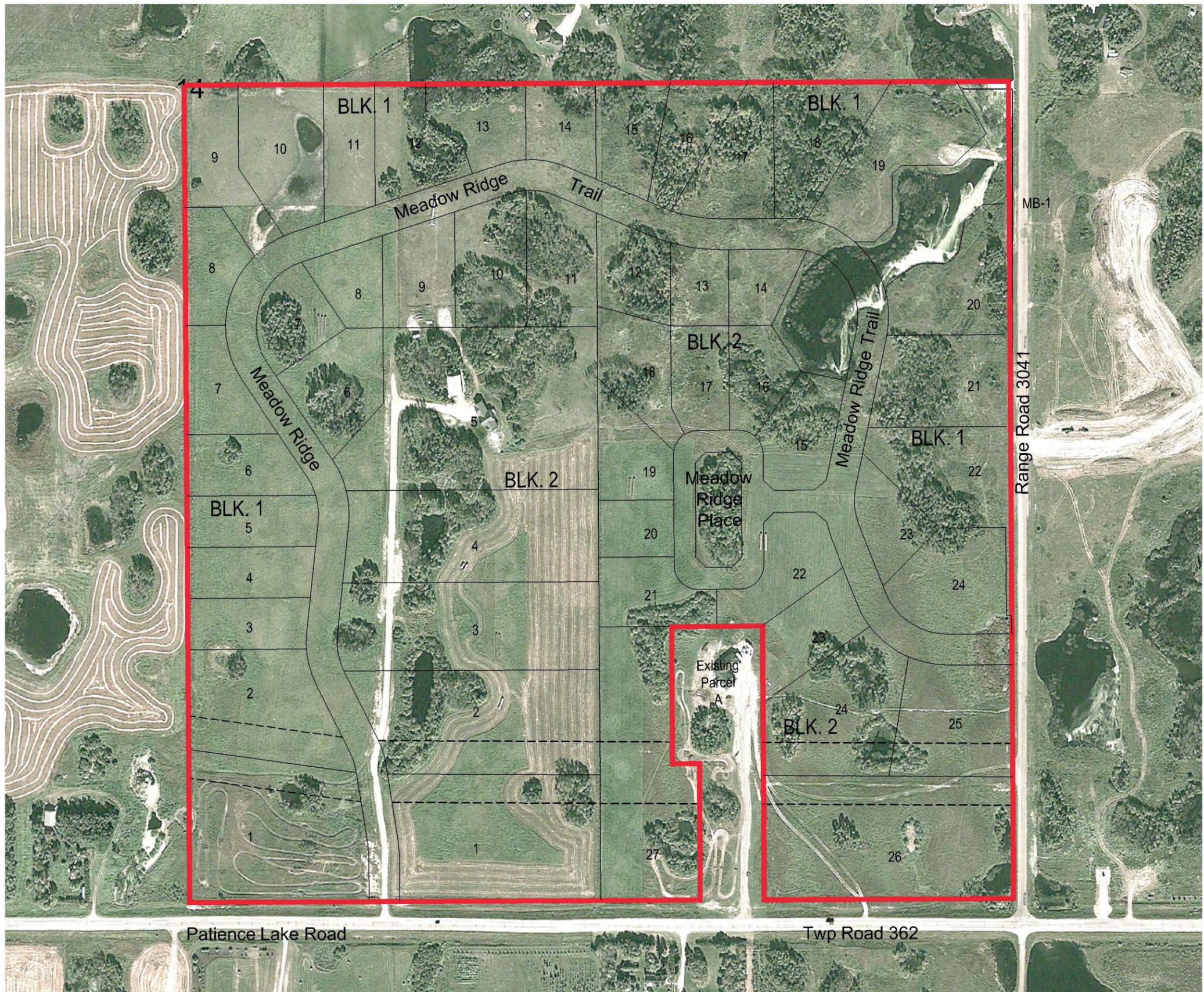
Concept Drawing

Meadow Ridge Estates

Note: This is the Original Conceptual Layout Plan and is no longer current.
For current design refer to the Plan of Proposed Subdivision



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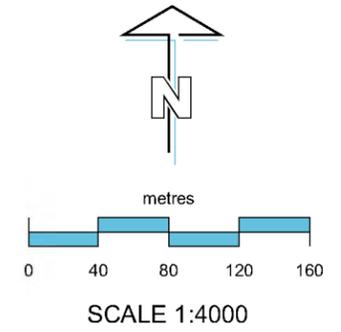
- Proposed Development Area
62.346 ha (154.06 ac)
- Legal Description :
SE14-Twp. 36-Rge04-W3M
- TransGas High Pressure Gas
Line- 30 m Setback

Residential- Acreage Lots

- 5 Lot Size Range (1.01 ac - 8.90 ac)
Average Lot Size (2.6 ac)
DUGA - 0.33

Land Use Summary

Roads (including widening)	6.67 ha (16.49 ac)
Municipal Reserve	0 ha (0 ac)
Municipal Buffer	0.75 ha (1.84 ac)
Lot Area	53.26 ha (132.45 ac)
Total	62.346 ha (154.06 ac)



Concept Drawing w/ Satellite Image

Meadow Ridge Estates

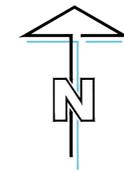
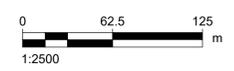
Note: This image shows the Original Conceptual Layout Plan, and is no longer current.
For current design refer to the Plan of Proposed Subdivision.



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NOTICE:
 THE EXISTENCE, LOCATION AND ELEVATION OF UTILITIES AND/OR CONCEALED STRUCTURES AT THE PROJECT SITE ARE NOT GUARANTEED BY AECOM CANADA LTD.

 THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXISTENCE, LOCATION AND ELEVATION OF ALL SUCH UTILITIES AND/OR STRUCTURES AND IS RESPONSIBLE FOR NOTIFYING THE APPROPRIATE COMPANY, DEPARTMENT OR PERSON(S) OF ITS INTENTION TO CARRY OUT ITS OPERATIONS.



LEGEND

- Proposed Development Area
62.346 ha (154.06 ac)
- TransGas High Pressure Gas Line- 30 m Setback
- Proposed 5 m Wide Easement
- Proposed Ditch Drainage
- Proposed Lot Drainage
- Proposed Retention Pond
- Proposed Culvert

Drainage Plan

Meadow Ridge Estates



Appendix B

Serviceability Review

September 2, 2016

Dan Beaulac
Partner
Meadow Ridge Estates
RR #6, Site 601, Box 103
Saskatoon, SK S7K 3J9

Dear Dan:

Project No: 60492462 (330)

**Regarding: Supplemental Design Basis Narrative
Stormwater Management and Potable Water Supply**

This letter has been prepared with supporting information to complement the proposed subdivision servicing requirements outlined in the Meadow Ridge Estates Serviceability Review, Rev 0, issued for use on March 8, 2016 and the Comprehensive Development Review, Rev 3, dated June 21, 2016.

1. Stormwater Management

Meadow Ridge Estates is located north of Patience Lake Road (Highway No. 394) and west of Range Road 3041. The lands generally slope in a southerly direction and a small portion of runoff from the Hidden Ridge Estates development is routed through the Meadow Ridge Estates subdivision. This runoff, combined with the runoff generated from the proposed development, drains into lands east of the proposed Meadow Ridge Estates development through a number of drainage runs. At present, both flow routes have been blocked with the construction of Patience Lake Road and Range Road 3041, thus the proposed subdivision is essentially self-contained.

The site has a rolling topography forming a number of low areas. These lows provide temporary storage for runoff and attenuate the peak flows. The runoff draining into Meadow Ridge Estates from the north is generally overflow from the sloughs of Hidden Ridge Estates. The catchment area draining to the Hidden Ridge Estates sloughs and to Meadow Ridge Estates is approximately 5 ha. In addition, a small area at the northwest corner also drains to Meadow Ridge Estates, but an equivalent area at southwest corner also drains out, therefore, no inflow and outflow is considered for these areas. The Meadow Ridge Estates development consists of 62.36 ha and will have three sub-catchments after development.

The pre-development imperviousness of the existing site is estimated to be 5% and the post-development imperviousness is estimated to be 12% upon full build-out of the subdivision; therefore, an overall increase in the runoff volume is anticipated. The runoff from these impervious areas is directly routed to pervious grassed areas and is subject to infiltration and evaporation. The runoff results for a range of design storms are shown in Table 1.

Table 1: Design Storm Runoff Volumes

Design Storm	Rainfall Depth (mm)	Runoff Volumes (m ³)								
		Catchment C-1			Catchment C-2			Catchment C-3		
		Pre Dev	Post Dev	Increase	Pre Dev	Post Dev	Increase	Pre Dev	Post Dev	Increase
1:2 yr 1 hr	16.50	279	686	407	234	503	269	56	188	132
1:5 yr 1 hr	28.71	995	1,697	702	847	1,282	435	263	527	264
1:25 yr 1 hr	46.20	5,624	6,499	875	4,651	4,890	239	1,315	1,958	643
1:100 yr 1 hr	54.12	8,128	9,033	905	6,682	6,764	82	1,842	2,672	830
1:100 yr 12 hr	82.92	8,441	10,027	1,586	6,882	7,412	530	1,779	2,817	1,038
1:100 yr 24 hr	89.90	1,546	3,804	2,258	1,295	2,791	1,496	313	1,043	730

The 1:100 year 12-hour storm event generates maximum runoff volume due to higher intensity of rain, however, the net increase in runoff would be greater in 1:100 year 24-hour storm event and is estimated to be 4500 cubic meters at full built out. The natural drainage system of the development site is blocked by the construction of Patience Lake Road and Range Road 3041; therefore the existing low areas in each catchment are proposed to be enlarged to accommodate runoff from the 100-year storm event. Table 2 summarizes the XPSWMM model results for water elevations and corresponding volume of three separate ponds at full build out.

Table 2: Water Elevations and Pond volume

Parameter	Elevation (m)			Volume (m ³)		
	Pond 1	Pond 2	Pond 3	Pond 1	Pond 2	Pond 3
NWL	536.500	537.400	-----	-----	-----	-----
HWL	537.600	538.000	537.000	9,950	4,830	2,700
Freeboard	538.000	538.500	538.000	14,150	9,470	17,450
1:2 yr 1 hr	536.585	537.439	536.566	683	505	189
1:5 yr 1 hr	536.707	537.498	536.657	1,695	1,285	531
1:25 yr 1 hr	537.247	537.756	536.896	6,505	4,837	1,982
1:100 yr 1 hr	537.510	537.880	536.979	9,047	6,622	2,710
1:100 yr 12 hr	537.608	537.920	536.990	10,031	7,216	2,822
1:100 yr 24 hr	536.951	537.609	536.759	3,802	2,787	1,043

A 450 mm diameter culvert is proposed under Range Road 3041 at the main subdivision entrance having an upstream invert elevation of 537.00. The modelling results show zero outflow from the culvert during the design storms, therefore the site does not discharge water during the design storm events. During an extraordinary storm event (greater than a 100 year event), excess water will be

able to escape through the proposed culvert and continue to follow the existing and historical drainage system, which discharges to another low area along Patience Lake Road about 560 metres east of Range Road 3041.

Development of Meadow Ridge Estates will increase the runoff volume by a nominal amount; however, the additional volume of runoff can be retained within the site utilizing the existing and newly constructed low areas in each sub-catchment. The low areas will be inter-connected through a network of ditches and culverts along the internal roadway. At the roadway connection to Range Road 3041, a new culvert will connect the proposed drainage system to the existing system to provide emergency relief and a maximum water elevation which can be referenced for building construction identifying the lowest recommended opening elevation. Since the majority of post-development runoff will be contained onsite with no offsite release during a 1:100 year storm event, the development will not negatively impact the adjacent land owners from a stormwater management perspective.

2. Potable Water System

The Meadow Ridge Estates development consists of 54 residential acreage lots ranging in size from just over 1 acre to 10 acres. Potable water will be distributed by a low pressure supply system through a proposed 75 mm diameter HDPE main with 25 mm diameter HDPE building service lines. The proposed 75 mm HDPE supply main is fed from an existing 100 mm diameter HDPE supply main that is owned and operated by Lost River Water Utility (LRWU).

The 100 mm HDPE Lost River Water Utility main is supplied water from a larger main located approximately 3.2 km south of the Meadow Ridge Estates development. The larger water main is operated by SaskWater Corporation and it is reported to have an approximate operating pressure of 80 to 100 psi. SaskWater provides a set flow rate to LRWU through a flow control valve where the flow rate can be adjusted based on the service area fluctuations as developments proceed.

There is sufficient capacity in the 100 mm HDPE supply line to service 120 lots and there is capacity to supply as many as 200 lots in the future, according to a letter from Lost River Water Utility dated November 15, 2013. The letter also indicates there are currently 34 residences being supplied by the 100 mm HDPE main.

The design basis for the Meadow Ridge Estates water distribution system is summarized below:

- The Meadow Ridge Estates development will be fed by a low pressure water system supplying potable water to each residence, which will be metered and invoiced separately by LRWU.
- Each residence will require onsite storage of at least 1000 imperial gallon utilizing water tanks and pressure systems to service the lot.
- The design of the private residential service line from the stub location, storage tanks and pressure system is by others.
- AECOM is responsible for the water system design up to the lot property line.
- Each residence is allotted a flow rate of 0.4 imperial gallons per minute (igpm).
- There are 53 lots in Meadow Ridge Estates connected to the 75 mm diameter supply main, requiring a total flow of 21.2 igpm at full build out.

- There are 34 residences outside of the Meadow Ridge Estates development that are currently supplied by the 100 mm HDPE water main. Total flow is estimated at 13.6 igpm (i.e. 34 x 0.4 igpm).
- The full build out of Lost River Water Utility is 200 lots (53 lots in Meadow Ridge Estates and the balance from other developments). The total flow is estimated at 80 igpm (i.e. 200 x 0.4 igpm).
- The delivery pressure at the connection point between SaskWater and the flow control valve to the LRWU connection is 80 psi. This value was provided by LRWU and is subject to change.
- The minimum delivery pressure for Meadow Ridge Estates is estimated at 15 psi at the property line and will vary based on the storage tank elevation. The minimum pressure is based on the potential development of 200 lots for all developments connecting to the Lost River Water Utility.
- The design basis for this memorandum is specific to the Meadow Ridge Estates development.

It was determined that a 75 mm diameter HDPE DR 17 supply main and 25 mm HDPE DR 11 service piping will meet the water supply requirements for the Meadow Ridge Estates development based on the design criteria and assumptions outlined in this memorandum.

The velocity in the 75 mm supply main and 25 mm service line will be lower than the recommended guideline provided by the Saskatchewan Ministry of Environment because this is a low pressure system with a generally lower flow rate. Reducing the pipe size in Meadow Ridge Estates will increase the velocity in the pipe network by a marginal amount, but this will also have a negative impact on the delivery pressure to the individual tanks at full build-out of the 200 lots in the service area. It is therefore recommended that a minimum pipe size of 75 mm be used for the supply main and 25 mm for the building services within Meadow Ridge Estates.

The potential for sediment accumulation within the pipeline is dependent on the peak velocity and the initial water quality supplied in the pipeline. Since low pressure systems with slower pipe velocities are more susceptible to mineral deposition, periodic flushing may be required and should be considered as part of the regular operation and maintenance program.

If there are any changes to the design basis presented in this memorandum, such as a reduction of delivery pressure or change in flow rate provided to the Lost River Water Utility, additional verification of the pipe sizes may be required.

Sincerely,
AECOM Canada Ltd.



Brent Rutten, P. Eng.
Civil Engineer
Brent.Rutten@aecom.com

BR:vec

Meadow Ridge Estates

Serviceability Review
RM of Corman Park
Portion of SE14-36-04-W3M

Revision 0

Prepared by:

AECOM

200 – 2100 8th Street East

Saskatoon, SK, Canada S7H 0V1

www.aecom.com

306 955 3300 tel

306 955 0044 fax

Project Number:

60303829 (4.2.1)

Date:

March 8, 2016

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations")
- represents Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

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March 8, 2016

Dan Beaulac
President
RR #6 Site 601, Box 103
Saskatoon, SK S7K 3J9

Dear Dan:

Project No: 60303829 (4.2.1)
Regarding: Serviceability Review
RM of Corman Park
Portion of SE14-36-04-W3M

AECOM is pleased to submit the above noted Serviceability Review for your use. This study provides for utility servicing, roadways and drainage provisions of the developed site. Preliminary cost estimates are also provided based on these concepts.

Feel free to contact the undersigned with any questions or concerns with the concepts.

Sincerely,
AECOM Canada Ltd.



Brent Rutten, P.Eng.
Civil Engineer
brent.rutten@aecom.com

/br

Encl.

Distribution List

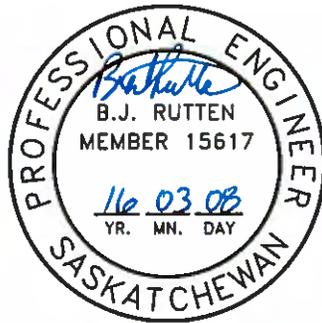
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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
A	B.R.	January 22, 2016	Issued for Review
0	B.R.	March 8, 2016	Issued for Use

AECOM Signatures

Report Prepared By:



Brent Rutten, P.Eng.
 Civil Engineer

Report Reviewed By:



Chris Cunningham, P.Eng.
 Senior Project Engineer

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Appendices

Appendix A Drawings

Executive Summary

The proposed Meadow Ridge Estates subdivision is a 51 acreage lot development located on 154 acres of private property in the RM of Corman Park (the RM), approximately 8 km southeast of the City of Saskatoon on Patience Lake Road at RR 3051. This report indicates the basic civil works, drainage concept, servicing requirements, and traffic accommodations proposed to comply with the necessary guidelines for development in the RM.

The internal private road cross section is based on a right-of-way width of 30 m. The 2,200 m long internal roadway will have an 8 m wide double seal surfaced driving width and a minimum cross slope of 3.0%. The sideslopes will be 4H:1V over 3 m followed by a 1 m wide ditch and the backslope will be 4H:1V over the remaining 4 m of the roadway cross section, resulting in a total ditch depth of 1 m. The proposed road structure includes 25 mm thick double seal coat over 150 mm thick soil stabilized gravel base course over a 100 mm thick layer of prepared subgrade. Upon final acceptance of the constructed roadway, all future maintenance and upgrades will be assumed by the RM.

Potable water will be provided by Lost River Water Corporation, who will operate, maintain and collect fees from the individual lot owners for the service. Fire protection water will not be provided for in the water main design. Fire and protective services will be provided by the City of Saskatoon Fire and Police Services, as well as the RCMP.

All domestic sanitary sewage produced in the development will be contained on each individual lot and treated by the MicroFAST Wastewater Treatment system, or similar. Detailed design of the septic system shall be provided by the building designer and shall be in compliance with all applicable building codes.

SaskTel, SaskEnergy and SaskPower have provided brief descriptions on how the concept plan would be serviced as outlined in this report. A representative will prepare detailed plans and service agreements once 12 official applications for services are submitted.

The anticipated costs to service this development are provided in the summary table below. As the detailed design progresses, the cost estimates will be revised accordingly with greater accuracy lower contingency allowances. The design and engineering cost estimate is inclusive of construction administration and post construction services, based on the extent of infrastructure identified in the concept plan.

Table E.1: Summary of Infrastructure Costs

Item	Total
Roadways & Drainage	\$ 1,450,000
Stormwater Management	\$ 100,000
Potable Water Servicing	\$ 410,000
Shallow Utility Servicing	\$ 460,000
Miscellaneous	\$ 80,000
Subtotal	\$ 2,500,000
20% Contingency	\$ 500,000
10% Engineering	\$ 250,000
Total	\$ 3,250,000

1. Introduction

AECOM has conducted a serviceability review for a 62.346 hectare (154.06 acre) property located in a portion of Southeast Section 14, Township 36, Range 4, West of the 3rd Meridian (SE14-36-04-W3M) within the Rural Municipality of Corman Park No. 343. The site is bounded by Range Road 3041 to the east and Township Road 362 (Patience Lake Hwy 394) to the south. The Applewood Estates subdivision is located on the east side of Range Road 3041 in SW13-36-04-W3M and Hidden Ridge Estates is located north of Meadow Ridge Estates in NE14-36-04-W3M. The remaining west quarters of Section 14 (NW and SW) consist of cultivated agricultural land occupied by individual dwellings. Figure 1 and Figure 2 in Appendix A of the Comprehensive Development Review (CDR) report illustrate the location of the development in relation to the overall regional and local context and Figure 3 shows the development in the immediate area.

AECOM has been in discussions with numerous utility providers and the RM of Corman Park to assess the existing infrastructure in the area, and determine if there is capacity within the network for the proposed development. Although no formal agreements have been made with local water providers for connection to a potable water supply, representatives have stated that sufficient water is available for servicing the proposed development. Following these discussions, conceptual lot layouts, roadways, residential services and drainage networks were developed. This report will aid in the decision making process of such approval authorities when considering the development permit application, subdivision application, servicing agreements and municipal services usage agreements.

2. Roadways

2.1 Existing Municipal Roads

The site is bounded by Range Road 3041 to the east and Township Road 362 (Patience Lake Hwy 394) to the south. The existing access driveway into the property is located at the southwest quadrant of the site. Access into the property from the south will remain at the current location, however, the road structure will be upgraded for the proposed development. Figures 8 and 9 in Appendix A illustrate the proposed roadway connections and conceptual subdivision lotting plan.

Refer to the Traffic Impact Analysis for the subject site and adjacent roadways. The study will review the proposed intersections of the access roads into the property. A preliminary design of these intersections has been conducted using a WB-37D design vehicle.

2.2 Proposed Residential Internal Subdivision Roads

The internal residential roadway will be constructed to the RM of Corman Park Subdivision Road Program Guidelines, design standards and specifications for a 30 m right-of-way with a rural subdivision cross section. The alignment will generally follow the natural contours of the land, minimize loss of natural vegetation, accommodate drainage and ensure good sightlines at access road locations. Upon successful completion of the project, the RM of Corman Park will assume full responsibilities for maintaining the road network within the subdivision.

The road cross section is based on a road right-of-way width of 30 m. The 2,200 m long road will have an 8 m wide crowned double seal coat driving surface with a minimum cross slope of 3.0%. The sideslope will be 4H:1V over 3 m followed by a 3 m wide ditch bottom with a 30H:1V gradient to provide a low flow swale. The backslope will be 4H:1V over the remaining 4 m of the right-of-way, resulting in a typical ditch depth of 1 m as measured from the ditch bottom to the road centreline and property line. The ditches will be loamed and seeded and culverts will be provided with flared ends and appropriate armoring to prevent soil erosion. The anticipated road structure includes a minimum of 100 mm subgrade preparation, below 150 mm soil stabilized granular base course, below a prime coat and 25 mm double seal coat road surface treatment.

2.3 Roadways Cost Estimate

Table 2.1 outlines estimated cost to construct the internal roadway, ditches, access driveways and culverts to the proposed 49 residential lots accessible from within the subdivision. The driveways to Lots 26 and 27 in Block 2 are not included in this estimate and will be the responsibility of the lot owners. All other work outside of the road ROW (i.e. private residential lots) is also not included in this estimate.

The unit prices are Class D estimates and provide a general magnitude of the construction costs. A 15% allowance for engineering was also added to the estimate.

Table 2.1: Roadway Servicing Construction Cost Estimate

Item	Total
1 Clearing & Grubbing	\$ 5,000.00
2 Topsoil Stripping & Stockpiling	\$ 76,406.00
3 Topsoil Screening for Reuse	\$ 61,008.00
4 Topsoil Replacement in Ditches and Lots - 200 mm depth	\$ 91,512.00
5 Hydro Seeding	\$ 152,520.00
6 Common Excavation to Roadway Embankment	\$ 231,000.00
7 Sub-Grade Preparation - 150 mm depth	\$ 129,600.00
8 Soil Stabilized Granular Base Course - 150 mm depth	\$ 59,400.00
9 Bituminous Prime Coat	\$ 26,400.00
10 Double Seal Coat - 25 mm Thick	\$ 264,000.00
11 Entrance Road Rehabilitation	\$ 40,000.00
12 Driveway Traffic Gravel - 75mm depth	\$ 17,640.00
13 450 mm dia CSP Culvert	\$ 90,000.00
14 600 mm dia CSP Culvert	\$ 120,000.00
15 750 mm dia CSP Culvert	\$ 25,000.00
16 Culvert Inlet/Outlet Flared Ends & Armouring (Fabric & Riprap)	\$ 20,000.00
17 100 mm Dia PVC Sch 40 Utility Conduits - Road Crossings	\$ 22,000.00
18 Other	\$ 18,514.00
Subtotal	\$ 1,450,000
20% Contingency	\$ 290,000
10% Engineering	\$ 145,000
Total	\$ 1,885,000

3. Stormwater Management

3.1 Existing Drainage Plan

The existing site has a mixed composition of natural vegetation, standing water, pasture, some cultivated crop area and two existing dwellings, which will remain upon full build-out. Within the total study area of 62.346 ha, the topographic elevations gently slope from a high point of 543.0 m in the north-central area to several low depressions of 537.0 m in the northeast, southeast and along the existing access road. The undulating terrain includes at least four separate catchment areas, which are primarily contained within the site as part of the existing natural system. Significant flows originating from offsite will not be routed through or onto the property. There are no areas with significant or unstable slopes and to restrict development. This assessment will examine the changes to runoff based on development of the Meadow Ridge Estates subdivision only.

3.2 Proposed Drainage Plan

Stormwater runoff will be conveyed via overland surface drainage routes using roadside ditches, swales and culverts. Residents will be encouraged to capture runoff from buildings for re-use in addition to incorporating rain gardens on private properties to minimize the effects of development. No minor piped stormwater sewer collection systems are proposed. Existing low areas will be incorporated into the drainage plan and expanded where necessary to provide sufficient stormwater runoff storage. These areas will be registered as naturalized municipal reserves (MR) or environmental reserves (ER) not requiring ongoing maintenance. Drainage runs will be incorporated along road right-of-way's following the existing patterns with minimal adjustments for development.

The pre-development imperviousness of the existing site is estimated to be 5%. The post-development imperviousness of the entire site is estimated to be 12% upon full build-out of the subdivision, therefore, an overall increase in the runoff volume is anticipated. The additional runoff produced by the development will be contained in the natural and constructed low areas. Final sizing of the storage areas will be completed during detailed design of the subdivision.

The XPSWMM stormwater computer modeling program will be utilized to determine the temporary storage required to attenuate the peak flow during a 1:100 storm event. The storage areas will be sized to contain the additional volume of runoff produced during a 1:100 year rainfall event at the HWL. Any overland flows originating from offsite will continue to flow around the property and will not be considered for storage onsite.

The pre-development volume of runoff produced during the 1:100 year storm (producing 90 mm depth of rainfall over 24 hours) from the total parcel size of 62.346 ha is 17,300 m³. The volume of post-development runoff produced from this area is approximately 21,300 m³, resulting in additional storage requirements of 4,000 m³. To account for no stormwater capacity downstream during extreme events, an additional 25% storage volume has been included, so the total volume of additional runoff to be contained onsite is 5,000 m³. Since the existing storage areas can accommodate this excess volume of runoff, additional storage areas are not required.

The operation, maintenance and water quality monitoring responsibilities will be assumed by the RM of Corman Park upon acceptance of the final construction certificate.

3.3 Stormwater Servicing Cost Estimate

This cost estimate considers site grading and drainage work required for any additional stormwater management features not included in the roadway cost estimate. The stormwater servicing estimate is outlined in Table 3.1. The unit prices are Class D estimates and provide a general magnitude of the servicing costs. A 15% allowance for engineering was also added to the estimate.

Table 3.1: Stormwater Servicing Construction Cost Estimate

Item	Total
1 Dewater, Desludge and Dispose of Unusable Material	\$ 50,000
2 Grading, Erosion Control, Landscaping	\$ 45,000
3 Materials Testing	\$ 5,000
Subtotal	\$ 100,000
20% Contingency	\$ 20,000
10% Engineering	\$ 10,000
Total	\$ 130,000

4. Potable Water Supply

4.1 Existing Water Infrastructure

4.1.1 Lost River Water Corporation

The nearest available potable water supply with sufficient capacity to service a new subdivision is owned and operated by Lost River Water Corporation (LRWU). A 100 mm diameter high density polyethylene (HDPE) potable water line was installed adjacent to the subject lands in 2012 along the east property line parallel to Range Road 3041. This is the water supply servicing the Hidden Ridge and Tuscan Ridge developments and is the primary alternative for a water supply to Meadow Ridge Estates. A user agreement between LRWU and the developer is currently underway.

SaskWater is currently providing 20 gal/min of water to LRWU at a pressure of 80 psi. Upon full build-out of the Hidden Ridge, Applewood and Tuscan Ridge subdivisions, there will still be adequate capacity in the system to service the Meadow Ridge Estates subdivision. LRWU has informed AECOM that the system is capable of increasing flows up to 60 gal/min prior to full build-out of the subdivisions. LRWU will install a lead-free, RF meter on each residence to monitor consumption and invoice each user individually.

4.1.2 PotashCorp Patience Lake Water Supply Main

An existing 75 mm diameter HDPE water supply pipeline, owned and operated by PCS Patience Lake Division, is located within a registered easement along the south boundary of the property along Township Road 362 (Patience Lake Hwy 394). The pipeline is located in the north ditch of the highway right-of-way, runs in an east-west orientation and connects to a north-south 150 mm diameter water main located in the west ditch of Highway 316, approximately 3 km west of the site.

There is no available capacity in the system to service the proposed development; therefore, this option will not be pursued.

4.1.3 Highway 394 Water Corporation

Highway 394 Water Corporation owns a small diameter (2") HDPE water line located east of the proposed development along Patience Lake Road. Potable water is supplied to the waterworks network from the City of Saskatoon by a SaskWater treated water pipeline system and the operation is contracted to Lost River Water Corp. The system operates on total chlorine residual and there are no reservoirs or pumphouses for the waterworks system. Since the network is providing a trickle system feed, each household requires a holding tank and water is pumped throughout the residence from the treated water pipeline system.

There is no available capacity in the system to service the proposed development; therefore, this option will not be pursued.

4.1.4 Applewood Estates

The Applewood Estates subdivision is serviced by an existing SaskWater pipeline located on Range Road 3041. There is no available capacity in the 75 mm diameter potable water system to service the proposed Meadow Ridge development; therefore, this option will not be pursued.

4.2 Proposed Water Infrastructure

The proposed water distribution system will be designed in accordance with the Water Security Agency EPB 501, "Waterworks Design Standard", November 2012, as well as other applicable local and provincial acts, regulations and publications referenced in the documents. An approval to construct, extend, or alter any waterworks will be obtained from the Water Security Agency before starting construction of the infrastructure.

The Lost River Water Corporation has confirmed its availability to supply potable water to Meadow Ridge Estates from their existing 100 mm diameter distribution main adjacent to the development. The water utility will operate and maintain the new onsite distribution lines and associated infrastructure. Appendix M contains correspondence indicating LRWU has sufficient capacity to service the subdivision.

The proposed new watermain alignment is illustrated in Figure 11. The design parameters outlined in Section 4.3 were used to model and analyze the performance of the distribution system. The design is based on supplying the peak flow available from the utility provider, which is limited to 20 gal/min based on current allowances. Each home owner will store approximately sufficient quantities of water within their dwelling and pump throughout the house as required.

Since the water supply has had full treatment including adequate disinfection contact time at the source location, supplemental water treatment is not required for this development. Water quality monitoring shall be performed by the water utility.

4.2.1 Fire and Protective Services

The development is located within the service agreement area between the City of Saskatoon Fire Department and the R.M. of Corman Park under a fee for service agreement. The City of Saskatoon charges \$852 per hour per unit (2015 rates). Discussion with the City of Saskatoon Fire Department noted that sufficient water capacity would be brought in the dispatch of fire truck equipment; this would include 1 tanker truck which holds 3000 gallons of water, and 2 pumper trucks which also have a capacity of 500 gallons each. Individual home owners can also choose to upgrade their own residential dwellings with enhanced fire protection by means of a built in sprinkler system or other method if desired.

The RM of Corman Park Police Services provide and deal with both provincial law and Corman Park bylaws. In addition, the RCMP provide services for matters pertaining to the criminal code and provincial laws.

4.2.2 Potable Water Design

Each private lot owner will be required to install their own water storage tanks (approx. 1000 gal) and household pumping system in order to fully service each dwelling. Since the water supply line is not intended to provide fire protection flows, a smaller diameter main line is adequate to meet domestic usage. A 75 mm diameter HDPE potable water supply line will be installed within the roadway ditch. Each lot will be serviced by a 25 mm diameter service line with a curb valve located within the road right-of-way at the property line. A yard hydrant and/or swab launch assembly will be installed so the water line can be flushed and cleaned when required.

Hydraulic modelling to size the domestic water supply main to adequately service the 62.346 ha area was performed using WaterCAD V8i. The pipeline elevations are assumed to be below the depth of frost, which typically results in a depth of cover of 3.0 m over the pipe to the finished ground surface.

4.3 Water Servicing Cost Estimate

The water servicing cost estimate for a direct connection to the LRWU water main is outlined in Table 4.1. The cost estimate includes piping, valves, fittings and service connection requirements. The unit prices are Class D estimates and provide a general magnitude of the servicing costs. A 15% allowance for engineering was also added to the estimate.

Table 4.1: Water Servicing Construction Cost Estimate

Item	Total
1 Potable Water Supply Line & Appurtenances	\$ 204,500
2 Automatic Air Release Assembly	\$ 10,000
3 Flushout/Swab Launch Assembly	\$ 20,000
4 Service Lines (Inc. valves, markers, etc.)	\$ 150,000
5 Connection to Existing Water Line	\$ 14,000
6 Tracer Wire	\$ 4,000
7 Other	\$ 7,500
	Subtotal \$ 410,000
	20% Contingency \$ 82,000
	10% Engineering \$ 41,000
	Total \$ 533,000

5. Wastewater Collection

Domestic wastewater collection will consist of onsite private sewage disposal systems administered by the homeowner and designed and constructed in accordance with the applicable building/plumbing codes, Ministry of the Health, Ministry of Environment, Saskatoon Health Region, Water Security Agency and the RM of Corman Park regulations, guidelines, bylaws and recommendations.

As outlined in the *Ridgewood Estates Hydro-Geotechnical Investigation* prepared by Golder Associates Ltd. dated August 2015, a sewage wastewater system such as the MicroFAST Wastewater Treatment system or similar is recommended for use at each dwelling. The hydro-geological investigation, as provided in Appendix D, will be registered on the title of each parcel to ensure the information is available to any purchaser through ISC.

6. Solid Waste

Each individual homeowner will contract domestic solid waste management services with a local waste management service provider (i.e. Loraas Disposal, Waste Management or other) to collect refuse and dispose of the material at an approved facility. It is anticipated roll-out type curbside garbage bins will be utilized on regular pick-up schedules. Storage and incineration of refuse will not be permitted onsite.

7. Shallow Utilities

AECOM conducted a review of the existing shallow utilities in the vicinity of the proposed development and engaged in dialogue with SaskTel, SaskEnergy and SaskPower to establish if the existing facilities can accommodate the anticipated loading. The utility providers made suggestions as to how to most economically service the development. Each of the utility entities requires an application for service to be submitted with building loading information to prepare higher accuracy cost estimates.

7.1 SaskTel

A review of the proposed development by SaskTel determined that existing copper and fibre optic cables in the area can be routed to the new subdivision from numerous locations, however, SaskTel will not install communication infrastructure to each lot during the initial subdivision construction. Individual applicants will be required to call the SaskTel business office to make the request for a new service and pay the service connection fee (2015 rate \$475.00). There will be no charge to the developer for this work. SaskTel will register a joint use easement with SaskPower for a minimum 4.5 m wide easement. Cables will be trenched as service is requested on an individual basis.

7.2 SaskPower

SaskPower has an existing overhead three phase 25 kVA distribution line running east-west along the south property line in the Patience Lake Road ROW and a 25 kVA underground line running north-south along the west side of Range Road 3041. In order to adequately service all 51 lots onsite, the new service lines will connect to each boundary distribution line in accordance with SaskPower Notification # 301579999, Quotation #96802 dated November 2, 2015.

SaskPower has designed the underground power distribution network to provide each lot with a 200-amp, 120/240-volt, single phase, three-wire service at a freestanding pedestal complete with a metering/splitter box located within 5m of the property line. It is the responsibility of each individual lot owner to install the underground service cables from the metering pedestal to the future house and buildings on each lot. SaskPower provided an initial capital cost estimate for electrical servicing of \$262,176.01, plus \$13,108.80 GST for a total cost of \$275,284.81.

7.3 SaskEnergy

SaskEnergy owns and operates a 168.3 mm diameter Polyethylene (PE) natural gas distribution pipeline located along the south boundary of the property (SE14-36-04-W3M), on the north side of Township Road 362. In order to service each new lot of the proposed development, SaskEnergy will tie into the existing pipeline in three separate locations and install a 60.3 mm diameter PE pipe within a registered easement along the roadway and private lots.

SaskEnergy provided a cost estimate of \$152,311.39 plus \$7,615.57 GST for a total customer contribution of \$159,926.96, as outlined in their letter quote dated January 14, 2015, WR# 221869.

7.4 TransGas

TransGas owns and operates a 323.9 mm diameter high pressure steel natural gas transmission line located within a 15 m wide right-of-way in an east-west orientation approximately 130 m inside the south boundary of the site. A building envelope setback of 30 m will apply from the pipeline and a 60 m housing setback limit is noted from the north driving lane centerline of Patience Lake Road.

A number of new infrastructure components, including the roadway, potable water line, natural gas distribution line, power and communication lines will be required to cross the existing TransGas pipeline to fully service the proposed development, however, no conflicts exist that cannot be resolved during detailed design. The new roadway elevation over the existing pipeline will be higher than the existing grade such that there is no reduction in cover material above the pipeline. Any new pipes and cables crossing the pipeline will be installed below the existing gas line with the necessary vertical clearance in accordance with TransGas crossing requirements while within the pipeline right-of-way. Refer to Appendix P for initial correspondence with TransGas.

7.5 Site Lighting

A review will be conducted of any required lighting for roadway and site access, municipal reserve and pedestrian lighting. There is no interest in establishing any non-compulsory lighting. Any lighting that is deemed required will adhere to the R.M. of Corman Park Landscape Guidelines (Companion to the R.M. of Corman Park Zoning Bylaw No. 9/94 and the Saskatoon Planning District Zoning Bylaw No. 69/96).

Table 7.1: Shallow Utility Cost Estimate

Item		Total
1	SaskTel	\$ 0
2	SaskPower	\$ 262,176
3	SaskEnergy	\$ 152,311
4	TransGas (allowance)	\$ 45,513
5	Site Lighting	\$ 0
Subtotal		\$ 460,000
20% Contingency		\$ 92,000
10% Administration		\$ 46,000
Total		\$ 598,000

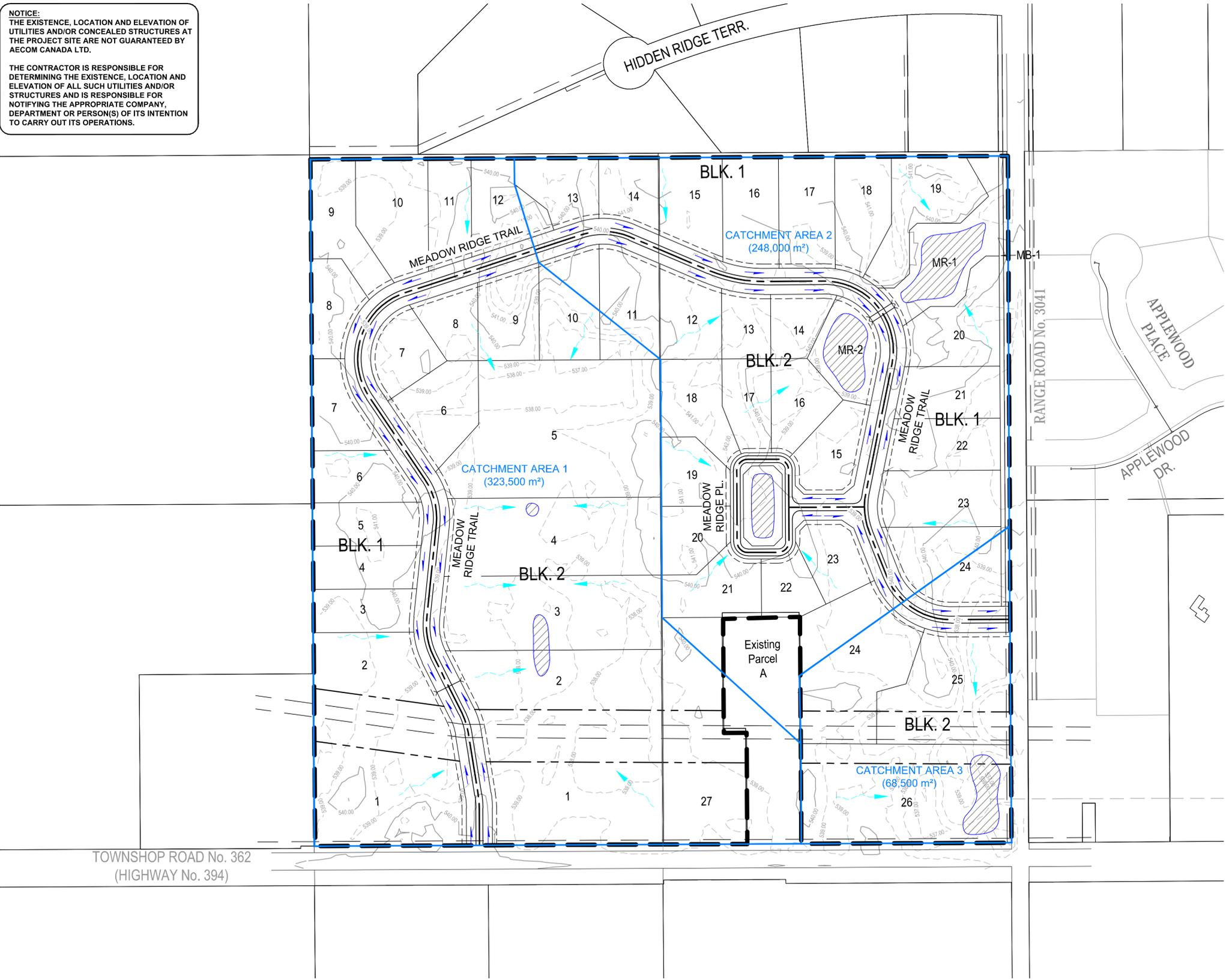
Appendix A

Drawings

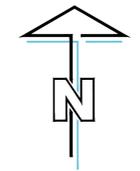
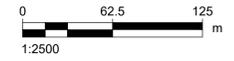
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NOTICE:
 THE EXISTENCE, LOCATION AND ELEVATION OF UTILITIES AND/OR CONCEALED STRUCTURES AT THE PROJECT SITE ARE NOT GUARANTEED BY AECOM CANADA LTD.

 THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXISTENCE, LOCATION AND ELEVATION OF ALL SUCH UTILITIES AND/OR STRUCTURES AND IS RESPONSIBLE FOR NOTIFYING THE APPROPRIATE COMPANY, DEPARTMENT OR PERSON(S) OF ITS INTENTION TO CARRY OUT ITS OPERATIONS.



TOWNSHIP ROAD No. 362
(HIGHWAY No. 394)



LEGEND

- Proposed Development Area
62.346 ha (154.06 ac)
- TransGas High Pressure Gas Line- 30 m Setback
- Proposed 5 m Wide Easement
- Proposed Ditch Drainage
- Proposed Lot Drainage
- Proposed Retention Pond
- Proposed Culvert

Drainage Plan

Meadow Ridge Estates



Appendix C

Traffic Impact Assessment

Dan Beaulac – Ridgewood Estates

Ridgewood Estates Traffic Impact Assessment DRAFT REPORT

Prepared by:

AECOM

200 – 2100 8th Street East
Saskatoon, SK, Canada S7H 0V1

306 955 3300 tel
306 955 0044 fax

Project Number:

60303829

Date:

September, 2015

Statement of Qualifications and Limitations

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September 29, 2015

Rebecca Row
Manager of Policy
R.M. of Corman Park No.344
111 Pinehouse Drive,
Saskatoon, SK, S7K 5W1

Dear Rebecca:

Project No: 60303829
Regarding: Ridgewood Estates Traffic Impact Assessment
DRAFT REPORT

AECOM is pleased to submit a draft report for the Ridgewood Estates Traffic Impact Assessment.

Please review the report and provide us with your comments. Do not hesitate to call the undersigned directly at 306.657.8946, should have any questions regarding our report.

Sincerely,

AECOM Canada Ltd.

Mushfiqur Rahman, M.A.Sc, P. Eng, PTOE
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Executive Summary

AECOM was commissioned by the landowners of the Ridgewood Estates to conduct a Traffic Impact Assessment (TIA) as a part of Comprehensive Development Review (CDR) process for the proposed Ridgewood Estates rural residential housing development which is located in the R.M. of Corman Park No. 344 around 4.5 km east of the City of Saskatoon's east limit. The purpose of this TIA was to identify the impact of the above development on the adjacent roadways and intersections. The study identified the following four key intersections which could be impacted by the Ridgewood development:

1. Highway No. 16 and Zimmerman Road Intersection
2. Patience Lake Road and Zimmerman Road Intersection
3. Patience Lake Road and Freeborn Road Intersection
4. Patience Lake Road and Range Road 3041 Intersection

The existing traffic movements at the Patience Lake Road and Freeborn Road Intersection are mostly through traffic and there is no substantial planned development along Freeborn Road. Therefore it is expected that at full build-out of Ridgewood Estates the traffic movement pattern at this intersection will not be changed remarkably and capacity would not be an issue at this intersection. Therefore this intersection was not investigated in-details in this study. Existing PM peak traffic volumes at the three other key intersections were collected and analyzed.

The trips generated from the development was calculated based on the Ridgewood Estate's concept plan and using the most recent version (9th edition) of the Trip Generation Manual, published by the Institute of Transportation Engineers (ITE). The concept plan incorporated a total of 51 single family dwelling units. Considering the ITE trip generation rate for single family dwelling units, a total of 39 a.m. peak hour trips and 51 p.m. peak hour trips were estimated to be generated from the proposed Ridgewood Estates. The new trips generated by the development were combined with the background traffic. Background traffic growth considered both natural growth of the existing traffic, and traffic generated by other planned developments in the vicinity of the study area. The combined trip were distributed and assigned to the adjacent road network. A capacity and Level of Service (LOS) analysis was performed using the traffic analysis software Synchro 8. The traffic analysis investigated both existing and future operating conditions during afternoon peak hour traffic conditions. The analysis provided the following key findings:

- Under existing traffic condition, all the three key intersections operate at a good level of service during afternoon peak hour. The existing turning traffic volume at the Patience Lake Road and Range Road 3041 Intersection is very low. The two-way stop controlled NB and SB movements of this intersection currently operate at a LOS "A".
- With the existing geometry and lane configuration, all the three key intersections will operated at a good level of service during 2020 afternoon peak hour traffic condition. The full build-out of Ridgewood Estate will generate substantial turning traffic movements at the Patience Lake Road and Range Road 3041 Intersection. However, the two-way stop controlled NB and SB movements will operate at a LOS "A".

The traffic generated from Ridgewood Estates will not have any significant impact on adjacent roadways and at the key intersections. All the three studied intersections will operate at a good level of service and have surplus capacity to accommodate additional traffic.

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1. Introduction

1.1 Background

AECOM was commissioned to conduct a Traffic Impact Assessment (TIA) as a part of Comprehensive Development Review (CDR) process for the proposed Ridgewood Estates rural residential housing development which is located in the R.M. of Corman Park No. 344 around 4.5 km east of the City of Saskatoon's east limit. The main purpose of this TIA was to identify the impact of the above development on the adjacent existing roadways. This report documents the results of the TIA and the potential traffic impacts of the development. The report includes a description of the assumptions and methods used to conduct the study as well as a discussion of the results.

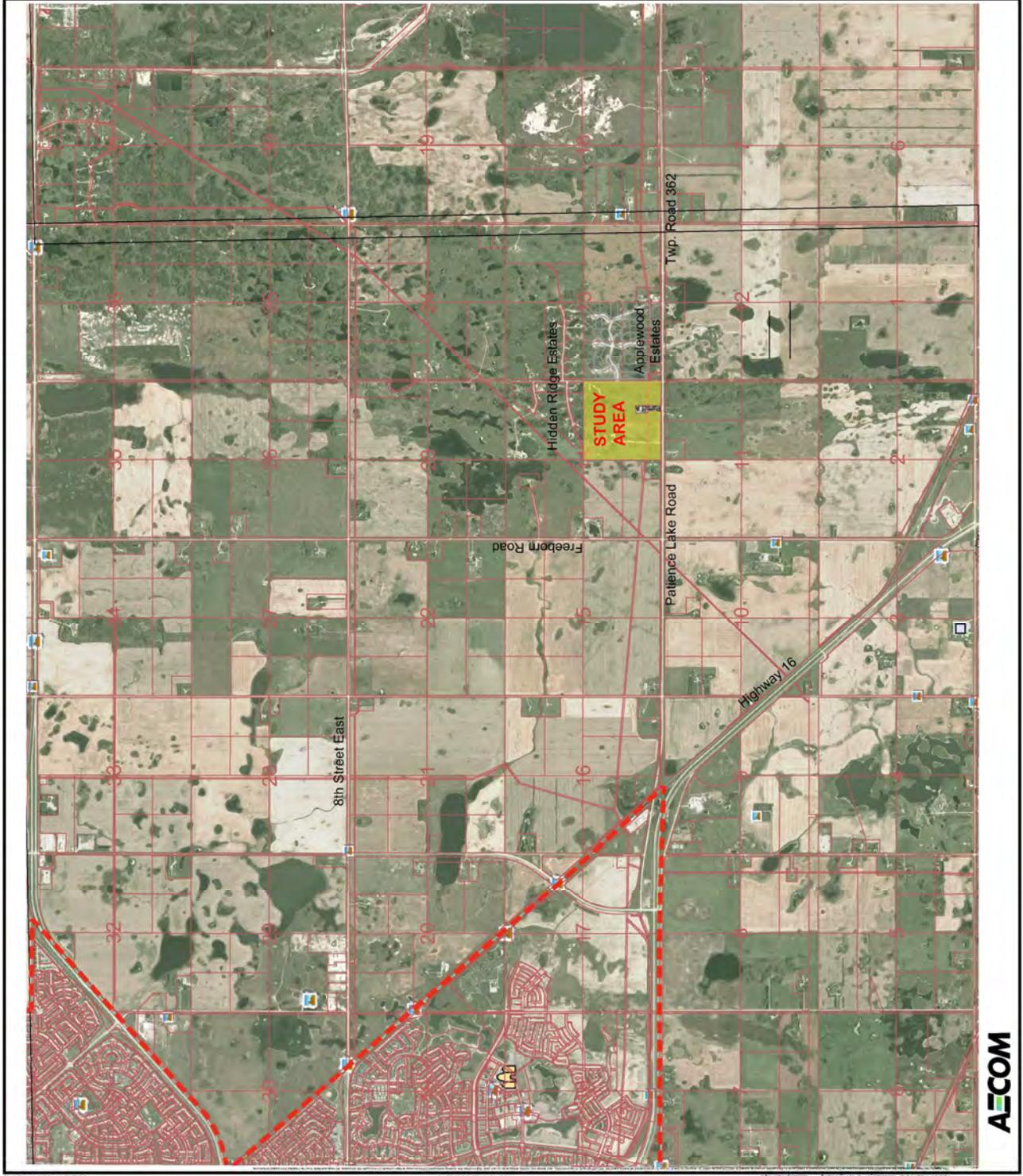
1.2 Study Objective

The Ridgewood Estates Multi Parcel Country Residential (MPCR) is going to proceed to the third stage of the approval process. A Comprehensive Development Review (CDR) report is required to be produced at this stage. As a part of this CDR process and to complete a transportation servicing review a Traffic Impact Assessment (TIA) was conducted. The goal of the study is to provide a baseline of the current operating conditions at the key intersections prior to site development and investigate the anticipated operating conditions once the Ridgewood MPCR is fully developed. Any mitigation required to ensure acceptable traffic flow and safety will be identified. The key objectives of this TIA were to:

- Identify and describe the principal municipal roadways
- Assess current operational and capacity conditions on existing roadways adjacent to the development
- Identify the internal roadways to MPCR that will adequately accommodate the full build-out traffic demand of the development and determine the access locations to the surrounding road network
- Identify the roadway standard for all newly constructed roadways and establish basic specification and standards
- Identify any roadway improvements, such as roadway widening or intersection treatments, necessary to the external roadways to accommodate anticipated traffic growth due to the development

1.3 Study Area

The study area is located in the R.M. of Corman Park No. 344 and at the NW quadrant of Patience Lake Road, and Range Road 3041 intersection. Highway 316 is located approximately 5 km east from the site and Highway No. 16 can be accessed via Highway No. 316, which is around 14.5 km from the proposed development. Patience Lake Road is connected to Zimmerman Road and provides access to the City of Saskatoon through Highway No. 16. The ongoing Applewood Estates development which includes 39 lots is located just east of the proposed development. Hidden Ridge (West) is adjacent the north boundary of Ridgewood Estates and includes 13 residences. Hidden Ridge (East) is north-east of Ridgewood Estates and includes 16 residences. **Figure 1.1** shows the study area.



LEGEND



RidgeWood Estates
SE 14-Twp. 36-R3604-W3M

Saskatoon City Limits



Study Area

RidgeWood Estates TIA

Figure 1.1

1.5 Study Horizon Year

As the site is located adjacent to the developing Applewood Estates, the development of the Ridgewood Estates will go with a slower pace at the very beginning and may peak up with demand. The developer of the Ridgewood Estates has strong knowledge of the land development process. Though the exact timeline of the Ridgewood Estates development is currently not clear, it is anticipated that the entire site will be fully built-out within the next 5 years. Therefore a 5-year time horizon was assumed for this study.

1.6 Study Methodology

The traffic impact assessment will be conducted according to the following methodology:

- Identify roadways and intersections critical to the proposed development,
- Conduct afternoon peak hour traffic count at the key 3 intersections to assess background traffic conditions,
- Identify land use designation according to the most recent version of the concept plan,
- Determine site generated trips based on the 9th edition of the Institute of Transportation Engineers' (ITE) Trip Generation Manual,
- Determine background traffic growth and determine trip generated from other ongoing developments,
- Project full built-out afternoon peak hour traffic condition at the identified key intersections by combining site generated traffic and background traffic on the road network,
- Conduct capacity and Level of Service analysis to assess existing and future intersection operations using the most recent version of the industry-standard traffic simulation/modelling software Synchro Version 8.0.
- Based on the above analysis, identify the impact of the proposed development on the existing road network and determine improvements required to mitigate the impacts.

2. Existing Conditions

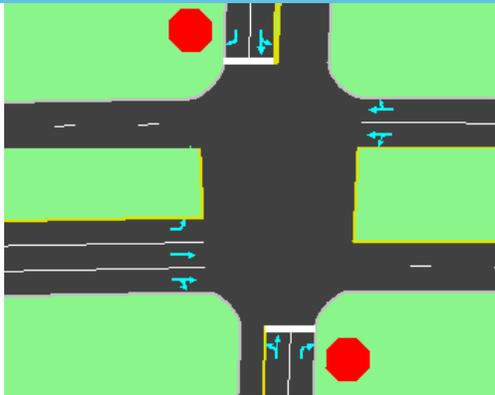
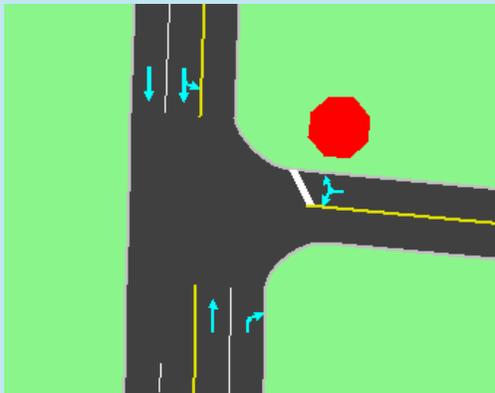
2.1 Existing Roadways

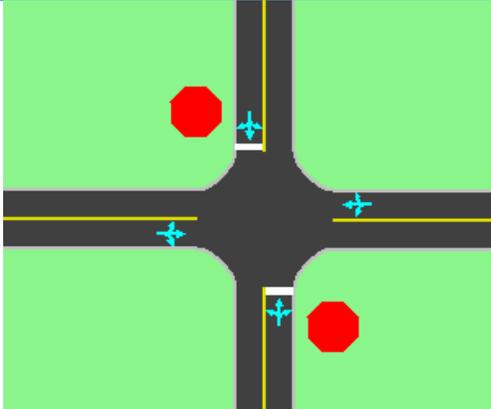
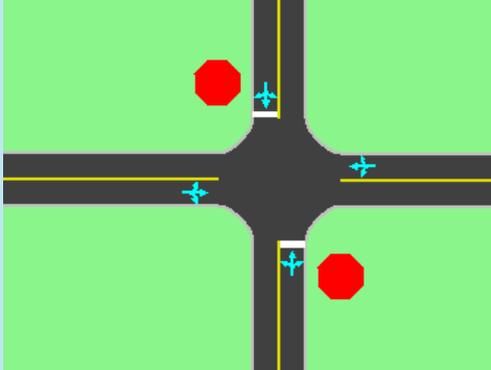
The Ridgewood Estates is directly situated on Patience Lake Road, and Range Road 3041. Highway No. 316 is approximately 3 km east from the proposed development and Highway No. 16 can be accessed via Highway No. 316, which is around 14.5 km. Patience Lake Road is connected to Zimmerman Road and provides access to the City of Saskatoon through Highway No. 16. **Figure 2.1** shows the roadway network of the study area.

2.2 Study Area Key Intersections

An assessment of the existing intersections surrounding the site was conducted at the inception of the study. The objective of the assessment was to identify the critical intersections that are expected to be impacted by the traffic generated from the proposed development. The details of the lane configurations and traffic controls were also identified. The list of the key intersections, the lane configurations and traffic controls are illustrated in Table 2.1. The identified key intersections are also shown in **Figure 2.1**.

Table 2.1 Lane Arrangements and Traffic Controls at the Key Intersections

Sl. No.	Description of the Intersection	Existing Lane Arrangement	Existing Traffic Control
1	Highway No. 16 and Zimmerman Road Intersection		Two-way stop control on Zimmerman Road and South Service Road
2	Patience Lake Road and Zimmerman Road Intersection		One-way stop control on Patience Lake Road

SI. No.	Description of the Intersection	Existing Lane Arrangement	Existing Traffic Control
3	Patience Lake Road and Freeborn Road Intersection		Two-way stop control on SB and NB Freeborn Road
4	Patience Lake Road and Range Road 3041 Intersection		Two-way stop control on SB and NB Range Road 3041

2.3 Existing Traffic Volumes

In order to assess the existing and future traffic operation at the key intersections, AECOM conducted traffic counts at the key intersections of the study area. It is expected that the highest traffic volumes and resulting traffic conflicts will occur during the afternoon peak hour. Therefore traffic counts were conducted during afternoon peak hours on Tuesday December 18, 2014 between 4:00 p.m. and 6:00 p.m. at the following key intersections:

1. Highway No. 16 and Zimmerman Road intersection
2. Patience Lake Road and Zimmerman Road Intersection
3. Patience Lake Road and Range Road 3041 intersection

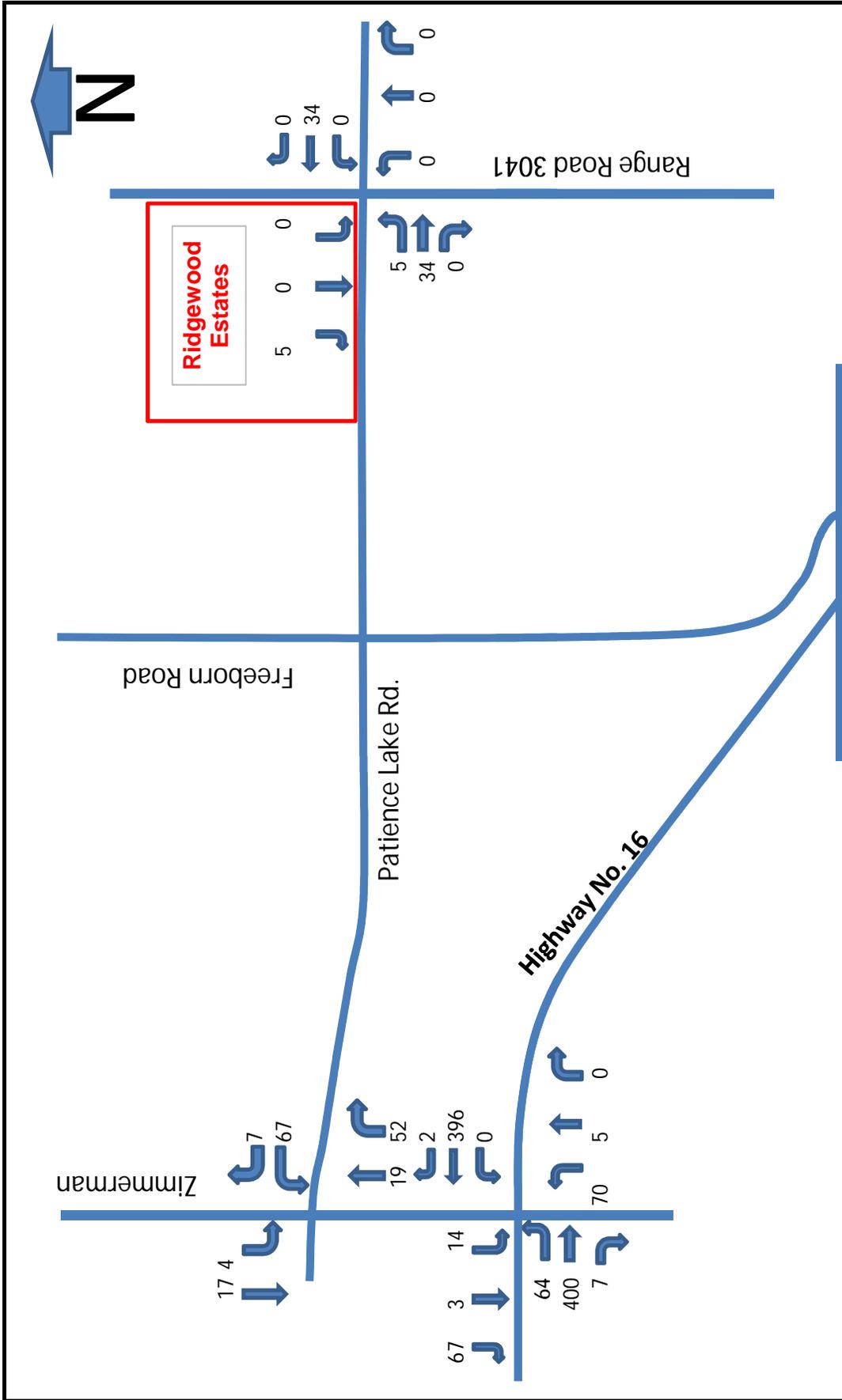
Data collection included passenger car, truck, and bus volumes. The traffic volume data summary is presented in Figure 2.2. The details of traffic counts are appended in the Appendix A.



**R.M. Corman Park
Ridgewood Estate TIA**

Figure 2.1: Roadway Network and Key Intersections of the Study Area





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Dan Beaulac – Ridgewood Estates
Ridgewood Estate TIA

Figure 2.2: Existing PM Peak Traffic Volumes at the Key Intersections

3. Traffic Projection

3.1.1 Trip Generation

The trips generated from the proposed Ridgewood Estates development was calculated based on the concept plan shown in Figure 1.2. The numbers of trips were estimated using the most recent version (9th edition) of the Trip Generation Manual, published by the Institute of Transportation Engineers (ITE). Approximately, 51 single family dwelling units will be developed. The ITE trip generation rate for single family dwelling units (SFU) was utilized to estimate the total trips generated from the proposed Ridgewood during the a.m. peak and p.m. peak hour. Table 3.1 describes the ITE land use code, trip generation rate, and directional distribution percentage.

Table 3.1 ITE Land Uses Code and Corresponding Trip Generation Rate

ITE Land Use	ITE CODE	AM			PM		
		Rate/Dwelling Units	Entering	Exiting	Rate/ Dwelling Units	Entering	Exiting
Single-Family Detached Housing	210	0.75	25%	75%	1.00	63%	37%

Based on the above ITE trip generation rates, the trips generated by the development were estimated. The numbers of trips during both AM and PM peak including their directional distributions are presented in Table 3.2.

Table 3.2 Trips Generated from the Site Developments

Land Use	Units	AM			PM		
		Total Trips	Entering	Exiting	Total Trips	Entering	Exiting
Single-Family Detached Housing	51	39	10	29	51	32	19

Table 3.2 shows that a total of 39 AM peak hour trips and 51 PM peak hour trips will be generated from the proposed Ridgewood Estates development at full build-out of the site.

3.1.2 Background Traffic

3.1.2.1 Background Traffic Growth

Background traffic growth is an estimation of the traffic growth on the adjacent road system of the study area which is expected to occur between existing conditions and any given future year due to overall growth and development of the surrounding region. The background traffic consists of two components:

1. Natural growth of existing traffic, and
2. Traffic generated by other planned developments in the vicinity of the study area.

3.1.2.2 Existing Traffic Growth

The City of Saskatoon's Transportation-System Impact Study (TIS) guidelines suggests to assume 2% background traffic growth per year in absence of any analysis. In this study the background traffic was projected at a rate of 2% per year for 5 years in order to get full-build-out year background traffic for Ridgewood Estates development.

3.1.2.3 Traffic Generated From Other Planned Developments

There are two residential developments located just north and east of the proposed development. They are:

1. Applewood Estates
2. Hidden Ridge

Applewood Estates is a 39-lot country residential subdivision located in the northeast quadrant of the Patience Lake Road and Range Road 3041 intersection. It is located east of the Ridgewood Estates development. The lots ranging from 1.5 - 6 acres were designed to create "ideal building sites" to offers privacy and a slower pace. So far 25% of Applewood Estates have been developed. The traffic generated from the remaining 75% of development will be added to the study area road network and at the intersections.

Hidden Ridge (West) is adjacent to the north boundary of Ridgewood Estates and includes 13 residences. **Hidden Ridge (East)** is in the north-east of Ridgewood Estates and includes 16 residences. Currently Hidden Ridge is almost fully developed. Therefore it was assumed that the existing traffic counts incorporated the traffic generated from Hidden Ridge.

Saskatoon Misbah School:

The construction of a 400 student K-12 school as well as a Mosque/Community Centre is proposed on Patience Lake Road (Highway No. 394) just north of the CP Sutherland Railway crossing. The site is located in the Rural Municipality of Corman Park adjoining the southeast limit of the City of Saskatoon. The access to the proposed school and Mosque/Community Centre will be provided through Patience Lake Road, which is directly connected to Zimmerman Road (Range Road 3044). The timeline of this development is currently unknown. Therefore traffic generated from this development was not considered in this study. However, there are some specific recommendations in the "Rosewood Neighbourhood Concept Plan Amendment" Report pertaining to the two impacted intersections i.e. Highway No. 16 and Zimmerman Road intersection and Patience Lake Road and Zimmerman Road Intersection. This has been discussed in the following sections.

Rosewood Neighbourhood Concept Plan Amendment:

The document entitled "Proposed Rosewood Neighbourhood Concept Plan Amendment Area (CPAA)" was prepared by Stantec Consulting Ltd. to amend the original Rosewood Neighbourhood Concept Plan. The amended Concept Plan includes "Future Urban Development," in addition to the previously designated "Residential" and "Urban Holding". The intent of CPAA was to increase the overall Rosewood neighbourhood density. A fundamental change noted in the CPAA that differs from the original Rosewood Concept Plan is the inclusion of the lands east of Zimmerman Road.

Two at-grade intersections along Zimmerman Road i.e. Zimmerman Road/Rosewood Boulevard and Zimmerman Road/ Connector Road will provide access to the residential, commercial and industrial areas to the east and west of Zimmerman Road. Patience Lake Road will be realigned to connect to Zimmerman Road at the Zimmerman Road/Rosewood Boulevard intersection. Highway No.16 is currently a controlled access roadway. An at-grade un-

signalized intersection currently exists at Highway No.16 and Zimmerman Road. A grade-separated interchange will be constructed at this location at some point in the future.

3.1.2.4 Background Traffic Estimation:

Existing traffic has been escalated with a rate of 2% per year for 5 years in order to get full-build-out year background traffic for Ridgewood Estates development.

New traffic added to the key intersections from Applewood development was calculated based on the Applewood Estates Traffic Impact Assessment (TIA) prepared by AECOM in May, 2011. The TIA estimated a total of 60 new trips generated by the development during afternoon peak hour. Approximately 25% of the Applewood Estates have been developed to date. It is expected that 75% remaining development will take place before the full build-out of Ridgewood Estates and the trips generated from the remaining 75% development will be added to the background traffic volumes at the study area key intersections.

A total of two access roads provide access to the Applewood development, including one located approximately 500 m north of the Patience Lake Road and Range Road 3041 intersection, and the other located approximately 800 m east of the Patience Lake Road and Range Road 3041 intersection with direct access onto Patience Lake Road. Considering the location of the two accesses, the Applewood TIA assumed that 50% of the traffic will utilize the Range Road 3041 access as the primary access point and the remaining 50% will use the Patience Lake Road access. The summary of the trip generation estimates incorporated in the TIA is reproduced in Table 3.3.

Table 3.3 Trip Generation for Applewood Estates Development

ACCESS	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Range Road 3041	5	10	15	20	10	30
Patience Lake Road	5	15	20	20	10	30
Total	10	25	35	40	20	60

75% of the trip shown in the above table will be added as the background traffic volumes at the study area key intersections.

The nature of Rosewood neighbourhood development is very extensive compare to Ridgewood Estates development. At full build-out, the whole Rosewood neighbourhood will have a residential population of approximately 11,900 people. It was assumed that the recommended improvements adopted in the CPAA for Highway No. 16 and Zimmerman Road intersection and Patience Lake Road and Zimmerman Road Intersection will take precedence over other small developments like Ridgewood Estates. The traffic at the Highway No. 16 and Zimmerman Road intersection is currently controlled by stop signs placed on Zimmerman Road and south Service Road. When warranted by traffic conditions this intersection will be signalized followed by the construction of an interchange in the future.

3.1.3 Traffic Distribution and Assignment

Being located just approximately 4.5 km east of the City of Saskatoon west limit and minutes away from shopping, groceries, medical services, pharmacy, and restaurants, the Ridgewood Estates will attract mostly the city dwellers who want to enjoy country charm with city conveniences. It is very likely that most of the traffic generated from Ridgewood Estates will be traveling to and from the City. For estimation purposes, it is assumed that 95% of trips

generated from the Ridgewood Estates Development will commute to and from Saskatoon. The remaining 5% will be destined to or be originated from an area east of the development (i.e. potential destinations such as PCS Patience Lake mine site).

Concept Plan of the Ridgewood Estates development includes a total of two accesses; one is located onto Range Road 3041 approximately 270 m north of the Patience Lake Road and Range Road 3041 intersection, and other is located onto Patience Lake Road approximately 600 m west of the Patience Lake Road and Range Road 3041 intersection.

Following the above trip distribution characteristics, the trips generated from the Ridgewood development as well as remaining planned development of Applewood were assigned to the surrounding road network. The trip generated from the Rosewood development was not considered in the analysis. The commercial and industrial development in the south-east of Rosewood is expected to begin before the residential build-out reaches that area. This is largely driven by demand by potential tenants. The residential development will be staged to maximize the existing infrastructure and connection locations. Patience Lake Road will be realigned to connect to Zimmerman Road at the Zimmerman Road/Rosewood Boulevard intersection and Highway No. 16/Zimmerman Road intersection will be signalized when warranted by traffic conditions followed by the construction of an interchange. The timeline of the above recommended improvement plans is currently unknown. Therefore trips generated from the Ridgewood Estates and Applewood Estates were only assigned to the Zimmerman Road/Patience Lake Road intersection and Highway No. 16/Zimmerman Road intersection.

An EXCEL based model was developed to assign the traffic at the key intersections of the study area. The traffic assignment was performed based on the orientation of the access locations and origin-destination of the trips. Figure 3.1 shows site generated traffic at the Patience Lake Road/Range Road 3041 Intersections as well as at the site Access Roads. Figure 3.2 shows 2020 PM peak hour background traffic and Figure 3.3 shows 2020 PM peak combined site generated traffic and background traffic at the key intersections.

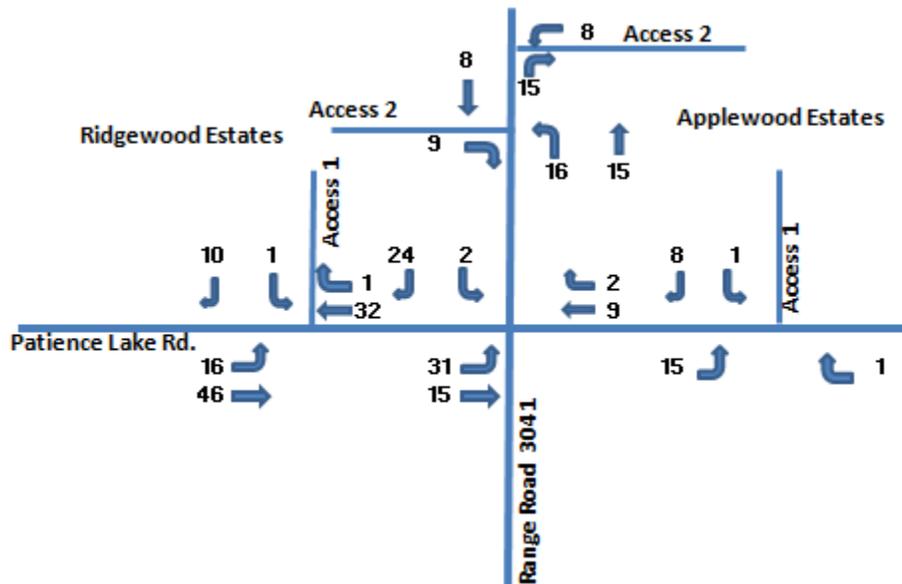
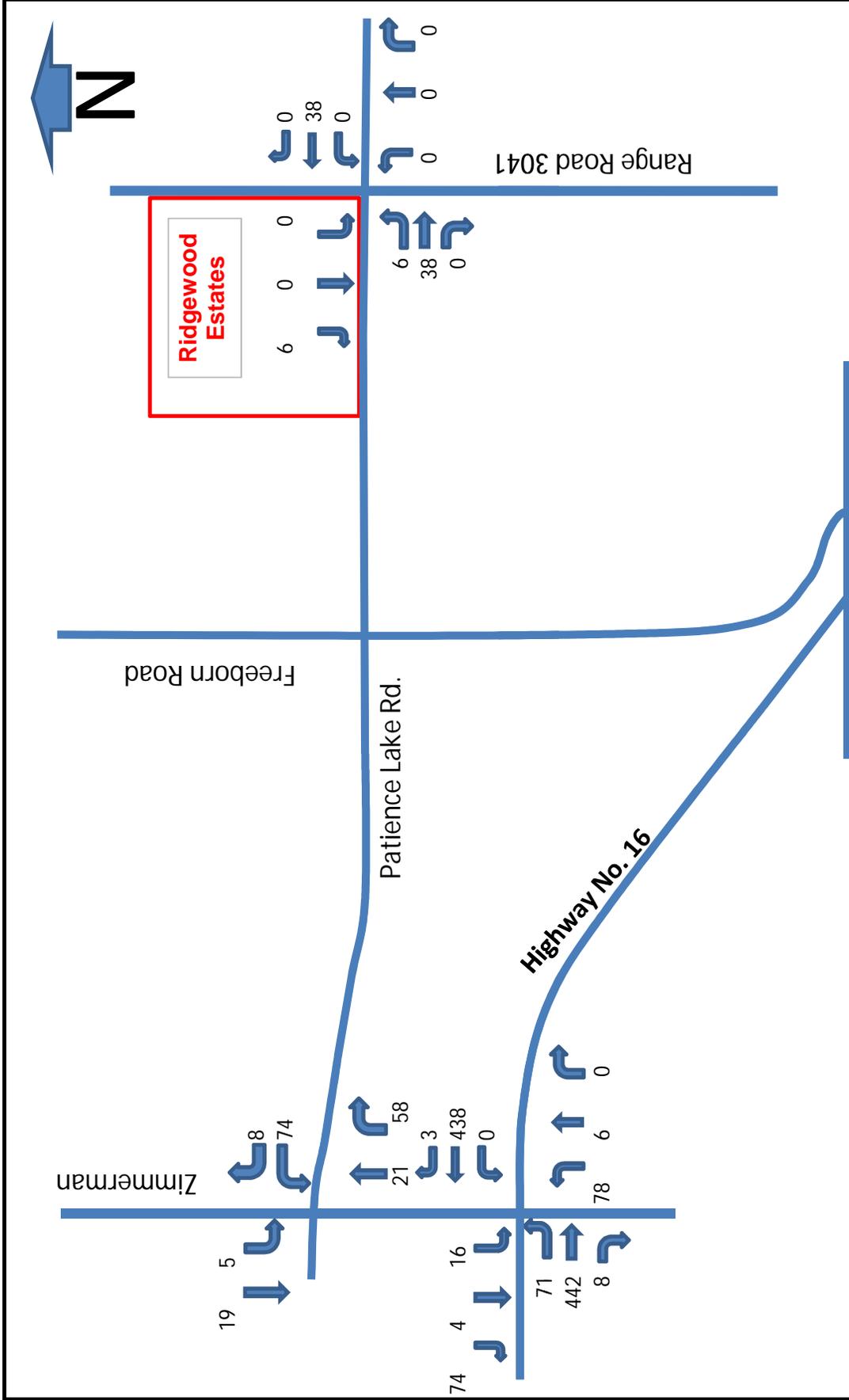


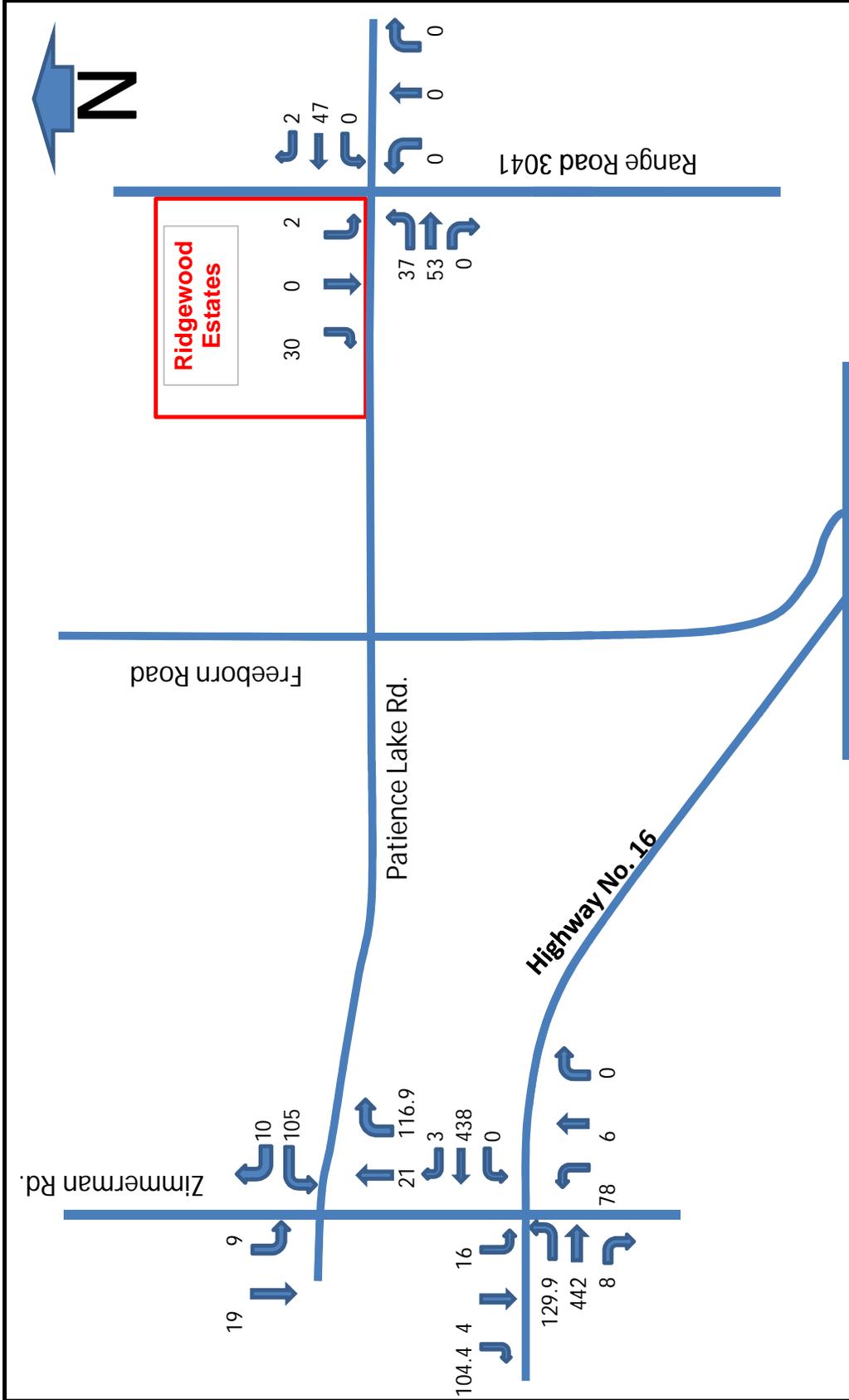
Figure 3.1 2020 PM Site Generated Traffic at the Patience Lake Road/Range Road 3041 Intersections as well as at the Site Access Roads



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Ridgewood Estate TIA

Figure 3.2: 2020 PM Peak Background Traffic at the Key Intersections



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Ridgewood Estate TIA

Figure 3.3: 2020 PM Peak Background and Site Generated Traffic Volumes at the Key Intersections

4. Traffic Analysis

4.1 Methodologies for Level of Service (LOS) and Capacity Analysis

This section identifies the methodology for Level of Service (LOS) and capacity analysis used in this study.

4.1.1 Level of Service (LOS)

The Level of Service (LOS) of each intersection movement is based on the amount of delay experienced by vehicles making the movement and is expressed as seconds/vehicle. Based on the delay, a letter grade is assigned to the individual movement. Generally, an LOS of 'D' is the lowest acceptable LOS for a given turning movement within an intersection when analyzing short-term planning horizons, while LOS-E is the lowest acceptable LOS for long-term planning horizons. LOS-F means the intersection is failing to maintain an acceptable LOS. Movements experiencing LOS-E or LOS-F in short-term or long-term planning, usually require improvements to reduce delays. An exception to this guideline is in situations where the affected traffic movement has a relatively small volume compared to other movements within the same intersection. **Table 4.1** summarizes the LOS criteria for signalized and un-signalized intersections as per the Highway Capacity Manual 2010. For stop controlled intersections, the LOS is based on the estimated average delay per vehicle among all traffic passing through the intersection. For signalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, the traffic signal phasing/timing plan, as well as pedestrian volumes. The average delay for each lane, lane group and the overall intersection is calculated.

Table 4.1 Level of Service Criteria

Level of Service (LOS)	Average Delay (Second per Vehicle)	
	Un-signalized Intersection & Roundabout	Signalized Intersection
A	0-10	0-10
B	10-15	10-20
C	15-25	20-35
D	25-35	35-55
E (Capacity)	35-50	55-80
F (Failure)	> 50	> 80

Source: Highway Capacity Manual 2010, Transportation Research Board, Washington, D.C. December, 2010.

4.1.2 Volume to Capacity Ratio

The Volume-to-Capacity (V/C) ratio is another measure of capacity of intersection operations. The V/C is defined as the ratio of flow rate to capacity for a transportation facility. The higher the value, the more congestion is experienced by motorists. A V/C ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are not expected to experience significant queues and delays. A V/C ratio between 0.85 and 0.95 generally indicates that the intersection is operating near its capacity. Higher delays may be expected, but continuously increasing queues should not occur. As the V/C ratio approaches 1.0, traffic flow may become unstable, and delays and queuing conditions may occur. At some intersections, if the V/C ratio exceeds 0.85 mitigation measures in the form of the addition of lane capacity and/or signal timing/phasing adjustments will be provided and an engineering justification will be provided for any acceptable higher value of V/C ratio.

4.2 Existing (2015) Operating Condition at Key Intersections

The Capacity and Level of Service (LOS) analysis was conducted for the following three key intersections:

5. Highway No. 16 and Zimmerman Road Intersection
6. Patience Lake Road and Zimmerman Road Intersection
7. Patience Lake Road and Range Road 3041 Intersection

The existing traffic at the Patience Lake Road and Freeborn Road Intersection are mostly east and west bound through traffic. There is no substantial planned development in the vicinity of this intersection as well as along Freeborn Road. Therefore it is expected that future traffic movements at this intersection will mostly be east and west bound through traffic and intersection capacity will not be an issue.

The capacity and LOS analysis at the above three key intersections was performed using Synchro 8 (an industry-standard traffic analysis software), which uses the methods outlined in the Highway Capacity Manual 2010. The analysis was based on existing traffic controls and lane configurations at the studied intersections. **Table 4.2** illustrates the performance of the three key intersections under existing PM peak hour traffic condition. Detailed outputs from Synchro analysis are contained in **Appendix B**.

Table 4.2 Existing (2015) Traffic Operating Condition

Peak Hour	Measure of Effectiveness	Northbound			Southbound			Eastbound			Westbound			
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Highway No. 16 and Zimmerman Road Intersection														
PM PEAK	Volume (vph)	70	5	0	14	3	67	69	400	7	0	396	2	
	V/C	0.2	0.0			0.04	0.09	0.07	0.17	0.09	0.00	0.13	0.13	
	Approach LOS	C			B									
	HCM LOS													
	ICU LOS / ICU	A/43.1%												
Patience Lake Road and Zimmerman Road Intersection														
PM PEAK	Volume (vph)		19	52	4	17					67		7	
	V/C		0.01	0.03	0.0	0.01					0.08			
	Approach LOS										A			
	HCM LOS													
	ICU LOS / ICU	A/14.1%												
Patience Lake Road and Range Road 3041 Intersection														
PM PEAK	Volume (vph)	0	0	0	0	0	5	5	34	0	0	34	0	
	V/C		0.0			0.1			0.1			0.0		
	Approach LOS	A			A									
	HCM LOS													
	ICU LOS / ICU	A/16.0%												

Existing conditions key findings from Synchro analysis:

It can be observed in the above Table that in general all the three intersections currently operate at an acceptable level of service during afternoon peak hour. The key findings are as follows:

- The two-way stop controlled NB and SB approaches of the Highway No. 16 and Zimmerman Road Intersection is currently operating at a level of service “C” and “B” respectively during afternoon peak hour. The V/C ratios for all the movements are well below the maximum acceptable level.
- The Patience Lake Road and Zimmerman Road Intersection operates at good level of service.
- The existing turning traffic volume at the Patience Lake Road and Range Road 3041 Intersection is very low. The predominant movements are EB and WB through movements. The two-way stop controlled NB and SB movements operate at a LOS “A”.

4.3 Future Operating Condition at the Key Intersections

In order to assess the impact of the full build-out of Ridgewood Estates development, the capacity and LOS analysis was conducted for the combined background and site generated traffic. The future analysis was conducted for the existing three intersections stated in section 4.2. The analysis was based on the assumptions that the existing intersection geometry, lane configuration and lane designation will not be changed. The summary of the analysis results are presented in **Table 4.3**. Details of the Synchro output are enclosed in **Appendix C**.

Table 4.3 Future (2020) Traffic Operating Condition

Peak Hour	Measure of Effectiveness	Northbound			Southbound			Eastbound			Westbound			
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Highway No. 16 and Zimmerman Road Intersection														
PM PEAK	Volume (vph)	78	6	0	16	4	104	130	442	8	0	438	3	
	V/C	0.32		0.0		0.06	0.15	0.13	0.19	0.10	0.0	0.14		
	Approach LOS	C			B									
	HCM LOS													
	ICU LOS / ICU	A/46.0%												
Patience Lake Road and Zimmerman Road Intersection														
PM PEAK	Volume (vph)		21	117	9	19					105		10	
	V/C		0.01	0.07	0.01	0.01					0.13			
	Approach LOS										A			
	HCM LOS													
	ICU LOS / ICU	A/20.3%												
Patience Lake Road and Range Road 3041 Intersection														
PM PEAK	Volume (vph)	0	0	0	2	0	30	37	53	0	0	47	2	
	V/C		0.0			0.03			0.03			0.0		
	Approach LOS	A			A									
	HCM LOS													
	ICU LOS / ICU	A/21.5%												

Key findings from Synchro analysis for full build-out traffic without improvements:

The analysis was conducted assuming the existing lane geometry and lane configuration will remain unchanged. The analysis found that all the three key intersections will operated at a good level of service during 2020 afternoon peak hour traffic condition. The key findings are as follows:

- The two-way stop controlled NB and SB approaches of the Highway No. 16 and Zimmerman Road Intersection will continue to operate at a level of service “C” and “B” respectively during afternoon peak hour. The V/C ratios are well below the maximum acceptable level.
- The Patience Lake Road and Zimmerman Road Intersection will operate at good level of service during 2020 afternoon peak hour traffic condition. The one-way stop controlled WB approach will operate at a LOS “A”.
- The full build-out of Ridgewood Estate will generate substantial turning traffic movement to and from SB approach of the Patience Lake Road and Range Road 3041 Intersection. However, the two-way stop controlled NB and SB movements will operate at a LOS “A”. The intersection will have enough capacity to accommodate future additional traffic.

5. Road Condition Assessment and Future Improvement Plan

5.1 Principal Municipal/Provincial Roadways

Patience Lake Road /Highway No. 394

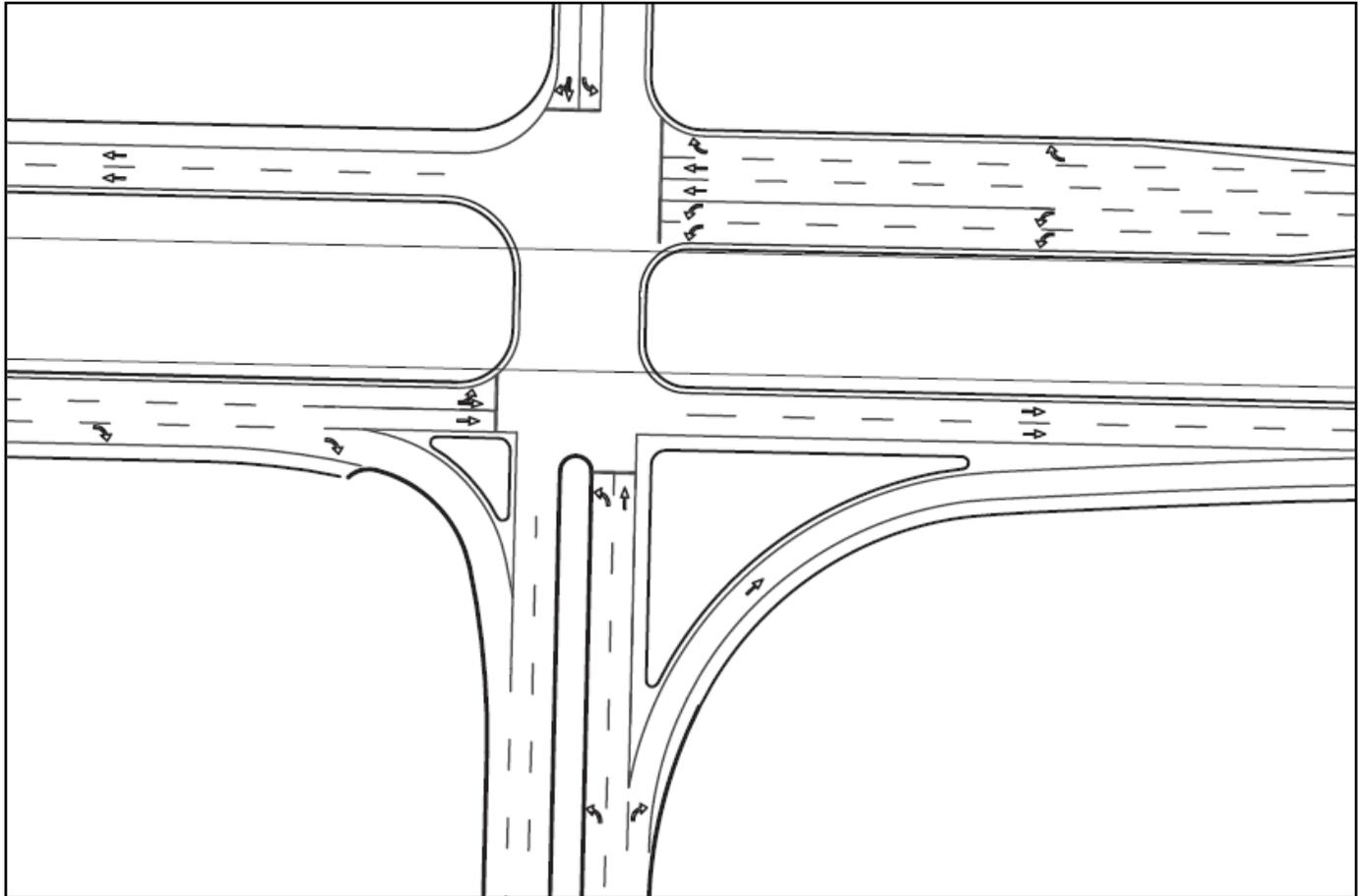
Patience Lake Road or Highway 394 is a minor provincial highway of Saskatchewan. It starts from Zimmerman Road around 135 m north of the Highway No.16 and Zimmerman Road intersection and goes eastward to Highway 316 north of Clavet. Highway 394 is maintained by the Ministry of Highways and Infrastructure and does not pass through any communities. It is a two-lane undivided paved road with 2.0 m shoulder. The pavement is in good condition.

Highway No. 16

Highway No. 16 is a part of the Yellowhead highway system, providing a major link between Winnipeg, Saskatoon and Edmonton. The highway runs from the Manitoba border near Marchwell to the Alberta border in Lloydminster. It is a two-lane facility from the Manitoba border to 10 km east of Saskatoon where it transitions to a four lane divided highway. The Patience Lake Road is connected to Highway No.16 through Zimmerman Road. The Highway No.16 and Zimmerman Road intersection is currently un-signalized. The amendment to the Rosewood Neighbourhood Concept Plan incorporates lands east of Zimmerman Road as an employment area consisting of commercial and light industrial land uses. Since the commercial and industrial land uses will be located adjacent to Highway No.16, it will have a huge impact on Highway No.16 and Zimmerman Road intersection. The Proposed Rosewood Concept Plan Amendment Area (CPAA) Report prepared by Stantec Consulting Ltd identified the following improvements at the Highway No.16 and Zimmerman Road intersection. It was assumed that the Rosewood neighbourhood would be fully developed by 2025 and by that time the Highway No.16 and Zimmerman Road intersection will be signalized with the configurations described in Table 5.1. The proposed improvements of the Highway No.16 and Zimmerman Road intersection are also illustrated in Figure 5.1.

Table 5.1 Future Configuration of Highway No.16 and Zimmerman Road Intersection

Eastbound Approach	Westbound Approach	Northbound Approach	Southbound Approach
Two left turn lanes	One shared through/left lane	Combined left turn/through lane	Single left turn lane
Two through lanes	One through lane	Single right turn lane	Single through lane
One right turn lane	One right turn lane		Right turn ramp with acceleration lane



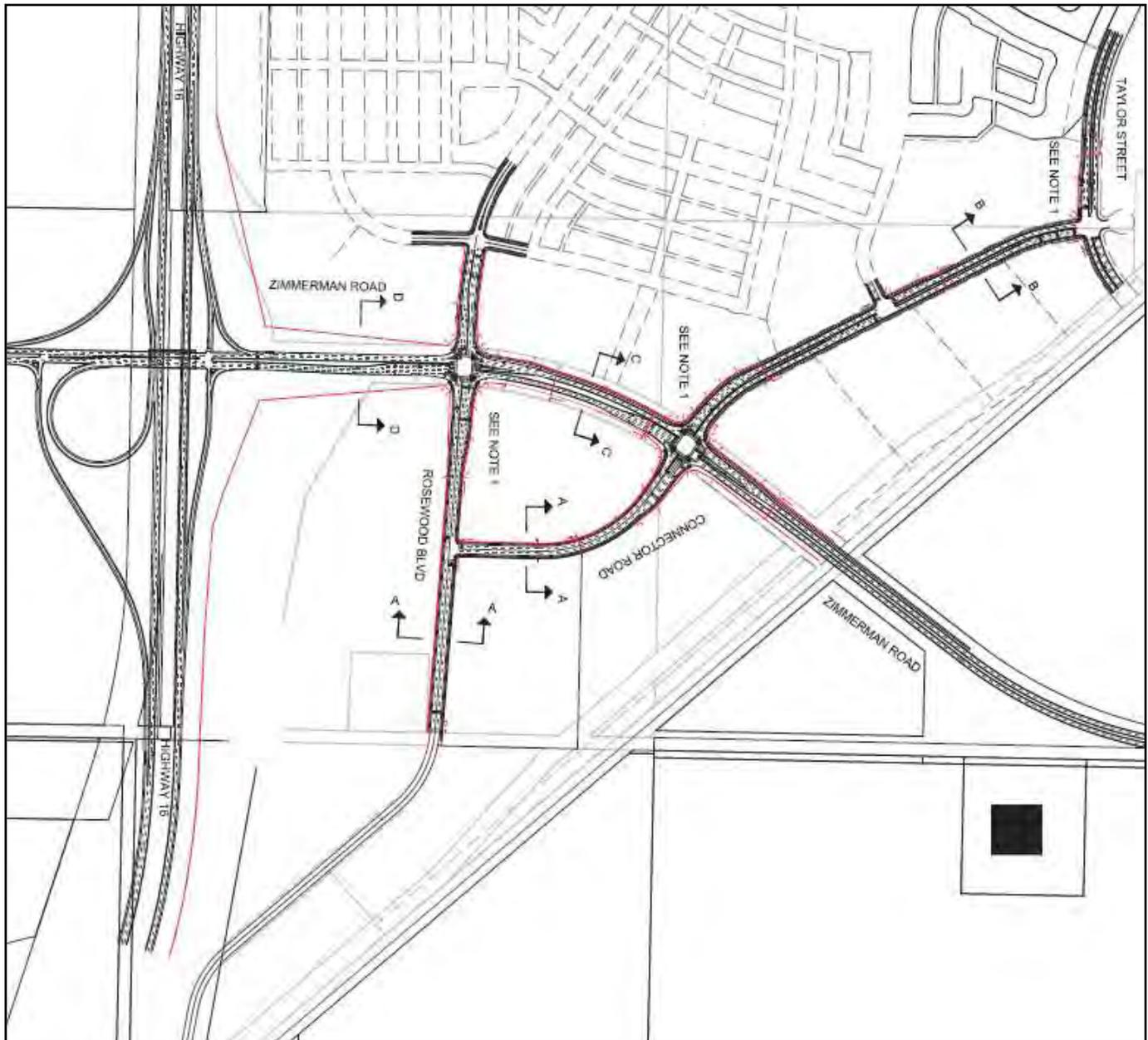
Source: Stantec Consulting Ltd., "Proposed Rosewood Concept Plan Amendment Report", May 2, 2014;

Figure 5.1 Highway No.16 and Zimmerman Road intersection Improvements Proposed in the Rosewood CPAA Report

The retail giant Costco Wholesale is in negotiations to open a second location in Saskatoon in the new Rosewood neighbourhood CPAA. If the deal goes through, this intersection will require more comprehensive improvements.

Zimmerman Road (Range Road 3044)

Zimmerman Road is a two-lane undivided partially paved road which connects Patience Lake Road to Highway No. 16. The Patience Lake Road/ Zimmerman Road intersection is located around 130 m north of Highway No. 16 and Zimmerman Road intersection. The road is unpaved beyond around 200 m from the Patience Lake Road/ Zimmerman Road intersection. The Proposed Rosewood Concept Plan Amendment Area (CPAA) Report prepared by Stantec Consulting Ltd identified two at-grade intersections along Zimmerman Road i.e. Zimmerman Road/Rosewood Boulevard and Zimmerman Road/ Connector Road. These two intersections will provide access to the residential, commercial and industrial areas to the east and west of Zimmerman Road. Patience Lake Road will be realigned to connect to Zimmerman Road at the Zimmerman Road/Rosewood Boulevard intersection. The proposed future road layouts are shown in Figure 5.2.



Source: Stantec Consulting Ltd., "Proposed Rosewood Concept Plan Amendment Report", May 2, 2014;

Figure 5.2 Realignment of Patience Lake Proposed in the Rosewood CPAA Report

Range Road 3041

Range Road 3041 is an unpaved grid road. The basic road top width varies from 8.2 metres to 8.3 metres and has 3 to 1 side slopes for the majority of the road. The exception is a short section of road just immediately north of Patience Lake Road that appears to have a 2 to 1 side slope. Adjacent to the proposed development, this section of Range Road 3041 presently has a seal coat surface directly on the sub-grade. There appears to be no granular base course applied to the road or any sub-grade strengthening in-place prior to application of the sealed surface. As a result, the road is soft and has very soft shoulders. The road will likely have failures in it when subjected to heavy loads, such as equipment and materials hauled into the subdivision for construction of proposed development.

It is anticipated that this section of Range Road 3041 will ultimately be paved upon full build-out of the proposed development. It is recommended that the road be re-constructed to proper road structure standards prior to applying a seal coat as a long-term solution.

5.2 Internal Road and Site Access

5.2.1 Internal Roads

The concept plan shown in Figure 1.2 includes one internal road (Ridgewood Trail) that services all of the lots with access occurring from the south boundary of the development on Patience Lake Road and the east boundary of the development on Range Road 3041. The concept plan also includes a small segment of road named Ridgewood Place which is connected to Ridgewood Trail. A total of 9 lots will be served through Ridgewood Place with a Cul-de-Sac. It is suggested that the internal roads will be paved with seal coat and constructed to the R.M. standard for subdivision roads.

5.2.2 Site access

Access on Patience Lake Road:

The Ridgewood Estates concept plan incorporates a direct access to the site from Patience Lake Road through an existing farm access which is located approximately 600 m west of the Patience Lake Road and Range Road 3041 intersection. Figure 5.3 illustrates the farm access currently located on Patience Lake Road.



Figure 5.3 Existing Farm Access on Patience Lake Road which will Provide Access to Ridgewood

The existing farm access on Patience Lake Road is a gravel road having a length of around 500 m. This road currently connects a homestead at the north end. This road will make part of the proposed internal road for Ridgewood Estates. It is suggested in the previous section that the internal road will be paved with a seal coat and constructed to the R.M. standard for subdivision. It is forecasted that 50% of the traffic generated from Ridgewood will use this access. The traffic will be controlled by a stop sign placed at the southbound approach. The access road will intersect Patience Lake Road at a right angle. It is anticipated that there will be no safety concern or sight distance issues at this intersection.

Access on Range Road 3041:

The concept plan shows the location of the second access on Range Road 3041 around 270 m north of the Patience Lake Road and Range Road 3041 intersection. The access to the Applewood Estates will be around 180 m further north from the proposed access. The proposed access will create two offset T-intersections on Range Road 3041. It has long been acknowledged that three-legged intersections operate more safely than comparable four-legged intersections because three-legged intersections have fewer conflict points. It is expected that the proposed location of the Ridgewood access on Range Road 3041 will not have any safety issue. There is a very good sight distance at the Patience Lake Road and Range Road 3041 intersection, which exceeds the desirable sight distance minimum requirement of 370 metres.

6. Summary and Conclusion

This study conducted a Traffic Impact Assessment (TIA) for the proposed Ridgewood development. The study investigated the impacts of the development on the surrounding road network. An assessment of the existing intersections that could be impacted by the development identified a total of four key intersections:

1. Highway No. 16 and Zimmerman Road Intersection
2. Patience Lake Road and Zimmerman Road Intersection
3. Patience Lake Road and Freeborn Road Intersection
4. Patience Lake Road and Range Road 3041 Intersection

The existing traffic at the Patience Lake Road and Freeborn Road Intersection are mostly through traffic and there is no substantial planned development along Freeborn Road. It is anticipated that the capacity would not be an issue for this intersection. Therefore this intersection was not investigated thoroughly. Existing PM peak traffic volumes at the three other key intersections were collected by conducting afternoon peak hour turning movement counts and prepared for analysis.

The numbers of trips generated from the Ridgewood Estates development were estimated using the ITE's Trip Generation Manual. A total of 39 AM peak hour trips and 51 PM peak hour trips will be generated from the proposed development. The new trips generated by the development were combined with the background traffic. Background traffic considered both natural growth of the existing traffic, and traffic generated by other planned developments in the vicinity of the study area. Existing traffic has been escalated with a rate of 2% per year for 5 years in order to get full-build-out year background traffic for Ridgewood Estates development. New traffic added to the key intersections from Applewood development was calculated based on the Applewood Estates Traffic Impact Assessment (TIA) prepared by AECOM in May, 2011. The combined site generated traffic and background trip were then distributed and assigned to the adjacent road network and at the key intersections. A capacity and Level of Service (LOS) analysis was performed using the traffic analysis software Synchro 8. The traffic analysis investigated both existing and future traffic operation during afternoon peak hour traffic conditions. The analysis provided the following key findings:

- Under existing traffic condition, all the three key intersections operate at a good level of service during afternoon peak hour. The two-way stop controlled NB and SB approaches of the Highway No. 16 and Zimmerman Road Intersection is currently operating at a level of service "C" and "B" respectively during afternoon peak hour. The Patience Lake Road and Zimmerman Road Intersection operates at good level of service. The two-way stop controlled NB and SB movements of the Patience Lake Road and Range Road 3041 Intersection operate at a LOS "A".
- With the existing geometric configuration and lane arrangement, all the three key intersections will operate at a good level of service during 2020 afternoon peak hour traffic condition. The one-way stop controlled WB approach of the Patience Lake Road and Zimmerman Road Intersection will operate at a LOS "A". The full build-out of Ridgewood Estate will generate substantial turning traffic movements at the Patience Lake Road and Range Road 3041 Intersection. However, the two-way stop controlled NB and SB movements of this intersection will operate at a LOS "A".

The traffic generated from Ridgewood Estates will not have any significant impact on adjacent roadways and at the key intersections at full-build out. All the three studied intersections will operate at a good level of service and have surplus capacity to accommodate addition traffic. The exiting geometry and lane configuration of the intersections do not require any changes in order to accommodate traffic generated from Ridgewood Estate development. However, two intersections on Zimmerman Road i.e. Highway No. 16 and Zimmerman Road Intersection and

Patience Lake Road and Zimmerman Road Intersection will have several improvements in the future with the progression of Rosewood Neighbourhood development in the east of Zimmerman Road.

The Rosewood Neighbourhood Concept Plan Amendment Area (CPAA) study prepared by Stantec Consulting Ltd. identified that the exiting un-signalized Highway No.16 and Zimmerman Road intersection will be signalized in the near future with the advancement of Rosewood neighbourhood development and a grade-separated interchange will be constructed at this location at some point in the future. Two at-grade intersections along Zimmerman Road i.e. Zimmerman Road/Rosewood Boulevard and Zimmerman Road/ Connector Road will provide access to the residential, commercial and industrial areas to the east and west of Zimmerman Road. Exiting Patience Lake Road will be realigned to connect to Zimmerman Road at the Zimmerman Road/Rosewood Boulevard intersection.

Appendix A

Synchro Analysis

Appendix B

Traffic Signal Warrant Analysis

Appendix D

**Hydro-Geotechnical
Investigation**

Golder Associates



August 2015

RIDGEWOOD ESTATES

Hydro-Geotechnical Investigation

Submitted to:
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REPORT



Report Number: 1406388

Distribution:

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1 Copy - Golder Associates Ltd.





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APPENDICES

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Information and Limitations

APPENDIX B

Borehole Records

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Laboratory Testing

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Water Well Records

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Hydraulic Conductivity Test Results



1.0 INTRODUCTION

1.1 Overview

This report presents the results of the hydro-geotechnical investigation conducted by Golder Associates Ltd. (Golder) for Ridgewood Estates, a proposed subdivision within the SE 14-36-04 W3M. The purpose of the hydro-geotechnical investigation was to assess the suitability of the site for development of single-family housing and satisfy the site assessment guidelines outlined in the Guidance Document for Developments and Subdivisions Where Onsite Wastewater Treatment Systems Are Proposed (Government of Saskatchewan 2012) as required by the Saskatoon Health Region for subdivision development.

This report should be read in conjunction with "Information and Limitations of this Report" included in Appendix A. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

1.2 Site Description

The proposed site is located in the SE 14-36-04 W3M within the Rural Municipality (R.M.) of Corman Park No. 344 (Saskatchewan) as shown on Figure 1. The total land area for the subdivision is 62 hectares (ha) (153 acres). There are 50 proposed lots ranging in size from 3.6 ha to 0.4 ha.

2.0 INVESTIGATION PROCEDURES

2.1 Desktop Study

Existing surface, subsurface and groundwater information (Acton 1978, Christiansen 1970, MDH Engineered Solutions 2011, Saskatchewan Research Council 1971) was compiled to provide a geological characterization of the site.

2.2 Field Study

Subsurface conditions were investigated from July 23 to July 25, 2014. The investigation consisted of drilling twelve boreholes (RR-14-001 to RR-14-012) and installing a deep monitoring well in each borehole. Shallow monitoring wells were installed at 7 of the borehole locations on August 13, 2014. The locations of the boreholes are shown on Figure 2.

A representative of Golder was present during drilling to monitor the drilling and collect soil samples. Standard penetration tests (SPT) were performed at approximately 1.5 metre (m) intervals. Samples recovered during the field investigation were returned to Golder's Saskatoon Laboratory for further testing and analysis. A Record of Borehole sheet was completed for each borehole to record the description and relative position of the soil strata, the location of the borehole, and other drilling notes. Record of Borehole sheets are included in Appendix B.

Monitoring wells were constructed using 51 millimetre (mm) diameter polyvinyl chloride (PVC) belled pipe, which was screened on the bottom 1.5 m. A sand-pack was placed into the annulus of the borehole surrounding the pipe; the sand-pack extended to approximately 0.3 m above the slotted pipe. Bentonite chips were placed to approximately 0.6 m above the sand-pack. Drill cuttings were placed above the bentonite chips and extended to the surface of the borehole.

Groundwater levels in the monitoring wells were measured on September 11, 2014 (Figure 3). On September 12 and September 16, 2014, falling head hydraulic conductivity tests were completed to determine the bulk hydraulic conductivity of the soil surrounding the well screen.



2.3 Laboratory Testing

Routine laboratory testing was conducted by Golder's Saskatoon Laboratory on selected soil samples recovered during the field investigation. The test results are shown on the Record of Borehole sheets found in Appendix B and a detailed summary of the laboratory tests performed is included in Appendix C.

Golder's laboratory testing program included the following:

- unconfined compression test to evaluate the undrained strength of the soil;
- moisture content analysis on the recovered sample, to evaluate the moisture profile of the soils; and
- Atterberg limit tests on selected samples, to determine the plasticity of the soil.

Selected soil samples were submitted to the ALS Laboratory in Saskatoon to determine the grain size distribution of the soil of selected samples using the Mini-Pipet method.

3.0 SITE CONDITIONS

3.1 Climate

The principal weather station in this area is at the Saskatoon Diefenbaker International Airport with 30 year normals provided between 1971 to 2000 (Environment Canada 2011). Climate can induce extremes and seasonal variations, mean January temperatures are -17 degrees Celsius (°C) and mean July temperatures are 18.2°C. Extreme maximums and minimums are 40.6°C and -50°C, respectively. Precipitation averaged 350 mm per year and snowfall average 972 mm year. The average wind velocity is 15.7 kilometres per hour (km/h) and maximum gust speeds reach 151 km/h. The prevailing winds are west and west-northwest.

3.2 Topography

The proposed development is located within a moraine land system (Hart, 1980). Moraine lands are formed on predominantly unsorted glacial deposits (till) comprised of undulating plains, "knob and kettle" terrain, and other topographical variations.

The slopes in the area are moderate to strong (5% to 15%) with interspersed low-lying depressions.

3.3 Soils

The proposed development is located in the Dark Brown soil zone of Saskatchewan, on the Weyburn soil association. Weyburn soils are loamy textured dark brown soils formed on unsorted glacial till. These soils are classified as moderately to very stony, with a low potential susceptibility to wind and water erosion.

3.4 Surficial Geology

Surficial geology was interpreted from geological maps produced by MDH Engineered Solutions (2011), Saskatchewan Research Council (1971) and E.A. Christiansen (1970).

The site topography is characterized by hummocky moraine. The site is located in an area referred to locally as the Strawberry Hills. The Strawberry Hills consist of a glacial till upland that was virtually an island located in the large Glacial Lake Saskatoon that formed in the Saskatoon area during the last glacial recession. The stratigraphy generally consists of glacial till consisting of the Battleford Formation nearest to the surface, underlain by the Floral Formation, and the till of the Sutherland Group. The glacial till contains sand and gravel



layers occurring within the till formations, between the till formations, and between the glacial till and bedrock. The thickness of the glacial till in the area is approximately 120 m. No significant thicknesses of glaciolacustrine deposits would be expected in the upland areas.

3.5 Stratigraphy

At ground surface in all boreholes, between 0.3 and 1.2 m of topsoil was encountered. The topsoil thickness varied across the site.

Stratigraphy below the topsoil consisted of silty clay till. In general, the silty clay till was soft to hard, and light brownish grey; turning to dark brownish grey at approximately 5 m below ground surface (BGS).

Three cross sections were developed from the stratigraphy encountered in the boreholes. The locations of stratigraphic cross sections are shown in Figure 4 and the cross sections are shown in Figures 5, 6 and 7. The subsurface conditions are inferred at borehole locations only and may vary between boreholes.

The results of grain size distribution testing on selected samples are presented in Table 1.

Table 1: Particle Size Analysis and Soil Texture

Borehole	Sample Number	Depth (mBGS)	Sand (%)	Silt (%)	Clay (%)	Soil Texture ^(a)
RW-14-001	SA04	2.5	57.1	28.8	14.1	Sandy Loam
RW-14-002	SA04	2.5	52.4	31.9	15.7	Loam
RW-14-004	SA04	2.5	51.4	35.7	12.8	Loam
RW-14-005	SA03	1.8	38.1	43.6	18.3	Loam
RW-14-007	SA02	1.0	43.9	35.7	20.4	Loam
RW-14-008	SA04	2.5	50.8	32.8	16.3	Loam
RW-14-010	SA08	5.8	54.3	30.2	15.4	Loam
RW-14-011	SA05	3.2	54.7	30.0	15.3	Loam

^(a) Soil texture classification based on Saskatchewan Ministry of Health (2009).

mBGS = metres below ground surface; % = percent

3.6 Hydrogeology

No major intertill aquifers have been mapped in this area, nor have the Empress Group Aquifers been identified. The water wells discussed in Section 3.6.1 may be established in localized aquifers which are not extensive or continuous.

3.6.1 Water Well Search

Review of the Saskatchewan Watershed Authority Groundwater Well Database, indicated that there are 10 water wells within a one kilometre radius that have been reported to the Saskatchewan Water Security Agency (Figure 8). All of the identified water wells were listed for domestic water use. The domestic well depths ranged between approximately 8 and 120 m. The search results are presented in Appendix D.

3.6.2 Groundwater Conditions

A summary of the measured groundwater elevations recorded during this investigation is presented in Table 2. The depth to groundwater on September 11, 2014 ranged from approximately 2.2 to 4.7 mBGS. The apparent groundwater flow direction was towards the south at an average gradient of 0.001. Groundwater gradient



RIDGEWOOD ESTATES

contours were drawn based on groundwater levels measured in monitoring wells CR-14-001 to CR-14-006 (Figure 3).

Table 2: Groundwater Elevation

Monitoring Well	Ground Surface Elevation (mASL)	Recorded Groundwater Elevation (mASL) September 11, 2014	Groundwater Depth (mBGS) September 11, 2014
RW-14-001S	539.74	537.85	3.00
RW-14-001D	539.74	538.58	2.25
RW-14-002S	540.05	537.54	3.42
RW-14-002D	540.05	538.17	2.91
RW-14-003S	539.54	537.19	3.45
RW-14-003D	539.54	537.34	3.18
RW-14-004S	539.36	537.32	3.04
RW-14-004D	539.36	537.41	3.07
RW-14-005S	538.63	537.35	2.39
RW-14-005D	538.63	537.00	2.85
RW-14-006D	538.73	535.08	4.73
RW-14-007D	540.04	536.75	4.40
RW-14-008D	540.45	538.32	3.19
RW-14-009D	540.54	538.02	3.60
RW-14-010D	539.82	537.73	3.22
RW-14-011S	538.99	536.41	3.59
RW-14-011D	538.99	537.26	2.82
RW-14-012S	539.54	dry	dry
RW-14-012D	539.54	536.90	3.71

mASL = metres above sea level; mBGS = metres below ground surface

The geochemical groundwater sampling results are presented in Table 3 and the Certificates of Analysis are located in Appendix C. Guidelines for Canadian Drinking Water Quality (Health Canada 2012) are presented in Table 3 for comparison purposes only. Geochemical groundwater parameters exceeding the guidelines are highlighted with gray. Within the development, a potable water supply for the site will be supplied via a piped distribution system and no direct use of groundwater as a potable source is anticipated.

RIDGEWOOD ESTATES

Table 3: Groundwater Geochemical and Bacteriological Results

Parameter	Units	RW-14-001S	RW-14-001D	RW-14-002S	RW-14-003S	RW-14-004S	RW-14-005S	RW-14-006D	RW-14-007D	RW-14-008D	RW-14-009D	RW-14-010D	RW-14-011S
General Parameters		Guidelines											
pH	pH units	6.5-9.5	7.78	7.87	7.59	7.57	7.63	7.58	7.63	7.65	7.54	7.47	7.78
Alkalinity	mg/L as CaCO ₃	500	283	490	571	311	364	332	268	391	374	374	563
Electrical Conductivity	µS/cm	12500	1380	1450	1980	786	1570	1570	0	1220	2440	4480	1400
Total Dissolved Solids (TDS)	mg/L	500	940	961	1420	463	1010	1110	1920	767	1800	4270	877
Hardness	mg/L as CaCO ₃	10700	747	742	1030	425	789	816	1380	625	1290	2770	682
Major Ions													
Chloride (Cl)	mg/L	250	3.7	11.9	8.1	7.5	122	16.6	53.6	12.1	18.6	62.0	10.2
Sulphate (SO ₄)	mg/L	500	11300	484	259	723	371	568	1160	273	1040	2790	179
Bicarbonate (HCO ₃)	mg/L	432	432	598	571	379	445	405	327	477	456	456	687
Carbonate (CO ₃)	mg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide (OH)	mg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrate (NO ₃ -N)	mg/L as N	10	50.5	22.4	0.86	0.64	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	16.9
Nitrite (NO ₂ -N)	mg/L as N	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen (NO ₃ + NO ₂)	mg/L	50.7	<0.50	22.4	0.87	0.66	0.76	<0.50	<0.50	<0.50	<0.50	<0.50	16.9
Calcium (Ca)	mg/L	431	111	129	149	109	123	195	287	123	257	476	85.2
Potassium (K)	mg/L	34	34	7.3	5.1	3.4	2.2	7.9	7.9	6.5	9.7	16	8.8
Magnesium (Mg)	mg/L	2340	114	102	160	37.1	117	79.9	161	77.1	158	384	114
Sodium (Na)	mg/L	300	645	59.0	86.5	6.6	52.8	57.3	90.2	40.3	96.3	314	66.7
Cation - Anion Balance	%	-0.6	1.7	1.3	723	0.6	-1.1	0.7	1.1	2.0	1.0	1.5	0.8
Bacteriological													
Total Coliforms	MPN/100 mL	0	>200.5	>200.5	>200.5	>200.5	>200.5	>200.5	>200.5	165	25	43	36
Escherichia Coli	MPN/100 mL	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous													
Heterotrophic Plate Count	CFU/mL	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000
Iron Reducing Bacteria	-	present											



RIDGEWOOD ESTATES

Table 3: Groundwater Geochemical and Bacteriological Results (continued)

Parameter	Units	Guidelines	RW-14-001S	RW-14-001D	RW-14-002S	RW-14-003S	RW-14-004S	RW-14-005S	RW-14-006D	RW-14-007D	RW-14-008D	RW-14-009D	RW-14-010D	RW-14-011S
<i>Metals</i>														
Aluminum	mg/L		<0.10	<0.10	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0064
Antimony	mg/L	0.006	<0.0020	<0.00020	0.00041	0.00024	0.00019	0.00036	<0.00020	<0.00020	<0.00020	0.00027	0.00054	0.00029
Arsenic	mg/L	0.010	<0.0020	0.00083	0.00138	0.00085	0.00053	0.00107	0.00302	0.00058	0.00212	0.00068	0.00109	0.00119
Barium	mg/L	1.0	0.046	0.0249	0.258	0.0454	0.0572	0.0548	0.0467	0.0196	0.0472	0.0338	0.0310	0.0861
Beryllium	mg/L		<0.0020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Bismuth	mg/L		<0.0040	<0.00040	<0.00040	<0.00040	<0.00020	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00020
Boron	mg/L	5.0	0.31	0.056	0.086	0.051	0.030	0.024	0.089	0.036	0.058	0.088	0.192	0.048
Cadmium	mg/L	0.005	<0.00020	0.000055	<0.00020	0.00047	0.00030	0.00031	0.00079	0.00057	<0.00020	0.00084	0.000176	0.000017
Chromium	mg/L	0.05	<0.0040	<0.00040	0.00173	0.00151	0.00043	0.00041	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00250
Cobalt	mg/L		<0.0020	0.00202	0.00028	0.00020	0.00012	0.00030	0.00131	0.00181	<0.00020	0.00310	0.00366	0.00025
Copper	mg/L	1	0.014	0.0023	0.0083	0.0044	0.00125	0.0042	0.0016	0.0018	0.0012	0.0068	0.0036	0.00490
Iron	mg/L	0.3	<0.40	<0.040	<0.040	<0.040	<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.020
Lead	mg/L	0.01	<0.0020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Lithium	mg/L		0.388	0.0415	0.0706	0.0461	0.0079	0.0309	0.0309	0.0323	0.0355	0.0633	0.115	0.0499
Manganese	mg/L	0.05	<0.010	0.853	<0.0010	0.0083	0.0329	0.0091	0.469	1.33	0.0437	1.01	0.607	0.00072
Molybdenum	mg/L		0.0083	0.00889	0.0108	0.00203	0.00142	0.00147	0.00636	0.00510	0.00412	0.00492	0.00756	0.00528
Nickel	mg/L		0.013	0.0055	0.0060	0.0064	0.00261	0.0057	0.0057	0.0058	0.0052	0.0117	0.0144	0.00475
Phosphorus	mg/L		<2.0	<0.2	<0.20	<0.20	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.10
Selenium	mg/L	0.01	0.164	0.00113	0.0205	0.0148	0.00058	0.00941	0.00040	0.00491	0.00067	0.00689	0.0375	0.0176
Silicon	mg/L		10.3	7.90	11.7	9.84	9.92	11.1	7.43	7.26	7.38	7.45	7.66	10.3
Silver	mg/L		<0.00040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020
Strontium	mg/L		2.70	0.364	0.740	0.364	0.226	0.331	0.685	0.434	0.475	0.835	2.01	0.399
Thallium	mg/L		<0.0010	<0.00010	<0.00010	<0.00010	<0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050
Tin	mg/L		<0.0020	<0.00020	<0.00020	0.00039	0.00030	<0.00020	0.00025	<0.00020	<0.00020	0.00021	<0.00020	0.00018
Titanium	mg/L		<0.010	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Uranium	mg/L	0.02	0.120	0.00782	0.0834	0.0372	0.00406	0.00620	0.00538	0.0145	0.00506	0.0289	0.0329	0.0197
Vanadium	mg/L		<0.0020	0.00046	0.00045	0.00034	0.00028	0.000387	0.00033	0.00029	0.00027	0.00030	0.00037	0.00051
Zinc	mg/L	5	<0.10	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	0.030	<0.010	0.0057

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; % = percent; mL = millilitre



Observations from the sampling events and geochemical analyses with respect to drinking water quality guidelines listed in the Guidelines for Canadian Drinking Water Quality (Health Canada 2012) were as follows:

- A total coliform count greater than zero was detected in all monitoring wells. Although care was taken to avoid sample contamination, it is suspected that these coliform counts may be a result of contamination during sampling in the field.
- Nitrate concentrations exceed the guideline of 10 mg/L in RW-14-001S, RW14-002S, and RW-14-011S
- The guidelines for total dissolved solids, alkalinity, sodium and sulphate are aesthetic objectives only.
- Uranium slightly exceeds drinking water guidelines in several wells, which is presumed to be a natural, background condition at the site.
- Selenium slightly exceeds drinking water guidelines in three wells, which is presumed to be a natural, background condition at the site.

3.6.3 Hydraulic Testing

Rising head hydraulic conductivity test were conducted on various monitoring wells at the site. The water level in the monitoring well was lowered using a bailer and the recovering water level was then monitored using an electric water level sensor (Solinst Levellogger) until a static water level, or approximately 90% recovery of the static water level was obtained. Hydraulic conductivity was subsequently calculated using the recorded Levellogger data and the AQTESOLV version 4.0 solution to the Bower and Rice model for unconfined formations (Butler 1998). The results are shown in Table 4. A summary of the AQTESOLV model inputs and results are included in Appendix E.

Table 4: Hydraulic Conductivity Measurements

Monitoring Well	Estimated Hydraulic Conductivity (m/s)
RW-14-002S	2.5x10 ⁻⁶
RW-14-003S	4.9x10 ⁻⁶
RW-14-004S	3.9x10 ⁻⁶
RW-14-005S	3.1x10 ⁻⁴
RW-14-006D	4.9x10 ⁻⁶
RW-14-011S	1.6x10 ⁻⁵
RW-14-012D	3.0x10 ⁻⁶

m/s = metres per second

4.0 NITRATE IMPACT ASSESSMENT

The goal of the nitrate impact assessment was to assess the fate of onsite wastewater treatment system (OWTS) effluent using nitrate-nitrogen as an indicator. Measured hydrogeological conditions at the site were used to develop a sufficiently robust conceptual model of the site hydrogeology to evaluate the fate of OWTS effluent in the subsurface and groundwater system.

A Type II mound was sized using the infiltration rate for worst case scenario for suitable soils that were found during the site investigation. The infiltration rate for clay loam was 10.78 litres per square metre (L/m²) which corresponds to a required infiltrative area of 104 square metres (m²) (from Table A-15, Government of



Saskatchewan 2012). A daily sewage flow of 2,550 litres per day (L/d) based on a five bedroom home was assumed.

4.1 Groundwater flow model

A three-dimensional MODFLOW model was constructed to approximate the geologic conditions beneath and surrounding the proposed development site (Figure 7) using Visual MODFLOW 2013.1 (v .164) Software. The 3-D representative groundwater model is considered to be reflective of general geologic and hydrogeologic conditions inferred for the area based on the limited available borehole data. The groundwater model had dimensions of 2400 m (east-west), 2400 m (north-south), and 20 m depth. The basic construction and parameterization of the model is illustrated on Figure 9 and is summarized in the following sections.

4.1.1 Base Case Model

The numerical grid was discretized into cells varying from 10 m (east-west) x 10 m (north-south) to 20 m (east-west) x 20 m (north-south). Layer thicknesses was set at 20 m.

Site specific horizontal hydraulic conductivities for the silty clay soil type found ranged from 1.0×10^{-4} m/s to 6.0×10^{-6} m/s. The vertical hydraulic conductivity was assigned equal to the horizontal hydraulic conductivity

The surveyed ground surface elevations from the nineteen Golder boreholes were used to define the top model surface. A constant elevation of 540 mASL was assigned and is consistent with the average of the surveyed ground surface elevations.

Twelve boreholes extend approximately 10 m in depth. A conservative depth estimate of 20 m was used for the groundwater model (i.e., the bottom of the model was set to 520 mASL).

MODFLOW Constant Head boundary conditions were applied to outer model boundaries to simulate the groundwater conditions inferred from the measured water levels.

Groundwater recharge was applied to the top model surface at a rate of 10 mm/yr.

4.1.2 Base Case Model Calibration

Limited calibration of the groundwater flow model focused on the adjustment of boundary conditions to simulate groundwater flow conditions consistent with those inferred from the measured site-specific data. Groundwater elevations measured on September 11, 2014 were considered representative of steady-state conditions. The results of the limited model calibration are discussed below.

The simulated groundwater elevations are typically within 1m of the measured values. The simulated groundwater elevations indicate a small bias in the calibration error below the measured data. The mean error of the calibration residuals is -0.006 m and the correlation coefficient is 0.914.

Predicted groundwater flow patterns simulated by the model are consistent with those observed on September 11, 2014, trending to the South (Figure 3).

Given the reasonable match to the observed hydraulic head elevations and groundwater flow patterns, the groundwater model presented herein is considered sufficient to provide a preliminary evaluation of groundwater flow and solute transport scenarios.



4.1.3 Seepage Assessment Models

To assess the potential migration of nitrates from the proposed Type II mounds, 3-D groundwater transport simulations were completed for two septic system designs using the MT3DMS contaminant transport engine within Visual MODFLOW. The 100-year transport simulations were completed with the transport-specific boundary conditions and parameterization details summarized below:

- Seepage from the Type II mounds is assigned through a recharge boundary condition. An estimated seepage rate of 2,550 L/day per seepage mound is applied over a seepage mound area of 104 m². This seepage rate is 930.75 mm/yr (per unit area) and is applied through a recharge boundary condition over the mound footprint.
- Steady-state groundwater flow conditions for the duration of the 100-year simulation.
- Longitudinal dispersivity was set to 10 m. Transverse dispersivities were set to 1 m.
- Effective porosity of the sand layer was set to 0.15. This is a conservative estimate when compared to the relationship between the porosity and measured moisture content of the selected soil samples.
- Initial nitrate concentrations were set to 0 mg/L and background concentrations varied between each scenario.
- Nitrate was considered to be a conservative solute (no attenuation or de-nitrification) and diffusion was not considered in this assessment.

Scenario 1 – A type II mound effluent nitrate concentration of 40 mg/L was applied for the duration of the 100-year simulation. This concentration is reflective of the expected nitrate concentration for untreated effluent of a Type II mound sewage disposal system. All other material properties were as conceptualized in the “Base Case” and presented on Figure 9.

Scenario 2 – A type II mound effluent nitrate concentration of 5 mg/L was applied for the duration of the 100-year simulation. This concentration is reflective of the expected nitrate concentration for MicroFAST Wastewater Treatment systems. All other material properties were as conceptualized in the “Base Case” and presented on Figure 9.

Scenario 3 – A type II mound effluent nitrate concentration of 5 mg/L (expected MicroFAST Wastewater Treatment concentration) was applied for the duration of the 100-year simulation along with observed background concentrations applied at RW-14-001, RW-14-002 and RW-14-011. All other material properties were as conceptualized in the “Base Case” and presented on Figure 9.

The results of the above simulations are presented on Figure 10 (Scenario 1), Figure 11 (Scenario 2) and Figure 12 (Scenario 3). These figures present the expected nitrate concentrations in groundwater at the end of the 100-year transport simulation for each nitrate loading scenario.

A review of the results on Figures 10, 11 and 12 allows the following observations:

Scenario 1 presents the simulated nitrate concentration results of the untreated effluent of the Type II mound design. The solute migration trends south and radially from the site in the direction of groundwater flow.



Maximum nitrate concentrations in groundwater are noted adjacent to the source areas and concentrations at the site boundary are noted to exceed 10 mg/L.

Scenario 2 presents the simulated nitrate concentrations after implementing the MicroFAST Wastewater Treatment system design. As noted in Scenario 1, the nitrate plume again trends south and radially from the site, but is limited to a maximum concentration of 5 mg/L. It should be noted that nitrate concentrations in groundwater for this scenario are less than 5 mg/L at the site boundary.

Scenario 3 presents the simulated nitrate concentration results from the MicroFAST systems in addition to the observed background nitrate concentrations. As with Scenarios 1 and 2, the solute migration trends south and radially from the site in the direction of groundwater flow. Maximum nitrate concentrations in groundwater are noted adjacent to the source areas and concentrations across the northern site boundary are noted to exceed 10 mg/L. It should be noted that these site boundary exceedances occur only when including the observed background nitrate concentration sources.

Based on the above results, the nitrate concentrations for the untreated effluent are shown to exceed 10 mg/L at the site boundary. The additional nitrate concentrations simulated from MicroFAST Wastewater Treatment systems are noted to be lower than those for the untreated effluent and within acceptable limits. While there is uncertainty with the input parameters and model construction details, the modelling results suggest that the MicroFAST system could be used to achieve nitrate concentrations at the site boundary that are less than 10 mg/L.

4.1.4 Model Uncertainties / Limitations and Discussion

The models incorporated herein are founded on limited site specific testing and/or historical borehole information (e.g., there is insufficient information with which to perform a rigorous calibration of the numerical model). Additional field information would be required to further refine the estimates provided herein. However, the limited analysis performed for this assessment to explore the impact of two seepage mound nitrate loading rates is considered sufficient for the intended purpose. Sources of nitrate other than the proposed Type II mounds (i.e., additional source zones or background nitrate concentrations were only considered in Scenario 3. The modelling results suggest that groundwater loadings of less than 10 mg/L at the site boundary can be achieved using the nitrate loading rates expected from MicroFAST Wastewater Treatment system.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Foundation Considerations

Single family dwellings to be constructed at the site will generally be founded in the upper silty clay. A typical single family dwelling could be founded on conventional strip or spread footings on undisturbed sand or clay using a design allowable bearing capacity of 100 kiloPascals (kPa). In order to reduce potential damage due to frost action, all exterior footings should be provided with 2.5 m of soil cover after final grading and the basement should not be left unheated for extended periods of time.

Footings should have a minimum width of 600 mm. Perimeter drainage should be provided at the base of the footings.

Excavations for basement construction should be in accordance with Saskatchewan Occupational Health and Safety Regulations to protect workers in the excavation.



Basement walls and other underground structures, such as septic tanks, should be designed using a rectangular earth pressure distribution, a lateral earth pressure coefficient of 1.0 and a total weight unit of soil of 2,000 kilograms per cubic metre (kg/m^3).

5.2 Groundwater

The measured depth to groundwater at the site ranged from 2.2 to 4.7 mBGS. Groundwater levels may fluctuate with seasonal variations. Basements should be provided with adequate perimeter drainage systems to reduce the potential for groundwater inflow to basements.

5.3 On-Site Waste Treatment Systems

OWTS design must address the protection of groundwater from on-site sewage disposal. There are two key factors to consider when assessing OWTS (Government of Saskatchewan 2012):

- 1) Pathogen Exposure
- 2) Cumulative Nitrate Assessment

Pathogen Exposure

Soil conditions and vadose zone depth was evaluated to determine whether there was sufficient retention time for pathogen removal. Government of Saskatchewan (2012) suggests that the retention time in the vadose zone should be 60 days to achieve at 99.9% removal of pathogens.

A sandy loam was the most porous type identified during the field investigation within the vadose zone. The design infiltration rate for sandy loam soil type is $0.60 \text{ gal/day/ft}^2$ which is equivalent to a Darcy velocity of $2.82 \times 10^{-7} \text{ m/s}$, which corresponds to 1.5 m of separation from the bottom of the mound to the underlying aquifer for a 60 day retention time. The most shallow groundwater level was found to be 2.2 mBGS; therefore, the measured soil profiles are capable of providing a 60 day retention time in the vadose zone for pathogen removal.

Cumulative Nitrate Assessment

Three groundwater quality samples from the site have nitrate concentrations greater than 10 mg/L. The source of nitrate in these wells was not determined. Scenario 3 was used to assess cumulative nitrate from Type II sewage mounds on the site considered these background concentrations.

The nitrate assessment showed that without further treatments, effluent discharged from a Type II sewage mound would result in nitrate concentrations greater than 10 mg/L leaving the site boundary. A reduction in the nitrate concentration of the sewage effluent is required to keep nitrate concentrations less than 10 mg/L at the boundary of the proposed development (not considering background nitrate concentrations). For this reason, a sewage wastewater system, such as the MicroFAST Wastewater Treatment system or similar, which reduces the nitrate concentration in sewage effluent to less than 5 mg/L is recommended.

6.0 CLOSURE

The findings of this report are based on the results of field and laboratory investigations conducted by Golder. Interpretation of soil and groundwater conditions was required between boreholes.

The report was prepared for Dan Beaulac for the proposed works described in the text. The data and recommendations should not be used for any other purpose, or by any other parties, without written consent



RIDGEWOOD ESTATES

from Golder. The findings and recommendations of this report were prepared in accordance with generally accepted professional engineering principles and practice. No other warranty, expressed or implied, is given.

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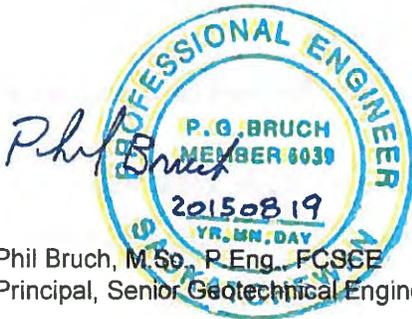


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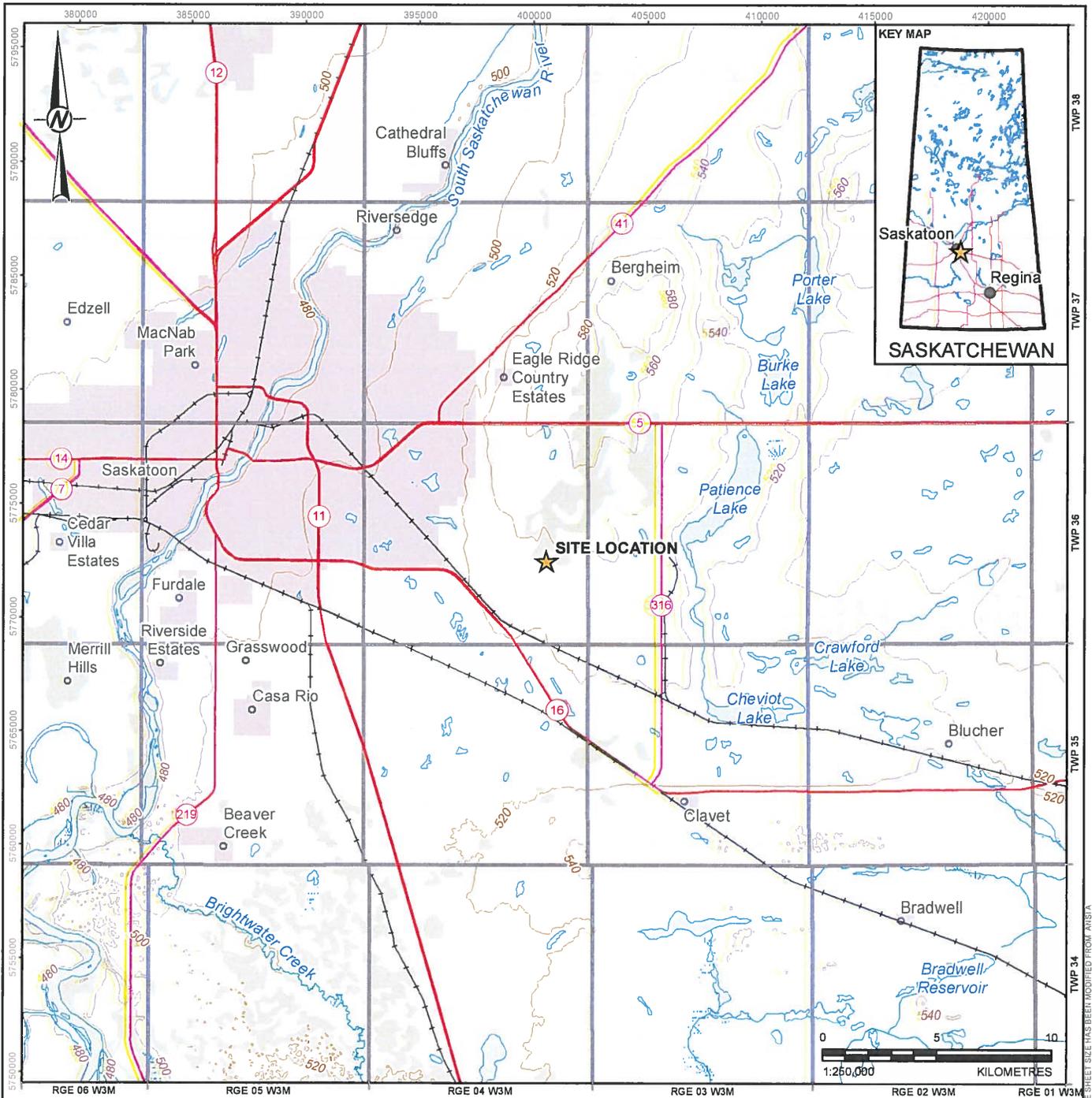


7.0 REFERENCES

- Acton, D.F. and J.G. Ellis. 1978. The Soils of Saskatoon Map Area (73-B). Soil Map and Report. Saskatchewan Institute of Pedology, Publication S4. University of Saskatchewan. Saskatoon, Saskatchewan.
- Butler, James J. 1998. The Design, Performance and Analysis of Slug Tests. Lewis Publishers, Washington, D.C., 1998.
- Christiansen, E.A. "Physical Environment of Saskatoon", 1970, Saskatchewan Research Council.
- Government of Saskatchewan. 2012. Guidance Document for Developments and Subdivisions Where Onsite Wastewater Treatment Systems are Proposed.
- Environment Canada. 2011. Principle Station Data – Saskatoon Diefenbaker International Airport. Canadian Climate Program, Atmospheric Environment Service, Ottawa, Canada.
- Health Canada 2012. Guidelines for Canadian Drinking Water Quality, August 2012.
- MDH Engineered Solutions Corp., 2011. Hydrogeology Mapping of NTS Mapsheet. Prepared for: Saskatchewan Watershed Authority. M1890-1030109. April 2011.
- Saskatchewan Ministry of Health. 2009. Saskatchewan Onsite Wastewater Disposal Guide. 2nd Edition
- Saskatchewan Research Council (SRC), "Geology and Groundwater Resources of the Saskatoon Area (73-B), Saskatchewan", 1971, Saskatchewan Research Council.



FIGURES



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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/4

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

TITLE
SITE LOCATION MAP

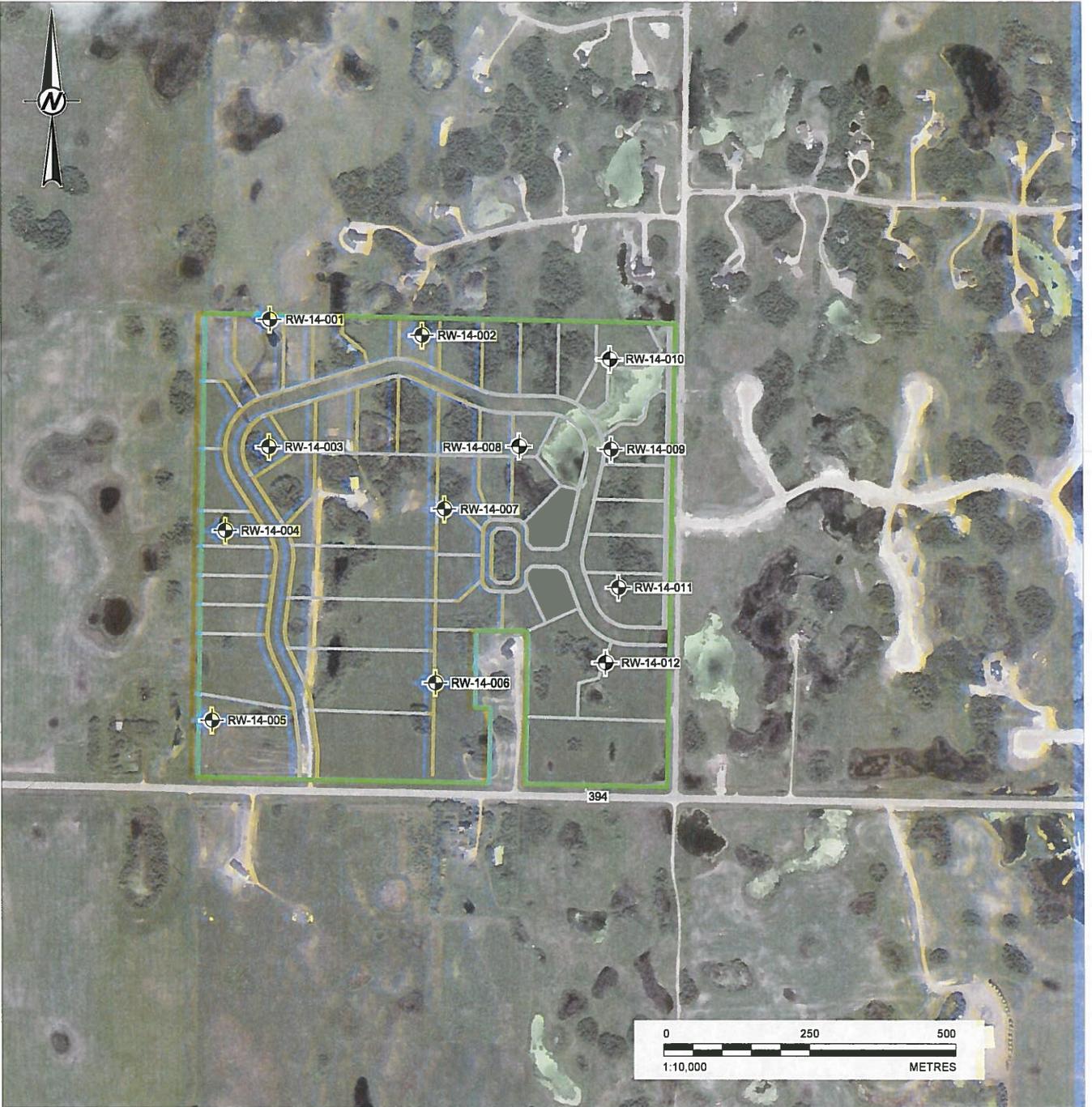
CONSULTANT



YYYY-MM-DD	2015-08-14
PREPARED	LMR
DESIGN	CR
REVIEW	CR
APPROVED	PB

REFERENCE
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CANVEC HIGHWAYS: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 13

PROJECT	PHASE	Rev.	FIGURE
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LEGEND

-  BOREHOLE LOCATION
-  STUDY AREA
-  LOT BOUNDARIES

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

TITLE
BOREHOLE LOCATION PLAN

CONSULTANT
YYYY-MM-DD 2015-08-17



PREPARED	MKH
DESIGN	CR
REVIEW	CR
APPROVED	PB

REFERENCE

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IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE.
NAD83 UTM ZONE 13

PROJECT No 1406388	PHASE 2000	Rev. A	FIGURE 2
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25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIA



Path: \\golder-proj\gsa\saskatoon\gsa\2014\1406388_Ridgewood Estates\Figures\Phase 2000 Hydrogeology Investigation - File Name: 1406388 GW CONTOUR PLAN.dwg

- LEGEND**
-  BOREHOLE LOCATION
 -  STUDY AREA
 -  LOT BOUNDARIES

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

TITLE
GROUNDWATER CONTOUR PLAN

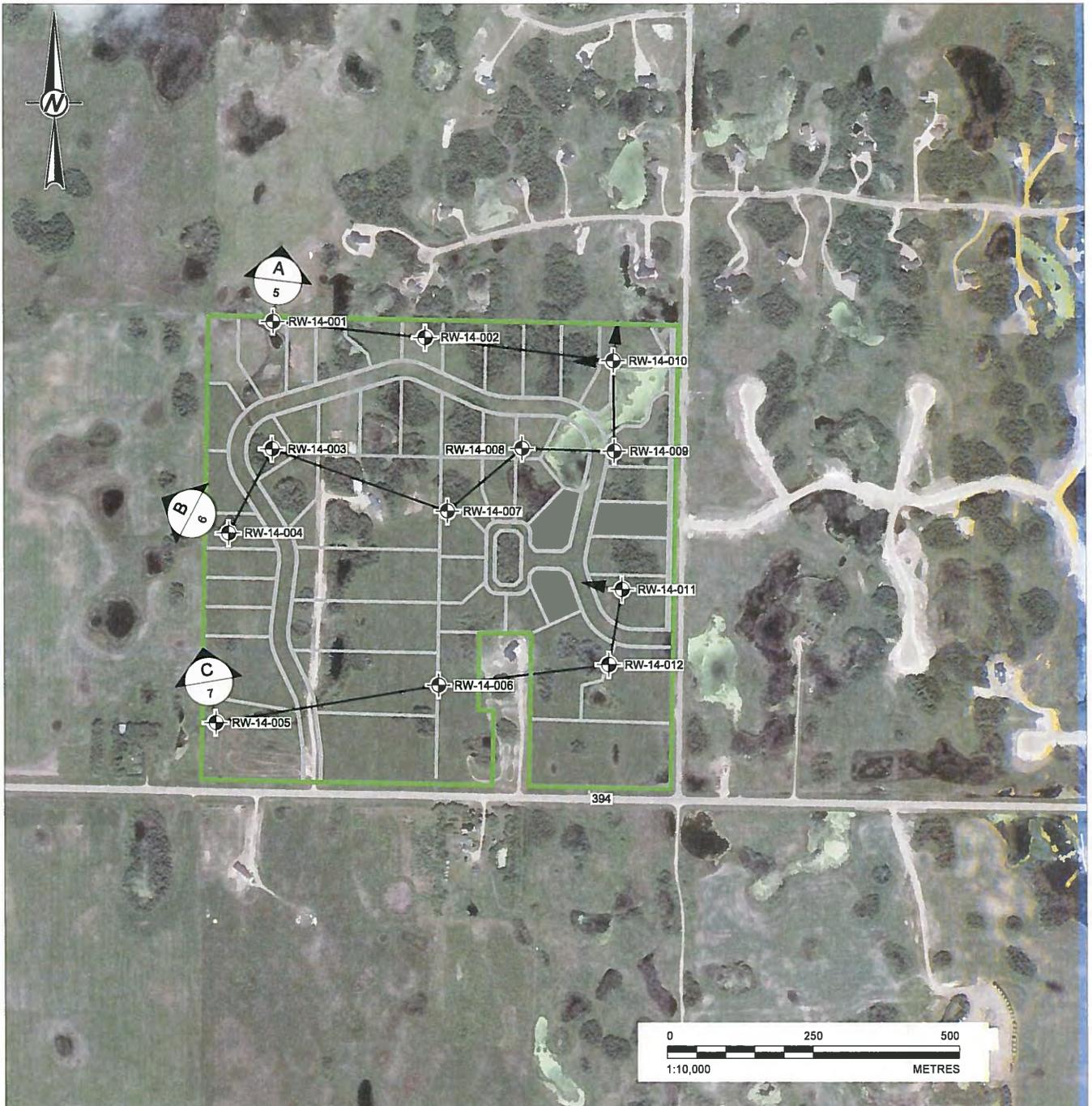
CONSULTANT	YYYY-MM-DD	2015-08-17
	PREPARED	MKH
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB

REFERENCE
IMAGE OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE.
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NAD83 UTM ZONE 13

PROJECT No 1406388	PHASE 2000	Rev. A	FIGURE 3
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

Path: g:\golder\gissaskatoon\pgs\2014\1406388 Ridgewood Estates\Figures\Phase 2000 Hydrogeol Investigation - File Name: 1406388 Cross Section Location Plan.dwg



- LEGEND**
-  BOREHOLE LOCATION
 -  STUDY AREA
 -  LOT BOUNDARIES

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

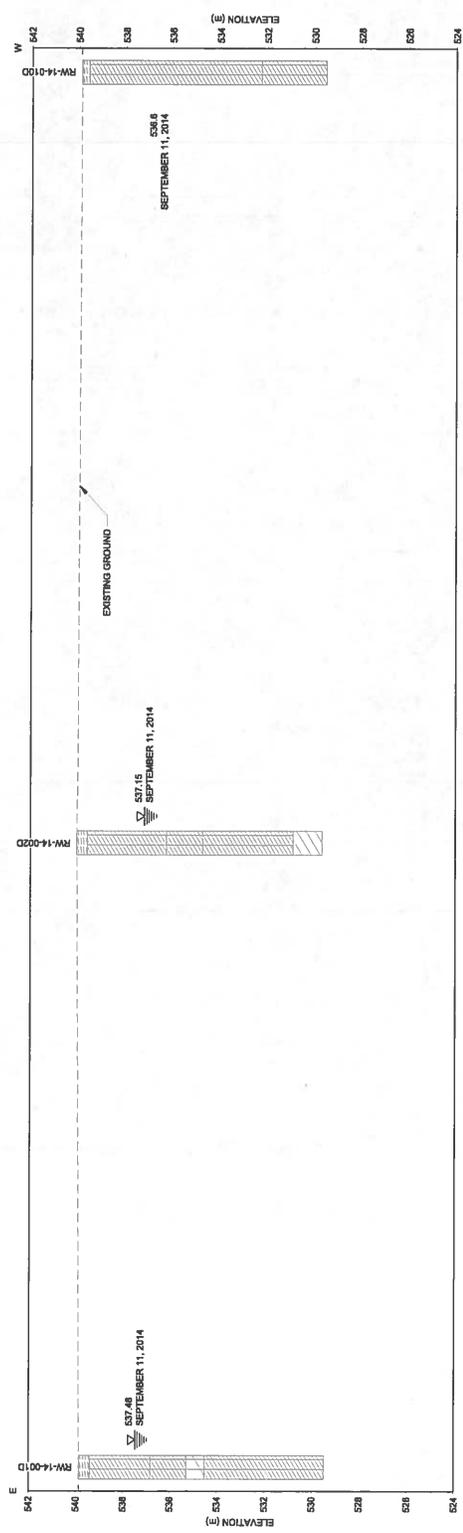
TITLE
CROSS SECTION LOCATION PLAN

CONSULTANT	YYYY-MM-DD	2015-08-17
	PREPARED	BDS
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB

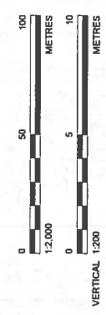
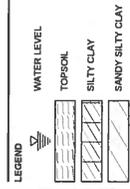
REFERENCE
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IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE.
NAD83 UTM ZONE 13

PROJECT No 1406388 PHASE 2000 Rev A FIGURE 4

IF THIS MEASUREMENT DOES NOT MATCH, WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A 25 mm



SCALE 1:2000
VERT SCALE 1:200
A CROSS SECTION A
4



CLIENT
RIDGEWOOD ESTATES

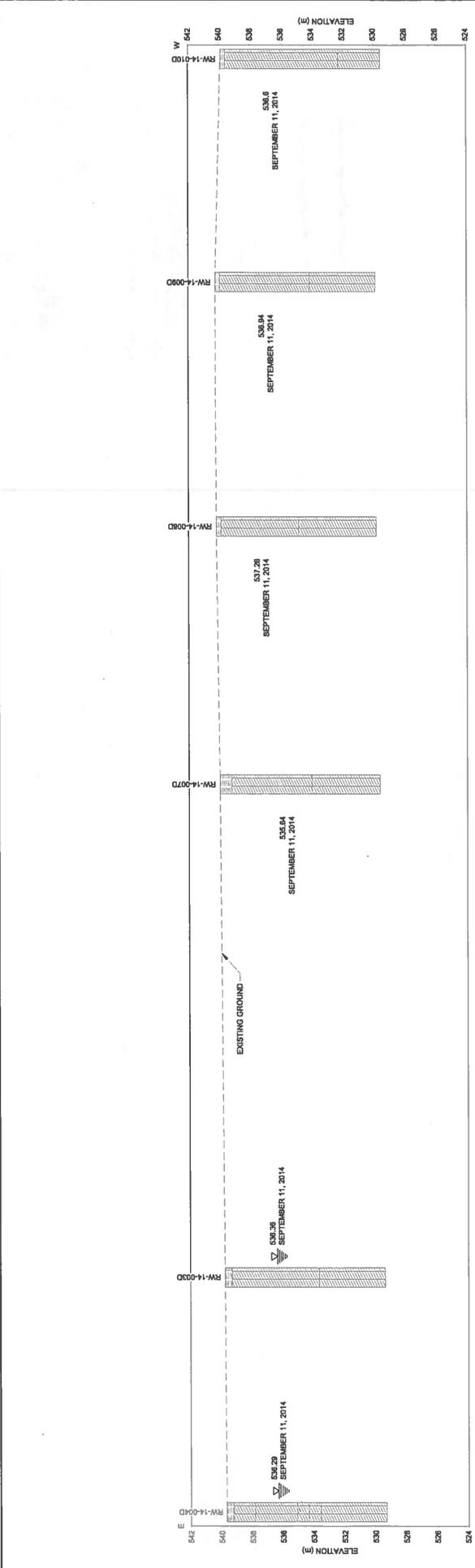
PROJECT
RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA

TITLE
CROSS SECTION A

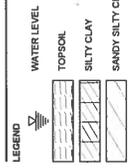
CONSULTANT	YYTY-AM-00	2015-08-17
PREPARED	BDS	
DESIGN	CR	
REVIEW	CR	
APPROVED	PB	



PROJECT No	1406388	PHASE	2000	Rev	0	
					FIGURE	5



SCALE 1:2500
VERT. SCALE 1:500
B CROSS SECTION B



CITY OF
RIDGEWOOD ESTATES

PROJECT
RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGICAL INVESTIGATION
SASKATCHEWAN, CANADA

TITLE
CROSS SECTION B

CONSULTANT	YYYY-MM-DD	2015-08-17
PREPARED	BOS	
DESIGN	CR	
REVIEW	CR	
APPROVED	PB	

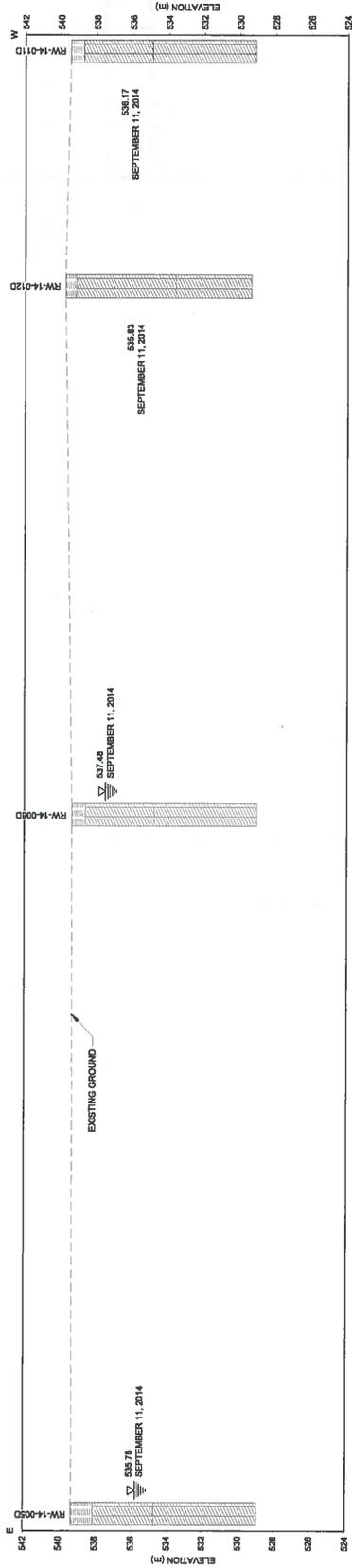


PROJECT No
1406388

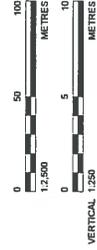
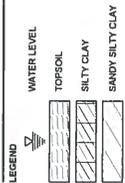
PHASE
2000

Rev
0

FIGURE
6



SCALE 1:2500
VERT. SCALE 1:250
C CROSS SECTION C



CLIENT
RIDGEWOOD ESTATES

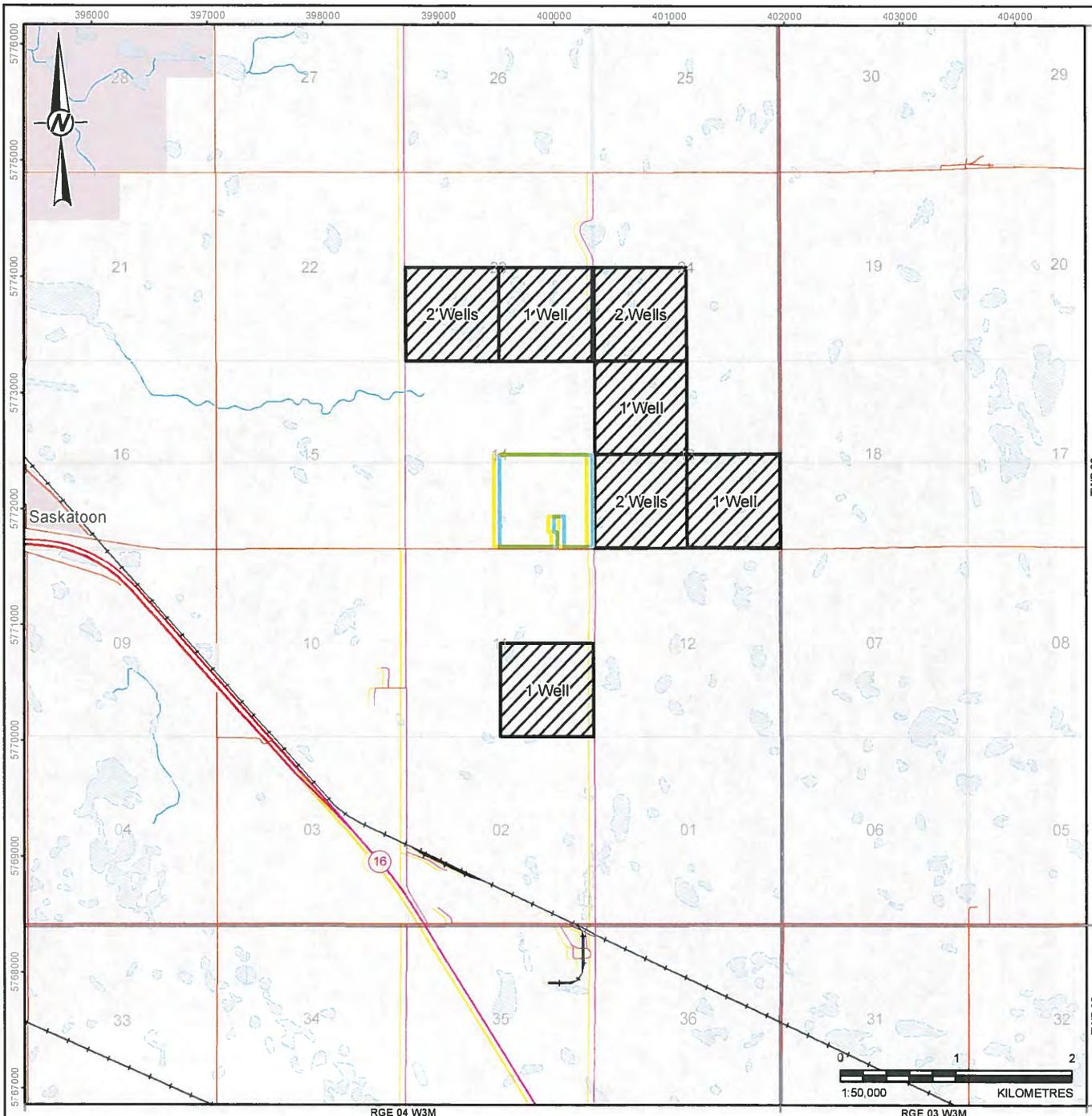
PROJECT
RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA

TITLE
CROSS SECTION C-C'

CONSULTANT	YYTY-AM-00	2015-08-17
PREPARED	BDS	
DESIGN	CR	
REVIEW	CR	
APPROVED	PB	



PROJECT No	1406388	PHASE	2000
Rev	0	FIGURE	7



TWP 36

TWP 35

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/A 25mm

Path: G:\2014\1406388 RidgeWood Estates\Figures\Phase 2000 Hydrogeology Investigation\FIG 8 Well Locations.mxd

- LEGEND**
-  LAND WITH REPORTED WITHDRAWAL WELL
 -  SUBDIVISION BOUNDARY

CLIENT
RIDGEWOOD ESTATES

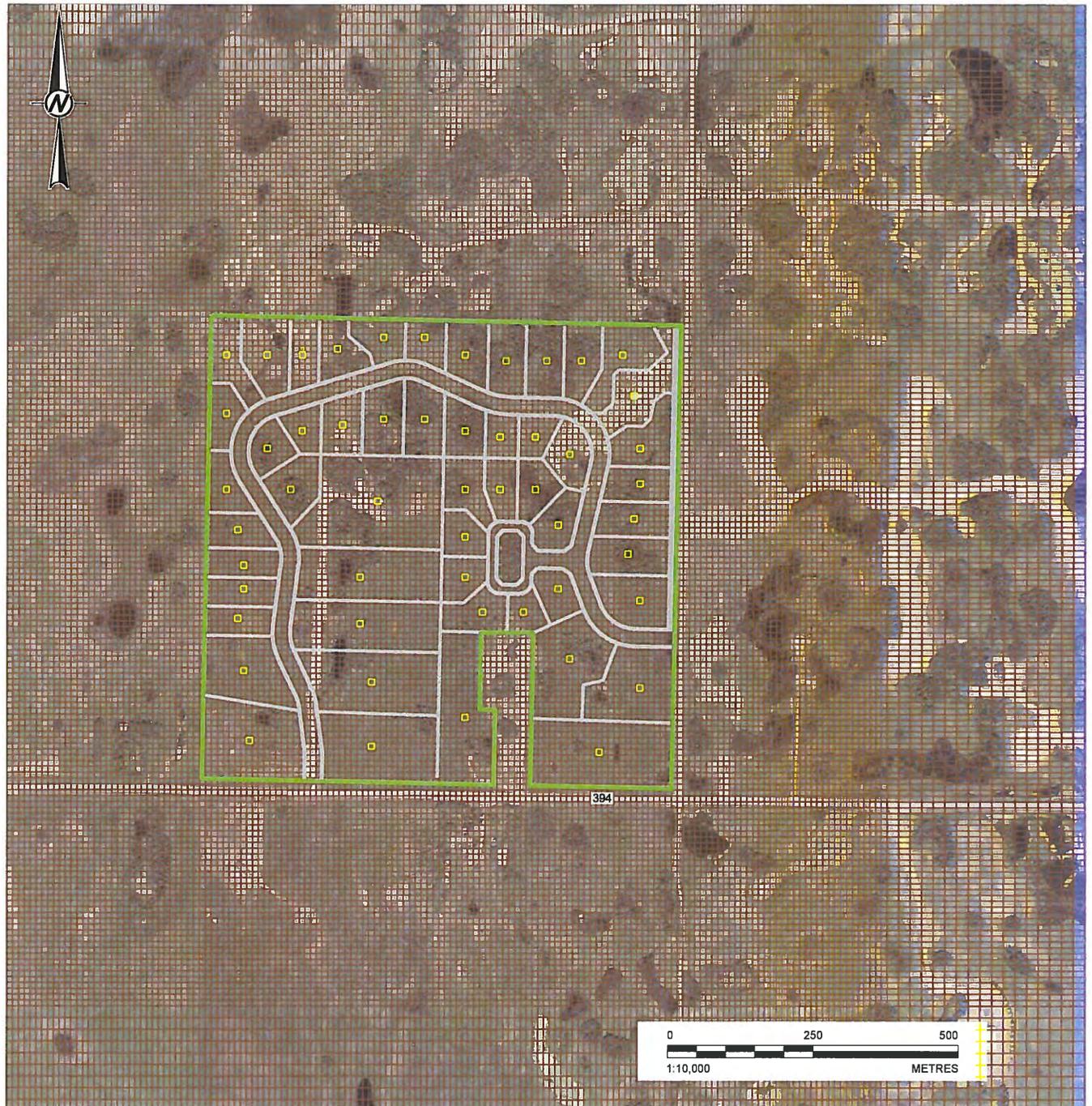
PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

TITLE
WELL LOCATIONS

CONSULTANT	YYYY-MM-DD	2015-08-14
	PREPARED	LMS
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB

REFERENCE
1. CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 13N

PROJECT	PHASE	Rev	FIGURE
1406388	2000	0	8



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LEGEND

-  SITE BOUNDARY
-  LOT BOUNDARIES
-  MODEL BOUNDARY AND MODEL MESH
-  SEPTIC MOUNDS

REFERENCE

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NAD83 UTM ZONE 13

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA**

TITLE
MODEL BOUNDARY AND MODEL MESH PLAN

CONSULTANT



YYYY-MM-DD	2015-08-17
PREPARED	MKH
DESIGN	CR
REVIEW	CR
APPROVED	PB

PROJECT No	PHASE	Rev	FIGURE
1406388	2000	A	9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIA 25 mm



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LEGEND

- SITE BOUNDARY
- LOT BOUNDARIES
- SOURCE CONCENTRATIONS
- SEPTIC MOUNDS

REFERENCE

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 IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE
 NAD83 UTM ZONE 13

CLIENT
 RIDGEWOOD ESTATES

PROJECT
 RIDGEWOOD ESTATES SUBDIVISION
 HYDROGEOLOGY INVESTIGATION
 SASKATCHEWAN, CANADA

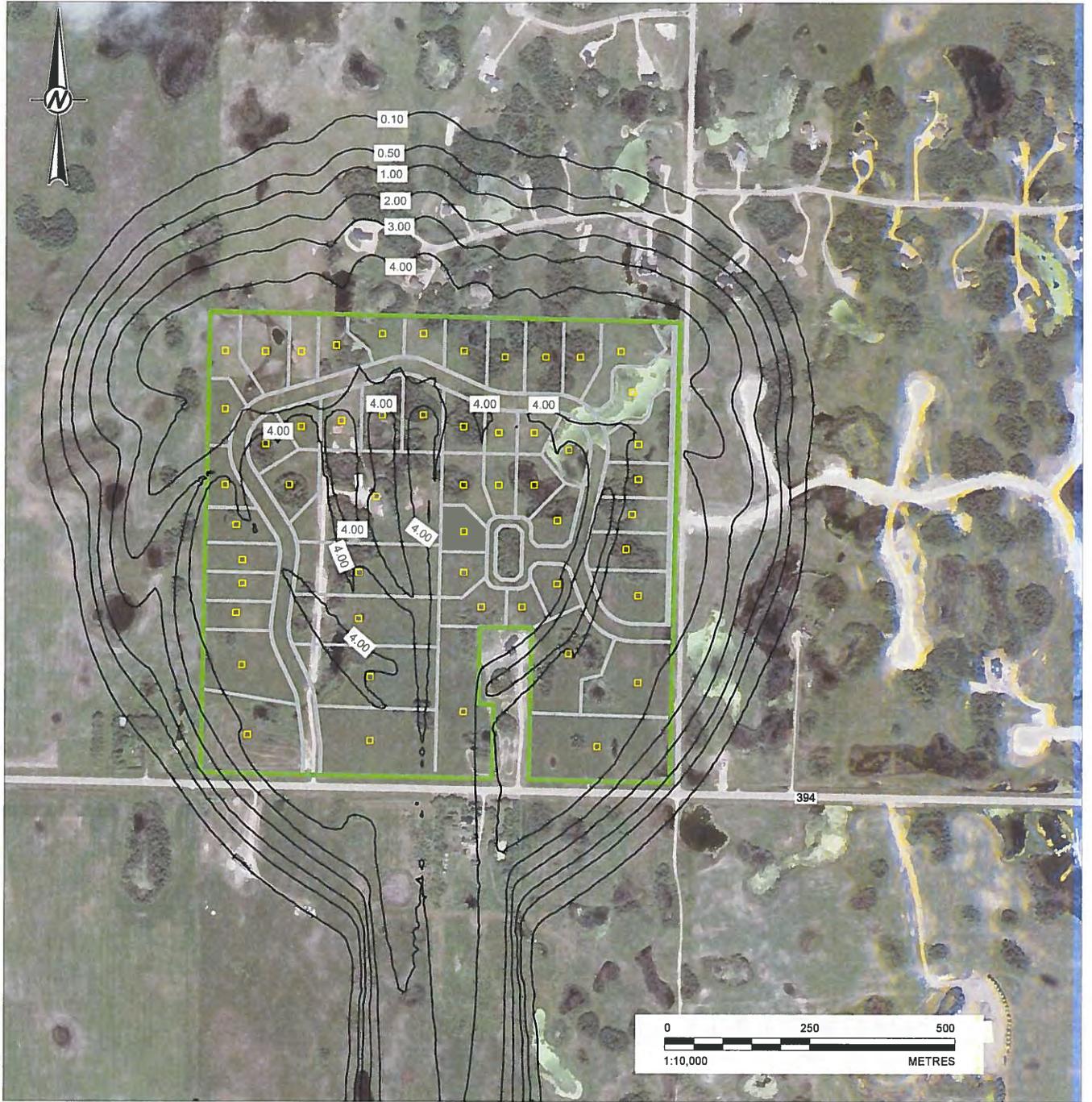
TITLE
**SCENARIO 1: TYPE II MOUND DISPOSING UNTREATED
 EFFULENT (SOURCE CONCENTRATION = 40 mg/L NO₃-N) 100
 YEAR CONCENTRATION CONTOURS**

CONSULTANT	YYYY-MM-DD	2015-08-17
	PREPARED	MKH
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB



PROJECT No.	PHASE	Rev	FIGURE
1406388	2000	A	10

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



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LEGEND

- SITE BOUNDARY
- LOT BOUNDARIES
- SOURCE CONCENTRATIONS
- SEPTIC MOUNDS

REFERENCE

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 IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE.
 NAD83 UTM ZONE 13

CLIENT
 RIDGEWOOD ESTATES

PROJECT
 RIDGEWOOD ESTATES SUBDIVISION
 HYDROGEOLOGY INVESTIGATION
 SASKATCHEWAN, CANADA

TITLE
**SCENARIO 2: TYPE II MOUND DISPOSING TREATED EFFULENT
 (SOURCE CONCENTRATION = 5 mg/L NO₃-N) 100 YEAR
 CONCENTRATION CONTOURS**

CONSULTANT	YYYY-MM-DD	2015-08-17
	PREPARED	MKH
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIA 26 mm

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- LEGEND**
- SITE BOUNDARY
 - LOT BOUNDARIES
 - SOURCE CONCENTRATIONS
 - SEPTIC MOUNDS

CLIENT
RIDGEWOOD ESTATES

PROJECT
RIDGEWOOD ESTATES SUBDIVISION
HYDROGEOLOGY INVESTIGATION
SASKATCHEWAN, CANADA

TITLE
SCENARIO 3: BACKGROUND SOURCE CONCENTRATIONS AND TYPE II MOUND DISPOSING TREATED EFFLUENT (SOURCE CONCENTRATION = 5 mg/L NO₃ - N) 100 YEAR CONCENTRATION CONTOURS

CONSULTANT	YYYY-MM-DD	2015-08-17
	PREPARED	MKH
	DESIGN	CR
	REVIEW	CR
	APPROVED	PB



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NAD83 UTM ZONE 13

PROJECT No	PHASE	Rev	FIGURE
1406388	2000	A	12

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



APPENDIX A

Information and Limitations

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT (cont'd)

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



APPENDIX B

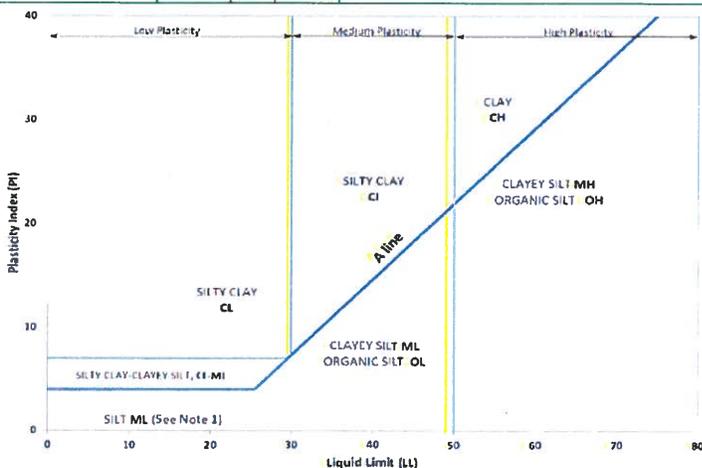
Borehole Records



METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil	Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	Organic Content	USCS Group Symbol	Group Name							
INORGANIC (Organic Content $\leq 30\%$ by mass)	COARSE-GRAINED SOILS ($>50\%$ by mass is larger than 0.075 mm)	GRAVELS ($>50\%$ by mass of coarse fraction is larger than 4.75 mm)	Poorly Graded	<4	≤ 1 or ≥ 3	$\leq 30\%$	GP	GRAVEL							
			Well Graded	≥ 4	1 to 3		GW	GRAVEL							
			Below A Line		n/a		GM	SILTY GRAVEL							
			Above A Line		n/a		GC	CLAYEY GRAVEL							
		SANDS ($\geq 50\%$ by mass of coarse fraction is smaller than 4.75 mm)	Poorly Graded	<6	≤ 1 or ≥ 3		SP	SAND							
			Well Graded	≥ 6	1 to 3		SW	SAND							
			Below A Line		n/a		SM	SILTY SAND							
			Above A Line		n/a		SC	CLAYEY SAND							
			Organic or Inorganic	Soil Group	Type of Soil		Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
								Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content $\leq 30\%$ by mass)	FINE-GRAINED SOILS ($\geq 50\%$ by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	$<5\%$	ML	SILT				
				Slow	None to Low	Dull	3mm to 6 mm	None to low	$<5\%$	ML	CLAYEY SILT				
			Liquid Limit ≥ 50	Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT				
				Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	$<5\%$	MH	CLAYEY SILT				
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30%	CL	SILTY CLAY				
				None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium	5% to 30%	CI	SILTY CLAY				
			Liquid Limit ≥ 50	None	High	Shiny	<1 mm	High	(see Note 2)	CH	CLAY				
				None	High	Shiny	<1 mm	High	(see Note 2)	CH	CLAY				
		HIGHLY ORGANIC SOILS (Organic Content $>30\%$ by mass)	Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT			
				Predominantly peat, may contain some mineral soil, fibrous or amorphous peat						75% to 100%		PEAT			



Note 1 - Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
 Note 2 - For soils with $<5\%$ organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.

For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.

For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.

A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to or indicates a range of similar soil types within a stratum.



ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse	19 to 75	0.75 to 3
	Fine	4.75 to 19	(4) to 0.75
SAND	Coarse	2.00 to 4.75	(10) to (4)
	Medium	0.425 to 2.00	(40) to (10)
	Fine	0.075 to 0.425	(200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (i.e., SAND and GRAVEL, SAND and CLAY)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure

PM: Sampler advanced by manual pressure

WH: Sampler advanced by static weight of hammer

WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL, w _p	plastic limit
LL, w _L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D _R	relative density (specific gravity, G _s)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO ₄	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness²

Term	SPT 'N' (blows/0.3m) ¹
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.

2. Definition of compactness descriptions based on SPT 'N' ranges from Terzaghi and Peck (1967) and correspond to typical average N₆₀ values.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N' ¹ (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.



LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

<p>I. GENERAL</p> <p>π 3.1416</p> <p>$\ln x$ natural logarithm of x</p> <p>$\log_{10} x$ x or log x, logarithm of x to base 10</p> <p>g acceleration due to gravity</p> <p>t time</p> <p>II. STRESS AND STRAIN</p> <p>γ shear strain</p> <p>Δ change in, e.g. in stress: $\Delta \sigma$</p> <p>ϵ linear strain</p> <p>ϵ_v volumetric strain</p> <p>η coefficient of viscosity</p> <p>ν Poisson's ratio</p> <p>σ total stress</p> <p>σ' effective stress ($\sigma' = \sigma - u$)</p> <p>σ'_{vo} initial effective overburden stress</p> <p>$\sigma_1, \sigma_2, \sigma_3$ principal stress (major, intermediate, minor)</p> <p>σ_{oct} mean stress or octahedral stress = $(\sigma_1 + \sigma_2 + \sigma_3)/3$</p> <p>$\tau$ shear stress</p> <p>u porewater pressure</p> <p>E modulus of deformation</p> <p>G shear modulus of deformation</p> <p>K bulk modulus of compressibility</p> <p>III. SOIL PROPERTIES</p> <p>(a) Index Properties</p> <p>$\rho(\gamma)$ bulk density (bulk unit weight)*</p> <p>$\rho_d(\gamma_d)$ dry density (dry unit weight)</p> <p>$\rho_w(\gamma_w)$ density (unit weight) of water</p> <p>$\rho_s(\gamma_s)$ density (unit weight) of solid particles</p> <p>γ' unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)</p> <p>$D_R$ relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)</p> <p>e void ratio</p> <p>n porosity</p> <p>S degree of saturation</p>	<p>(a) Index Properties (continued)</p> <p>w water content</p> <p>w_l or LL liquid limit</p> <p>w_p or PL plastic limit</p> <p>I_p or PI plasticity index = $(w_l - w_p)$</p> <p>W_s shrinkage limit</p> <p>I_L liquidity index = $(w - w_p) / I_p$</p> <p>I_C consistency index = $(w_l - w) / I_p$</p> <p>e_{max} void ratio in loosest state</p> <p>e_{min} void ratio in densest state</p> <p>I_D density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)</p> <p>(b) Hydraulic Properties</p> <p>h hydraulic head or potential</p> <p>q rate of flow</p> <p>v velocity of flow</p> <p>i hydraulic gradient</p> <p>k hydraulic conductivity (coefficient of permeability)</p> <p>j seepage force per unit volume</p> <p>(c) Consolidation (one-dimensional)</p> <p>C_c compression index (normally consolidated range)</p> <p>C_r recompression index (over-consolidated range)</p> <p>C_s swelling index</p> <p>C_α secondary compression index</p> <p>m_v coefficient of volume change</p> <p>c_v coefficient of consolidation (vertical direction)</p> <p>C_h coefficient of consolidation (horizontal direction)</p> <p>T_v time factor (vertical direction)</p> <p>U degree of consolidation</p> <p>σ'_p pre-consolidation stress</p> <p>OCR over-consolidation ratio = σ'_p / σ'_{vo}</p> <p>(d) Shear Strength</p> <p>τ_p, τ_r peak and residual shear strength</p> <p>ϕ' effective angle of internal friction</p> <p>δ angle of interface friction</p> <p>μ coefficient of friction = $\tan \delta$</p> <p>c' effective cohesion</p> <p>c_u, s_u undrained shear strength ($\phi = 0$ analysis)</p> <p>p mean total stress $(\sigma_1 + \sigma_3)/2$</p> <p>p' mean effective stress $(\sigma'_1 + \sigma'_3)/2$</p> <p>$q$ $(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$</p> <p>$q_u$ compressive strength $(\sigma_1 - \sigma_3)$</p> <p>S_t sensitivity</p>
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* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$\tau = c' + \sigma' \tan \phi'$
shear strength = (compressive strength)/2



LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of weathering

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varied from 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN Joint	PL Planar
FLT Fault	CU Curved
SH Shear	UN Undulating
VN Vein	IR Irregular
FR Fracture	K Slickensided
SY Stylolite	PO Polished
BD Bedding	SM Smooth
FO Foliation	SR Slightly Rough
CO Contact	RO Rough
AXJ Axial Joint	VR Very Rough
KV Karstic Void	
MB Mechanical Break	

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5772371.4 E 399549.8

RECORD OF BOREHOLE: RW-14-001D

SHEET 1 OF 1
 BORING DATE: 07/23/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. + rem V. ⊕ U - ○		10 ⁶ 10 ⁵ 10 ⁴ 10 ³		Wp WI			
0		GROUND SURFACE		538.74											TOC=540.823		
		TOPSOIL		0.00													
		(CL) SILTY CLAY; light brownish grey; cohesive, w-PL, soft		538.29													
1				0.46	001-1	AS											
					001-2	DO	6										
					001-3	AS											
2																	
					001-4	DO	12										
3				536.70													
		(CL) SILTY CLAY, trace gravel; light brownish grey, iron staining; cohesive, w>PL, firm		3.05	001-5	AS											
4					001-6	DO	17										
5				535.17													
		(CL) SILTY CLAY, some sand, some gravel; dark greyish brown, TILL; cohesive, w-PL		4.57	001-7	AS											
6				534.41													
		(CL) sandy SILTY CLAY, trace gravel; dark brownish grey, iron staining; cohesive, w>PL, firm		5.33	001-8	DO	21										
					001-9	AS											
7																	
					001-10	DO	21										
8																	
		- sand lenses throughout			001-11	AS											
					001-12	DO											
9																	
					001-13	AS											
10																	
					001-14	DO	7										
				529.38													
		END OF BOREHOLE = 10.36m		10.36													
		Note: 1. Water level observed at 2.247mBTOC.															

SK SOIL 1406388 BOREHOLE LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-001S

SHEET 1 OF 1

LOCATION: N 5772371.4 E 399549.8

BORING DATE: 08/13/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80	10 ⁶	10 ⁵			10 ⁴
0	150mm Dia. Solid Stem Auger Continuous Flight	GROUND SURFACE		0.00											TOC=540.840	
1																Bentonite
2																Sand
3																Screen
3.15		END OF BOREHOLE = 3.2m Note: 1. Stratigraphy inferred from RW-14-001D. 2. Water level observed at 2.995mBTOC.		3.15												Sept 11 2014
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5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

SK SOIL 1406388 BOREHOLE LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5772344.2 E 399810.8

RECORD OF BOREHOLE: RW-14-002D

SHEET 1 OF 1
 BORING DATE: 07/23/14
 DRILL RIG: M10
 DATUM: NAD83
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	20	40	60	80	10 ⁶	10 ⁵	10 ⁴		
0		GROUND SURFACE		540.05											TOC=541.074
		TOPSOIL		0.00											
		(CL) SILTY CLAY; light brownish grey; cohesive, w-PL, soft		539.59	002-1	AS									
1				0.46	002-2	DO									
		- mixed with sand and gravel at 1.5m			002-3	AS									
2					002-4	DO									
3					002-5	AS									
4		(CL) SILTY CLAY, some gravel, trace sand; light brownish grey; cohesive, w<PL, firm		536.24	002-6	DO									Sept 11 ∇ 2014
				3.81	002-7	AS									Bentonite
5		(CL) SILTY CLAY; dark brownish grey; cohesive, w-PL, stiff to hard		534.71	002-8	DO									
				5.33	002-9	AS									
6		- trace gravel at 6.7m			002-10	DO									
7					002-11	AS									
8					002-12	DO									
9		(CL) sandy SILTY CLAY, trace gravel; dark brownish grey; cohesive, w>PL		530.90	002-13	AS									Screen
				9.14	002-14	DO									Sand
10															
11		END OF BOREHOLE = 10.36m Note: 1. Water level observed at 2.905mBTOC.		529.68											
				10.36											

SK_SOIL 1406388 BOREHOLE LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5772153.9 E 399547.6

RECORD OF BOREHOLE: RW-14-003D

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 07/23/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴
0		GROUND SURFACE		539.54												TOC=540.521
		TOPSOIL		0.00												
		(CL) SILTY CLAY; light brownish grey; cohesive, w-PL, soft		539.09												
1				0.46	003-1	AS										
					003-2	DO	5									
					003-3	AS										
2		- trace gravel and iron staining at 1.8m														
					003-4	DO	8									
					003-5	AS										
3																
					003-6	ST										
					003-7	AS										
4																
					003-8	DO	9									
5																
					003-9	AS										
6		(CL) SILTY CLAY, trace gravel, trace sand; dark brownish grey, iron staining; cohesive, w-PL, firm		533.45												
				6.10	003-9	AS										
7																
					003-10	DO	14									
					003-11	AS										
8																
					003-12	DO	5									
					003-13	AS										
9																
					003-14	DO	3									
10																
11		END OF BOREHOLE = 10.36m Note: 1. Water level observed at 3.183mBTOC.		529.18												
				10.36												

SK SOIL 1406388 BOREHOLE LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-003S

SHEET 1 OF 1

LOCATION: N 5772153.9 E 399547.6

BORING DATE: 08/13/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, $k, \text{cm/s}$				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		nat V. + Q - ●		rem V. ⊕ U - ○				WATER CONTENT PERCENT			
								Cu, kPa				Wp	W			Wi			
0		GROUND SURFACE		0.00											TOC=540.640				
1	150mm Dia. Solid Stem Auger Continuous Flight														Bentonite				
2															Sand				
3															Screen				
3.1		END OF BOREHOLE = 3.1m Note: 1. Stratigraphy inferred from RW-14-003D. 2. Water level observed at 3.447mBTOC.		3.05											Sept 11 ▽ 2014				
4																			
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13																			
14																			
15																			

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5772010.9 E 399472.8

RECORD OF BOREHOLE: RW-14-004D

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 07/23/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁶	10 ⁵			10 ⁴	10 ³
0		GROUND SURFACE		539.36											TOC=540.473		
		TOPSOIL		0.00													
		(CL) SILTY CLAY; light brownish grey; cohesive, w-PL, wet		538.91	004-1	AS											
1				0.46	004-2	DO	11										
		- trace gravel, trace sand and iron staining at 1.5m		537.54	004-3	AS											
2		(CL) SILTY CLAY, some sand, trace gravel; light brownish grey, iron staining; cohesive, w-PL, firm		1.83	004-4	DO	8										
					004-5	AS											
3		- becomes w>PL, soft at 3.0m															
					004-6	DO	8										
4				534.79													
5		(CL) SILTY CLAY, trace gravel; dark brownish grey, iron staining; w-PL, firm		4.57	004-7	AS											
				534.03													
6		(CL) SILTY CLAY, some sand; light brownish grey; w>PL, soft		5.33	004-8	DO	10										
				533.27	004-9	AS											
7		(CL) SILTY CLAY, trace sand and gravel; dark brownish grey, iron staining; cohesive, w-PL, stiff to hard		6.10	004-10	DO	11										
					004-11	AS											
8					004-12	DO	7										
					004-13	AS											
9																	
10					004-14	ST											
				529.00													
11		END OF BOREHOLE = 10.36m Note: 1. Water level observed at 3.065mBTOC.		10.36													

SKL SOIL 1406388 BOREHOLE LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-004S

SHEET 1 OF 1

LOCATION: N 5772010.9 E 399472.8

BORING DATE: 08/13/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. + Q - ● rem V. ⊕ U - ○		WATER CONTENT PERCENT				
							20	40	60	80	10 ⁶	10 ⁵	10 ⁴	10 ³		
							40	80	120	160	Wp	W	Wi			
0		GROUND SURFACE		0.00											TOC=540.360	
1	150mm Dia. Solid Stem Auger Continuous Flight															Bentonite
2																Sand
3																Screen
3.1		END OF BOREHOLE = 3.1m Note: 1. Stratigraphy inferred from RW-14-004D. 2. Water level observed at 3.04mBTOC.		3.05												Sept 11 2014
4																
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6																
7																
8																
9																
10																
11																
12																
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14																
15																

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE

1 : 75



LOGGED: JS

CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-005D

SHEET 1 OF 1

LOCATION: N 5771686.4 E 399448.9

BORING DATE: 07/24/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁶	10 ⁵			10 ⁴	10 ³
0		GROUND SURFACE		538.63											TOC=539.845		
		TOPSOIL		0.00													
1		(CL) SILTY CLAY, trace sand and gravel; light brownish grey, iron staining; cohesive, w-PL, firm		537.42	005-1	AS											
				1.22	005-2	DO	5										
2					005-3	AS											
						005-4	DO	11									
3						005-5	AS										
						005-6	DO	12									
4		(CL) SILTY CLAY, trace sand and gravel; dark brownish grey; cohesive, w-PL, firm		534.06													
				4.57	005-7	AS											
5						005-8	DO	13									
						005-9	AS										
6						005-10	DO	10									
						005-11	AS										
7						005-12	DO	9									
						005-13	AS										
8					005-14	DO	6										
9																	
10																	
11		END OF BOREHOLE = 10.36m Note: 1. Water level observed at 2.847mBTOC.		528.27													
				10.36													

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ_GAL_SASK.GDT_08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-005S

SHEET 1 OF 1

LOCATION: N 5771686.4 E 399448.9

BORING DATE: 08/13/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		Wp			WI
0		GROUND SURFACE		0.00											TOC=539.735	
1	150mm Dia. Solid Stem Auger Continuous Flight														Bentonite	
2															Sand	
3															Screen Sept 11 2014	
3.2		END OF BOREHOLE = 3.2m Note: 1. Stratigraphy inferred from RW-14-005D. 2. Water level observed at 2.390mBTOC.		3.15												
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT_08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5771750.4 E 399832.1

RECORD OF BOREHOLE: RW-14-006D

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 07/24/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0		GROUND SURFACE		538.73												TOC=539.813	
		TOPSOIL		0.00													
1		(CL) SILTY CLAY, some sand, trace gravel; light olive brown, iron staining; cohesive, w<PL, firm - becomes w~PL at 1.5m		537.97	006-1	AS											
				0.76	006-2	DO	10										
						006-3	AS										
2						006-4	DO	14									
3						006-5	AS										
4						006-6	DO	16									
5		(CL) SILTY CLAY, trace gravel and sand; dark brownish grey, iron staining; w~PL, stiff to hard		534.16	006-7	AS										Bentonite	
				4.57		006-8	ST			+						Sept 11 ∇ 2014	
						006-9	AS										
6																	
7						006-10	DO	42									
8						006-11	AS										
9						006-12	DO	16									
10						006-13	AS										
					006-14	DO	13									Screen	
10				528.37												Sand	
		END OF BOREHOLE = 10.36m		10.36													
11		Note: 1. Water level observed at 4.730mBTOC.															
12																	
13																	
14																	
15																	

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ_GAL-SASK.GDT_08/17/15

DEPTH SCALE
1:75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates

RECORD OF BOREHOLE: RW-14-009D

SHEET 1 OF 1

LOCATION: N 5772149.9 E 400134.5

BORING DATE: 07/24/14

DATUM: NAD83

DRILL RIG: M10

DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT				
						20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
						nat V. + Q - ● rem V. ⊕ U - ○				Wp ----- Wl					
						40	80	120	160	10	20	30	40		
0		GROUND SURFACE		540.54											TOC=541.610
		TOPSOIL		0.00 540.23											
		(CL) SILTY CLAY, trace gravel; light brownish grey, iron staining; cohesive, firm		0.30	009-1	AS									
1					009-2	DO	3								
					009-3	AS									
2					009-4	DO	9								
					009-5	AS									
3					009-6	DO	>50								
					009-7	AS									
4					009-8	DO	22								
					009-9	AS									
5					009-10	ST			+						
					009-11	AS									
6					009-12	DO	>50								
					009-13	AS									
7					009-14	DO	17								
8															
9															
10															
11															
12															
13															
14															
15															
		END OF BOREHOLE = 10.36m		530.18											
		Note: 1. Water level observed at 3.595mBTOC.		10.36											

Sept 11
2014
Bentonite

Screen

Sand

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5772303.8 E 400133.1

RECORD OF BOREHOLE: RW-14-010D

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 07/25/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20		40		60		80			10 ⁻⁵
0		GROUND SURFACE		539.82												TOC=540.951	
		TOPSOIL		0.00													
		(CL) SILTY CLAY, trace sand and gravel; light brownish grey, iron staining; cohesive, w-PL, soft		539.51													
1				0.30	010-1	AS											
					010-2	DO	13										
					010-3	AS											
2		- becomes firm at 1.7m			010-4	DO	21										
					010-5	AS											
3					010-6	DO	>50										
					010-7	AS											
4					010-8	DO	20										
					010-9	AS											
5					010-10	DO	28										
					010-11	AS											
6					010-12	DO	35										
					010-13	AS											
7					010-14	DO	>50										
8		(CL) SILTY CLAY, trace sand and gravel; dark brownish grey, iron staining; cohesive, w-PL, stiff to hard		532.20													
				7.62													
9																	
10																	
11		END OF BOREHOLE = 10.36m Note: 1. Water level observed at 3.223mBTOC.		529.45													
				10.36													

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5771913.6 E 400147.2

RECORD OF BOREHOLE: RW-14-011S

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 08/13/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V.	rem V.	+			⊕
0		GROUND SURFACE		0.00											TOC=539.990		
1	150mm Dia. Solid Stem Auger Continuous Flight														Bentonite		
2															Sand		
3															Screen		
3.05		END OF BOREHOLE = 3.1m Note: 1. Stratigraphy inferred from RW-14-011D. 2. Water level observed at 3.585mBTOC.		3.05											Sept 11 ∇ 2014		

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ_GAL_SASK.GDT_08/17/15

DEPTH SCALE
1:75



LOGGED: JS
CHECKED: CR

PROJECT: 1406388 Ridgewood Estates
 LOCATION: N 5771785.0 E 400124.5

RECORD OF BOREHOLE: RW-14-012S

SHEET 1 OF 1
 DATUM: NAD83

BORING DATE: 08/13/14
 DRILL RIG: M10
 DRILLING CONTRACTOR: Mobile Augers and Research Ltd.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION AND GROUNDWATER OBSERVATIONS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT				
0	150mm Dia. Solid Stem Auger Continuous Flight	GROUND SURFACE		0.00											TOC=540.540	
1																Bentonite
2																Sand
3																Screen
3.05		END OF BOREHOLE = 3.1m Note: 1. Stratigraphy inferred from RW-14-012D. 2. Water level observed as dry on Sept 11, 2014.		3.05												
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

SK_SOIL_1406388_BOREHOLE_LOGS.GPJ GAL-SASK.GDT 08/17/15

DEPTH SCALE
1 : 75



LOGGED: JS
CHECKED: CR



APPENDIX C

Laboratory Testing



GENERAL TESTING RESULTS

Project #: 1406388

Phase : 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: R.V.

Date: August 20, 2014

Sample Identification				Laboratory Test Results										
Borehole #	Sample #	Depth (m)	Sample Type	Water Content (%)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing #200	SHT Group Index	ASTM Group Index	Specific Gravity	Dry Density (Kg/m ³)	Pocket Penetrometer (kPa)	Lab Vane (kPa)
RW-14-001	001-2	0.76-1.22		23.6										
RW-14-001	001-3	1.52-1.68		23.9										
RW-14-001	001-4	2.29-2.74		12.0										
RW-14-001	001-5	3.05-3.20			12	24	12							
RW-14-001	001-6	3.81-4.27		13.5										
RW-14-001	001-8	5.33-5.79		13.9										
RW-14-001	001-10	6.86-7.32		10.9										
RW-14-001	001-12	8.38-8.84		12.4										
RW-14-001	001-14	9.91-10.36												
RW-14-002	002-2	0.76-1.22		24.1										
RW-14-002	002-3	1.52-1.68			11	23	12							
RW-14-002	002-4	2.29-2.74		13.7										
RW-14-002	002-5	3.05-3.20												
RW-14-002	002-6	3.81-4.27		12.5										
RW-14-002	002-8	5.33-5.79		9.2										
RW-14-002	002-9	6.10-6.25			8	21	13							
RW-14-002	002-10	6.86-7.32		14.2										
RW-14-002	002-12	8.38-8.84		9.4										
RW-14-002	002-14	9.91-10.36		13.5										
RW-14-003	003-2	0.76-1.22		18.1										
RW-14-003	003-4	2.29-2.74		16.3										
RW-14-003	003-5	3.05-3.20			10	24	14							
RW-14-003	003-6	3.81-4.27		11.6							2045	76.8	64.5	
RW-14-003	003-8	5.33-5.79		14.3										
RW-14-003	003-10	6.86-7.32		15.1										
RW-14-003	003-11	7.62-7.77			10	21	11							
RW-14-003	003-12	8.38-8.84		15.4										
RW-14-003	003-14	9.91-10.36		13.1										
RW-14-004	004-2	0.76-1.22		26.4										
RW-14-004	004-3	1.52-1.68		12.7	11	21	10							
RW-14-004	004-4	2.29-2.74		13.5										
RW-14-004	004-5	3.05-3.20												
RW-14-004	004-6	3.81-4.27		14.8										
RW-14-004	004-7	4.57-4.72			11	24	13							
RW-14-004	004-8	5.33-5.79		14.8										
RW-14-004	004-10	6.86-7.32		13.7										

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.
Saskatoon, SK S7H 0T4

Reviewed by:



GENERAL TESTING RESULTS

Project #: 1406388

Phase : 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: R.V.

Date: August 20, 2014

Sample Identification				Laboratory Test Results										
Borehole #	Sample #	Depth (m)	Sample Type	Water Content (%)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing #200	SHT Group Index	ASTM Group Index	Specific Gravity	Dry Density (Kg/m ³)	Pocket Penetrometer (kPa)	Lab Vane (kPa)
RW-14-004	004-12	8.38-8.84												
RW-14-005	005-2	0.76-1.22		15.3										
RW-14-005	005-3	1.52-1.68		25.8	16	30	14							
RW-14-005	005-4	2.29-2.74		16.7										
RW-14-005	005-5	3.05-3.20		17.8										
RW-14-005	005-6	3.81-4.27		13.3										
RW-14-005	005-8	5.33-5.79		15.1										
RW-14-005	005-9	6.10-6.25			9	20	11							
RW-14-005	005-10	6.86-7.32		13.1										
RW-14-005	005-12	8.38-8.84		18.4										
RW-14-005	005-14	9.91-10.36												
RW-14-006	006-2	0.76-1.22		10.4										
RW-14-006	006-4	2.29-2.74		10.9										
RW-14-006	006-5	3.05-3.20			10	21	11							
RW-14-006	006-6	3.81-4.27		12.9										
RW-14-006	006-8	5.33-5.79		12.7							2024	120	103	
RW-14-006	006-10	6.86-7.32		12.6										
RW-14-006	006-11	7.62-7.77			10	27	17							
RW-14-006	006-12	8.38-8.84		11.8										
RW-14-006	006-14	9.91-10.36		12.4										
RW-14-007	007-2	0.76-1.22		19.3										
RW-14-007	007-3	1.52-1.68		13.6	9	23	14							
RW-14-007	007-4	2.29-2.74		13.3										
RW-14-007	007-5	3.05-3.20		13.2										
RW-14-007	007-6	3.81-4.27		13.2										
RW-14-007	007-8	5.33-5.79		13.3										
RW-14-007	007-10	6.86-7.32		14.8										
RW-14-007	007-11	7.62-7.77			9	22	13							
RW-14-007	007-12	8.38-8.84		13.7										
RW-14-007	007-14	9.91-10.36												
RW-14-008	008-2	0.76-1.22		22.1										
RW-14-008	008-3	1.52-1.68		18.5										
RW-14-008	008-4	2.29-2.74		17.7							1795	120	91.1	
RW-14-008	008-5	3.05-3.20			11	23	12							
RW-14-008	008-6	3.81-4.27		12.0										
RW-14-008	008-8	5.33-5.79		12.3										

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1721 8th Street E.
Saskatoon, SK S7H 0T4

Reviewed by:



GENERAL TESTING RESULTS

Project #: 1406388

Phase : 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: R.V.

Date: August 20, 2014

Sample Identification				Laboratory Test Results										
Borehole #	Sample #	Depth (m)	Sample Type	Water Content (%)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing #200	SHT Group Index	ASTM Group Index	Specific Gravity	Dry Density (Kg/m ³)	Pocket Penetrometer (kPa)	Lab Vane (kPa)
RW-14-008	008-10	6.86-7.32		10.5										
RW-14-008	008-11	7.62-7.77			10	22	12							
RW-14-008	008-12	8.38-8.84		11.3										
RW-14-008	008-14	9.91-10.36												
RW-14-009	009-2	0.76-1.22		23.1										
RW-14-009	009-3	1.52-1.68		16.2										
RW-14-009	009-4	2.29-2.74		22.1										
RW-14-009	009-6	3.81-4.27		20.0										
RW-14-009	009-8	5.33-5.79		12.3										
RW-14-009	009-9	6.10-6.25			11	27	16							
RW-14-009	009-10	6.86-7.32		12.3								2036	132	152
RW-14-009	009-14	9.91-10.36												
RW-14-010	010-2	0.76-1.22		11.1										
RW-14-010	010-3	1.52-1.68		11.6										
RW-14-010	010-4	2.29-2.74		11.8										
RW-14-010	010-6	3.81-4.27		12.9										
RW-14-010	010-7	4.57-4.72			11	22	11							
RW-14-010	010-8	5.33-5.79		13.5										
RW-14-010	010-10	6.86-7.32		11.1										
RW-14-010	010-11	7.62-7.77			10	20	10							
RW-14-010	010-12	8.38-8.84		12.7										
RW-14-010	010-14	9.91-10.36		11.8										
RW-14-011	011-2	0.76-1.22		12.6										
RW-14-011	011-3	1.52-1.68			10	25	15							
RW-14-011	011-4	2.29-2.74		14.0										
RW-14-011	011-5	3.05-3.20		13.5										
RW-14-011	011-6	3.81-4.27		13.0										
RW-14-011	011-8	5.33-5.79		12.7										
RW-14-011	011-9	6.10-6.25			9	21	12							
RW-14-011	011-10	6.86-7.32		11.3								2044	60	75.9
RW-14-011	011-12	8.38-8.84												
RW-14-012	012-2	0.76-1.22		18.3										
RW-14-012	012-3	1.52-1.68			12	24	12							
RW-14-012	012-4	2.29-2.74		11.6										
RW-14-012	012-6	3.81-4.27		10.7										
RW-14-012	012-7	4.57-4.72			10	22	12							

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.
Saskatoon, SK S7H 0T4

Reviewed by:



GENERAL TESTING RESULTS

Project #: 1406388

Phase : 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: R.V.

Date: August 20, 2014

Sample Identification				Laboratory Test Results										
Borehole #	Sample #	Depth (m)	Sample Type	Water Content (%)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing #200	SHT Group Index	ASTM Group Index	Specific Gravity	Dry Density (Kg/m ³)	Pocket Penetrometer (kPa)	Lab Vane (kPa)
RW-14-012	012-8	5.33-5.79		11.2										
RW-14-012	012-10	6.86-7.32		12.1										
RW-14-012	012-11	7.62-7.77			11	22	11							
RW-14-012	012-12	8.38-8.84		13.0										
RW-14-012	012-14	9.91-10.36												

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.
Saskatoon, SK S7H 0T4

Reviewed by:



Unconfined Compression

Project #: 1406388

Phase: 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: J.M.

Date: August 13, 2014

Borehole #: RW-14-003

Sample #: 003-6

Source:

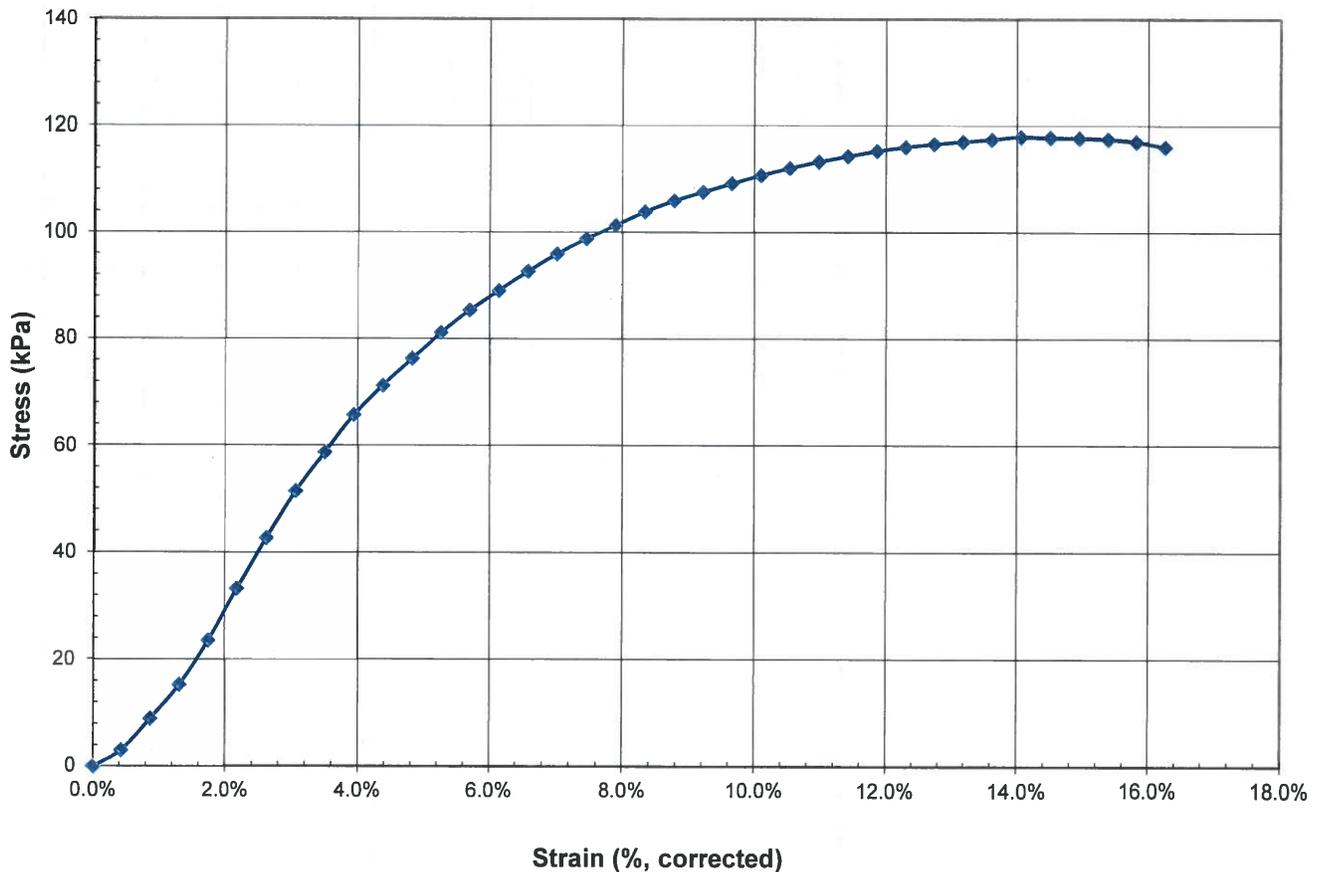
Visual Description of Sample: (CL) SILTY CLAY, trace gravel, light brown-grey, Fe staining, soft, w~PL.

Date Sample Received: July 31, 2014

Compressive Stress at Failure (kPa): 117.9
Strain at Failure (%): 14.1
Undrained Shear Strength (kPa): 59.0
Water Content (%): 13.1

Compressive Stress at 15% Strain (kPa): N/A
Undrained Shear Strength (kPa): N/A
Water Content (%): N/A

Plot of Unconfined Compression Test



Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.



Unconfined Compression

Project #: 1406388

Phase: 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: J.M.

Date: August 13, 2014

Borehole #: RW-14-006

Sample #: 006-8

Source:

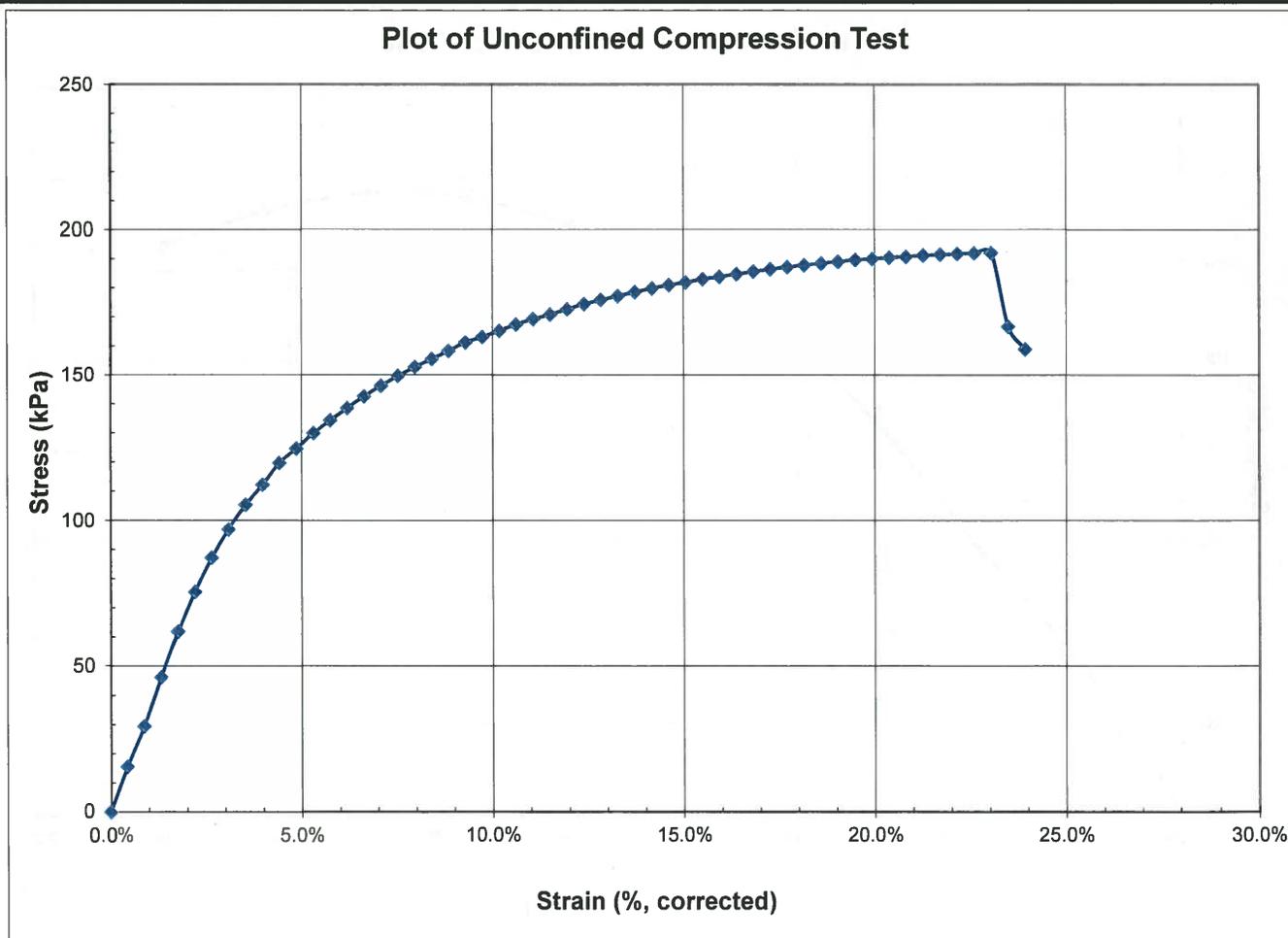
Visual Description of Sample: (CH) CLAY, trace gravel, trace sand, dark brown-grey, Fe staining, moist, firm.

Date Sample Received: July 31, 2014

Compressive Stress at Failure (kPa): N/A
Strain at Failure (%): N/A
Undrained Shear Strength (kPa): N/A
Water Content (%): N/A

Compressive Stress at 15% Strain (kPa): 181.7
Undrained Shear Strength (kPa): 90.8
Water Content (%): 12.3

Plot of Unconfined Compression Test



Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.



Unconfined Compression

Project #: 1406388

Phase: 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: J.M.

Date: August 13, 2014

Borehole #: RW-14-008

Sample #: 008-4

Source:

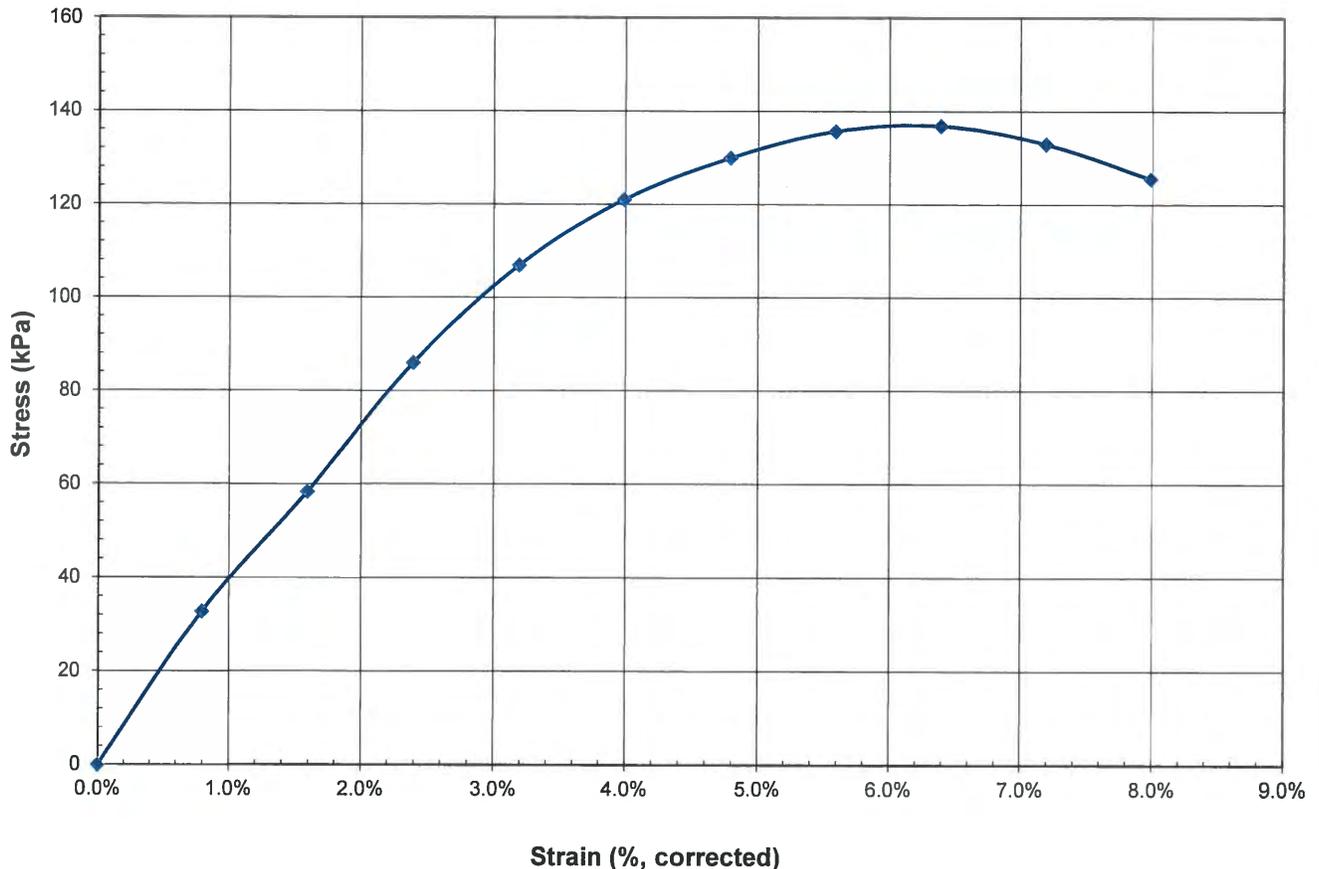
Visual Description of Sample: (CL) SILTY CLAY, trace sand, trace gravel, light brown-grey, Fe staining, moist, firm.

Date Sample Received: July 31, 2014

Compressive Stress at Failure (kPa): 136.9
Strain at Failure (%): 6.4
Undrained Shear Strength (kPa): 68.5
Water Content (%): 12.3

Compressive Stress at 15% Strain (kPa): N/A
Undrained Shear Strength (kPa): N/A
Water Content (%): N/A

Plot of Unconfined Compression Test



Comments: Sample cut at 1:1 ratio; therefore, results may not be accurate.

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.,
Saskatoon, Saskatchewan S7H 0T4

Reviewed by:



Unconfined Compression

Project #: 1406388

Phase: 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: J.M.

Date: August 13, 2014

Borehole #: RW-14-009

Sample #: 009-10

Source:

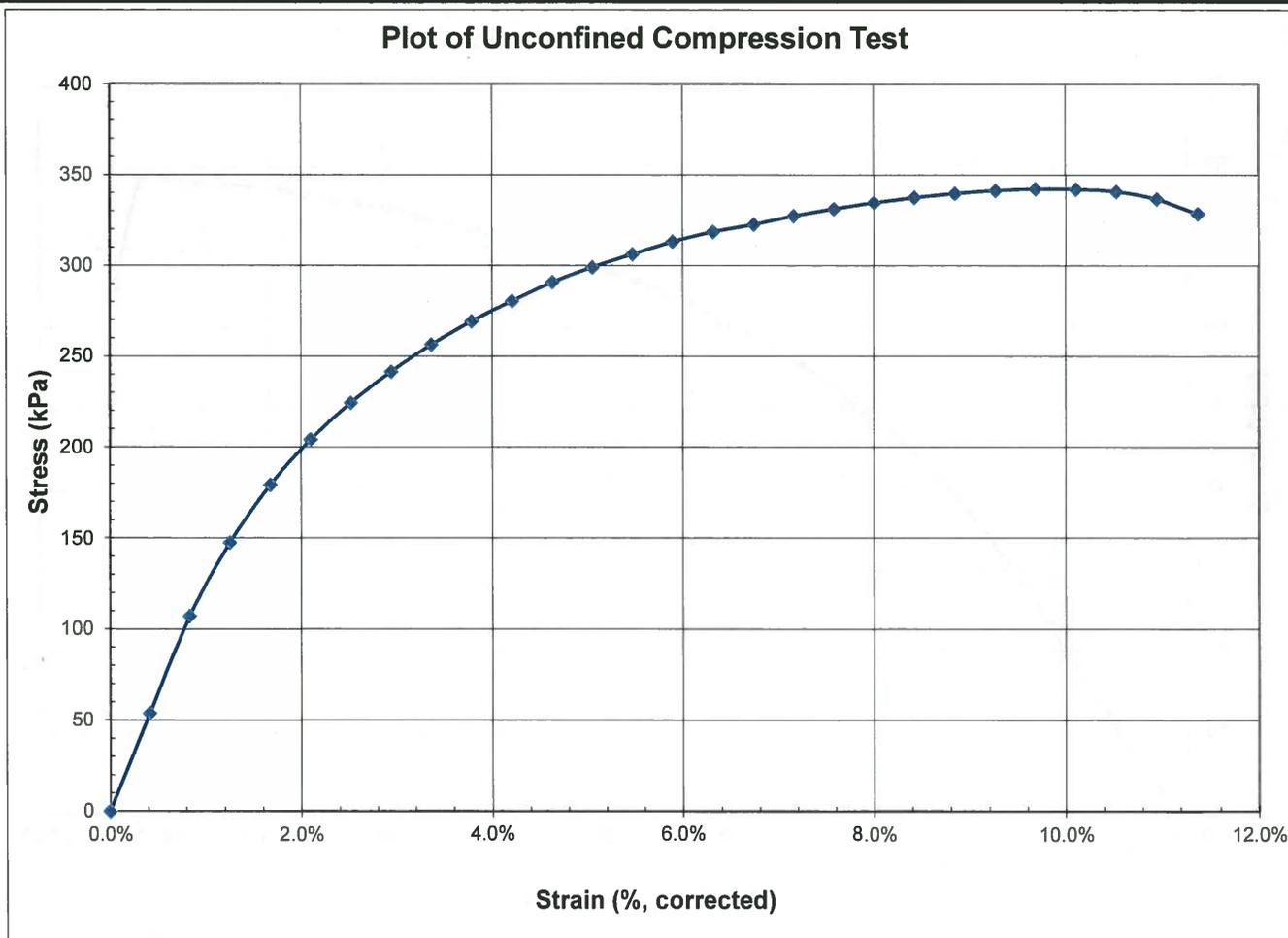
Visual Description of Sample: (CL) SILTY CLAY, trace gravel, light brown-grey, Fe staining, moist, firm.

Date Sample Received: July 31, 2014

Compressive Stress at Failure (kPa): 342.2
Strain at Failure (%): 9.7
Undrained Shear Strength (kPa): 171.1
Water Content (%): 11.8

Compressive Stress at 15% Strain (kPa): N/A
Undrained Shear Strength (kPa): N/A
Water Content (%): N/A

Plot of Unconfined Compression Test



Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.,
Saskatoon, Saskatchewan S7H 0T4

Reviewed by:



Unconfined Compression

Project #: 1406388

Phase: 1000

Short Title: Ridgewood / Geotech Terr. / Saskatoon, SK

Tested by: J.M.

Date: August 13, 2014

Borehole #: RW-14-011

Sample #: 011-10

Source:

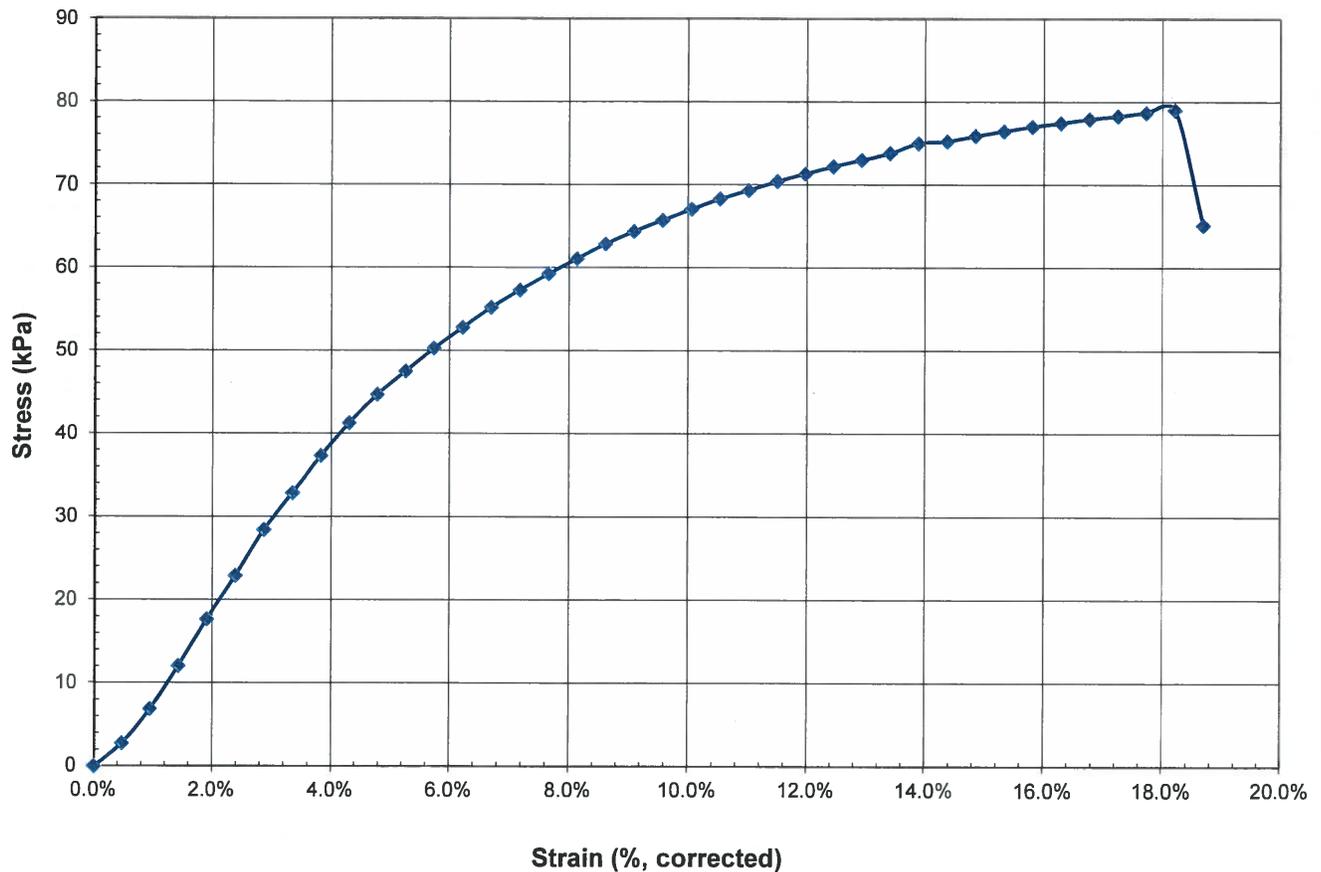
Visual Description of Sample: (CH) CLAY, trace gravel, trace sand, dark brown-grey, Fe staining, moist, firm.

Date Sample Received: July 31, 2014

Compressive Stress at Failure (kPa): N/A
Strain at Failure (%): N/A
Undrained Shear Strength (kPa): N/A
Water Content (%): N/A

Compressive Stress at 15% Strain (kPa): 76.1
Undrained Shear Strength (kPa): 38.0
Water Content (%): 12.4

Plot of Unconfined Compression Test



Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.



Golder Associates Ltd.
ATTN: ASHLEY KIRKPATRICK
1721 8th Street East
Saskatoon SK S7H 0T4

Date Received: 12-AUG-14
Report Date: 19-AUG-14 13:10 (MT)
Version: FINAL

Client Phone: 306-665-7989

Certificate of Analysis

Lab Work Order #: **L1500868**
Project P.O. #: NOT SUBMITTED
Job Reference: 1406388/2000
C of C Numbers:
Legal Site Desc:

Brian Morgan
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1500868-1 RW-14-001 SA03 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	57.1 28.8 14.1 Sandy loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-2 RW-14-002 SA04 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	52.4 31.9 15.7 Loam / Sandy loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-3 RW-14-004 SA04 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	51.4 35.7 12.8 Loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-4 RW-14-005 SA03 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	38.1 43.6 18.3 Loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-5 RW-14-007 SA02 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	43.9 35.7 20.4 Loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-6 RW-14-008 SA04 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um)	50.8 32.8 16.3		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1500868-6 RW-14-008 SA04 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method Texture	Loam				13-AUG-14	14-AUG-14	R2919809
L1500868-7 RW-14-010 SA08 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	54.3 30.2 15.4 Sandy loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809
L1500868-8 RW-14-011 SA05 Sampled By: JS Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	54.7 30.0 15.3 Sandy loam		0.10 0.10 0.10	% % %	13-AUG-14 13-AUG-14 13-AUG-14 13-AUG-14	14-AUG-14 14-AUG-14 14-AUG-14 14-AUG-14	R2919809 R2919809 R2919809 R2919809

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
PSA-1-SK	Soil	Particle Size Analysis:Mini-Pipet Method	SSIR-51 Method 3.2.1

Dry, < 2 mm soil is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. The homogenized suspension is allowed to settle in accordance with Stoke's Law so that only clay particles remain in suspension. To determine the clay fraction, an aliquot of the clay suspension is removed, then dried and weighed. The sand fraction is determined by wet sieving the remaining suspension, then drying and weighing the sand retained on the sieve. The silt fraction is determined by calculation where % Silt = 100 - (%Sand+%Clay)

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

Kalra, Y.P., Maynard, D.G. 1991. Methods manual for forest soil and plant analysis. Forestry Canada. p. 42-45.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1500868

Report Date: 19-AUG-14

Page 1 of 2

Client: Golder Associates Ltd.
 1721 8th Street East
 Saskatoon SK S7H 0T4
 Contact: ASHLEY KIRKPATRICK

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-1-SK	Soil							
Batch	R2919809							
WG1929341-1	DUP	L1500868-5						
% Sand (2.0mm - 0.05mm)		43.9	43.9	J	%	0.01	5	14-AUG-14
% Silt (0.05mm - 2um)		35.7	35.2	J	%	0.49	5	14-AUG-14
% Clay (<2um)		20.4	20.9	J	%	0.50	5	14-AUG-14
WG1929341-2	IRM	FARM2010						
% Sand (2.0mm - 0.05mm)			34.4		%		34-44	14-AUG-14
% Silt (0.05mm - 2um)			41.0		%		33-43	14-AUG-14
% Clay (<2um)			24.6		%		18-28	14-AUG-14

Quality Control Report

Workorder: L1500868

Report Date: 19-AUG-14

Page 2 of 2

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Golder Associates Ltd.
ATTN: Crystal Rinas
1721 8th Street East
Saskatoon SK S7H 0T4

Date Received: 17-SEP-14
Report Date: 24-SEP-14 12:00 (MT)
Version: FINAL

Client Phone: 306-665-7989

Certificate of Analysis

Lab Work Order #: L1519192
Project P.O. #: NOT SUBMITTED
Job Reference: 1406388
C of C Numbers:
Legal Site Desc:

Brian Morgan
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-1 RW-14-001 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 2200 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.10	DLA	0.10	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Barium (Ba)-Dissolved	0.046	DLA	0.010	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.0040	DLA	0.0040	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.31	DLA	0.20	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	<0.0040	DLA	0.0040	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.014	DLA	0.010	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.40	DLA	0.40	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.388	DLA	0.040	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.0083	DLA	0.0020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.013	DLA	0.010	mg/L		20-SEP-14	R2953510
Phosphorus (P)-Dissolved	<2.0	DLA	2.0	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.164	DLA	0.0020	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	10.3	DLA	1.0	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.00040	DLA	0.00040	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	2.70	DLA	0.0040	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.0010	DLA	0.0010	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.120	DLA	0.00040	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	<0.0020	DLA	0.0020	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	<0.10	DLA	0.10	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	432.		20	mg/L		18-SEP-14	R2951569
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO ₃)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO ₃)	354		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	3.7		1.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	12500		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	431	DLA	30	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	34	DLA	30	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	2340	DLA	30	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	645	DLA	60	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO ₄)	11300	DLA	90	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-1 RW-14-001 SHALLOW Sampled By: CLIENT Matrix:							
Ion Balance Calculation							
Cation - Anion Balance	-0.6	BL:INT		%		20-SEP-14	
TDS (Calculated)	15200			mg/L		20-SEP-14	
Hardness (as CaCO3)	10700			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	50.6	PEHT	0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050	PEHT	0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	50.7	PEHT	0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.52		0.10	pH		18-SEP-14	R2951569
L1519192-2 RW-14-002 SHALLOW Sampled By: CLIENT Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	0.00041	DLA	0.00020	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	0.00138	DLA	0.00020	mg/L		20-SEP-14	R2953510
Barium (Ba)-Dissolved	0.258	DLA	0.0010	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.086	DLA	0.020	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	<0.000020	DLA	0.000020	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	0.00173	DLA	0.00040	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	0.00028	DLA	0.00020	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.0083	DLA	0.0010	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.0706	DLA	0.0040	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	<0.0010	DLA	0.0010	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.0108	DLA	0.00020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.0060	DLA	0.0010	mg/L		20-SEP-14	R2953510
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.0205	DLA	0.00020	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	11.7	DLA	0.10	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	0.740	DLA	0.00040	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.0834	DLA	0.000040	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	0.00045	DLA	0.00020	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	598.		20	mg/L		18-SEP-14	R2951569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-2 RW-14-002 SHALLOW Sampled By: CLIENT Matrix:							
Alkalinity by Auto. Titration							
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO3)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO3)	490		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	11.9		1.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	1450		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	129		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	7.3		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	102		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	59.0		2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO4)	259		3.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							
Cation - Anion Balance	1.3			%		20-SEP-14	
TDS (Calculated)	961			mg/L		20-SEP-14	
Hardness (as CaCO3)	742			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	22.4		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050		0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	22.4		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.87		0.10	pH		18-SEP-14	R2951569
L1519192-3 RW-14-003 SHALLOW Sampled By: CLIENT Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 2200 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	0.00024	DLA	0.00020	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	0.00085	DLA	0.00020	mg/L		20-SEP-14	R2953510
Barium (Ba)-Dissolved	0.0454	DLA	0.0010	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.051	DLA	0.020	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	0.000047	DLA	0.000020	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	0.00151	DLA	0.00040	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.0044	DLA	0.0010	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.0461	DLA	0.0040	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	0.0083	DLA	0.0010	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.00203	DLA	0.00020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.0064	DLA	0.0010	mg/L		20-SEP-14	R2953510

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-3 RW-14-003 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Dissolved Metals in Water by CRC ICPMS							
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.0148	DLA	0.00020	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	9.84	DLA	0.10	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	0.364	DLA	0.00040	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	0.00039	DLA	0.00020	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.0372	DLA	0.000040	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	0.00034	DLA	0.00020	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	571.		20	mg/L		18-SEP-14	R2951569
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO3)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO3)	468		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	8.1		1.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	1980		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	149	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	5.1	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	160	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	86.5	DLA	4.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO4)	723	DLA	6.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							
Cation - Anion Balance	-0.4			%		20-SEP-14	
TDS (Calculated)	1420			mg/L		20-SEP-14	
Hardness (as CaCO3)	1030			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	0.86		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050		0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	0.87		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.59		0.10	pH		18-SEP-14	R2951569
L1519192-4 RW-14-004 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 2200 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	0.00053		0.00010	mg/L		20-SEP-14	R2953510

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-4 RW-14-004 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Dissolved Metals in Water by CRC ICPMS							
Barium (Ba)-Dissolved	0.0572		0.00050	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.00020		0.00020	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.030		0.010	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	0.000030		0.000010	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	0.00043		0.00020	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	0.00012		0.00010	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.00125		0.00050	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.020		0.020	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.00010		0.00010	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.0079		0.0020	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	0.0329		0.00050	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.00142		0.00020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.00261		0.00050	mg/L		20-SEP-14	R2953510
Phosphorus (P)-Dissolved	<0.10		0.10	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.00058		0.00010	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	9.92		0.050	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.000020		0.000020	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	0.226		0.00020	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	0.00030		0.00010	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.00050		0.00050	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.00406		0.000020	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	0.00028		0.00010	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	<0.0050		0.0050	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	379.		20	mg/L		18-SEP-14	R2951569
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO3)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO3)	311		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	7.5		1.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	786		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	109		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	3.4		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	37.1		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	6.6		2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO4)	110		3.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							
Cation - Anion Balance	0.6			%		20-SEP-14	
TDS (Calculated)	463			mg/L		20-SEP-14	
Hardness (as CaCO3)	425			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	0.64		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050		0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	0.66		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.57		0.10	pH		18-SEP-14	R2951569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-5 RW-14-005 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 2200 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	0.00036	DLA	0.00020	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	0.00107	DLA	0.00020	mg/L		20-SEP-14	R2953510
Barium (Ba)-Dissolved	0.0548	DLA	0.0010	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.024	DLA	0.020	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	0.000031	DLA	0.000020	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	0.00041	DLA	0.00040	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	0.00030	DLA	0.00020	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.0042	DLA	0.0010	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.0309	DLA	0.0040	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	0.0091	DLA	0.0010	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.00147	DLA	0.00020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.0057	DLA	0.0010	mg/L		20-SEP-14	R2953510
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.00941	DLA	0.00020	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	11.1	DLA	0.10	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	0.331	DLA	0.00040	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.00620	DLA	0.000040	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	0.00038	DLA	0.00020	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	445.		20	mg/L		18-SEP-14	R2951569
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO ₃)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO ₃)	364		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	122	DLA	2.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	1570		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	123	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	2.2	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	117	DLA	2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	52.8	DLA	4.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO ₄)	371	DLA	6.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-5 RW-14-005 SHALLOW Sampled By: CLIENT Matrix:							
Ion Balance Calculation							
Cation - Anion Balance	-1.1			%		20-SEP-14	
TDS (Calculated)	1010			mg/L		20-SEP-14	
Hardness (as CaCO3)	789			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	0.75		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050		0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	0.76		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.63		0.10	pH		18-SEP-14	R2951569
L1519192-6 RW-14-011 SHALLOW Sampled By: CLIENT Matrix:							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	18-SEP-14	20-SEP-14	R2953908
Iron Bacteria	Present					18-SEP-14	R2956311
Note: Approximate population 2200 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	36		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Escherichia Coli	0		0	MPN/100mL	17-SEP-14	18-SEP-14	R2952131
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	0.0094		0.0050	mg/L		20-SEP-14	R2953510
Antimony (Sb)-Dissolved	0.00029		0.00010	mg/L		20-SEP-14	R2953510
Arsenic (As)-Dissolved	0.00119		0.00010	mg/L		20-SEP-14	R2953510
Barium (Ba)-Dissolved	0.0861		0.00050	mg/L		20-SEP-14	R2953510
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		20-SEP-14	R2953510
Bismuth (Bi)-Dissolved	<0.00020		0.00020	mg/L		20-SEP-14	R2953510
Boron (B)-Dissolved	0.048		0.010	mg/L		20-SEP-14	R2953510
Cadmium (Cd)-Dissolved	0.000017		0.000010	mg/L		20-SEP-14	R2953510
Chromium (Cr)-Dissolved	0.00250		0.00020	mg/L		20-SEP-14	R2953510
Cobalt (Co)-Dissolved	0.00025		0.00010	mg/L		20-SEP-14	R2953510
Copper (Cu)-Dissolved	0.00490		0.00050	mg/L		20-SEP-14	R2953510
Iron (Fe)-Dissolved	<0.020		0.020	mg/L		20-SEP-14	R2953510
Lead (Pb)-Dissolved	<0.00010		0.00010	mg/L		20-SEP-14	R2953510
Lithium (Li)-Dissolved	0.0499		0.0020	mg/L		20-SEP-14	R2953510
Manganese (Mn)-Dissolved	0.00072		0.00050	mg/L		20-SEP-14	R2953510
Molybdenum (Mo)-Dissolved	0.00528		0.00020	mg/L		20-SEP-14	R2953510
Nickel (Ni)-Dissolved	0.00475		0.00050	mg/L		20-SEP-14	R2953510
Phosphorus (P)-Dissolved	<0.10		0.10	mg/L		20-SEP-14	R2953510
Selenium (Se)-Dissolved	0.0176		0.00010	mg/L		20-SEP-14	R2953510
Silicon (Si)-Dissolved	10.3		0.050	mg/L		20-SEP-14	R2953510
Silver (Ag)-Dissolved	<0.000020		0.000020	mg/L		20-SEP-14	R2953510
Strontium (Sr)-Dissolved	0.399		0.00020	mg/L		20-SEP-14	R2953510
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L		20-SEP-14	R2953510
Tin (Sn)-Dissolved	0.00018		0.00010	mg/L		20-SEP-14	R2953510
Titanium (Ti)-Dissolved	<0.00050		0.00050	mg/L		20-SEP-14	R2953510
Uranium (U)-Dissolved	0.0197		0.000020	mg/L		20-SEP-14	R2953510
Vanadium (V)-Dissolved	0.00061		0.00010	mg/L		20-SEP-14	R2953510
Zinc (Zn)-Dissolved	0.0057		0.0050	mg/L		20-SEP-14	R2953510
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	687.		20	mg/L		18-SEP-14	R2951569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1519192-6 RW-14-011 SHALLOW							
Sampled By: CLIENT							
Matrix:							
Alkalinity by Auto. Titration							
Hydroxide (OH)	<10.		10	mg/L		18-SEP-14	R2951569
Carbonate (CO3)	<10.		10	mg/L		18-SEP-14	R2951569
Alkalinity, Total (as CaCO3)	563		20	mg/L		18-SEP-14	R2951569
Chloride (Cl)							
Chloride (Cl)	10.2		1.0	mg/L	19-SEP-14	19-SEP-14	R2953254
Conductivity (Automated)							
Conductivity	1400		10	uS/cm		18-SEP-14	R2951569
ICP Cations							
Calcium (Ca)	85.2		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Potassium (K)	8.8		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Magnesium (Mg)	114		1.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sodium (Na)	66.7		2.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Sulfur (as SO4)	179		3.0	mg/L	18-SEP-14	18-SEP-14	R2952011
Ion Balance Calculation							
Cation - Anion Balance	0.8			%		20-SEP-14	
TDS (Calculated)	877			mg/L		20-SEP-14	
Hardness (as CaCO3)	682			mg/L		20-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	16.9		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrite-N	<0.050		0.050	mg/L	17-SEP-14	17-SEP-14	R2950921
Nitrate+Nitrite-N	16.9		0.50	mg/L	17-SEP-14	17-SEP-14	R2950921
pH by Meter (Automated)							
pH	7.78		0.10	pH		18-SEP-14	R2951569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
DLA	Detection Limit adjusted for required dilution
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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ALK-PCT-SK	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
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This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

CL-COL-SK	Water	Chloride (Cl)	APHA 4500-CL E
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Chloride in aqueous matrices is determined colorimetrically by auto-analyzer.

EC-PCT-SK	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
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This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ETL-ROUTINE-ICP-SK	Water	ICP Cations	APHA 3120 B-ICP-OES-ROU
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These ions are determined directly y ICP-OES.

Reference

Greenberg, Arnold E., Cleseri, Lenore S., Eaton, Andrew D., Standard Methods For The Examination of Water and Wastewater, 18th Edition, 1992, Method 3120B.

HPC-PP-WP	Water	Heterotrophic Plate Count	APHA 9215B
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This is a procedure for estimating the number of live heterotrophic bacteria in water and measuring changes during water treatment and distribution or in swimming pools. In the pour plate method, samples are diluted and plated on to media. After incubation, the colonies are counted and reported as CFU/mL.

IB-BART-WP	Water	Iron Bacteria	BART TEST KIT
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Iron Related Bacteria- IRB

Iron Related Bacteria include organisms that reduce or oxidize iron. Problems include esthetic (taste and odour) problems and 'red water'. Iron-Related Bacteria include Crenothrix, Gallionella, Siderocapsa, Sphaerotilus and Thiobacillus ferroxidans.

IRB: Analytical Method

A small amount of sample is transferred to a vial. A color reaction is observed (over 8 days) within the chamber to indicate the presence of Iron Related Bacteria. The colour reaction determines the population of Iron Related Bacteria. The results are reported as estimated value of Colony Forming Units (CFU/ml).

IONBALANCE-OP03-SK	Water	Ion Balance Calculation	APHA 1030-E
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MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
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This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

N2/N3-SK	Water	Nitrate, Nitrite and Nitrate+Nitrite-N	APHA 4500 NO3F
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Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water-soluble dye has a magenta color, which is measured at 520nm. Original nitrite can also be determined by removing the cadmium column and following the same procedure. Nitrate-N, Nitrite-N and NO3+NO2-N are reported.

Reference

Greenberg, Arnold E., Cleseri, Lenore S., Eaton, Andrew D., Standard Methods For The Examination of Water and Wastewater, 18th Edition, 1992, Method 4500NO3-F.

PH-PCT-SK	Water	pH by Meter (Automated)	APHA 4500-H pH Value
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This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

TC,EC-QT51-SK	Water	Total Coliform, E. Coli - Quanti-Tray	APHA 9223B 2B
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Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>The analysis of Total Coliform (TC) & Escherichia coli (EC) is processed by Quanti-tray (QT): Two substrates, ONPG for TC detection and MUG for EC detection are used. The substrates are added to the 100 ml sample dispensed into the 51 well tray. The tray is incubated at 35 Celcius for 24 hours. A colour reaction develops to indicate a positive reaction (presence of TC, EC). The number of positive wells are counted and converted to Most Probable Number Units (MPNU) per 100 ml.</p>			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1519192

Report Date: 24-SEP-14

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Client: Golder Associates Ltd.
 1721 8th Street East
 Saskatoon SK S7H 0T4

Contact: Crystal Rinas

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-PCT-SK Water								
Batch R2951569								
WG1953353-2	LCS							
Alkalinity, Total (as CaCO3)			96.9		%		85-115	18-SEP-14
WG1953353-3	MB							
Alkalinity, Total (as CaCO3)			<20		mg/L		20	18-SEP-14
CL-COL-SK Water								
Batch R2953254								
WG1953431-4	LCS							
Chloride (Cl)			104.1		%		85-115	19-SEP-14
WG1953431-1	MB							
Chloride (Cl)			<1.0		mg/L		1	19-SEP-14
EC-PCT-SK Water								
Batch R2951569								
WG1953353-2	LCS							
Conductivity			98.5		%		90-110	18-SEP-14
WG1953353-3	MB							
Conductivity			<10		uS/cm		10	18-SEP-14
ETL-ROUTINE-ICP-SK Water								
Batch R2952011								
WG1953479-2	DUP	L1519192-4						
Calcium (Ca)			109	112	mg/L	2.4	20	18-SEP-14
Potassium (K)			3.4	3.4	mg/L	1.3	20	18-SEP-14
Magnesium (Mg)			37.1	37.4	mg/L	0.8	20	18-SEP-14
Sodium (Na)			6.6	6.6	mg/L	0.3	20	18-SEP-14
Sulfur (as SO4)			110	110	mg/L	0.1	20	18-SEP-14
WG1953479-3	LCS							
Calcium (Ca)			99.8		%		80-120	18-SEP-14
Potassium (K)			95.3		%		80-120	18-SEP-14
Magnesium (Mg)			98.2		%		80-120	18-SEP-14
Sodium (Na)			94.1		%		80-120	18-SEP-14
Sulfur (as SO4)			96.8		%		90-110	18-SEP-14
WG1953479-1	MB							
Calcium (Ca)			<1.0		mg/L		1	18-SEP-14
Potassium (K)			<1.0		mg/L		1	18-SEP-14
Magnesium (Mg)			<1.0		mg/L		1	18-SEP-14
Sodium (Na)			<2.0		mg/L		2	18-SEP-14
Sulfur (as SO4)			<3.0		mg/L		3	18-SEP-14



Quality Control Report

Workorder: L1519192

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HPC-PP-WP								
Water								
Batch	R2953908							
WG1954216-6	DUP	L1519192-1						
Heterotrophic Plate Count		>3000	>3000		CFU/mL	0.0	65	20-SEP-14
WG1954216-1	MB							
Heterotrophic Plate Count			<10		CFU/mL		10	20-SEP-14
WG1954216-2	MB							
Heterotrophic Plate Count			<10		CFU/mL		10	20-SEP-14
WG1954216-3	MB							
Heterotrophic Plate Count			<10		CFU/mL		10	20-SEP-14
MET-D-CCMS-SK								
Water								
Batch	R2953510							
WG1953512-3	CRM	TMRM 20						
Aluminum (Al)-Dissolved			105.6		%		80-120	20-SEP-14
Antimony (Sb)-Dissolved			111.4		%		80-120	20-SEP-14
Arsenic (As)-Dissolved			103.6		%		80-120	20-SEP-14
Barium (Ba)-Dissolved			100.9		%		80-120	20-SEP-14
Beryllium (Be)-Dissolved			101.7		%		80-120	20-SEP-14
Bismuth (Bi)-Dissolved			97.0		%		80-120	20-SEP-14
Boron (B)-Dissolved			96.1		%		80-120	20-SEP-14
Cadmium (Cd)-Dissolved			101.0		%		80-120	20-SEP-14
Chromium (Cr)-Dissolved			103.6		%		80-120	20-SEP-14
Cobalt (Co)-Dissolved			101.2		%		80-120	20-SEP-14
Copper (Cu)-Dissolved			99.2		%		80-120	20-SEP-14
Iron (Fe)-Dissolved			97.5		%		80-120	20-SEP-14
Lead (Pb)-Dissolved			97.7		%		80-120	20-SEP-14
Lithium (Li)-Dissolved			98.0		%		80-120	20-SEP-14
Manganese (Mn)-Dissolved			99.4		%		80-120	20-SEP-14
Molybdenum (Mo)-Dissolved			100.6		%		80-120	20-SEP-14
Nickel (Ni)-Dissolved			102.8		%		80-120	20-SEP-14
Phosphorus (P)-Dissolved			103.1		%		70-130	20-SEP-14
Selenium (Se)-Dissolved			103.0		%		80-120	20-SEP-14
Silicon (Si)-Dissolved			102.2		%		80-120	20-SEP-14
Silver (Ag)-Dissolved			100.6		%		80-120	20-SEP-14
Strontium (Sr)-Dissolved			103.0		%		80-120	20-SEP-14
Thallium (Tl)-Dissolved			107.5		%		80-120	20-SEP-14
Tin (Sn)-Dissolved			101.5		%		80-120	20-SEP-14
Titanium (Ti)-Dissolved			95.4		%		80-120	20-SEP-14

Quality Control Report

Workorder: L1519192

Report Date: 24-SEP-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch	R2953510							
WG1953512-3 CRM		TMRM_20						
Uranium (U)-Dissolved			100.1		%		80-120	20-SEP-14
Vanadium (V)-Dissolved			102.0		%		80-120	20-SEP-14
Zinc (Zn)-Dissolved			104.3		%		80-120	20-SEP-14
WG1953512-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-SEP-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Barium (Ba)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Bismuth (Bi)-Dissolved			<0.00020		mg/L		0.0002	20-SEP-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-SEP-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-SEP-14
Chromium (Cr)-Dissolved			<0.00020		mg/L		0.0002	20-SEP-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-14
Iron (Fe)-Dissolved			<0.020		mg/L		0.02	20-SEP-14
Lead (Pb)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Lithium (Li)-Dissolved			<0.0020		mg/L		0.002	20-SEP-14
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-14
Molybdenum (Mo)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-14
Phosphorus (P)-Dissolved			<0.10		mg/L		0.1	20-SEP-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-SEP-14
Silver (Ag)-Dissolved			<0.000020		mg/L		0.00002	20-SEP-14
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-SEP-14
Thallium (Tl)-Dissolved			<0.000050		mg/L		0.00005	20-SEP-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Titanium (Ti)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-14
Uranium (U)-Dissolved			<0.000020		mg/L		0.00002	20-SEP-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	20-SEP-14
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	20-SEP-14
N2/N3-SK	Water							



Quality Control Report

Workorder: L1519192

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
N2/N3-SK		Water						
Batch	R2950921							
WG1953426-1	DUP	L1519192-3						
Nitrate-N		0.86	0.92		mg/L	6.9	20	17-SEP-14
Nitrite-N		<0.050	<0.050	RPD-NA	mg/L	N/A	25	17-SEP-14
Nitrate+Nitrite-N		0.87	0.93		mg/L	6.8	20	17-SEP-14
WG1953426-3	LCS							
Nitrate-N			3.08		mg/L		2.55-3.45	17-SEP-14
Nitrite-N			0.510		mg/L		0.425-0.575	17-SEP-14
Nitrate+Nitrite-N			3.59		mg/L		3-4	17-SEP-14
WG1953426-2	MB							
Nitrate-N			<0.50		mg/L		0.5	17-SEP-14
Nitrite-N			<0.050		mg/L		0.05	17-SEP-14
Nitrate+Nitrite-N			<0.50		mg/L		0.5	17-SEP-14
PH-PCT-SK		Water						
Batch	R2951569							
WG1953353-2	LCS							
pH			6.87		pH		6.76-6.96	18-SEP-14

Quality Control Report

Workorder: L1519192

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1519192

Report Date: 24-SEP-14

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
	2	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
	3	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
	4	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
	5	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
	6	Not provided	18-SEP-14 11:07	0.25	22	hours	EHTR-FM
Bacteriological Tests							
Iron Bacteria							
	1	Not provided	18-SEP-14 16:40	24	27	hours	EHT
	2	Not provided	18-SEP-14 16:40	24	27	hours	EHT
	3	Not provided	18-SEP-14 16:40	24	27	hours	EHT
	4	Not provided	18-SEP-14 16:40	24	27	hours	EHT
	5	Not provided	18-SEP-14 16:40	24	27	hours	EHT
	6	Not provided	18-SEP-14 16:40	24	27	hours	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1519192 were received on 17-SEP-14 13:35.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



L1519192-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Company: Golder Associates
 Contact: Crystal Rinas
 Address: 1721 8th St E
 Saskatoon SK S7H 0T4
 Phone: 306-665-7989 Fax: 306-665-3342

Report Format / Distribution
 Standard Other
 PDF Excel Digital Fax
 Email 1: crinas@golder.com
 Email 2:

Service Requested (Rush for routine analysis subject to availability)
 Regular (Default)
 Priority (Specify Date Required → →)
 Emergency (1 Business Day) - 100% Surcharges apply
 For Emergency < 1 Day, ASAP of ALS

Analysis Request
 Please indicate below Filtered, Preserved or both (F, P, F/P)
 Filtered: Preserved: Both:

Client / Project Information
 Job #: 1406388
 PO / AFE:
 LSD:
 Quote #:
 ALS Contact:
 Date (dd-mm-yy):
 Time (hh:mm):
 Sampler:
 Sample Type:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sampler	Sample Type	Number of Containers
	RW-14-001 shallow				Routine	
	RW-14-002 shallow				MET-D-COMS-SK	
	RW-14-003 shallow				TC, EC Q151-SK	
	RW-14-004 shallow				IR-BART	
	RW-14-005 shallow				HPC	
	RW-14-006 deep					
	RW-14-007 deep					
	RW-14-008 deep					
	RW-14-009 deep					
	RW-14-010 deep					
	RW-14-011 shallow				Routine	
	RW-14-042 deep				Routine	

Special Instructions / Regulations / Regulations / Hazardous Details

Golder requests report "STANDARDQC_ALS" and custom digital report "GOLDER_SK".

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

Released by:

Received by:

Date (dd-mm-yy): 17 Feb 13.17

Temperature: 7 °C

Verified by: 44

Date: 17-02-13

Time: 1:30

Observations: Yes/No? If Yes add SIF



Golder Associates Ltd.
ATTN: Crystal Rinas
1721 8th Street East
Sasktoon SK S7H 0T4

Date Received: 23-SEP-14
Report Date: 29-SEP-14 13:17 (MT)
Version: FINAL

Client Phone: 306-665-7989

Certificate of Analysis

Lab Work Order #: L1521788
Project P.O. #: NOT SUBMITTED
Job Reference: 1406388
C of C Numbers:
Legal Site Desc:

Brian Morgan
Account Manager

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ADDRESS: #819-58th St E., Saskatoon, SK S7K 6X5 Canada | Phone: +1 306 668 8370 | Fax: +1 306 668 8383
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-1 RW-14-001 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 13:15							
Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00083	DLA	0.00020	mg/L		23-SEP-14	R2957744
Barium (Ba)-Dissolved	0.0249	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.056	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	0.000055	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	0.00202	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0023	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.0415	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	0.853	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00889	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0055	DLA	0.0010	mg/L		23-SEP-14	R2957744
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.00113	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.90	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	0.364	DLA	0.00040	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.00782	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00046	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	357.		20	mg/L		24-SEP-14	R2957305
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO ₃)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO ₃)	293		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	9.9		1.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	1380		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	111		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	7.2		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	114		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	38.3		2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO ₄)	484		3.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-1 RW-14-001 DEEP Sampled By: CLIENT on 22-SEP-14 @ 13:15 Matrix: GROUNDWATER							
Ion Balance Calculation							
Cation - Anion Balance	1.7			%		24-SEP-14	
TDS (Calculated)	940			mg/L		24-SEP-14	
Hardness (as CaCO3)	747			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.78		0.10	pH		24-SEP-14	R2957305
L1521788-2 RW-14-007 DEEP Sampled By: CLIENT on 22-SEP-14 @ 14:15 Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00058	DLA	0.00020	mg/L		23-SEP-14	R2957744
Barium (Ba)-Dissolved	0.0196	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.036	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	0.000057	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	0.00181	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0018	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.0323	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	1.33	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00510	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0058	DLA	0.0010	mg/L		23-SEP-14	R2957744
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.00491	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.26	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	0.434	DLA	0.00040	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.0145	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00029	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	327.		20	mg/L		24-SEP-14	R2957305

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-2 RW-14-007 DEEP Sampled By: CLIENT on 22-SEP-14 @ 14:15 Matrix: GROUNDWATER							
Alkalinity by Auto. Titration							
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO3)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO3)	268		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	53.6	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	2410		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	287	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	7.9	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	161	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	90.2	DLA	4.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO4)	1160	DLA	6.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							
Cation - Anion Balance	1.1			%		24-SEP-14	
TDS (Calculated)	1920			mg/L		24-SEP-14	
Hardness (as CaCO3)	1380			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.63		0.10	pH		24-SEP-14	R2957305
L1521788-3 RW-14-008 DEEP Sampled By: CLIENT on 22-SEP-14 @ 14:45 Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	165		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00212	DLA	0.00020	mg/L		23-SEP-14	R2957744
Barium (Ba)-Dissolved	0.0472	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.058	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	<0.000020	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0012	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.0355	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	0.0437	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00412	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0052	DLA	0.0010	mg/L		23-SEP-14	R2957744

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-3 RW-14-008 DEEP Sampled By: CLIENT on 22-SEP-14 @ 14:45 Matrix: GROUNDWATER							
Dissolved Metals in Water by CRC ICPMS							
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.00067	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.38	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	0.475	DLA	0.00040	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.00506	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00027	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	477.		20	mg/L		24-SEP-14	R2957305
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO3)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO3)	391		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	12.1		1.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	1220		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	123		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	6.5		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	77.1		1.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	40.3		2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO4)	273		3.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							
Cation - Anion Balance	2.0			%		24-SEP-14	
TDS (Calculated)	767			mg/L		24-SEP-14	
Hardness (as CaCO3)	625			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.65		0.10	pH		24-SEP-14	R2957305
L1521788-4 RW-14-010 DEEP Sampled By: CLIENT on 22-SEP-14 @ 15:00 Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 9000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	43		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	0.00054	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00109	DLA	0.00020	mg/L		23-SEP-14	R2957744

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-4 RW-14-010 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 15:00							
Matrix: GROUNDWATER							
Dissolved Metals in Water by CRC ICPMS							
Barium (Ba)-Dissolved	0.0310	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.192	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	0.000176	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	0.00366	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0036	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.115	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	0.607	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00756	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0144	DLA	0.0010	mg/L		23-SEP-14	R2957744
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.0375	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.66	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	2.01	DLA	0.0020	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.0329	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00037	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	456.		20	mg/L		24-SEP-14	R2957305
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO ₃)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO ₃)	374		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	62.0		1.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	4480		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	476	DLA	10	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	16	DLA	10	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	384	DLA	10	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	314	DLA	20	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO ₄)	2790	DLA	30	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							
Cation - Anion Balance	1.5			%		24-SEP-14	
TDS (Calculated)	4270			mg/L		24-SEP-14	
Hardness (as CaCO ₃)	2770			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.47		0.10	pH		24-SEP-14	R2957305

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-5 RW-14-009 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 15:30							
Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	25		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	0.00027	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00068	DLA	0.00020	mg/L		23-SEP-14	R2957744
Barium (Ba)-Dissolved	0.0338	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.098	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	0.000084	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	0.00310	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0068	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.0633	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	1.01	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00492	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0117	DLA	0.0010	mg/L		23-SEP-14	R2957744
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.00689	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.45	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	0.835	DLA	0.00040	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	0.00021	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.0289	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00030	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	0.030	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	456.		20	mg/L		24-SEP-14	R2957305
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO3)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO3)	374		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	18.6		1.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	2440		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	257	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	9.7	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	158	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	96.3	DLA	4.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO4)	1040	DLA	6.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-5 RW-14-009 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 15:30							
Matrix: GROUNDWATER							
Ion Balance Calculation							
Cation - Anion Balance	1.0			%		24-SEP-14	
TDS (Calculated)	1800			mg/L		24-SEP-14	
Hardness (as CaCO3)	1290			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.54		0.10	pH		24-SEP-14	R2957305
L1521788-6 RW-14-006 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 16:00							
Matrix: GROUNDWATER							
Miscellaneous Parameters							
Heterotrophic Plate Count	>3000		10	CFU/mL	24-SEP-14	26-SEP-14	R2960649
Iron Bacteria	Present					24-SEP-14	R2962574
Note: Approximate population 35000 CFU/mL							
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	>200.5		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Escherichia Coli	0		0	MPN/100mL	23-SEP-14	24-SEP-14	R2957824
Dissolved Metals in Water by CRC ICPMS							
Aluminum (Al)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Antimony (Sb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Arsenic (As)-Dissolved	0.00302	DLA	0.00020	mg/L		23-SEP-14	R2957744
Barium (Ba)-Dissolved	0.0467	DLA	0.0010	mg/L		23-SEP-14	R2957744
Beryllium (Be)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Bismuth (Bi)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Boron (B)-Dissolved	0.099	DLA	0.020	mg/L		23-SEP-14	R2957744
Cadmium (Cd)-Dissolved	0.000079	DLA	0.000020	mg/L		23-SEP-14	R2957744
Chromium (Cr)-Dissolved	<0.00040	DLA	0.00040	mg/L		23-SEP-14	R2957744
Cobalt (Co)-Dissolved	0.00131	DLA	0.00020	mg/L		23-SEP-14	R2957744
Copper (Cu)-Dissolved	0.0016	DLA	0.0010	mg/L		23-SEP-14	R2957744
Iron (Fe)-Dissolved	<0.040	DLA	0.040	mg/L		23-SEP-14	R2957744
Lead (Pb)-Dissolved	<0.00020	DLA	0.00020	mg/L		23-SEP-14	R2957744
Lithium (Li)-Dissolved	0.0309	DLA	0.0040	mg/L		23-SEP-14	R2957744
Manganese (Mn)-Dissolved	0.469	DLA	0.0010	mg/L		23-SEP-14	R2957744
Molybdenum (Mo)-Dissolved	0.00636	DLA	0.00020	mg/L		23-SEP-14	R2957744
Nickel (Ni)-Dissolved	0.0057	DLA	0.0010	mg/L		23-SEP-14	R2957744
Phosphorus (P)-Dissolved	<0.20	DLA	0.20	mg/L		23-SEP-14	R2957744
Selenium (Se)-Dissolved	0.00040	DLA	0.00020	mg/L		23-SEP-14	R2957744
Silicon (Si)-Dissolved	7.43	DLA	0.10	mg/L		23-SEP-14	R2957744
Silver (Ag)-Dissolved	<0.000040	DLA	0.000040	mg/L		23-SEP-14	R2957744
Strontium (Sr)-Dissolved	0.695	DLA	0.00040	mg/L		23-SEP-14	R2957744
Thallium (Tl)-Dissolved	<0.00010	DLA	0.00010	mg/L		23-SEP-14	R2957744
Tin (Sn)-Dissolved	0.00025	DLA	0.00020	mg/L		23-SEP-14	R2957744
Titanium (Ti)-Dissolved	<0.0010	DLA	0.0010	mg/L		23-SEP-14	R2957744
Uranium (U)-Dissolved	0.00539	DLA	0.000040	mg/L		23-SEP-14	R2957744
Vanadium (V)-Dissolved	0.00033	DLA	0.00020	mg/L		23-SEP-14	R2957744
Zinc (Zn)-Dissolved	<0.010	DLA	0.010	mg/L		23-SEP-14	R2957744
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	405.		20	mg/L		24-SEP-14	R2957305

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1521788-6 RW-14-006 DEEP							
Sampled By: CLIENT on 22-SEP-14 @ 16:00							
Matrix: GROUNDWATER							
Alkalinity by Auto. Titration							
Hydroxide (OH)	<10.		10	mg/L		24-SEP-14	R2957305
Carbonate (CO3)	<10.		10	mg/L		24-SEP-14	R2957305
Alkalinity, Total (as CaCO3)	332		20	mg/L		24-SEP-14	R2957305
Chloride (Cl)							
Chloride (Cl)	16.6		1.0	mg/L	24-SEP-14	24-SEP-14	R2957871
Conductivity (Automated)							
Conductivity	1570		10	uS/cm		24-SEP-14	R2957305
ICP Cations							
Calcium (Ca)	195	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Potassium (K)	7.9	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Magnesium (Mg)	79.9	DLA	2.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sodium (Na)	57.3	DLA	4.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Sulfur (as SO4)	558	DLA	6.0	mg/L	24-SEP-14	24-SEP-14	R2957527
Ion Balance Calculation							
Cation - Anion Balance	0.7			%		24-SEP-14	
TDS (Calculated)	1110			mg/L		24-SEP-14	
Hardness (as CaCO3)	816			mg/L		24-SEP-14	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrite-N	<0.050		0.050	mg/L	23-SEP-14	23-SEP-14	R2956620
Nitrate+Nitrite-N	<0.50		0.50	mg/L	23-SEP-14	23-SEP-14	R2956620
pH by Meter (Automated)							
pH	7.58		0.10	pH		24-SEP-14	R2957305

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PCT-SK	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
CL-COL-SK	Water	Chloride (Cl)	APHA 4500-CL E
Chloride in aqueous matrices is determined colorimetrically by auto-analyzer.			
EC-PCT-SK	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
ETL-ROUTINE-ICP-SK	Water	ICP Cations	APHA 3120 B-ICP-OES-ROU
These ions are determined directly y ICP-OES.			
Reference Greenberg, Arnold E., Cleseri, Lenore S., Eaton, Andrew D., Standard Methods For The Examination of Water and Wastewater, 18th Edition, 1992, Method 3120B.			
HPC-PP-WP	Water	Heterotrophic Plate Count	APHA 9215B
This is a procedure for estimating the number of live heterotrophic bacteria in water and measuring changes during water treatment and distribution or in swimming pools. In the pour plate method, samples are diluted and plated on to media. After incubation, the colonies are counted and reported as CFU/mL.			
IB-BART-WP	Water	Iron Bacteria	BART TEST KIT
Iron Related Bacteria- IRB Iron Related Bacteria include organisms that reduce or oxidize iron. Problems include esthetic (taste and odour) problems and 'red water'. Iron-Related Bacteria include Crenothrix, Gallionella, Siderocapsa, Sphaerotilus and Thiobacillus ferroxidans.			
IRB: Analytical Method A small amount of sample is transferred to a vial. A color reaction is observed (over 8 days) within the chamber to indicate the presence of Iron Related Bacteria. The colour reaction determines the population of Iron Related Bacteria. The results are reported as estimated value of Colony Forming Units (CFU/ml).			
IONBALANCE-OP03-SK	Water	Ion Balance Calculation	APHA 1030-E
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
N2/N3-SK	Water	Nitrate, Nitrite and Nitrate+Nitrite-N	APHA 4500 NO3F
Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water-soluble dye has a magenta color, which is measured at 520nm. Original nitrite can also be determined by removing the cadmium column and following the same procedure. Nitrate-N, Nitrite-N and NO3+NO2-N are reported.			
Reference Greenberg, Arnold E., Cleseri, Lenore S., Eaton, Andrew D., Standard Methods For The Examination of Water and Wastewater, 18th Edition, 1992, Method 4500NO3-F.			
PH-PCT-SK	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
TC,EC-QT51-SK	Water	Total Coliform, E. Coli - Quanti-Tray	APHA 9223B 2B
The analysis of Total Coliform (TC) & Escherichia coli (EC) is processed by Quanti-tray (QT): Two substrates, ONPG for TC detection and MUG for EC detection are used. The substrates are added to the 100 ml sample dispensed into the 51 well tray. The tray is incubated at 35 Celcius for 24 hours. A			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		colour reaction develops to indicate a positive reaction (presence of TC, EC). The number of positive wells are counted and converted to Most Probable Number Units (MPNU) per 100 ml.	

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

Page 1 of 6

Client: Golder Associates Ltd.
 1721 8th Street East
 Saskatoon SK S7H 0T4

Contact: Crystal Rinas

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-PCT-SK Water								
Batch R2957305								
WG1957672-2	LCS							
Alkalinity, Total (as CaCO3)			102.2		%		85-115	24-SEP-14
WG1957672-3	MB							
Alkalinity, Total (as CaCO3)			<20		mg/L		20	24-SEP-14
CL-COL-SK Water								
Batch R2957871								
WG1958467-4	LCS							
Chloride (Cl)			109.4		%		85-115	24-SEP-14
WG1958467-1	MB							
Chloride (Cl)			<1.0		mg/L		1	24-SEP-14
EC-PCT-SK Water								
Batch R2957305								
WG1957672-2	LCS							
Conductivity			99.98		%		90-110	24-SEP-14
WG1957672-3	MB							
Conductivity			<10		uS/cm		10	24-SEP-14
ETL-ROUTINE-ICP-SK Water								
Batch R2957527								
WG1957582-3	LCS							
Calcium (Ca)			95.3		%		80-120	24-SEP-14
Potassium (K)			93.9		%		80-120	24-SEP-14
Magnesium (Mg)			95.5		%		80-120	24-SEP-14
Sodium (Na)			94.8		%		80-120	24-SEP-14
Sulfur (as SO4)			93.2		%		90-110	24-SEP-14
WG1957582-1	MB							
Calcium (Ca)			<1.0		mg/L		1	24-SEP-14
Potassium (K)			<1.0		mg/L		1	24-SEP-14
Magnesium (Mg)			<1.0		mg/L		1	24-SEP-14
Sodium (Na)			<2.0		mg/L		2	24-SEP-14
Sulfur (as SO4)			<3.0		mg/L		3	24-SEP-14
HPC-PP-WP Water								
Batch R2960649								
WG1958318-1	DUP	L1521788-1						
Heterotrophic Plate Count			>3000	>3000	CFU/mL	0.0	65	26-SEP-14
WG1958318-2	MB							
Heterotrophic Plate Count			<10		CFU/mL		10	26-SEP-14
Water								



Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK								
	Water							
Batch	R2957744							
WG1957407-3 CRM		TMRM_20						
Aluminum (Al)-Dissolved			103.7		%		80-120	23-SEP-14
Antimony (Sb)-Dissolved			103.1		%		80-120	23-SEP-14
Arsenic (As)-Dissolved			103.4		%		80-120	23-SEP-14
Barium (Ba)-Dissolved			101.8		%		80-120	23-SEP-14
Beryllium (Be)-Dissolved			99.5		%		80-120	23-SEP-14
Bismuth (Bi)-Dissolved			103.9		%		80-120	23-SEP-14
Boron (B)-Dissolved			92.6		%		80-120	23-SEP-14
Cadmium (Cd)-Dissolved			100.3		%		80-120	23-SEP-14
Chromium (Cr)-Dissolved			102.9		%		80-120	23-SEP-14
Cobalt (Co)-Dissolved			101.0		%		80-120	23-SEP-14
Copper (Cu)-Dissolved			100.4		%		80-120	23-SEP-14
Iron (Fe)-Dissolved			99.1		%		80-120	23-SEP-14
Lead (Pb)-Dissolved			103.1		%		80-120	23-SEP-14
Lithium (Li)-Dissolved			105.0		%		80-120	23-SEP-14
Manganese (Mn)-Dissolved			104.5		%		80-120	23-SEP-14
Molybdenum (Mo)-Dissolved			98.1		%		80-120	23-SEP-14
Nickel (Ni)-Dissolved			102.1		%		80-120	23-SEP-14
Phosphorus (P)-Dissolved			98.6		%		70-130	23-SEP-14
Selenium (Se)-Dissolved			100.9		%		80-120	23-SEP-14
Silicon (Si)-Dissolved			104.5		%		80-120	23-SEP-14
Silver (Ag)-Dissolved			101.1		%		80-120	23-SEP-14
Strontium (Sr)-Dissolved			100.1		%		80-120	23-SEP-14
Thallium (Tl)-Dissolved			106.3		%		80-120	23-SEP-14
Tin (Sn)-Dissolved			101.2		%		80-120	23-SEP-14
Titanium (Ti)-Dissolved			102.7		%		80-120	23-SEP-14
Uranium (U)-Dissolved			100.7		%		80-120	23-SEP-14
Vanadium (V)-Dissolved			101.0		%		80-120	23-SEP-14
Zinc (Zn)-Dissolved			103.6		%		80-120	23-SEP-14
WG1957407-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	23-SEP-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Barium (Ba)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14



Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK		Water						
Batch R2957744								
WG1957407-1 MB								
Bismuth (Bi)-Dissolved			<0.00020		mg/L		0.0002	23-SEP-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-SEP-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	23-SEP-14
Chromium (Cr)-Dissolved			<0.00020		mg/L		0.0002	23-SEP-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-14
Iron (Fe)-Dissolved			<0.020		mg/L		0.02	23-SEP-14
Lead (Pb)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Lithium (Li)-Dissolved			<0.0020		mg/L		0.002	23-SEP-14
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-14
Molybdenum (Mo)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-14
Phosphorus (P)-Dissolved			<0.10		mg/L		0.1	23-SEP-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-SEP-14
Silver (Ag)-Dissolved			<0.000020		mg/L		0.00002	23-SEP-14
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-SEP-14
Thallium (Tl)-Dissolved			<0.000050		mg/L		0.00005	23-SEP-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Titanium (Ti)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-14
Uranium (U)-Dissolved			<0.000020		mg/L		0.00002	23-SEP-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-14
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	23-SEP-14
N2/N3-SK		Water						
Batch R2956620								
WG1957649-1 DUP		L1521788-6						
Nitrate-N		<0.50	<0.50	RPD-NA	mg/L	N/A	20	23-SEP-14
Nitrite-N		<0.050	<0.050	RPD-NA	mg/L	N/A	25	23-SEP-14
Nitrate+Nitrite-N		<0.50	<0.50	RPD-NA	mg/L	N/A	20	23-SEP-14
WG1957649-3 LCS								
Nitrate-N			2.98		mg/L		2.55-3.45	23-SEP-14
Nitrite-N			0.512		mg/L		0.425-0.575	23-SEP-14
Nitrate+Nitrite-N			3.49		mg/L		3-4	23-SEP-14
WG1957649-2 MB								
Nitrate-N			<0.50		mg/L		0.5	23-SEP-14



Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
N2/N3-SK	Water							
Batch	R2956620							
WG1957649-2 MB								
Nitrite-N			<0.050		mg/L		0.05	23-SEP-14
Nitrate+Nitrite-N			<0.50		mg/L		0.5	23-SEP-14
PH-PCT-SK	Water							
Batch	R2957305							
WG1957672-2 LCS								
pH			6.84		pH		6.76-6.96	24-SEP-14

Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1521788

Report Date: 29-SEP-14

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	22-SEP-14 13:15	24-SEP-14 11:42	0.25	47	hours	EHTR-FM
	2	22-SEP-14 14:15	24-SEP-14 11:42	0.25	45	hours	EHTR-FM
	3	22-SEP-14 14:45	24-SEP-14 11:42	0.25	45	hours	EHTR-FM
	4	22-SEP-14 15:00	24-SEP-14 11:42	0.25	45	hours	EHTR-FM
	5	22-SEP-14 15:30	24-SEP-14 11:42	0.25	44	hours	EHTR-FM
	6	22-SEP-14 16:00	24-SEP-14 11:42	0.25	44	hours	EHTR-FM
Bacteriological Tests							
Heterotrophic Plate Count							
	1	22-SEP-14 13:15	24-SEP-14 12:23	24	47	hours	EHTL
	2	22-SEP-14 14:15	24-SEP-14 12:23	24	46	hours	EHTL
	3	22-SEP-14 14:45	24-SEP-14 12:23	24	46	hours	EHTL
	4	22-SEP-14 15:00	24-SEP-14 12:23	24	45	hours	EHTL
	5	22-SEP-14 15:30	24-SEP-14 12:23	24	45	hours	EHTL
	6	22-SEP-14 16:00	24-SEP-14 12:23	24	44	hours	EHTL
Iron Bacteria							
	1	22-SEP-14 13:15	24-SEP-14 12:00	24	47	hours	EHTL
	2	22-SEP-14 14:15	24-SEP-14 12:00	24	46	hours	EHTL
	3	22-SEP-14 14:45	24-SEP-14 12:00	24	45	hours	EHTL
	4	22-SEP-14 15:00	24-SEP-14 12:00	24	45	hours	EHTL
	5	22-SEP-14 15:30	24-SEP-14 12:00	24	44	hours	EHTL
	6	22-SEP-14 16:00	24-SEP-14 12:00	24	44	hours	EHTL

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1521788 were received on 23-SEP-14 11:35.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



L1521788-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Page 1 of 1

Standard Other PDF Excel Digital Fax
 Email 1: crinas@golder.com Email 2:
 Report Format / Distribution

Regular (Default) Priority (Specify Date Required → → →)
 Emergency (1 Business Day) - 100% Surcharge
 For Emergency < 1 Day, ASAP or Weekend - Contact ALS
 Service Requested (Rush for routine analysis subject to availability)

Invoice To Same as Report? Yes No
 Company: 306-665-7989 Fax: 306-665-3342
 Client / Project Information
 Job #: 1406388
 PO / AFE:
 LSD:
 Quote #:
 ALS Contact:
 Sampler:

Sample #	Lab Work Order # (do not use only)	Sample Identification (This description will appear on the report)		Date (dd-mm-yy)	Time (h:mm)	Sample Type	Analysis Request				Number of Containers	
							Routine	MET-D-CMS-SK	TC, EC Q151-SK	IR-BART		HP
		RW-14-001 deep		22-Sep-14	13:15	Groundwater	X	X	X	X		4
		RW-14-007 deep		22-Sep-14	14:15	Groundwater	X	X	X	X		4
		RW-14-008 deep		22-Sep-14	14:45	Groundwater	X	X	X	X		4
		RW-14-010 deep		22-Sep-14	15:00	Groundwater	X	X	X	X		4
		RW-14-009 deep		22-Sep-14	15:30	Groundwater	X	X	X	X		4
		RW-14-006 deep		22-Sep-14	16:00	Groundwater	X	X	X	X		4

Special Instructions / Regulations / Hazardous Details

Golder requests report "STANDARDQC_ALS" and custom digital report "GOLDER_SK".

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

Released by: [Signature] Date (dd-mm-yy) 23 Sep 14 Time (h:mm) 10:23 Received by: [Signature] Date: 23 Sep 14 Time: 10:30
 Temperature: 6.2°C Verified by: [Signature] Date: 23 Sep 14 Time: 10:30
 Observations: Yes/No? If Yes add SIF



APPENDIX D

Water Well Records

LINDEN, DALE		Completion	05/01/1974
			RM
		Major Basin	06
		SubBasin	30
		NTS Map	73B00
WWDR#	012381		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			600.00 ft from N/S Boundary S
							360.00 ft from E/W Boundary W

Well Information						
Driller #	PRAIRIE WATER LTD					
Water Use	Domestic					
Hole #						
Well Use	Withdrawal	Well Casings				
Installation Method	Bored	Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	28.00	0.00	0.00	0.00	Porous Concrete	
Water Level	0.00	0.00	0.00	0.00		
Bit	0.00	Screens				
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00
Pump Test						
Draw Down	0.00 ft	Elevation		1,700.00 ft	Aquifer	
Duration	0.00 hrs	Rec. Pumping Rate		0.00	E-Log No	
Pumping Rate	0.00 igpm	Intake		0.00	Phys E03	
Temp	0.00 deg. F					

Lithology List

Depth (ft)	Material	Colour	Description
10.00	Clay	Brown	Unknown
20.00	Clay	Grey	Unknown
27.00	Clay	Grey	Sandy
28.00	Gravel	Unknown	Unknown
32.00	Clay	Grey	Unknown

STEINSEN, WALLEY		Completion	08/01/1970
			RM
		Major Basin	06
		SubBasin	30
		NTS Map	73B00
WWDR#	031795		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	23	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			800.00 ft from N/S Boundary S
							1,000.00 ft from E/W Boundary W

Well Information						
Driller #	PEDERSON DRILLING					
Water Use	Domestic					
Hole #						
Well Use	Withdrawal	Well Casings				
Installation Method	Drilled	Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	60.00	0.00	0.00	4.00	Steel	
Water Level	24.00	0.00	0.00	0.00		
Bit	4.00	Screens				
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		5.00	60.00	4.00	25.00	Stainless Steel
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
Pump Test						
Draw Down	20.00 ft	Elevation		1,780.00 ft	Aquifer	
Duration	7.00 hrs	Rec. Pumping Rate		5.00	E-Log No	
Pumping Rate	12.00 igpm	Intake		48.00	Phys E22	
Temp	42.00 deg. F					

Lithology List

Depth (ft)	Material	Colour	Description
27.00	Clay	Brown	Soft
37.00	Sandy Clay	Unknown	Soft
52.00	Clay	Blue	Sand Streaks
61.00	Silty Clay	Brown	Sandy

ANTONIUK, KEN	Completion 10/18/1976
	RM
	Major Basin 06
	SubBasin 30
	NTS Map 73B00
WWDR# 048641	

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	24	036	04	3		
							Location of Well (in Quarter)
							200.00 ft from N/S Boundary S
Zone	Easting	Northing	Source	Accuracy			600.00 ft from E/W Boundary W

Well Information						
Driller #	MITCHELL DRILLING (1979) LTD					
Water Use	Domestic					
Hole #	001	Well Casings				
Well Use	Withdrawal	Length (ft)	Btm (ft)	Dia (in)	Description	
Installation Method	Drilled	0.00	65.00	4.50	Black Iron	
Depth	80.00	0.00	0.00	0.00		
Water Level	11.00	0.00	0.00	0.00		
Bit	6.20	Screens				
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		10.00	75.00	4.00	10.00	Stainless Steel
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
Pump Test						
Draw Down	16.00 ft	Elevation		1,800.00 ft	Aquifer	
Duration	24.00 hrs	Rec. Pumping Rate		25.00	E-Log SCANNED	
Pumping Rate	38.00 igpm	Intake		60.00	Phys E22	
Temp	42.00 deg. F					

Lithology List

Depth (ft)	Material	Colour	Description
12.00	Till	Brown	Unknown
32.00	Till	Grey	Unknown
38.00	Gravel	Unknown	Sandy
60.00	Till	Grey	Unknown
76.00	Gravel	Unknown	Sandy
80.00	Till	Grey	Unknown

STATHAM, TED		Completion	05/20/1977
			RM
		Major Basin	06
		SubBasin	30
		NTS Map	73B00
WWDR#	051299		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	11	036	04	3		
Zone	Easting	Northing	Source	Accuracy	Location of Well (in Quarter)		
					500.00	ft from N/S Boundary	N
					600.00	ft from E/W Boundary	E

Well Information							
Driller #	PEDERSON DRILLING						
Water Use	Domestic						
Hole #	002						
Well Use	Withdrawal			Well Casings			
Installation Method	Drilled			Length (ft)	Btm (ft)	Dia (in)	Description
Depth	162.00			143.00	142.00	5.00	Black Iron
Water Level	0.00			0.00	0.00	0.00	
Bit	6.50						
Flowing Head	0.00			Screens			
				Length (ft)	Btm (ft)	Dia (in)	Slot (in) Description
				15.00	157.00	4.00	7.00 Stainless Steel
				0.00	0.00	0.00	0.00
				0.00	0.00	0.00	0.00
Pump Test							
Draw Down	0.00 ft						
Duration	60.00 hrs	Elevation	1,750.00 ft			Aquifer	
Pumping Rate	6.00 igpm	Rec. Pumping Rate	6.00			E-Log	No
Temp	0.00 deg. F	Intake	138.00			Phys	E22

Lithology List

Depth (ft)	Material	Colour	Description
1.00	Topsoil	Black	Unknown
16.00	Till	Brown	Oxidized
18.00	Till	Brown	Hard
140.00	Till	Grey	Hard
157.00	Sand	Grey	Fine
162.00	Till	Grey	Hard

ANTONUUK, KEN		Completion	06/18/1985
			RM
			Major Basin 06
			SubBasin 30
			NTS Map 73B00
WWDR#	080788		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	23	036	04	3		
							Location of Well (in Quarter)
							600.00 ft from N/S Boundary N
Zone	Easting	Northing	Source	Accuracy			
							800.00 ft from E/W Boundary E

Well Information							
Driller #	MITCHELL DRILLING (1979) LTD						
Water Use	Domestic						
Hole #	1						
Well Use	Withdrawal	Well Casings					
Installation Method	Drilled	Length (ft)	Btm (ft)	Dia (in)	Description		
Depth	100.00	70.00	0.00	5.00	P.V.C.		
Water Level	22.00	0.00	0.00	0.00			
Bit	5.10	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		5.00	75.00	4.00	20.00	Stainless Steel	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	26.00 ft						
Duration	2.00 hrs	Elevation	1,790.00 ft		Aquifer		
Pumping Rate	20.00 igpm	Rec. Pumping Rate	12.00		E-Log	SCANNED	
Temp	41.00 deg. F	Intake	60.00		Phys	E22	

Lithology List

Depth (ft)	Material	Colour	Description
12.00	Till	Brown	Unknown
41.00	Till	Grey	Unknown
75.00	Sand	Unknown	Till Streaks
100.00	Till	Grey	Unknown

HAMILTON, IAN		Completion	07/07/1985
			RM
		Major Basin	06
		SubBasin	30
		NTS Map	73B00
WWDR#	082742		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	23	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			600.00 ft from N/S Boundary N
							660.00 ft from E/W Boundary W

Well Information							
Driller #	MAGNUM WELL SERVICE INC						
Water Use	Domestic						
Hole #	001						
Well Use	Withdrawal						
Installation Method	Drilled						
Depth	75.00			Well Casings Length (ft)	55.00	Btm (ft)	54.00
Water Level	24.00					Dia (in)	5.00
Bit	7.80					Description	P.V.C.
Flowing Head	0.00			Screens Length (ft)	10.00	Btm (ft)	65.00
						Dia (in)	5.00
						Slot (in)	25.00
						Description	Stainless Steel
							0.00
							0.00
Pump Test							
Draw Down	30.00 ft						
Duration	2.00 hrs	Elevation	1,775.00 ft		Aquifer		
Pumping Rate	22.00 igpm	Rec. Pumping Rate	10.00		E-Log	No	
Temp	42.00 deg. F	Intake	45.00		Phys	E22	

Lithology List

Depth (ft)	Material	Colour	Description
3.00	Topsoil	Unknown	Unknown
28.00	Clay	Brown	Unknown
38.00	Clay	Yellow	Stoney
42.00	Clay	Unknown	Gravelly
50.00	Till	Grey	Unknown
75.00	Sand & Gravel	Unknown	Clay Streaks

FREEBORN, DON	Completion 04/15/1986
	RM
	Major Basin 06
	SubBasin 30
	NTS Map 73B00
WWDR# 086518	

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			750.00 ft from N/S Boundary S
							400.00 ft from E/W Boundary W

Well Information							
Driller #	MITCHELL DRILLING (1979) LTD						
Water Use	Domestic						
Hole #	1						
Well Use	Withdrawal	Well Casings					
Installation Method	Drilled	Length (ft)	Btm (ft)	Dia (in)	Description		
Depth	330.00	0.00	0.00	0.00	P.V.C.		
Water Level	32.00	0.00	0.00	0.00			
Bit	5.10	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		10.00	300.00	4.00	25.00	Stainless Steel	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	89.00 ft	Elevation		1,760.00 ft	Aquifer		
Duration	4.00 hrs	Rec. Pumping Rate		25.00	E-Log SCANNED		
Pumping Rate	65.00 igpm	Intake		150.00	Phys E22		
Temp	41.00 deg. F						

Lithology List

Depth (ft)	Material	Colour	Description
16.00	Silt	Brown	Unknown
125.00	Till	Grey	Sandy
188.00	Till	Grey	Cobblestones
194.00	Sand	Unknown	Coarse
247.00	Till	Grey	Sandy
253.00	Sand	Grey	Fine
286.00	Till	Grey	Unknown
316.00	Sand	Unknown	Fine-medium
340.00	Till	Grey	Unknown

TOUCHER, PAUL		Completion	09/22/1998
			RM 344
			Major Basin 06
			SubBasin 30
			NTS Map 73B01
WWDR#	110409		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	NW	13	036	04	3		
Zone	Easting	Northing	Source	Accuracy	Location of Well (in Quarter)		
					300.00	ft from N/S Boundary	S
					600.00	ft from E/W Boundary	E

Well Information							
Driller #	MITCHELL DRILLING (1979) LTD						
Water Use	Domestic						
Hole #	001	Well Casings					
Well Use	Withdrawal	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	73.00	71.00	5.00	P.V.C.		
Depth	260.00	0.00	0.00	0.00			
Water Level	16.00	0.00	0.00	0.00			
Bit	5.10	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		4.00	75.00	4.00	20.00	Stainless Steel	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	38.00	ft					
Duration	2.00	hrs	Elevation	1,771.00	ft	Aquifer	
Pumping Rate	10.00	igpm	Rec. Pumping Rate	8.00		E-Log	SCANNED
Temp	44.00	deg. F	Intake	60.00		Phys	E22

Lithology List

Depth (ft)	Material	Colour	Description
17.00	Gravel	Unknown	Oxidized
71.00	Till	Grey	Unknown
76.00	Sand	Unknown	Fine-medium
102.00	Clay	Grey	Unknown
118.00	Sand	Grey	Fine
260.00	Till	Grey	Cobblestones

THURSTON, KEVIN	Completion 05/01/1991
	RM 344
	Major Basin 06
	SubBasin 30
	NTS Map 73B01
WWDR# 112621	

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	24	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	HAYTER DRILLING LTD						
Water Use	Domestic						
Hole #	001						
Well Use	Withdrawal		Well Casings				
Installation Method	Drilled		Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	360.00		0.00	0.00	5.00	P.V.C.	
Water Level	123.00		0.00	0.00	0.00	0.00	
Bit	4.50		Screens				
Flowing Head	0.00		Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
			20.00	348.00	4.00	12.00	Stainless Steel
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
Pump Test							
Draw Down	50.00 ft						
Duration	3.00 hrs	Elevation	1,770.00 ft		Aquifer		
Pumping Rate	15.00 igpm	Rec. Pumping Rate	15.00		E-Log	No	
Temp	0.00 deg. F	Intake	300.00		Phys	E22	

Lithology List

Depth (ft)	Material	Colour	Description
12.00	Sand	Brown	Unknown
16.00	Till	Brown	Unknown
17.00	Rock	Unknown	Unknown
31.00	Till	Brown	Unknown
74.00	Till	Grey	Rocky
170.00	Till	Grey	Unknown
181.00	Till	Grey	Silty
182.00	Rock	Unknown	Unknown
196.00	Till	Grey	Silty
201.00	Till	Grey	Unknown
203.00	Sand & Gravel	Unknown	Unknown
250.00	Till	Grey	Unknown

252.00	Sand	Unknown	Unknown
255.00	Sand & Gravel	Unknown	Unknown
292.00	Till	Grey	Unknown
294.00	Till	Grey	Rocky
304.00	Sand	Grey	Fine
317.00	Till	Grey	Silty
325.00	Clay	Grey	Unknown
360.00	Sand & Gravel	Unknown	Clean

MENZIES, CALVIN		Completion	07/18/2002
		RM	344
		Major Basin	06
		SubBasin	30
		NTS Map	73B01
WWDR#	119562		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	PRAIRIE WATER LTD						
Water Use	Domestic						
Hole #	001						
Well Use	Withdrawal		Well Casings				
Installation Method	Bored		Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	45.00		46.00	45.00	36.00	Porous Concrete	
Water Level	0.00		0.00	0.00	0.00	0.00	
Bit	42.00		Screens				
Flowing Head	0.00		Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
Pump Test							
Draw Down	0.00 ft		Elevation		1,782.00 ft	Aquifer	
Duration	0.00 hrs		Rec. Pumping Rate		4.00	E-Log No	
Pumping Rate	0.00 igpm		Intake		0.00	Phys E22	
Temp	0.00 deg. F						

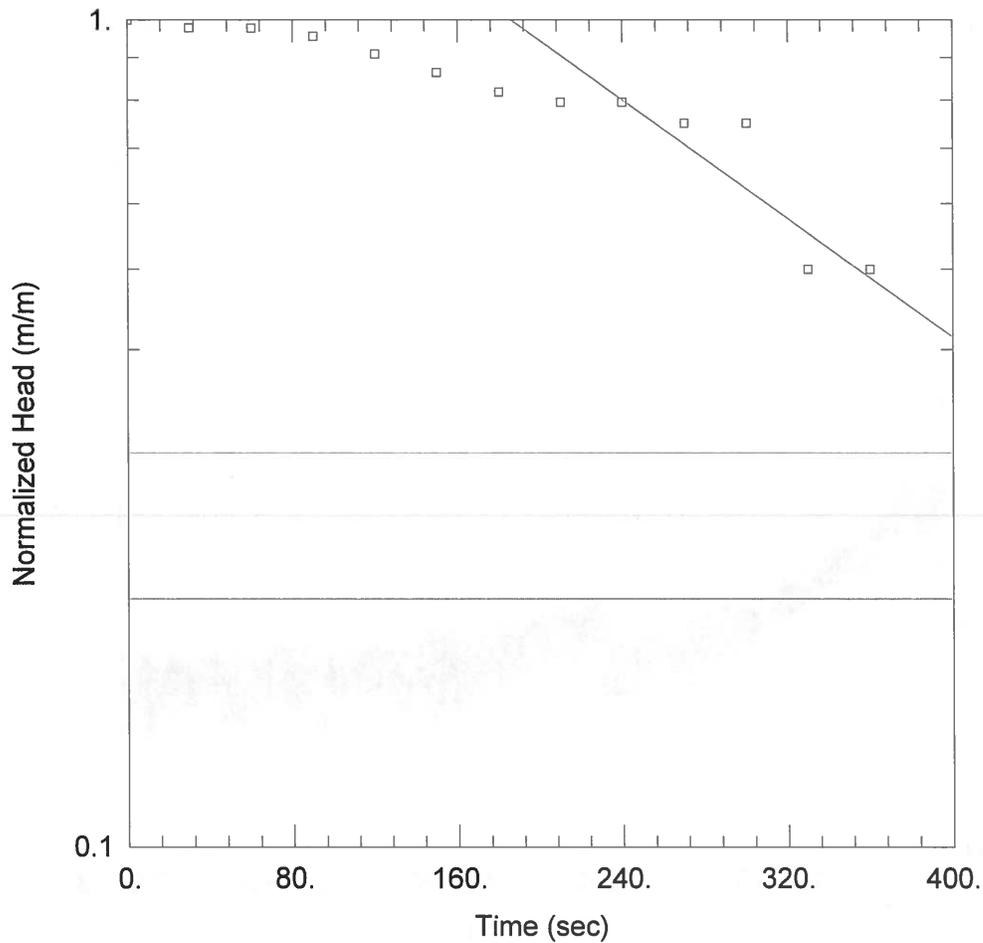
Lithology List

Depth (ft)	Material	Colour	Description
2.00	Fill	Unknown	Unknown
4.00	Topsoil	Unknown	Unknown
26.00	Till	Brown	Unknown
35.00	Till	Grey	Unknown
39.00	Till	Grey	Gravel Streaks
45.00	Till	Grey	Unknown



APPENDIX E

Hydraulic Conductivity Test Results



WELL TEST ANALYSIS

Data Set: N:\...RW-14-002S.aqt

Date: 06/03/15

Time: 11:38:32

PROJECT INFORMATION

Company: Golder Associates

Client: Ridgewood

Project: 1406388

Location: SE-14-36-04-W3M

Test Date: September 12, 2014

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RW-14-002S)

Initial Displacement: 0.044 m

Total Well Penetration Depth: 1.5 m

Casing Radius: 0.02625 m

Static Water Column Height: 0.346 m

Screen Length: 1.5 m

Well Radius: 0.02625 m

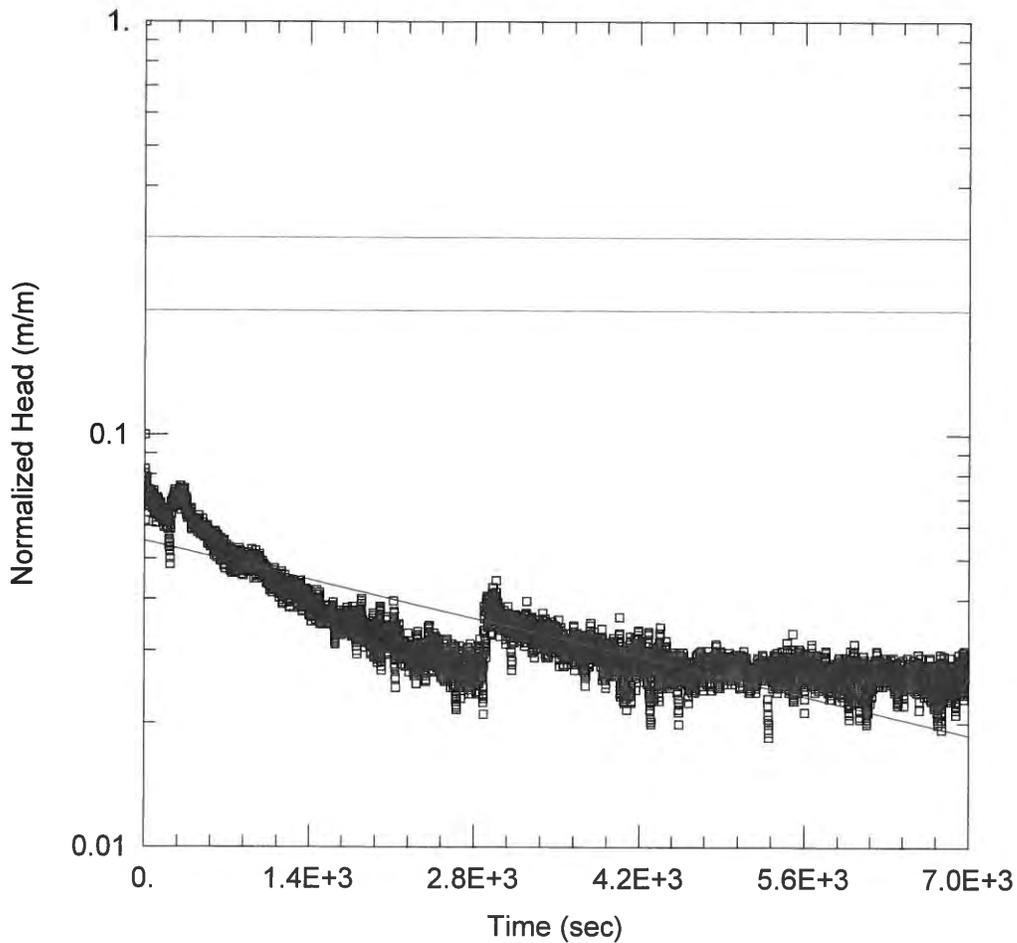
SOLUTION

Aquifer Model: Unconfined

K = 2.478E-6 m/sec

Solution Method: Bouwer-Rice

y0 = 0.09472 m



WELL TEST ANALYSIS

Data Set: N:\...RW-14-003S.aqt
 Date: 06/03/15

Time: 11:38:57

PROJECT INFORMATION

Company: Golder Associates
 Client: Casa Rio
 Project: 1406369

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RW-14-003S)

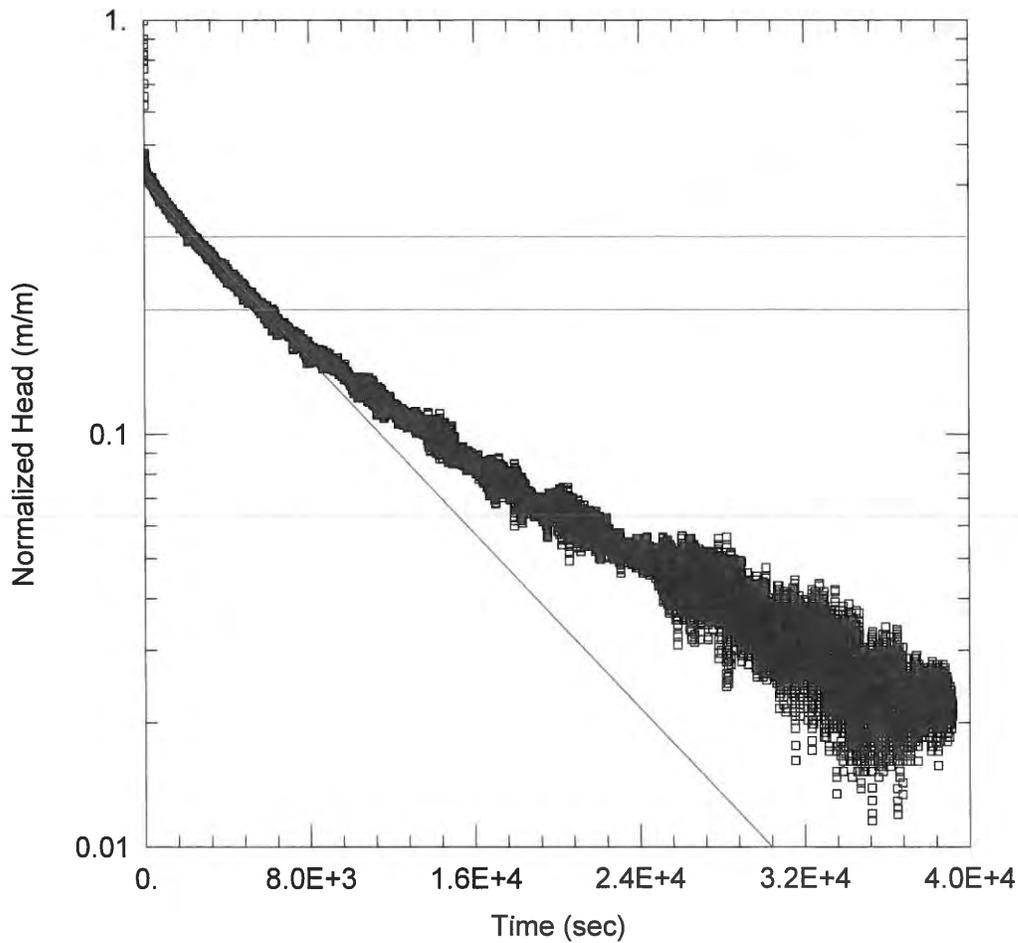
Initial Displacement: 0.357 m
 Total Well Penetration Depth: 1.5 m
 Casing Radius: 0.02625 m

Static Water Column Height: 0.733 m
 Screen Length: 1.5 m
 Well Radius: 1. m
 Gravel Pack Porosity: 0.4

SOLUTION

Aquifer Model: Unconfined
 K = 4.92E-6 m/sec

Solution Method: Bouwer-Rice
 y0 = 0.01978 m



WELL TEST ANALYSIS

Data Set: N:\...RW-14-004S.aqt

Date: 06/03/15

Time: 11:39:24

PROJECT INFORMATION

Company: Golder Associates

Client: Casa Rio

Project: 1406369

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RW-14-004S)

Initial Displacement: 0.2168 m

Total Well Penetration Depth: 1.5 m

Casing Radius: 0.02625 m

Static Water Column Height: 1.043 m

Screen Length: 1.5 m

Well Radius: 1. m

Gravel Pack Porosity: 0.4

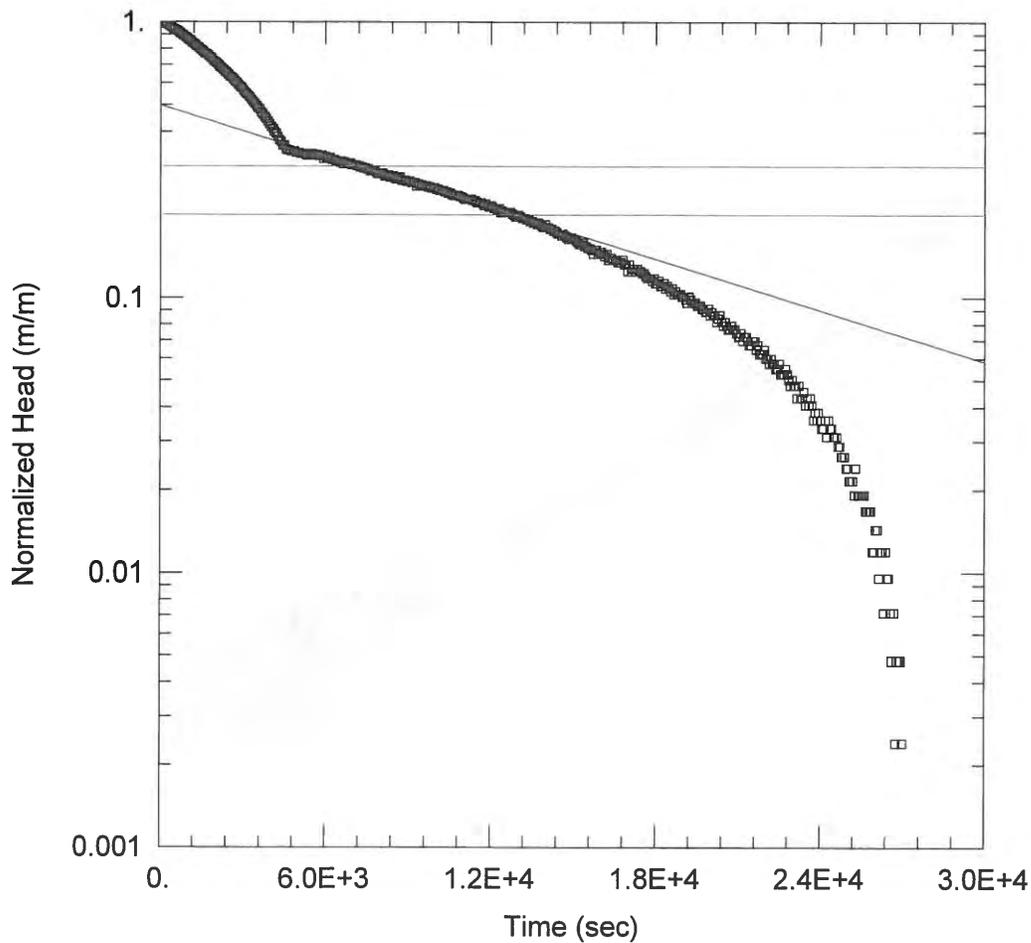
SOLUTION

Aquifer Model: Unconfined

K = 3.851E-6 m/sec

Solution Method: Bouwer-Rice

y0 = 0.08693 m



WELL TEST ANALYSIS

Data Set: N:\...\RW-14-006D.aqt
 Date: 06/03/15

Time: 11:40:54

PROJECT INFORMATION

Company: Golder Associates
 Client: Casa Rio
 Project: 1406369

AQUIFER DATA

Saturated Thickness: 9 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RW-14-006D)

Initial Displacement: 0.417 m
 Total Well Penetration Depth: 6.303 m
 Casing Radius: 0.02625 m

Static Water Column Height: 6.303 m
 Screen Length: 1.5 m
 Well Radius: 1 m
 Gravel Pack Porosity: 0.4

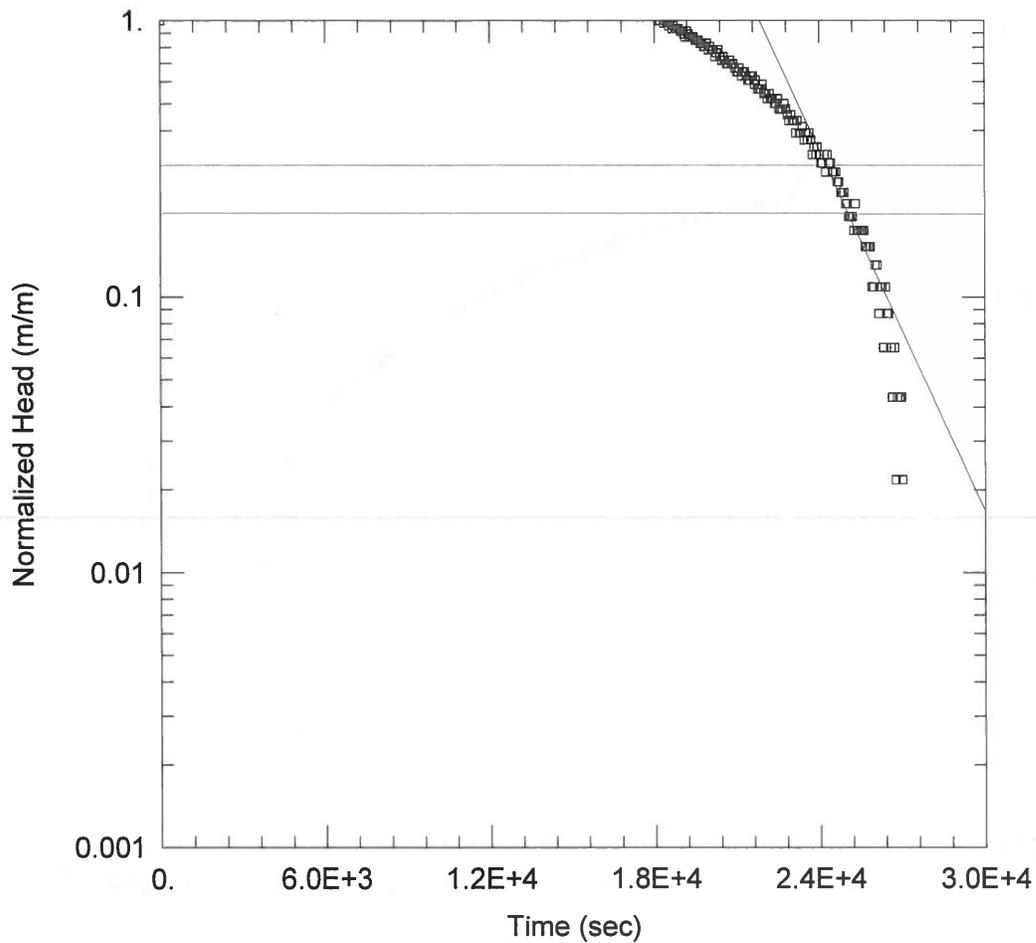
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 4.859E-6 m/sec

y0 = 0.2081 m



WELL TEST ANALYSIS

Data Set: N:\...RW-14-011S.aqt

Date: 06/03/15

Time: 11:41:18

PROJECT INFORMATION

Company: Golder Associates

Client: Casa Rio

Project: 1406369

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RW-14-011S)

Initial Displacement: 0.046 m

Total Well Penetration Depth: 1.5 m

Casing Radius: 0.02625 m

Static Water Column Height: 0.49 m

Screen Length: 1.5 m

Well Radius: 1. m

Gravel Pack Porosity: 0.4

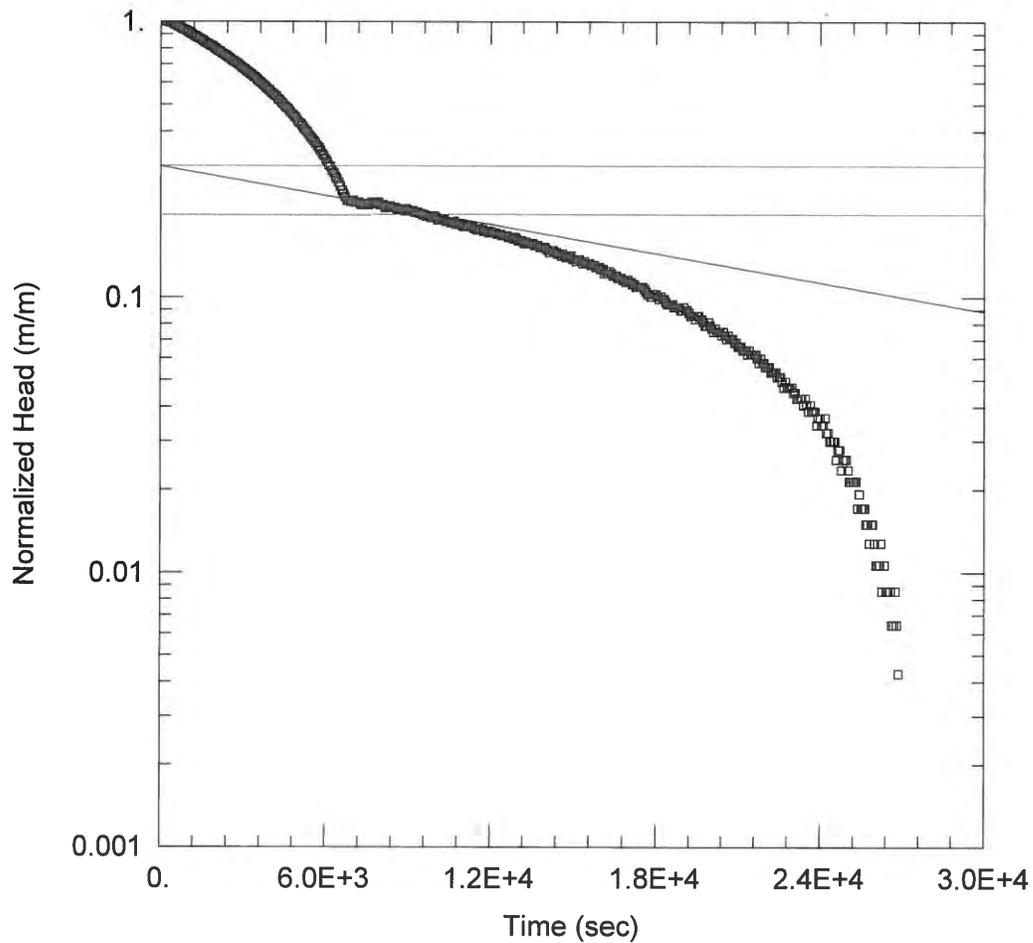
SOLUTION

Aquifer Model: Unconfined

K = 1.589E-5 m/sec

Solution Method: Bouwer-Rice

y0 = 2598.4 m



WELL TEST ANALYSIS

Data Set: N:\...RW-14-012D.aqt
 Date: 06/03/15

Time: 11:41:51

PROJECT INFORMATION

Company: Golder Associates
 Client: Casa Rio
 Project: 1406369

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (RW-14-012D)

Initial Displacement: 0.467 m
 Total Well Penetration Depth: 7.512 m
 Casing Radius: 0.02625 m

Static Water Column Height: 7.512 m
 Screen Length: 1.5 m
 Well Radius: 1. m
 Gravel Pack Porosity: 0.4

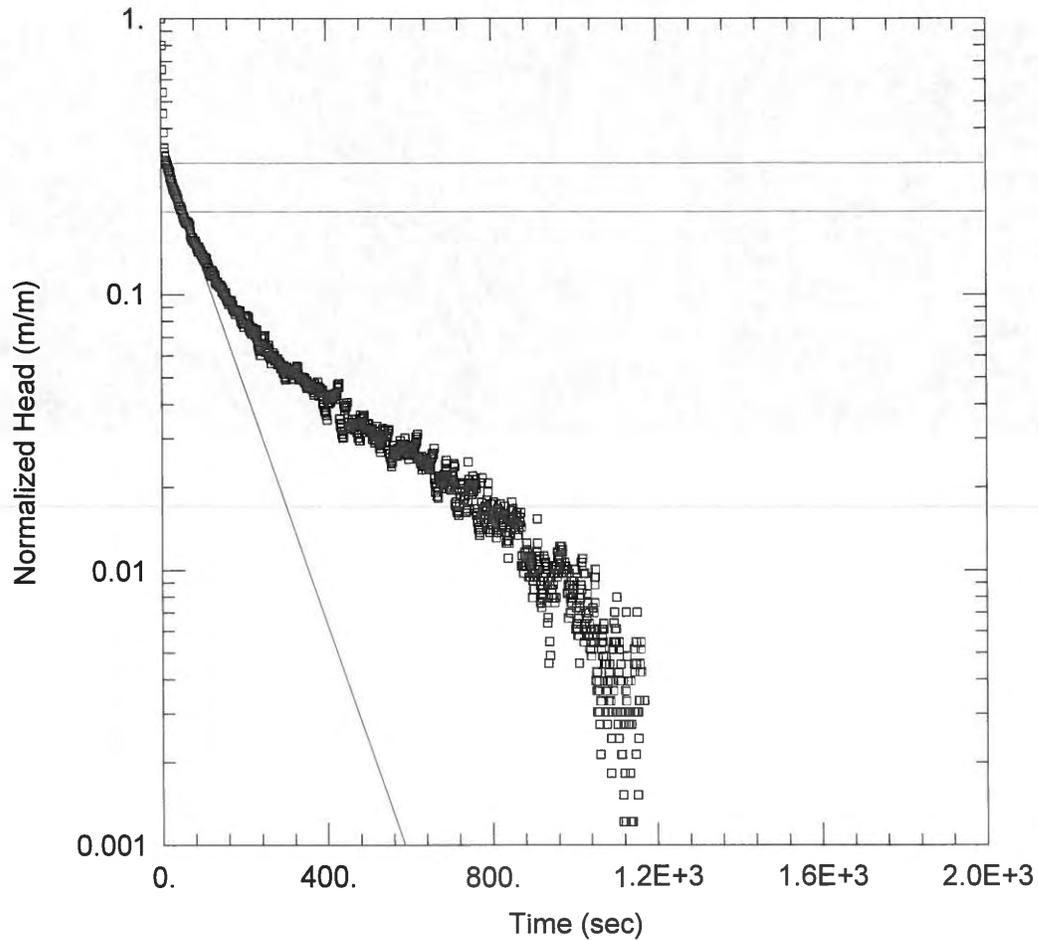
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 2.946E-6$ m/sec

$y_0 = 0.1395$ m



WELL TEST ANALYSIS

Data Set: N:\...RW-14-005S.aqt

Date: 06/03/15

Time: 11:40:22

PROJECT INFORMATION

Company: Golder Associates

Client: Casa Rio

Project: 1406369

AQUIFER DATA

Saturated Thickness: 9. m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (RW-14-005S)

Initial Displacement: 0.3281 m

Static Water Column Height: 1.869 m

Total Well Penetration Depth: 1.5 m

Screen Length: 1.5 m

Casing Radius: 0.02625 m

Well Radius: 1. m

Gravel Pack Porosity: 0.4

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0003146$ m/sec

$y_0 = 0.1103$ m

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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Appendix E

Terrestrial Assessment

Golder Associates



October 2014

TERRESTRIAL ASSESSMENT

Ridgewood Estates Subdivision

Submitted to:
Mr. Dan Beulac
RR #6 Site 601
Box 103
Saskatoon, SK
S7K 3J9

REPORT



Report Number: 1406388

Distribution:

1 Copy - Dan Beulac,
Saskatoon, Saskatchewan
2 Copies - Golder Associates Ltd.,
Saskatoon, Saskatchewan





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APPENDICES

Appendix A

Photos



1.0 INTRODUCTION

Mr. Dan Beulac is planning to construct a multi-parcel country residential subdivision in SE 14-36-4 W3M, approximately 8 kilometres (km) east of the City of Saskatoon (the Project) (Figure 1). There are currently two acreage properties in this quarter section, but the remaining area is undeveloped. As part of the process for developing a subdivision, Golder Associates Ltd. (Golder) was retained to complete a field assessment of the proposed Project area and prepare this report. Andrew Stewart (ecologist, Golder) completed two field evaluations of the quarter section on June 18, 2014 and August 5, 2014 to capture early and late growing periods, as well as the key breeding and nesting periods. The purpose of the field assessment was to document any evident environmental sensitivities and record observed plant and wildlife species. Representative photographs of the inspected area are attached (Appendix A).

2.0 ENVIRONMENTAL OVERVIEW

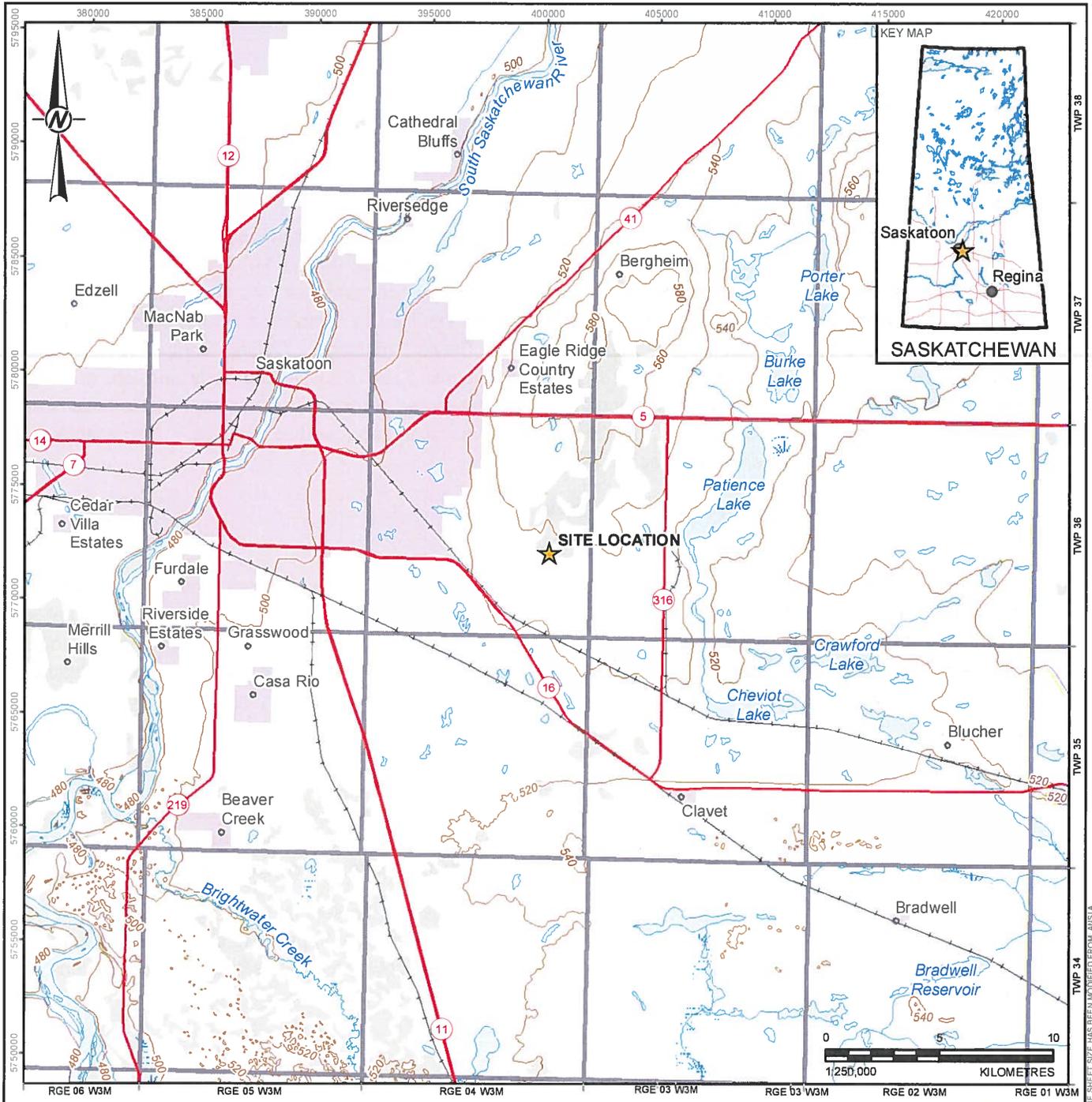
2.1 Terrain, Topography, and Soils

The Project is located in the Minichinas Upland Landscape Area of the Moist Mixed Grassland Ecoregion (Acton et al. 1998). The Minichinas Upland is a morainal landscape of hummocky terrain and pot and kettle topography, with some less sloped glaciolacustrine areas. Glaciolacustrine areas have clay loam and clay soils. Hummocky areas are characterized by dark brown loamy soils, and are more likely to support native vegetation (Acton et al. 1998).

2.2 Land Use

The majority of the Minichinas Upland Landscape Area is cropland (Acton et al. 1998). However, the Project is located on a quarter section of land that supports primarily modified grassland cover with numerous patches of woody vegetation and pothole wetlands. The northeast portion of the Project area supports predominantly native grassland vegetation in association with additional shrubland, wetland, and treed bluffs.

Portions of the quarter section are grazed by a small herd of cattle and horses, but the majority appears to be used as hayland. The portions of native grassland are not fenced and do not appear to be currently grazed or managed, allowing for the establishment of more shrubby and treed cover, as well as additional populations of introduced and weedy species.



Path: G:\2014\1406388_Ridgewood Estates\Figures\Phase 4000\Plants and Wildlife\FIG 1 General Location Map.mxd

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES SUBDIVISION
 TERRESTRIAL ASSESSMENT
 SASKATCHEWAN, CANADA**

TITLE
GENERAL LOCATION MAP

CONSULTANT	YYYY-MM-DD	2014-09-23
	PREPARED	LMR
	DESIGN	AS
	REVIEW	AS
	APPROVED	ME



REFERENCE
 NATIONAL TOPOGRAPHIC BASE DATA (NTDB) DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2007.
 CANVEC HIGHWAYS: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
 NAD 83 UTM ZONE 13

PROJECT	PHASE	Rev.	FIGURE
1406388	4000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/4



2.3 Hydrological Resources

The Minichinas Upland Landscape Area is generally poorly drained, with local drainage into Patience Lake (Acton et al. 1998), 7 km east of the Project, or the local potholes distributed throughout the area. The quarter section the Project is located on does not have any defined drainages. It does have numerous low areas that contain wetlands, often with rings of woody vegetation. The majority of the wetlands observed were classified as Class III or Class IV wetlands (i.e., seasonal or permanent wetlands with an open water area surrounded by a ring of vegetation that often includes sedges [*Carex spp.*] or cattail [*Typha latifolia*]) based on the Stewart and Kantrud (1979) classification system. The largest wetland is located in the northeast corner of the Project area. Several wetlands showed evidence of having higher than average water levels, as indicated by water extending beyond the woody riparian vegetation (e.g., willows [*Salix spp.*], trembling aspen [*Populus tremuloides*]) that normally surround the wetlands. Several of the treed bluffs also contained standing water at the time of the survey. The shallow depressions in the bluffs appeared to contain water on an ephemeral or seasonal basis and supported various grassland/wetland species that prefer mesic growing conditions.

2.4 Vegetation

The Project site is characterized by modified grassland, native grassland, scattered wetlands, and patches of woody vegetation. The majority of the upland to the south and west of the Project area has been seeded with tame grass mixture consisting of smooth brome (*Bromus inermis*), alfalfa (*Medicago sativa*), and sweet clover (*Melilotus spp.*). Noxious and nuisance weeds such as sow thistle (*Sonchus spp.*), nodding thistle (*Carduus nutans*), dandelion (*Taraxacum officinale*), Canada thistle (*Cirsium arvense*), and blue lettuce (*Lactuca tatarica*) have also become established throughout this area.

A smaller area to the northeast supports a remnant native grassland community, although introduced species were commonly observed throughout this area and with decreased grazing pressure, shrubby encroachment was widespread. Dominant species observed include needle-and-thread (*Hesperostipa comata*), June grass (*Koeleria macrantha*), snowberry (*Symphoricarpos occidentalis*), and Canada goldenrod (*Solidago canadensis*). Woodland areas are dominated by trembling aspen with an understory of shrubs and forbs including chokecherry (*Prunus virginiana*), wild raspberry (*Rubus idaeus ssp. strigosus*), current (*Ribes sp.*), Canada anemone (*Anemone canadensis*), and Wood's rose (*Rosa woodsii*). Wetland areas were dominated by cattail (*Typha latifolia*), sedge species, and duckweed (*Lemna minor*), with occasional rings of woody vegetation that included willow and trembling aspen. Large patches of weedy species were observed in the native grassland, mainly dominated by Canada thistle and sow thistle.

A list of all species observed during the field assessment is provided in Table 1. No federal or provincial listed plant species were observed.



RIDGEWOOD ESTATES

Table 1: Plant Species Observed During the 2014 Field Assessments

Common Name	Scientific Name	Common Name	Scientific Name
Trees and Shrubs			
<i>Amelanchier alnifolia</i>	Saskatoon	<i>Ribes oxycanthoides</i>	northern gooseberry
<i>Cornus sericea</i> ssp. <i>sericea</i>	red-osier dogwood	<i>Rosa acicularis</i>	prickly rose
<i>Elaeagnus commutata</i>	silverberry	<i>Rosa woodsii</i>	common wild rose
<i>Juniperus communis</i>	ground juniper	<i>Rubus idaeus</i>	wild red raspberry
<i>Populus tremuloides</i>	trembling aspen	<i>Salix</i> sp.	willow
<i>Prunus virginiana</i>	choke cherry	<i>Symphoricarpos albus</i>	snowberry
Grasses and Grass-like Species			
<i>Alopecurus aequalis</i>	short-awned foxtail	<i>Carex siccata</i>	hay sedge
<i>Beckmannia syzigachne</i>	slough grass	<i>Carex sychnocephala</i>	long-beaked sedge
<i>Bromus inermis</i>	smooth brome	<i>Eleocharis palustris</i>	creeping spike-rush
<i>Bromus mollis</i>	soft chess	<i>Elymus canadensis</i>	Canada wild rye
<i>Carex atherodes</i>	awned sedge	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	slender wheatgrass
<i>Carex deweyana</i>	Dewey's sedge	<i>Festuca hallii</i>	plains rough fescue
<i>Carex foenea</i>	silvery-flowered sedge	<i>Juncus balticus</i>	wire rush
<i>Carex inops</i>	sun sedge	<i>Pascopyrum smithii</i>	western wheatgrass
<i>Carex pellita</i>	woolly sedge	<i>Phalaris arundinacea</i>	reed canary grass
<i>Carex pellita</i>	woolly sedge	<i>Schizachne purpurascens</i>	purple oat grass
<i>Carex pensylvanica</i>	sun-loving sedge		
<i>Carex praegracilis</i>	graceful sedge	<i>Hesperostipa comata</i>	needle-and-thread
Forbs			
<i>Achillea millefolium</i> var. <i>millefolium</i>	common yarrow	<i>Lactuca tatarica</i> *	Tartarian lettuce*
<i>Agoseris glauca</i> var. <i>glauca</i>	false dandelion	<i>Lemna minor</i>	common duckweed
<i>Alisma triviale</i>	broad-leaved water-plantain	<i>Liatris punctata</i>	dotted blazingstar
<i>Allium textile</i>	prairie onion	<i>Linum lewisii</i>	wild blue flax
<i>Anemone canadensis</i>	Canada anemone	<i>Lithospermum incisum</i>	narrow-leaved puccoon
<i>Anemone cylindrica</i>	long-fruited anemone	<i>Lycopus asper</i>	western water-horehound
<i>Anemone patens</i>	prairie crocus	<i>Lysimachia ciliata</i>	fringed loosestrife
<i>Antennaria microphylla</i>	small-leaved pussy-toes	<i>Maianthemum stellatum</i>	starflower false Solomon's-seal
<i>Arabis hirsuta</i>	hairy rock cress	<i>Medicago sativa</i>	alfalfa
<i>Artemisia frigida</i>	pasture sagewort	<i>Melilotus alba</i>	white sweet-clover
<i>Artemisia ludoviciana</i>	prairie sagewort	<i>Melilotus officinalis</i>	yellow sweet-clover
<i>Aster ericoides</i>	tufted white prairie aster	<i>Mentha arvensis</i>	wild mint
<i>Aster laevis</i>	smooth aster	<i>Monarda fistulosa</i>	wild bergamot
<i>Astragalus agrestis</i>	field milk-vetch	<i>Orthocarpus luteus</i>	owl-clover
<i>Astragalus missouriensis</i>	missouri milk-vetch	<i>Oxytropis monticola</i>	late yellow locoweed
<i>Astragalus pectinatus</i>	narrow-leaved milk vetch	<i>Pedimelum argophyllum</i>	silvery scurf pea



RIDGEWOOD ESTATES

Table 1: Plant Species Observed During the 2014 Field Assessments (continued)

Common Name	Scientific Name	Common Name	Scientific Name
Forbs (continued)			
<i>Campanula rotundifolia</i>	harebell	<i>Penstemon procerus</i>	slender blue beardtongue
<i>Carduus nutans</i> *	nodding thistle*	<i>Plantago major</i>	common plantain
<i>Cerastium arvense</i>	field mouse-ear chickweed	<i>Polygonum amphibium</i>	water smartweed
<i>Chenopodium album</i>	lamb's-quarters	<i>Potentilla anserina</i>	silverweed
<i>Cirsium arvense</i> *	Canada thistle*	<i>Potentilla norvegica</i>	rough cinquefoil
<i>Cirsium vulgare</i> *	bull thistle*	<i>Potentilla pensylvanica</i>	prairie cinquefoil
<i>Comandra umbellata</i>	bastard toadflax	<i>Ranunculus gmelinii</i>	yellow water crowfoot
<i>Conyza canadensis</i>	horseweed	<i>Ratibida columnifera</i>	prairie coneflower
<i>Crepis runcinata</i>	scapose hawk's-beard	<i>Rumex occidentalis</i>	western dock
<i>Dalea purpurea</i> var. <i>purpurea</i>	purple prairie-clover	<i>Senecio integerrimus</i>	entire-leaved groundsel
<i>Descurainia sophia</i>	flixweed	<i>Sisyrinchium montanum</i>	common blue-eyed grass
<i>Epilobium ciliatum</i>	northern willowherb	<i>Solidago canadensis</i>	Canada goldenrod
<i>Equisetum arvense</i>	common horsetail	<i>Solidago mollis</i>	velvety goldenrod
<i>Erigeron asper</i>	rough fleabane	<i>Sonchus arvensis</i> *	perennial sow-thistle*
<i>Erigeron glabellus</i>	smooth fleabane	<i>Spiraea alba</i>	narrow-leaved meadowsweet
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	<i>Stachys palustris</i>	marsh hedge-nettle
<i>Fragaria virginiana</i>	wild strawberry	<i>Stellaria longipes</i>	long-stalked chickweed
<i>Gaillardia aristata</i>	gaillardia	<i>Taraxacum officinale</i> **	common dandelion **
<i>Galium boreale</i>	northern bedstraw	<i>Thalictrum venulosum</i>	veiny meadow rue
<i>Galium triflorum</i>	sweet-scented bedstraw	<i>Thermopsis rhombifolia</i>	golden bean
<i>Geum triflorum</i>	three-flowered avens	<i>Thlaspi arvense</i>	stinkweed
<i>Glycyrrhiza lepidota</i>	wild licorice	<i>Typha latifolia</i>	cattail
<i>Gutierrezia sarothrae</i>	broomweed	<i>Urtica dioica</i>	common nettle
<i>Helianthus subrhomboides</i>	rhombic-leaved sunflower	<i>Vicia americana</i>	wild vetch
<i>Heterotheca villosa</i>	golden aster	<i>Zizia aptera</i>	heart-leaved Alexanders

* Noxious Weed under the *Weed Control Act* (2010).

** Nuisance Weed under the *Weed Control Act* (2010).

2.4.1 Listed Species

A search of the Saskatchewan Conservation Database (2014) indicated ten provincially tracked species that have been previously observed within 10 km of the Project area (Table 2). Several of these species have unique habitat requirements, such as sandy hillsides, which are not present within the Project area. However, some of the species included in the list have matching habitat requirements and have a greater potential to occur in the Project area.

RIDGEWOOD ESTATES

Table 2: Historical Occurrences of Listed Plant Species Within Ten Kilometres of the Project Area

Common Name	Scientific Name	Year of Last Observation (SKCDC 2014)	Provincial Status*	SARA	COSEWIC	Habitat Preference
Five-lobed Cinquefoil	<i>Potentilla nivea</i> var. <i>pentaphylla</i>	1952	S2	N/A	N/A	Dry, open prairie surrounding alkaline slough
Downy Gentian	<i>Gentiana puberulenta</i>	1931	S1	N/A	N/A	Mesic to dry black soil prairies, gravelly hills, shrubby barrens and remnant prairie
White-top	<i>Erigeron strigosus</i>	1960	S2S3	N/A	N/A	Open prairie
Blunt-leaved Yellow-cress	<i>Rorippa curvipes</i> var. <i>truncata</i>	1988	S2S3	N/A	N/A	Low, moist and wet areas including riverbanks, meadows and roadsides.
Crawe's Sedge	<i>Carex crawei</i>	1970	S1	N/A	N/A	Open habitats with wet, calcareous soils.
Engelmann's Spike-rush	<i>Eleocharis engelmannii</i>	1965	S2	N/A	N/A	sloughs and drying flooded areas of cultivated fields
Prairie Ragwort	<i>Senecio plattensis</i>	1906	S3S4	N/A	N/A	Mesic grassland, sloughs, shores, open woods
Smooth Wild-rye	<i>Elymus glaucus</i>	1931	S2	N/A	N/A	Sandy thickets, wooded dunes and deciduous woods
Low Milk-vetch	<i>Astragalus lotiflorus</i>	1947	S3	N/A	N/A	Dry calcareous gravel, gravelly or sandy hillsides, prairie bluffs, dry slopes, open wooded or bushy hillsides, canyons, stream valleys, ponds, lakeshores, roadsides and waste places
Crowfoot	<i>Viola pedatifida</i>	2012	S3	N/A	N/A	Mesic prairie

SKCDC = Saskatchewan Conservation Data Centre; SARA = Species at Risk Act; COSEWIC = Committee on the Status of Endangered Wildlife in Canada; N/A = not applicable.



Two vegetation surveys were completed; the first on June 18, 2014, and the second on August 5, 2014. The June survey was done in an attempt to capture many of the earlier flowering listed plant species such as crowfoot violet (*Viola pedatifida*). Data collection methods were based on the recommended federal and provincial survey methods and standards for rare plants (i.e., Saskatchewan Ministry of Environment 2014, Henderson 2009). No federally or provincially listed species were observed during the field surveys.

Two small communities of plains rough fescue (*Festuca hallii*) were observed on the hillsides adjacent to the large Class IV wetland in the northeast portion of the Project area. Plains rough fescue is not a federally or provincially listed species; however its occurrence could be indicative of a fescue grassland community of which only limited amounts remain across the province. The population of plains rough fescue occupied a small area approximately 200 square metres. Much of the fescue habitat has been encroached by species such as smooth brome and snowberry, limiting much of the potential habitat found in the Project area.

2.5 Wildlife and Wildlife Habitat

The landscape surrounding the Project has been heavily modified by agriculture, infrastructure development, and acreage development. The presence of developed roads and nearby acreages reduces the quality of natural wildlife habitat in the Project area. Nonetheless, the wetlands and mosaic of open grasslands and patches of woody vegetation, coupled with the variation in terrain, provide suitable nesting, rearing, and foraging habitat for several species, as well as escape and thermal cover (Figure 2). Collectively, the Project area is considered to have moderate wildlife habitat potential.

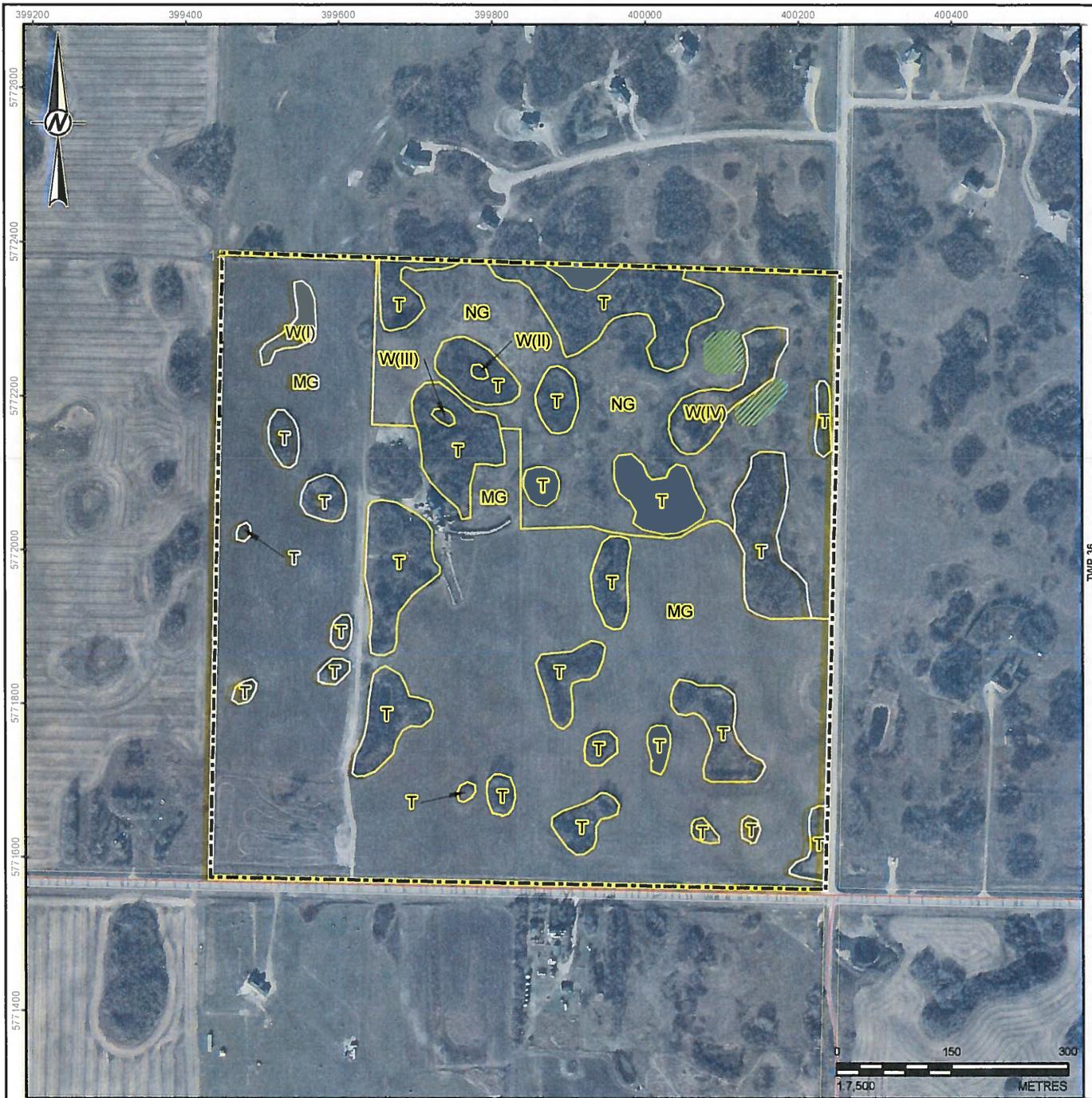
During the field assessments, nineteen bird species were observed by sight or identified by song (Table 3). The majority of these species were identified in woodland or shrub land areas, while the remainder were identified in wetland or grassland areas. Signs of white-tailed deer (*Odocoileus virginianus*) and four other mammals were also observed. A single amphibian species was identified by song. No federal or provincial listed wildlife species were observed and the habitat suitability for these species is low to moderate.



RIDGEWOOD ESTATES

Table 3: Wildlife Species Observed in SE 14-36-3 W3M

Common Name	Scientific Name	Habitat
Birds		
Red-winged blackbird	<i>Agelaius phoeniceus</i>	Wetland
Grasshopper sparrow	<i>Ammodramus savannarum</i>	Native grassland
Blue-winged teal	<i>Anas discors</i>	Wetland
Mallard	<i>Anas platyrhynchos</i>	Wetland
Cedar waxwing	<i>Bombycilla cedrorum</i>	Shrubland
American goldfinch	<i>Carduelis tristis</i>	Shrubland
Northern Harrier	<i>Circus cyaneus</i>	Native grassland
Marsh wren	<i>Cistothorus palustris</i>	Wetland
American crow	<i>Corvus brachyrhynchos</i>	Shrubland
American coot	<i>Fulica americana</i>	Wetland
Song sparrow	<i>Melospiza melodia</i>	Native grassland
Ruddy duck	<i>Oxyura jamaicensis</i>	Wetland
House sparrow	<i>Passer domesticus</i>	Shrubland
Savannah sparrow	<i>Passerculus sandwichensis</i>	Native grassland
Black-capped chickadee	<i>Poecile atricapillus</i>	Shrubland
Chipping sparrow	<i>Spizella passerina</i>	Shrubland
House wren	<i>Troglodytes aedon</i>	Shrubland
Western kingbird	<i>Tyrannus verticalis</i>	Shrubland
Mourning dove	<i>Zenaida macroura</i>	Shrubland
Mammals		
Field mouse	<i>Apodemus sylvaticus</i>	Native grassland
Thirteen lined ground squirrel	<i>Ictidomys tridecemlineatus</i>	Native grassland
White-tailed deer	<i>Odocoileus virginianus</i>	Shrubland
Northern pocket gopher	<i>Thomomys talpoides</i>	Native grassland
Richardson's ground squirrel	<i>Urocitellus richardsonii</i>	Native grassland
Amphibians		
Boreal chorus frog	<i>Pseudacris maculata</i>	Wetland



TWP 36

RGE 04 W3M

LEGEND

- HABITAT DELINEATION
- PLAINS ROUGH FESCUE PLANT COMMUNITY
- STUDY AREA
- MG - MODIFIED GRASSLAND
- NG - NATIVE GRASSLAND
- T - TREE
- W(I) - CLASS I - EPHEMERAL WETLAND
- W(II) - CLASS II - TEMPORARY WETLAND
- W(III) - CLASS III - SEASONAL WETLAND
- W(IV) - CLASS IV - SEMI-PERMANENT WETLAND

REFERENCE

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 CANVEC ROADS: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
 NAD 83 UTM ZONE 13

CLIENT
 RIDGEWOOD ESTATES

PROJECT
 RIDGEWOOD ESTATES SUBDIVISION
 TERRESTRIAL ASSESSMENT
 SASKATCHEWAN, CANADA

TITLE
 HABITAT MAP

CONSULTANT



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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/A



3.0 CLOSURE

We trust that this presents the information that you require. Should any portion of this document require clarification, or if additional information is required, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Andrew Stewart, P.Ag.
Ecologist

Mark Ealey, B.Sc.
Associate, Senior Reclamation Specialist

AS/ME/rk

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References

- Acton, D.F., G.A. Padbury, and C.T. Stushnoff. 1998. The Ecoregions of Saskatchewan. Canadian Plains Research Centre, University of Regina. Hignell Printing Limited, Winnipeg, Manitoba. 205pp.
- Henderson, D. 2009. Rare Plant Occupancy Guidelines for Prairie Plant Species at Risk. Prairie and Northern Wildlife Research Center. Saskatoon.
- Saskatchewan Ministry of Environment. 2014. Rare Prairie Plant Survey Protocol. Fish and Wildlife Branch Technical Report No. 2014-20.3211 Albert Street, Regina, Saskatchewan. 8pp.
- SKCDC (Saskatchewan Conservation Data Centre). 2014. Wildlife Application (Project Review Website). Available at: <http://gisweb1.serm.gov.sk.ca/wildlifelogin/form.asp>. Accessed August 18, 2014.
- Stewart, R.E. and H.A. Kantrud. 1971. Classification of Natural Ponds and Lakes in the Glaciated Prairie Region. Resource Publication 92, Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C. Jamestown, ND. Available at: <http://www.npwrc.usgs.gov/resource/wetlands/pondlake/index.htm> (Version 16APR1998). Accessed: October 30, 2013.
- The Weed Control Act*. 2010. Chapter W-11.1 of the Statutes of Saskatchewan, 2010. Regina, Saskatchewan. 26 pp.



APPENDIX A

Photos



Photo 1: Looking west across modified grassland in the southeast portion of the Project area, existing residences visible in the background.



Photo 2: Looking south across native grassland in the northeast portion of the Project area.



Photo 3: Looking west across native grassland in the northeast portion of the Project area. Establishment of shrubby species due to decreased grazing pressure.



Photo 4: Looking north through mesic treed bluff habitat.



Photo 5: Looking north at flooded basin within a treed bluff.



Photo 6: Looking west at open Class IV wetland in northwest portion of the Project area.



Photo 7: Looking south at plains rough fescue (*Festuca hallii*) population on the north side of the large Class IV wetland in the northeast portion of the Project area.



Photo 8: Looking northwest at plains rough fescue (*Festuca hallii*) population on the south side of the large Class IV wetland in the northeast portion of the Project area.

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Appendix F

**Phase 1 Environmental Site
Assessment**

Golder Associates



September 2014

REPORT

**Phase II Environmental Site
Assessment at Ridgewood
Estates, SE 14-36-04 W3M, Near
Saskatoon, Saskatchewan**

Submitted to:

Mr. Dan Beaulac
DB Ventures
RR #6 Site 601, Box 103
R.M. Corman Park
Saskatchewan S7K 39J

REPORT



Report Number: 1406388

Distribution:

2 Copies - Ridgewood Estates
2 Copies - Golder Associates Ltd.





Executive Summary

Golder Associates Ltd. was retained by DB Ventures to conduct a Phase I Environmental Site Assessment at the parcel of land described as "RidgeWood Estates" and located in the Rural Municipality of Corman Park, on the south east quarter of Section 14, Township 36, Range 4 West of the Third Meridian. It is understood that DB Ventures requires this Phase I ESA prior to redevelopment of the Site as part of the planned residential community of RidgeWood Estates.

The primary objective of the Phase I Environmental Site Assessment was to:

- Document conditions at the Site at the time of the reconnaissance and, based on available sources of information and observations of surface conditions during the reconnaissance, to identify operations or practices of past and current occupants, lessors, and owners that may present potential environmental concerns. In addition, perform a cursory evaluation of potential environmental concerns associated with adjacent properties.

The Phase I Environmental Site Assessment was completed in general accordance with the Canadian Standards Association document Z768-01 entitled "Phase I Environmental Site Assessments". The scope of this Phase I Environmental Site Assessment did not include a Hazardous Building Materials Assessment or Mould Assessment. The assessment included cursory observations of the neighbouring land uses, but did not constitute a rigorous evaluation of the adjacent properties.

Site History Summary

The Site is located at the intersection of Patience Lake Road and Range Road 3041 approximately 8 kilometres east of the southeast corner of Saskatoon, Saskatchewan, and covers an area of approximately 155 acres. The Site is located within the south east quarter of Section 14, Township 36, and Range 4 W3M (SE 14-036-4 W3M), and is accessed directly from Highway 394. The property is split between the western portion, and the eastern portion (Parcel # 153820830 and Parcel # 165160458, respectively). An irregular segment of SE 14-036-4 W3M is developed as a residential property, and is not part of the Site described within this report.

Currently the Site consists of two (2) buildings; a shop and a house located on the western portion of the property. A gravel approach runs in a north-south direction from Highway 394 to the buildings. The exterior areas of the Site predominately consisted of hayland, pasture (with six cattle and two horses on Site) and a trout pond approximately 100 metres south of the house.

Areas of Potential Environmental Concern

Based on the findings of the Phase I Environmental Site Assessment, the following Areas of Potential Environmental Concern were identified (Figure 3):

- Septic Field – One septic outlet (31 millimetre [1.25 inch]) is present on the Site approximately 60 meters northeast of the house. The Site Representative reported that the septic tank and field are properly permitted.



PHASE I ENVIRONMENTAL SITE ASSESSMENT AT RIDGWOOD ESTATES

- One 1,000 litre Diesel and one 1,000 litre Gasoline Tank – The two fuel tanks located on Site do not have secondary containment. Minor spills or releases to the ground surface can be mitigated with the use of secondary containment and therefore are recommended.

The above noted items represent potential environmental concerns. However, it is understood that the residential property within the Site will not be part of the redevelopment plan and the residential portion of the Site would be retained by the current owner. Under these conditions the aboveground storage tanks used for fueling would not represent a potential environmental concern to the portion of the Site planned for redevelopment. In addition the septic field would not represent a concern to the portion of the Site proposed for redevelopment as long as the design (distance to water wells and residences as an example) and permit requirements (The Plumbing and Drainage Regulations) are maintained in conjunction with the planned redevelopment.



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Figure 1: Site Location Plan in order following text

Figure 2: Site and Surrounding Land Use

Figure 3: Areas of Potential Environmental Concern

APPENDICES

APPENDIX A
Regulatory Information

APPENDIX B
Aerial Photographs

APPENDIX C
Site Photographs



1.0 INTRODUCTION

1.1 Background

Golder Associates Ltd. (Golder) was retained by DB Ventures to conduct a Phase I Environmental Site Assessment (ESA) at the parcel of land described as "RidgeWood Estates" and located in the Rural Municipality (R.M.) of Corman Park, on the south east quarter of Section 14, Township 36, Range 4 West of the Third Meridian (the Site). It is understood that DB Ventures requires this Phase I ESA prior to redevelopment of the Site as part of the planned residential community of RidgeWood Estates.

1.2 Objectives

The primary objective of the Phase I ESA was to:

- Document conditions at the Site at the time of the reconnaissance and, based on available sources of information and observations of surface conditions during the reconnaissance, to identify operations or practices of past and current occupants, lessors, and owners that may present potential environmental concerns. In addition, perform a cursory evaluation of potential environmental concerns associated with adjacent properties.

1.3 Scope and Methodology

The Phase I ESA was completed in general accordance with the Canadian Standards Association (CSA) document Z768-01 entitled "Phase I Environmental Site Assessments". The scope of the Phase I ESA was to identify potential environmental concerns by visual examination of surface features and operating practices, and from available documented information sources. In addition to the Site reconnaissance conducted on August 14, 2014, the information reviewed in completing the Phase I ESA included the following:

- aerial photographs obtained from Information Services Corporation (ISC) and the Natural Resources Canada National Air Photo Library;
- information on environmental spills and registered hazardous material storage provided by Saskatchewan Ministry of the Environment (MOE);
- information provided by EcoLog Environmental Risk Information Services Ltd. (ERIS);
- land titles provided by ISC;
- a search of water well information obtained from the Water Security Agency website; and
- information obtained through interviewing Mr. Dwayne Pitka, the current landowner, hereafter referred to as the "Site Representative".

The scope of this Phase I ESA did not include a Hazardous Building Materials Assessment or Mould Assessment. The assessment included cursory observations of the neighbouring land uses, but did not constitute a rigorous evaluation of the adjacent properties.



1.4 Site Description

1.4.1 Site Location and Setting

The Site is located at the intersection of Patience Lake Road and Range Road 3041 approximately 8 kilometres (km) east of the southeast corner of Saskatoon, Saskatchewan, and covers an area of approximately 155 acres. The Site is located within the south east quarter of Section 14, Township 36, and Range 4 W3M (SE 14-036-4 W3M), and is accessed directly from Highway 394. The property is composed of two parcels (#153820830 [west half] and #165160458 [east half]). An irregular segment of SE 14-036-4 W3M is developed as a residential property, and is not part of the Site described within this report.

Currently the Site consists primarily of hay field and pasture land. A residential development including a house, yard and shop, belonging to the Site Representative were present near the centre of the west parcel. A gravel road runs in a north-south direction from Highway 394 to the yard. A small herd of six cattle and two horses were present in the fields north of the yard and a trout pond approximately 100 metres (m) south of the yard was also present, belonging to the Site Representative.

The Site location is illustrated on Figure 1. The surrounding land use and Site plan are provided on Figure 2. Additional information regarding the Site is summarized in Tables 1, 2 and 3 below.

Table 1: Site Physical Description

Item	Data
Site Area	Approximately 155 acres.
Buildings on the Site	Two; a shop and a house.
Percentage Coverage of Exterior Areas by Landscaped/Grassed/Bare Ground Areas	>99%
Percentage Coverage of Exterior Area by Paved or Other Sealed Surface Materials	<1%

% = percent

Table 2: Site Buildings Construction

Item	Data
Shop Building	
Date of Construction	2008.
Number of Floors (Including ground level)	One.
Number and Use of Levels Below Ground Level	None (slab on grade construction, concrete floor)
Percentage of Site Building Covered by Subsurface Developed Levels	0%
Major Renovations, Additions or Demolitions Since Construction	None.



PHASE I ENVIRONMENTAL SITE ASSESSMENT AT RIDGEWOOD ESTATES

Table 2: Site Buildings Construction (continued)

Item	Data
Building Construction Details	The exterior is finished with siding. The roof is finished with shingles.
Building Interior Finishing	The shop is steel clad with a concrete floor.
House	
Date of Construction	2008.
Number of Floors (Including ground level)	Two. Raised ground level and basement.
Number and Use of Levels Below Ground Level	One. Residential (basement).
Percentage of Site Buildings Covered by Subsurface Developed Levels	100%
Major Renovations, Additions or Demolitions Since Construction	None.
Building Construction Details	The exterior is finished with siding. The roof is finished with shingles.
Building Interior Finishing	The building interior was not observed.

% = percent

Table 3: Site Services

Item	Data
Water Supply Source	Domestic use water is stored in two (2) outdoor 1,000 L steel above ground storage tanks. There is one (1) well in use on-Site, approximately 70 m to the north of the house.
Storm Water Flow and Discharge Location	Surface water drains to roadside ditches and the sloughs on Site (approximately 5).
Sanitary/Process Wastewater Discharge Location	There is a septic pump-out system in place on Site. Solid waste is pumped out by a truck and hauled away approximately two to three times per year. Liquid waste is pumped to the septic field approximately 200 m to the northwest of the House.
Sumps on-Site	None.
Electricity Back-up Generator on-Site	None.
Site is on Natural Gas Supply	No.
Hydraulic Equipment Present on-Site	None.
Building Heating/Cooling Systems	Geothermal heating and cooling systems in the house. Overhead forced air heating in the shop.

L = litre; m = metre

2.0 SITE PHYSICAL SETTING

2.1 Topography and Hydrology

The topography of the Site is generally hummocky and at similar grade with the adjacent properties. Surface drainage collects in roadside drainage ditches, natural depressions, on Site sloughs and the trout pond. Drainage within the Site, based on topography, is anticipated to primarily drain into local depressions and sloughs on Site and otherwise drain to rural ditches. The nearest major water body is Patience Lake located approximately 5 km northeast of the Site.



2.2 Geology and Hydrogeology

Golder referenced the reports "Geology of the Saskatoon Region, Saskatchewan" prepared by E.A. Christiansen Consulting Ltd., dated March 15, 1979 (E.A. Christiansen 1979) and "Hydrogeology Mapping of NTS Mapsheet Saskatoon 73B" prepared by MDH Engineered Solutions, dated April 2011 (MDH 2011) when preparing the geologic and hydrogeologic descriptions of the Site.

The above reports and associated mapping identified locations, elevations and thicknesses of soils, bedrock and aquifers in the region. The average ground surface elevation in the vicinity of the Site is approximately 540 meters above sea level (m asl). Surficial and shallow soils in the general area of the Site are surficial stratified deposits of gravel, sand, silt and clay (drift) approximately 5 m thick. Overburden in the area is approximately 85 m thick and is composed of four primary groups, in descending order; Battleford Formation Tills (~2 m thick), Floral Formation Tills (~60 m thick), Warman Formation Tills (~3 m thick), Dundum Formation Till (~20 m thick) and Pierre Formation Sand, Silt and Clay (~ 215 m thick).

Bedrock in the area is composed of the Pierre Formation, encountered at approximately 455 m asl, underlain by the Judith River Formation at approximate 370 m asl.

2.3 Water Wells

Golder accessed the Saskatchewan Water Security Agency water well database and searched for water wells within a 1.6 km of the Site (approximately one quarter section). The search identified two (2) water wells located in adjacent quarter section SW 14-036-04 W3M, and thirteen (13) water wells located in quarter section SW 13-036-04 W3M that have been reported to the Saskatchewan Water Security Agency. Five of the identified water wells are listed for Domestic water use, nine as Research wells, and one is not specified. The domestic well depths ranged between approximately 8 and 100 m. The research wells were drilled to depths between 34 and 110 m. The unspecified use well was drilled to a depth of 295 m. The search results are presented in Appendix A.

Based on the Site visit, one (1) water well was present at the Site approximately 30 m northwest of the house. The well was completed to approximately 40 m depth.

3.0 SITE HISTORY AND OPERATIONS

The primary use of the Site is agricultural with the majority of the property being used as hay fields and pasture land for the six cattle and two horses kept on Site. The yard present on the west parcel is used as a residence for the Site Representative and also houses equipment used to operate the agricultural portions of the Site including one tractor, a swathing attachment, bailer, and associated maintenance items.

The current Site occupant purchased both the western and eastern portions of the property in 2003, then subdivided and sold the eastern portion in 2006 to DB Ventures. The existing residential buildings were constructed in 2008. The Site features as seen during the Site visit are identified on Figure 3.

4.0 INFORMATION REVIEW

4.1 Land Titles

Golder conducted a search for land titles using resources available through ISC. Based on the review of available information, the Site is composed of two parcels; one owned by the Site Representative (west parcel)



PHASE I ENVIRONMENTAL SITE ASSESSMENT AT RIDGWOOD ESTATES

and one owned by DB Ventures (east parcel). DB Ventures acquired the east parcel in 2005 from the Site Representative. DB Ventures sold a 5 acre portion of the east parcel in 2011. This portion is not part of the Site. The Site Representative acquired the Site (including the more recently subdivided 5 acre portion) in 2003. Prior to 2003, the Site was owned by George and Tina Popoff. It is uncertain what the land use was prior to 2003. The land titles are provided in Appendix A.

4.2 Historic Aerial Photographs

Aerial photographs dated 1944, 1959, 1975 and 1985, in addition to Google images from 2002, 2007, 2011 and 2014 were reviewed to help develop a history of land use of the Site and adjacent properties within 250 m of the Site. Refer to Appendix B for aerial photos of the Site. Observations based on the review of aerial photographs are summarized below in Table 4.

Table 4: Aerial Photograph Review

Date	Site	SURROUNDING PROPERTY DIRECTION			
		North	East	South	West
1944	The Site is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.
1959	The Site is undeveloped and appears to be either crop or pasture land. An east-west clearing runs across the southern third of the Site, and appears to be a right-of-way or road alignment.	Not shown in the aerial photograph.	The area is undeveloped and appears to be either crop or pasture land. The right-of way continues from Site to the east.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land with few visible residential/farming buildings.	The area is undeveloped and appears to be either crop or pasture land. The right-of way continues from Site to the west. Residential or farming buildings are visible on the property to the immediate west.



**PHASE I ENVIRONMENTAL SITE ASSESSMENT AT
RIDGEWOOD ESTATES**

Table 4: Aerial Photograph Review (continued)

Date	Site	SURROUNDING PROPERTY DIRECTION			
		North	East	South	West
1975	The Site is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. An access road, running north-south, is visible to the east of the Site.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.
1985	The Site is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. An access road, running north-south, is visible to the east of the Site.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.
2002	The Site is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. An access road, running north-south, is visible to the east of the Site, with additional residential or farming structures further east.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.



**PHASE I ENVIRONMENTAL SITE ASSESSMENT AT
RIDGWOOD ESTATES**

Table 4: Aerial Photograph Review (continued)

Date	Site	SURROUNDING PROPERTY DIRECTION			
		North	East	South	West
2007	An access road is visible on the western third of the Site, and a portion of the western property appears to be crop land.	The area is under development, apparently as a community with multiple residential lots. A portion of the surrounding land remains either crop or pasture land.	A road, immediately bordering the Site, has been constructed in a north-south direction to provide access to the community to the north. Few residential/farming properties remain further to the east. A portion of the surrounding land remains either crop or pasture land.	A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.
2011	The Site is developed similar to current conditions. Buildings are visible in the locations of the present day Shop and House.	Multiple residential lots with houses are visible to the north. A portion of the surrounding land remains either crop or pasture land.	A north-south road is visible immediately east of the Site. Few residential/farming properties remain further to the east. A portion of the surrounding land remains either crop or pasture land.	Buildings have been constructed in the portion of the quarter section not included in the Site area. A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be either crop or pasture land. Residential or farming buildings are visible on the property to the immediate west.



**PHASE I ENVIRONMENTAL SITE ASSESSMENT AT
RIDGEWOOD ESTATES**

Table 4: Aerial Photograph Review (continued)

Date	Site	SURROUNDING PROPERTY DIRECTION			
		North	East	South	West
2014	The Site is developed similar to current conditions. Buildings are visible in the locations of the present day Shop and House.	Multiple residential lots with houses are visible to the north. A portion of the surrounding land remains either crop or pasture land.	A north-south road is visible immediately east of the Site. A new, apparently residential, community has been constructed on the quarter section to the east. A portion of the surrounding land remains either crop or pasture land.	Buildings are visible in the portion of the quarter section not included in the Site area. A road borders the Site to the south. The road runs in an east-west direction. There appears to be one residential establishment on the south side of the road. The surrounding area is undeveloped and appears to be either crop or pasture land.	The area is undeveloped and appears to be primarily crop land. Residential or farming buildings are visible on the property to the immediate west.

Based on a review of the aerial photographs, the Site was developed after 2007. Properties to the north and east appear to have been developed as residential communities since 2002. Property to the south and west appears to remain in use as crop and pasture land.

4.3 EcoLog ERIS Regulatory Database Search

EcoLog ERIS is a database and information service company that specializes in providing environmental and historical information compiled from government and private source records. A copy of the Ecolog ERIS report is provided in Appendix A. The databases searched by Ecolog ERIS for records pertaining to the Site and surrounding area within a 250 m search radius are listed in the Ecolog ERIS report.

Golder received a response from Ecolog ERIS, dated August 12, 2014, a copy of which is provided in Appendix A. The response indicated that no records were found for the Site or surrounding area within 205 m of the Site.

4.4 RM of Corman Park

Golder contacted the R.M. of Corman Park to inquire whether environmental information was on file for the Site. Golder received a response on August 7, 2014. The response indicated that no records were available for the Site, and there is no record of a landfill or dumpsite within 500 m of the property. A copy of the letter is provided in Appendix A.

4.5 City of Saskatoon Fire and Protective Services

Golder contacted the City of Saskatoon Fire and Protective Services to inquire whether any environmental information was on file for the Site. Golder received a response on August 19, 2014. The response indicated that



no records were available for the Site, and there is no record of a landfill or dumpsite within 500 m of the property. A copy of the letter is provided in Appendix A.

4.6 Freedom of Information and Protection of Privacy Database Search

Golder contacted the MOE to inquire whether any environmental information was on file for the Site. Golder received a response on August 14, 2014. The response indicated that the MOE did not have any records for the Site. A copy of the letter is provided in Appendix A.

4.7 Saskatchewan Ministry of Environment Databases

4.7.1 Hazardous Material Storage

Golder accessed the MOE Hazardous Material Storage Database on August 20, 2014 and searched for hazardous material storage within a 1.6 km radius of the Site (approximately one quarter section). The search did not identify any reported hazardous material storage sites in the search area.

4.7.2 Spills

Golder accessed the MOE Spills Database on August 20, 2014 and searched for reported spills within a 1.6 km radius of the Site (approximately one quarter section). The search did not identify any recorded spills in the search area.

5.0 INTERVIEWS

On August 14, 2014, Golder conducted an interview at the time of Site visit with Mr. Dwayne Pitka, the current occupant and owner of the western portion of the Site. Mr. Pitka provided a tour of the Site. Mr. Pitka has been the owner of the property since 2003. Information collected during the interview was incorporated into Sections 1.4, 3.0 and the following Sections. The following points summarize the information obtained from the interview:

- The Site was primarily used as hay fields and pasture land. A yard was present near the center of the western portion of the Site with a house and shop which had been built in 2008 and has had no major modifications since that time.
- Heating and cooling systems on Site are geothermal.
- Four aboveground storage tanks (ASTs) are present on Site, all located to the southwest of the house, and all installed in 2008:
 - one 1,000 litre (L) steel single walled diesel tank;
 - one 1,000 L steel single walled gasoline tank; and
 - two 1,000 L steel single walled water tanks.
- One (1) water well is present approximately 30 m northwest of the house and completed to approximately 40 m depth.
- The shop building houses a tractor, swathing attachment, bailer, and associated maintenance items such as antifreeze, lubricants and degreasers. All chemicals were observed to be stored in retail quantities and containers. The maintenance conducted on Site results in the generation of limited volumes of waste oil.



The waste oil is temporarily stored in drums on a neighbouring property until picked up for disposal by a contractor.

- Sanitary waste is managed by a septic tank. The liquids are pumped out of the tank via a 31 millimetre (mm) (1.25 inch) diameter hose to an outlet approximately 60 m northeast of the house and the solids are pumped out of the underground storage tank (UST) approximately once every 3 months. The Site Representative reported that the septic tank and field are properly permitted, although a copy of the permit was not available for review.
- Recyclables are hauled in to Saskatoon and disposed of in public bins on an as needed basis. Domestic waste is disposed of at the local municipal disposal facility.
- The undeveloped areas of the Site are occupied by hay fields, pasture, and a small trout pond.
- The Site Representative reported that the planned redevelopment of the Site will not include the residence (yard and trout pond) of the Site Representative that is located on the west parcel.

6.0 PREVIOUS INVESTIGATIONS

No previous investigations for the Site were available for review.

7.0 SITE VISIT

A Site visit was conducted on August 14, 2014, by Golder and consisted of a visual inspection of the Site in conjunction with interviews. The Site visit was documented with notes and a photographic log. Photographs of the Site are provided in Appendix C and Site visit findings are discussed below.

7.1 General Appearance and Housekeeping

During the Site visit Golder noted that housekeeping in general was good. Equipment and materials appeared to be properly stored, and were kept neatly and in an organized manner.

7.2 Air Emissions

No regulated air emission sources were present on-Site.

7.3 Heating and Cooling Systems

Comfort heating and air conditioning is provided to the house by a geothermal heating and cooling system. The shop uses overhead forced air heating units, but does not have a cooling system in place.

7.4 Sumps, Pits and Drains

No sumps, pits or drains were reported on-Site.

7.5 Water and Waste Water Discharges

One (1) water well was present on the Site, approximately 30 m northwest of the House. General usage water is also stored in two 1,000 L steel single walled above ground storage tanks.

Sanitary waste and grey water was disposed of in one septic tank located on Site. Solid wastes were pumped from the septic tanks approximately two to three times per year and hauled off Site in trucks. Liquid wastes were pumped through a piping network to a septic field located approximately 60 m northeast of the House.



Storm water runoff from the Site, in general, drains naturally into roadside ditches, sloughs, and natural depressions. No process waters were present at the Site.

7.6 Waste Management and Handling

Waste produced at the Site at the time of the Site visit consisted of:

- domestic waste;
- recyclables; and
- used oil.

Domestic waste was stored in garbage containers and removed to the R.M. of Corman Park disposal facility by the landowner. Recycling was removed from Site on an as needed basis by the landowner, and disposed of in public bins in Saskatoon. Used oil was removed from the Site following equipment maintenance, and was stored in drums at a neighbouring property until the volume was sufficient for pick-up by a contractor.

7.7 Chemical Storage, Handling, and Management

Chemical storage consisted primarily of products associated with the upkeep of the Site equipment. Products were observed in the shop building and included oil, antifreeze, lubricants and degreasers in retail size containers.

7.8 Spills and Releases

Minimal oil staining was observed within the shop building. The concrete floor in the shop appeared to be in good condition with no visible cracks or staining.

7.9 Aboveground Storage Tanks (ASTs)

Four ASTs were observed on-Site:

- one 1,000 L steel single walled diesel tank on a stand;
- one 1,000 L steel single walled gasoline tank on a stand; and
- two 1,000 L steel single walled water tanks on stands.

The diesel and gasoline are used to fuel farming equipment including a tractor, truck and all terrain vehicle (ATV). The water was used to irrigate the garden at the residence.

7.10 Underground Storage Tanks (USTs)

No USTs were observed on-Site or reported by the Site Representatives.

7.11 Stressed Vegetation

Native grassland vegetation and interconnected tree stands were present throughout the majority of Site. Stressed vegetation was not observed at the time of the Site visit.



7.12 Asbestos

Since the late 1970s, the manufacturing and use of asbestos-containing building materials (ACMs) has continued to decrease. There is no firm date outlining when asbestos in building materials was discontinued. Manufacturers produced and ceased production of asbestos-containing materials at different times. It is commonly presumed that buildings constructed prior to 1980 are more likely to contain both friable and non-friable forms of asbestos such as mechanical insulations, ceiling tiles, floor tiles, ceiling textures, etc. Generally, buildings constructed from 1980 to 1985/86 are more likely to contain non-friable asbestos in the form of floor tiles, sheet flooring, drywall joint compound, etc. Even buildings constructed much more recently may contain ACMs in the form of exterior window caulking, roofing materials, and/or Transite piping.

The shop and house were constructed in 2008. Given the date of construction it is unlikely that these buildings were made from asbestos-based building products.

7.13 Lead

Although lead based paints (LBPs) were banned from uses on exterior, or interior surfaces of buildings, furniture, or household products in the 1970s in Canada, various commercial paints are still known to contain lead in concentrations greater than 0.5 percent by weight (e.g., road paint, exterior paints). Lead based paint was a hard glossy paint typically used on doors, windows, stairs, railings, column, radiators and trims.

Given the date of construction of the shop and house, it is unlikely that LBPs were used on Site. Surfaces that were finished with paint were noted to be in good condition and not flaking or peeling. Radiators were not present in the buildings. The exteriors of the buildings on-Site were metal clad and did not have any peeling or flaking.

7.14 Polychlorinated Biphenyls

Buildings constructed prior to 1978-1979 may contain polychlorinated biphenyls (PCB)-containing electrical equipment.

Based on the date of construction of the shop and house (2008) it is unlikely that PCB-containing electrical equipment was present on-Site.

7.15 Urea Formaldehyde Foam Insulation

Urea Formaldehyde Foam Insulation (UFFI) is low-density foam that was used as an insulating material until approximately December 1980. UFFI was commonly injected through walls by drilling injection holes, typically in walls, roof structures, ceilings and overhangs. The concern with UFFI relate to exposure to gases as the UFFI cures, ages and degrades.

No obvious evidence of UFFI materials was observed at the Site at the time of the Site reconnaissance.

7.16 Ozone-Depleting Substances

Current federal and provincial regulations prohibit the future manufacture sale, purchase and use of ozone-depleting substances (ODS). ODSs are commonly used as refrigerants in air conditioning and refrigeration units, and will eventually require replacement. ODSs were also historically used as industrial solvents.



It is assumed that there is a domestic use refrigerator within the House. The date of manufacture was not reviewed, however given the timeframe of Site development, it is unlikely that ODSs were present in the cooling equipment of any refrigeration systems present.

7.17 Mould

A limited visual review of accessible building interior areas for obvious evidence of water intrusion and/or the proliferation of microbial growth was conducted at the time of the Site reconnaissance. This assessment included surfaces of building materials capable of supporting mould growth such as ceiling tiles, drywall, carpeting, and areas that may have had a history of water intrusion or on-going saturation capable of contributing to mould growth.

The Site Representative indicated that there have been no issues regarding mould or water damage to the Site buildings.

7.18 Radioactive Materials

No licensed radioactive equipment, materials, sources or waste were observed by Golder or identified by the Site Representatives during the Site visit.

7.19 Radon Gas

Radon gas is a product of the natural decay series that begins with uranium. Radon is produced directly from radium, which can be commonly found in geological rock formations such as black shale and/or granite. In open air or locations with high air circulation, radon is not considered a health problem due to the dilution of the gas.

Based on Site geology (i.e., low prevalence of uranium-rich soils and bedrock), the potential for radon gas accumulation is considered to be low.

7.20 Herbicides and Pesticides

The Site Representative indicated that herbicides and pesticides were not used on the property.

7.21 Mercury

Although the use of mercury in products such as thermostats, button batteries, thermometers, fluorescent light tubes, and barometers began to decrease in the 1970s due to growing environmental concerns, many of these products still contain mercury and/or mercury containing compounds.

Given the date of construction of the Site buildings (2008) it is unlikely that mercury containing products are present.

7.22 Surrounding Land Use

A visual reconnaissance of the operations of the adjacent properties was carried out from the Site and publicly accessible areas.

NORTH

The Site was bordered to the north by a section of land that was undergoing residential development. The new development was named Hidden Ridge Estates. The land was primarily treed, with many small sloughs and some grassland. There were residential, ground-mounted transformers at each residential lot.



EAST

The Site was bordered to the east by agricultural land and Range Road 3041 (runs north south). A new residential development, named Applewood Estates, was underway further east. Currently, the land was a mix of forest and grassland. There were residential, ground-mounted transformers at each residential lot. A natural gas valve station was present adjacent to the southeast corner of the Site.

SOUTH

The Site was bordered to the south by Patience Lake Road, then natural prairie land.

WEST

The Site was bordered to the west by agricultural cropland and pasture.

8.0 SITE HISTORY SUMMARY

The Site is located at the intersection of Patience Lake Road and Range Road 3041 approximately 8 km east of the southeast corner of Saskatoon, Saskatchewan, and covers an area of approximately 155 acres. The Site is located within the south east quarter of Section 14, Township 36, and Range 4 W3M (SE 14-036-4 W3M), and is accessed directly from Highway 394. The property is composed of two parcels (#153820830 [west] and #165160458 [east]). An irregular segment between the two parcels is developed as a residential property, and is not part of the Site described within this report.

Currently the Site consists primarily of hay field and pasture land. A residential development including a house, yard and shop, belonging to the Site Representative were present near the centre of the west parcel. A gravel road runs in a north-south direction from Highway 394 to the yard. A small herd of six cattle and two horses were present in the fields north of the yard and a trout pond approximately 100 m south of the yard were also present, belonging to the Site Representative.

Areas of Potential Environmental Concern

Based on the findings of the Phase I ESA, the following Areas of Potential Environmental Concern (APECs) were identified (Figure 3):

- **Septic Field** – One septic outlet (31 mm [1.25 inch]) is present on the Site approximately 60 m northeast of the house. The Site Representative noted that the septic field is properly permitted.
- **One 1,000 L Diesel and one 1,000 L Gasoline Tank** – The two fuel tanks located on Site do not have secondary containment. Minor spills or releases to the ground surface can be mitigated with the use of secondary containment and therefore are recommended.

The above noted items represent potential environmental concerns. However, it is understood that the residential property within the Site will not be part of the redevelopment plan and the residential portion of the Site would be retained by the current owner. Under these conditions the AST tanks used for fueling would not represent a potential environmental concern to the portion of the Site planned for redevelopment. In addition the septic field would not represent a concern to the portion of the Site proposed for redevelopment as long as the design (distance to water wells and residences as an example) and permit requirements (The Plumbing and Drainage Regulations) are maintained in conjunction with the planned redevelopment.



PHASE I ENVIRONMENTAL SITE ASSESSMENT AT RIDGEWOOD ESTATES

9.0 REFERENCES

The following is a list of persons contacted and references reviewed for the purposes of preparing this report:

Source	Date
Canadian Standards Association Document Z768-01 'Phase I – Environmental Site Assessments'	November 2001
"Geology of the Saskatoon Region, Saskatchewan" prepared by E.A. Christiansen Consulting Ltd., dated March 15, 1979 (E.A. Christiansen 1979)	March 15, 1979
"Hydrogeology Mapping of NTS Mapsheet Saskatoon 73B" prepared by MDH Engineered Solutions, dated April 2011 (MDH 2011)	April 2011
EcoLog Environmental Risk Information Services (EcoLog ERIS Report)	August 13, 2014
Sask Water Corporation	July 18, 2014
City of Saskatoon Fire and Protective Services	August 19, 2014
Saskatchewan Ministry of Environment	August 14/20, 2014
Rural Municipality of Corman Park	August 7, 2014
Information Services Corporation	August, September 2014
Dwayne Pitka, Site Representative	August 14, 2014



10.0 LIMITATIONS AND USE OF THIS REPORT

This report was prepared for the exclusive use of DB Ventures. The report, which specifically includes all tables and figures, is based on data and information collected during the Site activities conducted by Golder and is based solely on the conditions of the property at the time of the field investigations, supplemented by historical information and data obtained by Golder and others as described in this report. The assessment of environmental conditions and possible hazards at this Site has been made using the results of chemical analysis of soil samples collected from a limited number of locations. The conditions between sampling locations have been inferred based on conditions observed. Site conditions may vary from these sample locations. Additional study, including further investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a site may be contaminated and remain undetected.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. In addition, Golder disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The content of this report is based on information collected during previous investigations conducted by others and ourselves, our present understanding of the Site conditions, and our professional judgment in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change. The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.



11.0 CLOSURE

Should you have any questions or concerns, please do not hesitate to contact the undersigned at 306-665-7989.

Report Signature Page

GOLDER ASSOCIATES LTD.

Alexandria Beveridge
Geological Engineer

Jackie Kellington, A.Sc.T.
Environmental Technologist



Doug Sweeney, M.Sc., P.Eng.
Associate, Senior Engineer

HC/JK/DS/jlb

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Association of Professional Engineers & Geoscientists
of Saskatchewan

CERTIFICATE OF AUTHORIZATION

Golder Associates Ltd.

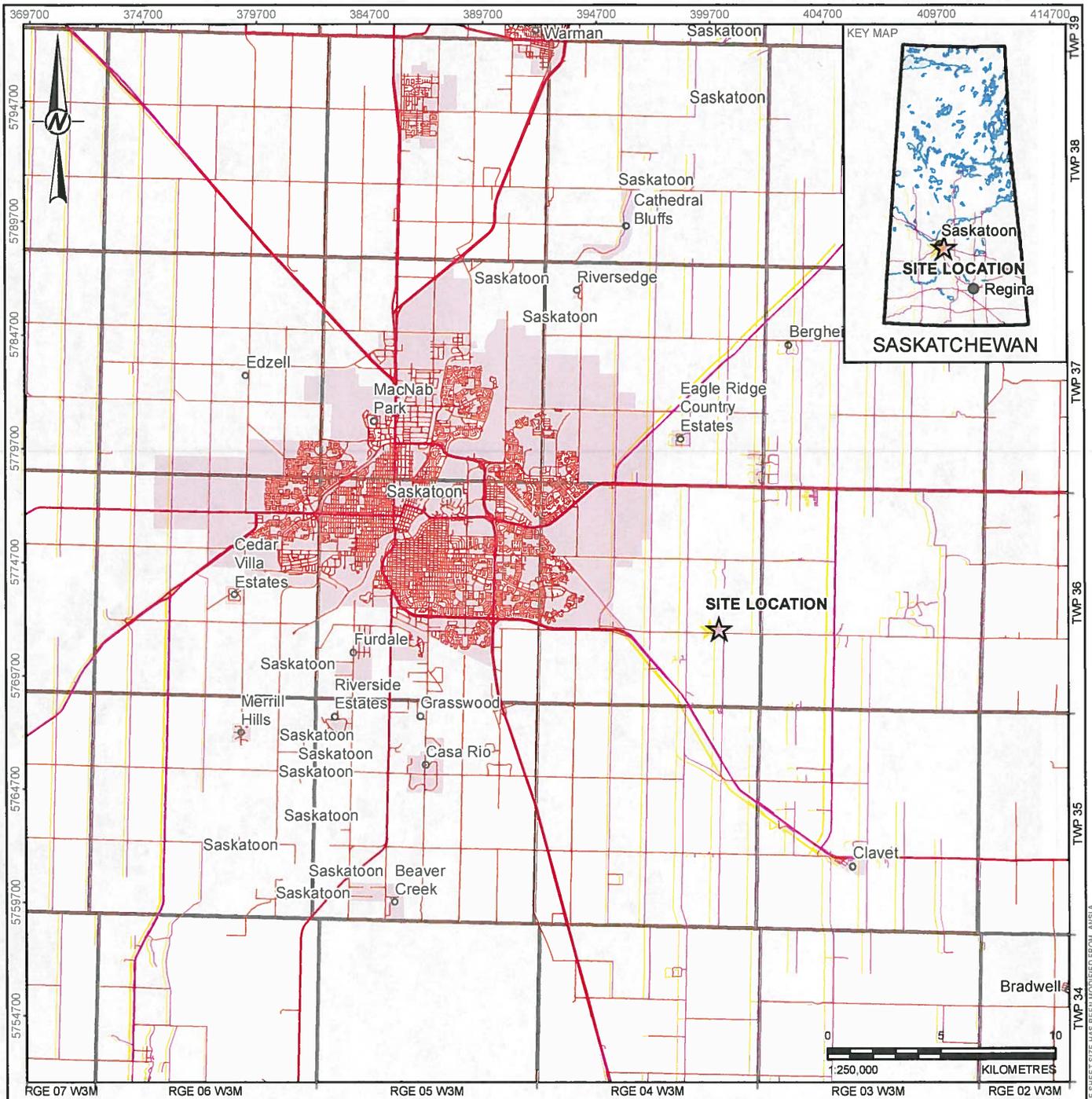
Number C0230

Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
<u>GEOTECH.</u>	<u>6324</u>	



FIGURES



Path: G:\2014\1406386_Ridgewood Estates\Figures\FIG 1_Site_Location_Plan.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIA 28mm

REFERENCE
 CANVEC ROADS: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
 NATIONAL TOPOGRAPHIC DATA BASE (NTDB) 250K DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2007.
 NAD 83 UTM ZONE 13

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DB VENTURES

PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK,
 SASKATCHEWAN**

TITLE
SITE LOCATION PLAN

CONSULTANT

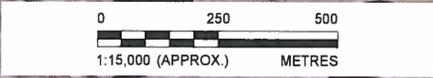


YYYY-MM-DD	2014-08-20
PREPARED	GAE
DESIGN	JK
REVIEW	JK
APPROVED	DS

PROJECT	PHASE	Rev.	FIGURE
1406388	1	A	1



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PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK,
 SASKATCHEWAN**

CONSULTANT	YYYY-MM-DD	2014-08-22
	PREPARED	S. CHARLTON
	DESIGN	J. KELLINGTON
	REVIEW	J. KELLINGTON
	APPROVED	D.SWEENEY

TITLE	PROJECT No	CONTROL	Rev.	FIGURE
SURROUNDING LAND USE	1406388		0	2

Path: \\golder\gdp\gdp\laskaton\ggs\2014\1406388_RidgeWood Estates\Figures\ File Name: 1406388_Surround_Land_Use.dwg

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



KEY AREAS

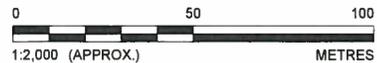
- ① APPROXIMATE LOCATION OF SEPTIC FIELD
- ② DIESEL AND GASOLINE ABOVEGROUND STORAGE TANKS
- ⊕ WATER WELL

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CLIENT
DB VENTURES

PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIGDEWOOD ESTATES, SE-14-36-04 W3M, CORMAN PARK
 SASKATCHEWAN**

CONSULTANT

YYYY-MM-DD 2014-09-12

TITLE
SITE PLAN



PREPARED S. CHARLTON

DESIGN J. KELLINGTON

REVIEW J. KELLINGTON

APPROVED D. SWEENEY

PROJECT No.
1406388

CONTROL

Rev.
0

FIGURE
3



APPENDIX A

Regulatory Information

LINDEN, DALE		Completion	05/01/1974
			RM
			Major Basin 06
			SubBasin 30
			NTS Map 73B00
WWDR#	012381		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			600.00 ft from N/S Boundary S
							360.00 ft from E/W Boundary W

Well Information						
Driller #	PRAIRIE WATER LTD					
Water Use	Domestic					
Hole #						
Well Use	Withdrawal	Well Casings				
Installation Method	Bored	Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	28.00	0.00	0.00	0.00	Porous Concrete	
Water Level	0.00	0.00	0.00	0.00		
Bit	0.00	Screens				
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
Pump Test						
Draw Down	0.00 ft	Elevation		1,700.00 ft	Aquifer	
Duration	0.00 hrs	Rec. Pumping Rate		0.00	E-Log No	
Pumping Rate	0.00 igpm	Intake		0.00	Phys E03	
Temp	0.00 deg. F					

Lithology List

Depth (ft)	Material	Colour	Description
10.00	Clay	Brown	Unknown
20.00	Clay	Grey	Unknown
27.00	Clay	Grey	Sandy
28.00	Gravel	Unknown	Unknown
32.00	Clay	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031779		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	002						
Well Use	Water Test Hole			Well Casings			
Installation Method	Drilled			Length (ft)	Btm (ft)	Dia (in)	Description
Depth	112.00			0.00	0.00	0.00	
Water Level	0.00			0.00	0.00	0.00	
Bit	0.00	Screens					
Flowing Head	0.00			Length (ft)	Btm (ft)	Dia (in)	Slot (in) Description
				0.00	0.00	0.00	0.00
				0.00	0.00	0.00	0.00
				0.00	0.00	0.00	0.00
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft			Aquifer	
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00			E-Log	SCANNED
Temp	0.00 deg. F	Intake	0.00			Phys	E22

Lithology List

Depth (ft)	Material	Colour	Description
7.00	Sand	Unknown	Coarse
29.00	Till	Yellow	Unknown
49.00	Till	Grey	Unknown
63.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031780		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	003	Well Casings					
Well Use	Water Test Hole	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	0.00	0.00	0.00			
Depth	112.00	0.00	0.00	0.00			
Water Level	0.00	0.00	0.00	0.00			
Bit	0.00	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft	Aquifer			
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log	SCANNED		
Temp	0.00 deg. F	Intake	0.00	Phys	E22		

Lithology List

Depth (ft)	Material	Colour	Description
17.00	Till	Yellow	Sandy
44.00	Till	Grey	Unknown
78.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031781		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information						
Driller #	ELK POINT DRILLING CORP					
Water Use	Research					
Hole #	004					
Well Use	Water Test Hole					
Installation Method	Drilled	Well Casings				
Depth	112.00	Length (ft)	Btm (ft)	Dia (in)	Description	
Water Level	0.00	0.00	0.00	0.00		
Bit	0.00	Screens				
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00
Pump Test						
Draw Down	0.00 ft					
Duration	0.00 hrs	Elevation	1,775.00 ft		Aquifer	
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00		E-Log	SCANNED
Temp	0.00 deg. F	Intake	0.00		Phys	E22

Lithology List

Depth (ft)	Material	Colour	Description
24.00	Till	Yellow	Silty
45.00	Till	Grey	Unknown
78.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031782		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	005	Well Casings					
Well Use	Water Test Hole	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	0.00	0.00	0.00			
Depth	112.00	0.00	0.00	0.00			
Water Level	0.00	0.00	0.00	0.00			
Bit	0.00	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft	Aquifer			
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log	SCANNED		
Temp	0.00 deg. F	Intake	0.00	Phys	E22		

Lithology List

Depth (ft)	Material	Colour	Description
16.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WVDR#	031783		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	006	Well Casings					
Well Use	Water Test Hole	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	0.00	0.00	0.00			
Depth	112.00	0.00	0.00	0.00			
Water Level	0.00	0.00	0.00	0.00			
Bit	0.00	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft	Aquifer			
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log	SCANNED		
Temp	0.00 deg. F	Intake	0.00	Phys	E22		

Lithology List

Depth (ft)	Material	Colour	Description
34.00	Till	Yellow	Unknown
59.00	Till	Grey	Sandy
73.00	Till	Grey	Unknown
76.00	Sand	Unknown	Medium-coarse
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031784		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	007	Well Casings					
Well Use	Water Test Hole	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	0.00	0.00	0.00			
Depth	113.00	0.00	0.00	0.00			
Water Level	0.00	0.00	0.00	0.00			
Bit	0.00	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft	Aquifer			
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log	SCANNED		
Temp	0.00 deg. F	Intake	0.00	Phys	E22		

Lithology List

Depth (ft)	Material	Colour	Description
25.00	Till	Yellow	Unknown
54.00	Till	Grey	Unknown
88.00	Till	Green	Unknown
113.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031785		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #	008						
Well Use	Water Test Hole			Well Casings			
Installation Method	Drilled		0.00	0.00	0.00	0.00	0.00
Depth	112.00		0.00	0.00	0.00	0.00	0.00
Water Level	0.00		0.00	0.00	0.00	0.00	0.00
Bit	0.00	Screens					
Flowing Head	0.00		0.00	0.00	0.00	0.00	0.00
			0.00	0.00	0.00	0.00	0.00
			0.00	0.00	0.00	0.00	0.00
			0.00	0.00	0.00	0.00	0.00
Pump Test							
Draw Down	0.00 ft						
Duration	0.00 hrs	Elevation	1,775.00 ft	Aquifer			
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log SCANNED			
Temp	0.00 deg. F	Intake	0.00	Phys E22			

Lithology List			
Depth (ft)	Material	Colour	Description
21.00	Till	Yellow	Unknown
46.00	Till	Grey	Unknown
74.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

SASK RESEARCH COUNCI		Completion	
		RM	
		Major Basin 06	
		SubBasin 30	
		NTS Map 73B00	
WWDR#	031786		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information							
Driller #	ELK POINT DRILLING CORP						
Water Use	Research						
Hole #							
Well Use	Water Test Hole		Well Casings				
Installation Method	Drilled		Length (ft)	Btm (ft)	Dia (in)	Description	
Depth	293.00		0.00	0.00	0.00		
Water Level	0.00		0.00	0.00	0.00		
Bit	0.00		Screens				
Flowing Head	0.00		Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
Pump Test							
Draw Down	0.00 ft	Elevation		1,775.00 ft	Aquifer		
Duration	0.00 hrs	Rec. Pumping Rate		0.00	E-Log SCANNED		
Pumping Rate	0.00 igpm	Intake		0.00	Phys E22		
Temp	0.00 deg. F						

Lithology List

Depth (ft)	Material	Colour	Description
37.00	Till	Yellow	Unknown
44.00	Till	Grey	Unknown
75.00	Till	Green	Unknown
156.00	Till	Grey	Unknown
184.00	Silt	Grey	Clayey
189.00	Sand	Grey	Medium-coarse
205.00	Silt	Grey	Clayey
217.00	Sand	Grey	Medium-coarse
252.00	Till	Grey	Unknown
293.00	Shale	Grey	Silty

POPOFF, G G		Completion	07/01/1925
			RM
		Major Basin	06
		SubBasin	30
		NTS Map	73B00
WWDR#	031787		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	14	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information							
Driller #	UNKNOWN						
Water Use	Domestic						
Hole #							
Well Use	Withdrawal	Well Casings					
Installation Method	Drilled	Length (ft)	Btm (ft)	Dia (in)	Description		
Depth	112.00	0.00	0.00	0.00	Steel		
Water Level	70.00	0.00	0.00	0.00	0.00		
Bit	6.20	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		0.00	0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	
Pump Test							
Draw Down	0.00 ft	Elevation		1,775.00 ft	Aquifer	Glac	
Duration	0.00 hrs	Rec. Pumping Rate		0.00	E-Log	No	
Pumping Rate	0.00 igpm	Intake		0.00	Phys	E03	
Temp	0.00 deg. F						

Lithology List

Depth (ft)	Material	Colour	Description
112.00	Clay	Unknown	Unknown

FREEBORN, DON	Completion 04/15/1986
	RM
	Major Basin 06
	SubBasin 30
	NTS Map 73B00
WWDR# 086518	

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			750.00 ft from N/S Boundary S
							400.00 ft from E/W Boundary W

Well Information							
Driller #	MITCHELL DRILLING (1979) LTD						
Water Use	Domestic						
Hole #	1			Well Casings			
Well Use	Withdrawal		Length (ft)	Btm (ft)	Dia (in)	Description	
Installation Method	Drilled		290.00	0.00	5.00	P.V.C.	
Depth	330.00		0.00	0.00	0.00		
Water Level	32.00		0.00	0.00	0.00		
Bit	5.10		Screens				
Flowing Head	0.00		Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
			10.00	300.00	4.00	25.00	Stainless Steel
			0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	
Pump Test							
Draw Down	89.00 ft		Elevation		1,760.00 ft	Aquifer	
Duration	4.00 hrs		Rec. Pumping Rate		25.00	E-Log SCANNED	
Pumping Rate	65.00 igpm		Intake		150.00	Phys E22	
Temp	41.00 deg. F						

Lithology List

Depth (ft)	Material	Colour	Description
16.00	Silt	Brown	Unknown
125.00	Till	Grey	Sandy
188.00	Till	Grey	Cobblestones
194.00	Sand	Unknown	Coarse
247.00	Till	Grey	Sandy
253.00	Sand	Grey	Fine
286.00	Till	Grey	Unknown
316.00	Sand	Unknown	Fine-medium
340.00	Till	Grey	Unknown

TOUCHER, PAUL		Completion	09/22/1998
			RM 344
			Major Basin 06
			SubBasin 30
			NTS Map 73B01
WWDR#	110409		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	NW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			300.00 ft from N/S Boundary S
							600.00 ft from E/W Boundary E

Well Information							
Driller #	MITCHELL DRILLING (1979) LTD						
Water Use	Domestic						
Hole #	001	Well Casings					
Well Use	Withdrawal	Length (ft)	Btm (ft)	Dia (in)	Description		
Installation Method	Drilled	73.00	71.00	5.00	P.V.C.		
Depth	260.00	0.00	0.00	0.00			
Water Level	16.00	0.00	0.00	0.00			
Bit	5.10	Screens					
Flowing Head	0.00	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
		4.00	75.00	4.00	20.00	Stainless Steel	
		0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00		
Pump Test							
Draw Down	38.00 ft		Elevation		1,771.00 ft	Aquifer	
Duration	2.00 hrs		Rec. Pumping Rate		8.00	E-Log SCANNED	
Pumping Rate	10.00 igpm		Intake		60.00	Phys E22	
Temp	44.00 deg. F						

Lithology List				
Depth (ft)	Material	Colour	Description	
17.00	Gravel	Unknown	Oxidized	
71.00	Till	Grey	Unknown	
76.00	Sand	Unknown	Fine-medium	
102.00	Clay	Grey	Unknown	
118.00	Sand	Grey	Fine	
260.00	Till	Grey	Cobblestones	

SASK HIGHWAYS & TRAN:		Completion	07/25/1989
			RM 344
			Major Basin 06
			SubBasin 30
			NTS Map 73B01
WWDR#	116889		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
05	SW	13	036	04	3		
							Location of Well (in Quarter)
							0.00 ft from N/S Boundary
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from E/W Boundary

Well Information						
Driller #	UNKNOWN					
Water Use	Research					
Hole #	140					
Well Use	Soil Test Hole					
Installation Method	Drilled					
Depth	358.00					
Water Level	0.00					
Bit	4.80					
Flowing Head	0.00					
Well Casings						
	Length (ft)	Btm (ft)	Dia (in)	Description		
	0.00	0.00	0.00			
	0.00	0.00	0.00			
	0.00	0.00	0.00			
Screens						
	Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description	
	0.00	0.00	0.00	0.00		
	0.00	0.00	0.00	0.00		
	0.00	0.00	0.00	0.00		
Pump Test						
Draw Down	0.00 ft					
Duration	0.00 hrs	Elevation	1,781.00 ft		Aquifer	
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00		E-Log	SCANNED
Temp	0.00 deg. F	Intake	0.00		Phys	E22

Lithology List

Depth (ft)	Material	Colour	Description
7.00	Silt	Grey	Calcareous
11.00	Sand	Yellow	Silty
17.00	Till	Grey	Sandy
21.00	Till	Grey	Sandy
43.00	Till	Grey	Sandy
62.00	Till	Grey	Sandy
99.00	Till	Grey	Calcareous
158.00	Till	Grey	Calcareous
169.00	Sand	Grey	Fine-medium
177.00	Till	Brown	Calcareous
200.00	Till	Grey	Calcareous
201.00	Till	Grey	Clayey

213.00	Till	Grey	Calcareous
259.00	Till	Grey	Calcareous
274.00	Till	Grey	Calcareous
279.00	Silt	Grey	Clayey
287.00	Sand	Grey	Silty
288.00	Concretion	Unknown	Unknown
290.00	Sand	Grey	Fine
292.00	Bentonite	Unknown	Unknown
308.00	Sand	Grey	Silty
322.00	Silt	Grey	Sandy
345.00	Silt	Grey	Clayey
358.00	Silty Clay	Grey	Noncalcareous

MENZIES, CALVIN		Completion	07/18/2002
WWDR# 119562		RM	344
		Major Basin	06
		SubBasin	30
		NTS Map	73B01

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information									
Driller #	PRAIRIE WATER LTD								
Water Use	Domestic								
Hole #	001								
Well Use	Withdrawal								
Installation Method	Bored								
Depth	45.00	Well Casings Length (ft)	46.00	Btm (ft)	45.00	Dia (in)	36.00	Description	Porous Concrete
Water Level	0.00		0.00		0.00		0.00		
Bit	42.00	Screens							
Flowing Head	0.00	Length (ft)	0.00	Btm (ft)	0.00	Dia (in)	0.00	Slot (in)	0.00
			0.00		0.00		0.00		0.00
			0.00		0.00		0.00		0.00
			0.00		0.00		0.00		0.00
Pump Test									
Draw Down	0.00 ft		Elevation		1,782.00 ft	Aquifer			
Duration	0.00 hrs		Rec. Pumping Rate		4.00	E-Log		No	
Pumping Rate	0.00 igpm		Intake		0.00	Phys		E22	
Temp	0.00 deg. F								

Lithology List

Depth (ft)	Material	Colour	Description
2.00	Fill	Unknown	Unknown
4.00	Topsoil	Unknown	Unknown
26.00	Till	Brown	Unknown
35.00	Till	Grey	Unknown
39.00	Till	Grey	Gravel Streaks
45.00	Till	Grey	Unknown

MIDAS OILS		Completion	07/19/1952
			RM 344
			Major Basin 06
			SubBasin 30
			NTS Map 73B01
WWDR#	220557		

Well Location							
LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	14	036	04	3		
							Location of Well (in Quarter)
Zone	Easting	Northing	Source	Accuracy			
							0.00 ft from N/S Boundary
							0.00 ft from E/W Boundary

Well Information						
Driller #	UNKNOWN					
Water Use						
Hole #						
Well Use						
Installation Method						
Depth	970.00	Well Casings				
Water Level	0.00	Length (ft)	Btm (ft)	Dia (in)	Description	
Bit	0.00	0.00	0.00	0.00		
Flowing Head	0.00	0.00	0.00	0.00		
		Screens				
		Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
		0.00	0.00	0.00	0.00	
Pump Test						
Draw Down	0.00 ft					
Duration	0.00 hrs	Elevation	1,765.00 ft	Aquifer		
Pumping Rate	0.00 igpm	Rec. Pumping Rate	0.00	E-Log		
Temp	0.00 deg. F	Intake	0.00	Phys		

Lithology List

Depth (ft)	Material	Colour	Description
------------	----------	--------	-------------

Province of Saskatchewan Land Titles Registry Title

Title #: 129965888 **As of:** 28 Aug 2014 16:58:37
Title Status: Active **Last Amendment Date:** 22 Nov 2005 09:48:50.180
Parcel Type: Surface **Issued:** 22 Nov 2005 09:48:48.617
Parcel Value: \$100,000.00 CAD
Title Value: \$100,000.00 CAD **Municipality:** RM OF CORMAN PARK NO. 344
Converted Title: 76S40857
Previous Title and/or Abstract #: 126819513

DWAYNE THEODORE PITKA is the registered owner of Surface Parcel #153820830

Reference Land Description: Blk/Par APlan No 101847810 Extension 0

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000*.

Registered Interests:

Interest #: 130269179	CNV Pipeline Easement	Value: N/A Reg'd: 15 Apr 1958 01:13:03 Interest Register Amendment Date: N/A Interest Assignment Date: N/A Interest Scheduled Expiry Date: N/A Expiry Date: N/A
	S1/2-14 Holder: TRANS GAS LIMITED 700 - 1777 Victoria Ave Regina, Saskatchewan, Canada S4P 4K5 Client #: 105200985 Int. Register #: 103808639 Converted Instrument #: FP4383 Feature #: 100077612	
Interest #: 130269180	CNV Caveat	Value: N/A Reg'd: 06 Oct 1964 01:46:59

Interest Register Amendment**Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A

S1/2 - 14

Holder:

Potash Company of America
 Ferguson et al No 1 Bank of Commerce Bldg
 Saskatoon, Saskatchewan, Canada

Client #: 106603983**Int. Register #:** 103808640**Converted Instrument #:** 64S19199

Interest #:
130269191

CNV Pipeline Easement

Value: N/A**Reg'd:** 28 Jun 1965 01:48:33**Interest Register Amendment****Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A

S1/2-14

Holder:

Potash Corporation of Saskatchewan Inc.
 N/A, Saskatchewan, Canada

Client #: 106015340**Int. Register #:** 103808651**Converted Instrument #:** 65S12542**Feature #:** 100064483

Interest #:
130269203

Public Utility Easement

Value: N/A**Reg'd:** 21 Jan 2004 15:12:38**Interest Register Amendment****Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A**Holder:**

RURAL MUNICIPALITY OF CORMAN PARK NO. 344
 111 PineHouse Drive
 Saskatoon, Saskatchewan, Canada S7K 5W1

Client #: 101591580
Int. Register #: 108592993

Addresses for Service:

Name	Address
Owner: DWAYNE THEODORE PITKA	351 Carleton Drive Saskatoon, Saskatchewan, Canada S7H 3P2

Client #: 116041238

Notes:

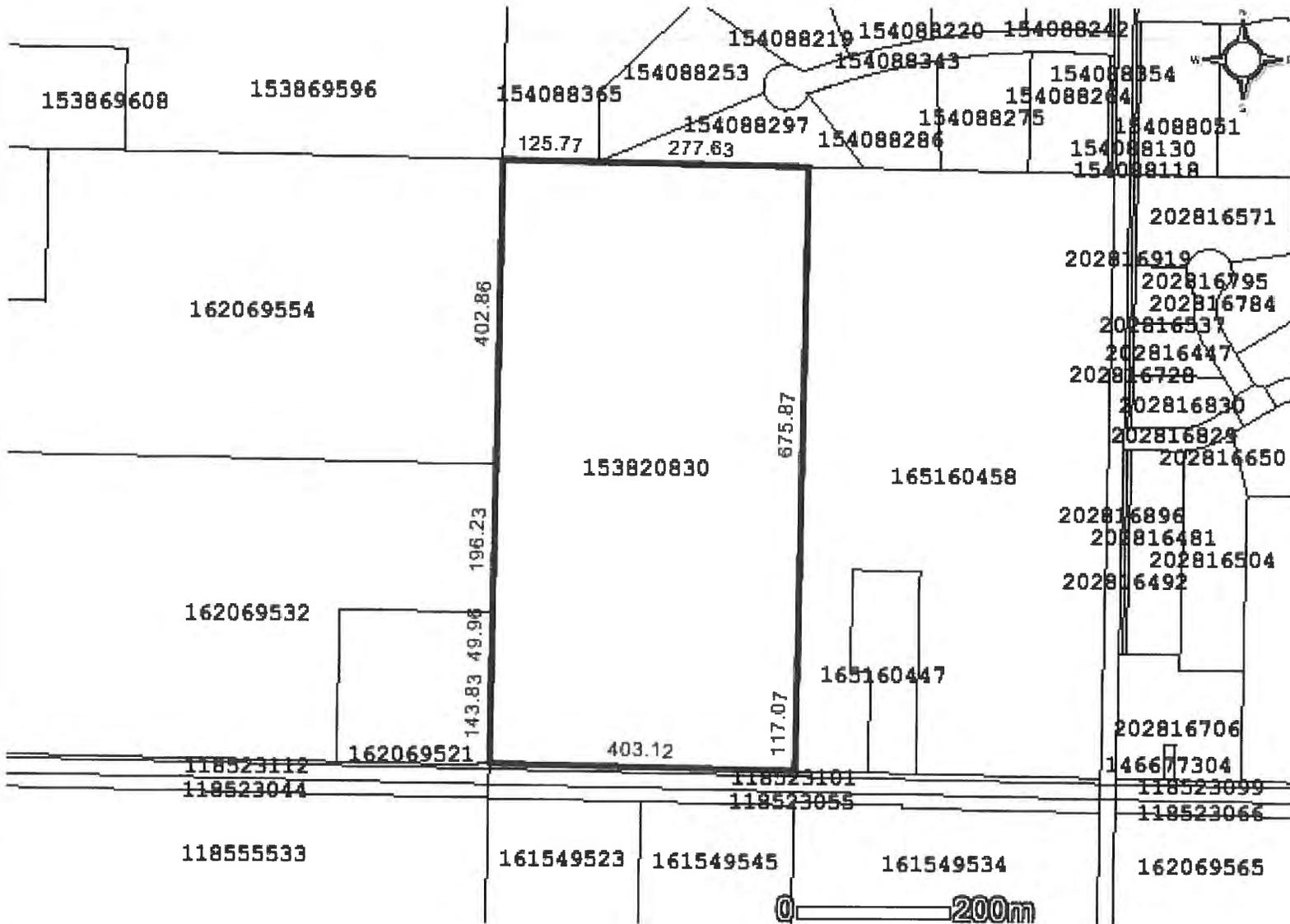
Parcel Class Code: Parcel (Generic)

[Back](#)



**Information
Services
Corporation**

Surface Parcel Number: 153820830
LLD: (Parcel: A)Plan 101847810 Ext 0
Parcel Class Code: Parcel (Generic)
Area: 32.183 hectares (79.53 acres)
Request Date: 18-Jul-2014 4:51:15 o'clock PM CST



DISCLAIMER: THIS IS NOT A PLAN OF SURVEY. It is a consolidation of plans to assist in identifying the location, size and shape of a parcel in relation to other parcels. Parcel boundaries and area may have been adjusted to fit with adjacent parcels. To determine actual boundaries, dimensions, or area of any parcel, refer to the plan, or consult a surveyor.

Interest Register Amendment**Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A

S1/2 - 14

Holder:

Potash Company of America
 Ferguson et al No 1 Bank of Commerce Bldg
 Saskatoon, Saskatchewan, Canada

Client #: 106603983**Int. Register #:** 103808640**Converted Instrument #:** 64S19199

Interest #:
154808680

CNV Pipeline Easement

Value: N/A**Reg'd:** 28 Jun 1965 01:48:33**Interest Register Amendment****Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A

S1/2-14

Holder:

Potash Corporation of Saskatchewan Inc.
 N/A, Saskatchewan, Canada

Client #: 106015340**Int. Register #:** 103808651**Converted Instrument #:** 65S12542**Feature #:** 100064483

Interest #:
154808691

Public Utility Easement

Value: N/A**Reg'd:** 21 Jan 2004 15:12:38**Interest Register Amendment****Date:** N/A**Interest Assignment****Date:** N/A**Interest Scheduled Expiry****Date:** N/A**Expiry Date:** N/A**Holder:**

RURAL MUNICIPALITY OF CORMAN PARK NO. 344
 111 PineHouse Drive
 Saskatoon, Saskatchewan, Canada S7K 5W1

Client #: 101591580
Int. Register #: 108592993

Interest #:
154808703

Public Utility Easement

Value: N/A
Reg'd: 21 Oct 2009 13:33:05
Interest Register Amendment
Date: N/A
Interest Assignment
Date: N/A
Interest Scheduled Expiry
Date: N/A
Expiry Date: N/A

Holder:

RURAL MUNICIPALITY OF CORMAN PARK NO. 344
 111 PineHouse Drive
 Saskatoon, Saskatchewan, Canada S7K 5W1
Client #: 101591580
Int. Register #: 115905438

Addresses for Service:

Name

Address

Owner:

Daniel Beaulac

231 Adolph Way Saskatoon, Saskatchewan, Canada S7N
 3K2

Client #: 106208917

Owner:

JESSICA BEAULAC

231 ADOLPH WAY SASKATOON, Saskatchewan, Canada
 S7N 3K2

Client #: 119393185

Notes:

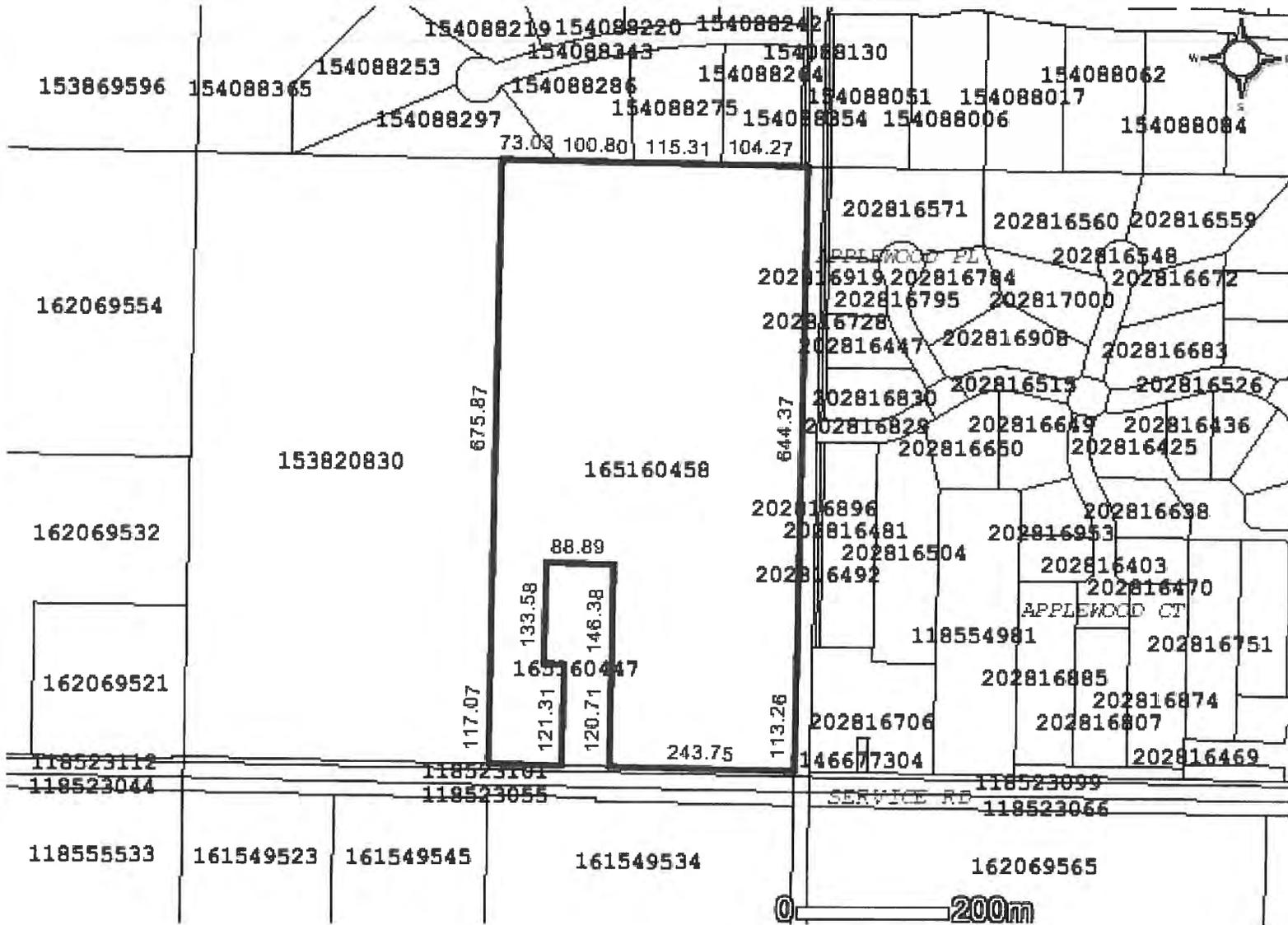
Parcel Class Code: Parcel (Generic)

Back



**Information
Services
Corporation**

Surface Parcel Number: 165160458
LLD: SE 14-36-04-3 Ext 2
Parcel Class Code: Parcel (Generic)
Area: 30.163 hectares (74.53 acres)
Request Date: 18-Jul-2014 4:50:25 o'clock PM CST



DISCLAIMER: THIS IS NOT A PLAN OF SURVEY. It is a consolidation of plans to assist in identifying the location, size and shape of a parcel in relation to other parcels. Parcel boundaries and area may have been adjusted to fit with adjacent parcels. To determine actual boundaries, dimensions, or area of any parcel, refer to the plan, or consult a surveyor.

SASKATCHEWAN LAND TITLES OFFICE
INSTRUMENT WORK SHEET

FEEES	Inst. <i>JR</i>
Total Fees <i>80.50</i>	From <i>Self</i>
Amt. Rec'd <i>377.50</i>	Address <i>1414 1st St. S.</i>
Balance	Their Reference <i>Reg. 111</i>

Is Dup. C. of T. with Instrument? In Office? *Yes* Being Returned to above Addressee? *No*

Is Instrument Registrable? *Yes* Titles Affected *76-5-40856*

Totally Correct

ENCUMBRANCES		CERTIFICATES, NOTICES, REQUIRED	
Title	General Register	Type	Quantity
<i>Case FP4383</i>	<i>ml</i>	Abstract	
<i>Case 63-5-67752</i>		G.R.C.	
<i>EC 64-5-19189</i>		Cert. of Chge.	
<i>Case 65-5-12542</i>		Other Cert.	
<i>Case 71-5-02453</i>		Notices	

Remarks:

JR Initials

PROVINCE OF SASKATCHEWAN

THE LAND TITLES ACT

TRANSFER

I, TINA POPOFF, of the city of White Rock, in the Province of British Columbia, widow, and Executrix of the Estate of GEORGE G. POPOFF, DECEASED, late retired farmer of the City of White Rock, in the Province of British Columbia, being registered as owner as such Executrix of an Estate in fee simple in possession of the piece of land, situated in the Province of Saskatchewan and described as follows:

Parcel No. 1

The North West Quarter of Section Twelve (12), and the West Half and South East Quarter of Section Fourteen (14), all in Township Thirty-six (36), in Range Four (4), West of the Third Meridian, in the Province of Saskatchewan, in the Dominion of Canada, containing Six Hundred and Forty (640) acres, more or less,

Except:

Firstly: 3.70 acres⁴/₁₀₀ out of the NW 1/4-12, 1.01 acres⁴/₁₀₀ out of the SW 1/4-14 and 1.51 acres⁴/₁₀₀ out of the SE 1/4-14, all taken for Roadway as shown on a Plan of Record in the Land Titles Office for the Saskatoon Land Registration District 67-5-00887.

Secondly: 1.30 acres⁴/₁₀₀ out of the NW 1/4-14 and 1.23 acres⁴/₁₀₀ out of the SW 1/4-14, both taken for Roadway as shown on a Plan of Record in the said Land Titles Office as No. 74-5-11951.

12,000,000

Received in the Crown

Do I HEREBY in consideration of the sum of One (\$1.00) Dollar, the receipt of which I hereby acknowledge, paid to me by Tina Popoff, of the City of White Rock, in the Province of British Columbia, widow, transfer to the said Tina Popoff, all my estate and interest in the said piece of land.

Dated at the City of White Rock in the Province of British Columbia, this 11th day of November, A.D. 1976.

Signed by the said
Tina Popoff as Executrix
of the Estate of GEORGE G. POPOFF,
DECEASED.)

Tina Popoff
TINA POPOFF

in the presence of:

Nicki Quervial
15225 Thrift Avenue
White Rock BC
Artelia Student



PROVINCE OF SASKATCHEWAN
DEPARTMENT OF FINANCE, TAXATION BRANCH

27604

SUCCESSION DUTY ACT

CONSENT TO THE TRANSFER OF PROPERTY

SUCCESSION DUTY AND GIFT TAX DIVISION
REVENUE BUILDING, 1871 SMITH STREET
REGINA, SASKATCHEWAN S4P 2N7

ESTATE OF:

GEORGE G. POPOFF, WHITE ROCK, BRITISH COLUMBIA

DATE June 18, 1976

DATE OF DEATH March 9, 1976

CONSENT IS HEREBY GIVEN TO THE TRANSFER, DELIVERY
OR PAYMENT OVER OF THE FOLLOWING PROPERTY:

The Northwest Quarter of Section Twelve (12), and the West Half and the South East Quarter
of Section Fourteen (14), all in Township Thirty-six (36), in Range Four (4), West of the
Third Meridian, in the Province of Saskatchewan, in the Dominion of Canada, containing—
Six Hundred and Forty (640) acres, more or less///

ANY LIEN IN RESPECT OF THE AFORESAID PROPERTY CREATED UNDER THE PROVISIONS OF THE SUCCESSION DUTY ACT IS
HEREBY DISCHARGED.

THE DESCRIPTION OF THE PROPERTY COVERED BY THIS CONSENT IS FOLLOWED BY THREE TYPED OBLIQUE STROKES. ANY
ADDITION, ALTERATION OR ERASURE RENDERS THIS CONSENT NULL AND VOID.

1 ORIGINAL

f

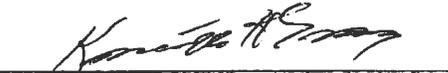
CANADA)
PROVINCE OF BRITISH COLUMBIA)
TO WIT:)

I, TINA POPOFF, of the City of White Rock, in the Province
of British Columbia, widow, MAKE OATH AND SAY:

1. THAT the within parcel of land described as
PARCEL NO. 1, together with all improvements
thereon, is in my opinion of the value of
one hundred and twenty-six thousand (\$126,000.00)
Dollars, and no more.
2. THAT the true consideration for the foregoing
transfer is a bequest under the Lost Will and
Testament of the said GEORGE G. POPOFF, Deceased.
3. THAT I am the widow of the said GEORGE G. POPOFF,
Deceased, and the transferee in this transfer.

Sworn before me)
at the City of White Rock)
in the Province of British Columbia)
this 16th day of November)
A.D. 1976.)


TINA POPOFF


~~A Commissioner for Oaths in and~~
~~for the Province of British Columbia~~
~~A Notary Public in and for the~~
Province of British Columbia

CANADA)
PROVINCE OF BRITISH COLUMBIA)
TO WIT :)

I, VICKI AUERBACH, of the city of White Rock,
in the Province of British Columbia, Student, MAKE OATH AND SAY:

1. THAT I was personally present and did see Tina Popoff,
named in the within Instrument, who is personally
known to me to be the person named therein, duly sign,
and execute the same for purposes named therein.
2. THAT the same was executed in the city of White Rock,
in the Province of British Columbia and that I am
subscribing witness thereto.
3. THAT I know the said Tina Popoff and she is in my
belief of the full age of twenty-one years.

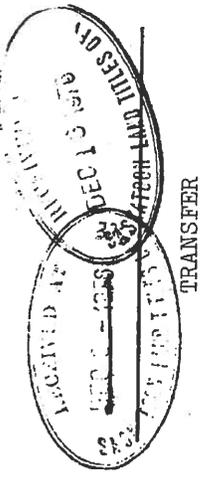
Sworn before me at)
the City of White Rock)
in the Province of British Columbia)
this 16th day of November A.D. 1976)

Vicki Auerbach

Kenneth H. Gray
~~A Commissioner for Oaths in and~~
and for the Province of British Columbia
~~A Justice of the Peace in and for~~
Province of British Columbia

Dated ~~76-5-40041~~
November, A.D. 1976
76-5-40857

IN THE MATTER OF THE
ESTATE OF
GEORGE G. POPOFF, Deceased.



TRANSFER

THIS INSTRUMENT
No. 76-5-40041, CERTIFICATE

I certify that the within instrument is duly
prepared and Registered in the Land Titles
Office for the Saskatoon Land Registration
District at Saskatoon in the Province of
Saskatchewan on the...16...day of....R.F....

A.D. 1976, Number 76-5-40857
Registrar
S.L.R.B.

DATABASE REPORT



Project Property: *Ridgewood
n/a
Saskatoon SK
1406388*

P.O. Number: *1406388*

Report Type: *Standard Report*

Order #: *20140718080*

Requested by: *Golder Associates Ltd.*

Date: *August 12, 2014*

Ecolog ERIS Ltd.
Environmental Risk Information
Service Ltd. (ERIS)
A division of Glacier Media Inc.
P: 1.866.517.5204
E: info@erisinfo.com

www.erisinfo.com

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Executive Summary

Property Information:

Project Property: *Ridgewood
n/a Saskatoon SK*

P.O. Number: *1406388*

Coordinates:

Latitude: *52.087415*
Longitude: *-106.459062*
UTM Northing: *5,771,765.15*
UTM Easting: *400,032.46*
UTM Zone: *UTM Zone 13U*

Elevation: *1,772 FT
540.00 M*

Order Information:

Order No.: *20140718080*
Date Requested: *25/07/2014*
Requested by: *Golder Associates Ltd.*
Report Type: *Standard Report*

Additional Products:

Aerial Photographs *National Collection - Digital (PDF)*
Land Title Search *Title Search*

Executive Summary: Report Summary

Database	Name	Searched	Project Property	Within 0.25 km	Total
AUWR	Automobile Wrecking & Supplies	Y	0	0	0
CHEM	Chemical Register	Y	0	0	0
CONV	Convictions	Y	0	0	0
DIS	Wastewater Dischargers	Y	0	0	0
EEM	Environmental Effects Monitoring	Y	0	0	0
EHS	ERIS Historical Searches	Y	0	0	0
EIIS	Environmental Issues Inventory System	Y	0	0	0
ES	Environmental Spills	Y	0	0	0
FCON	Federal Convictions	Y	0	0	0
FCS	Contaminated Sites on Federal Land	Y	0	0	0
HMS	Hazardous Material Storage	Y	0	0	0
HORW	Horizontal Wells	Y	0	0	0
HSSS	Hazardous Substance Storage Sites	Y	0	0	0
HSST	Hazardous Substance Storage Tanks	Y	0	0	0
IAFT	Indian & Northern Affairs Fuel Tanks	Y	0	0	0
ILOA	Intensive Livestock Operation Approvals	Y	0	0	0
MINE	Canadian Mine Locations	Y	0	0	0
MNR	Mineral Occurrences	Y	0	0	0
NATE	National Analysis of Trends in Emergencies System (NATES)	Y	0	0	0
NDFT	National Defence & Canadian Forces Fuel Tanks	Y	0	0	0
NDSP	National Defence & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEES	National Environmental Emergencies System (NEES)	Y	0	0	0
NPCB	National PCB Inventory	Y	0	0	0
NPRI	National Pollutant Release Inventory	Y	0	0	0
OGS	Upstream Oil & Gas Site Spills	Y	0	0	0
OGW	Oil and Gas Wells	Y	0	0	0
PAP	Canadian Pulp and Paper	Y	0	0	0
PCFT	Parks Canada Fuel Storage Tanks	Y	0	0	0
PES	Pesticide Register	Y	0	0	0
RST	Retail Fuel Storage Tanks	Y	0	0	0
SCT	Scott's Manufacturing Directory	Y	0	0	0
WDS	Waste Disposal Site Inventory	Y	0	0	0
WWIS	Water Well Information System	Y	0	0	0
Total:			0	0	0

Executive Summary: Site Report Summary - Project Property

<i>Map Key</i>	<i>DB</i>	<i>Company/Site Name</i>	<i>Address</i>	<i>Dir/Dist m</i>	<i>Elev diff m</i>	<i>Page Number</i>
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No records found in the selected databases for the project property.

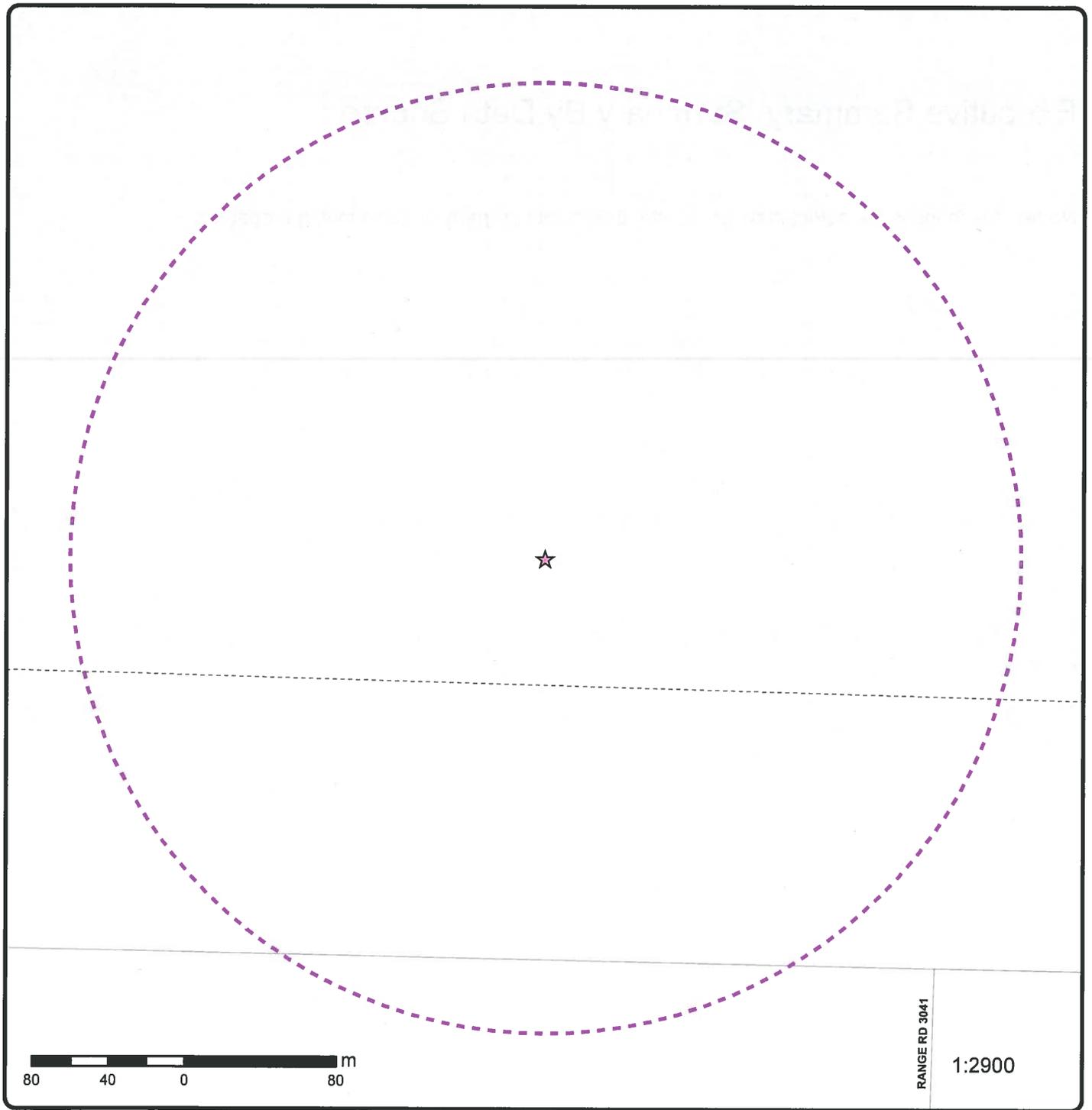
Executive Summary: Site Report Summary - Surrounding Properties

<i>Map Key</i>	<i>DB</i>	<i>Company/Site Name</i>	<i>Address</i>	<i>Dir/Dist m</i>	<i>Elev Diff m</i>	<i>Page Number</i>
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No records found in the selected databases for the surrounding properties.

Executive Summary: Summary By Data Source

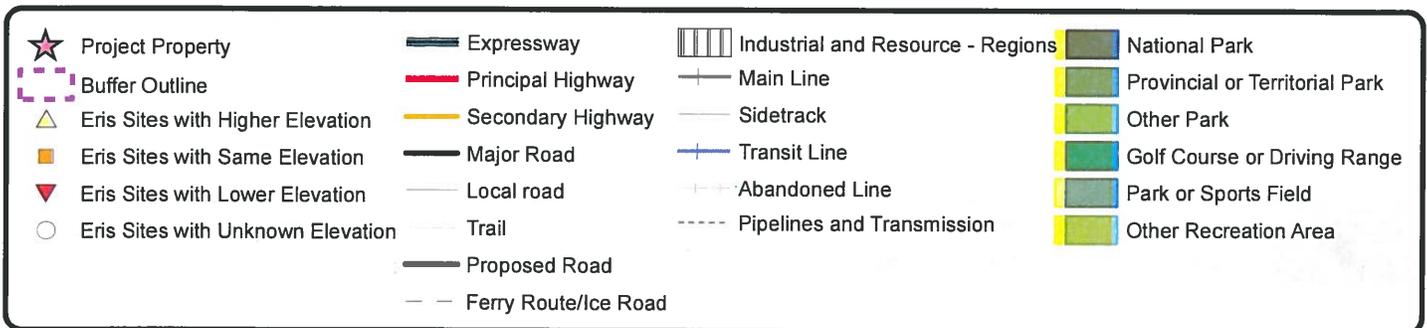
No records found in the selected databases for the project property or surrounding properties.



Map

Order No: 20140718080

Address: n/a, Saskatoon, SK



106°28'W



Aerial

Order No: 20140718080

Address: n/a, Saskatoon, SK

Source: ESRI World Imagery, Updated December 2012

© Ecolog ERIS Ltd

Detail Report

<i>Map Key</i>	<i>Number of Records</i>	<i>Direction/ Distance m</i>	<i>Elevation m</i>	<i>Site</i>	<i>DB</i>
----------------	------------------------------	----------------------------------	------------------------	-------------	-----------

No records found in the selected databases for the project property or surrounding properties.

Unplottable Summary

DB	Company Name/Site Name	Address	City	Postal
----	------------------------	---------	------	--------

No unplottable records were found that may be relevant for the search criteria.

Unplottable Report

No unplottable records were found that may be relevant for the search criteria.

Appendix: Database Descriptions

EcoLog Environmental Risk Information Services Ltd (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. **Note:** Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.

Automobile Wrecking & Supplies:

Private AUWR

This database provides an inventory of all known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 2001-Jun 2010

Chemical Register:

Private CHEM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-Jun 2010

Convictions:

Provincial CONV

This database summarizes the penalties and convictions handed down by the Saskatchewan courts. Companies and individuals that have been found guilty of environmental offenses under Saskatchewan's Environmental Protection Legislation are listed in this database. The records in this database are associated with the City the offense took place and are not plotted.

Government Publication Date: 1995-Mar 2012

Wastewater Dischargers:

Provincial DIS

This database is maintained by SERM and supplies the locations of the wastewater dischargers in the province. The geographic coordinates have been provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the LSD or Quarter section only.

Government Publication Date: 2000-Apr 2012

Environmental Effects Monitoring:

Federal EEM

The Environmental Effects Monitoring program assesses the effects of effluent from industrial or other sources on fish, fish habitat and human usage of fisheries resources. Since 1992, pulp and paper mills have been required to conduct EEM studies under the Pulp and Paper Effluent Regulations. This database provides information on the mill name, geographical location and sub-lethal toxicity data.

Government Publication Date: 1992-2007*

ERIS Historical Searches:

Private EHS

EcoLog ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Mar 2013

Environmental Issues Inventory System:

Federal EIS

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

*Government Publication Date: 1992-2001**

Environmental Spills:

Provincial ES

This database includes an inventory of known spills that occurred throughout the province and that are reported under regulation R.R.S. c. D-14, Reg. 1. Some of the geographic coordinates have been provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the LSD or Quarter section only.

Government Publication Date: 1977-Jun 2013

Federal Convictions:

Federal FCN

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

*Government Publication Date: 1988-Jun 2007**

Contaminated Sites on Federal Land:

Federal FCS

The Federal Contaminated Sites Inventory includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government.

Government Publication Date: June 2000-Jul 2014

Hazardous Material Storage:

Provincial HMS

The Saskatchewan Hazardous Materials Storage Program collects this information. With the approval of the Ministry of Environment, hazardous substances and waste dangerous goods can be stored in underground storage tanks, above-ground storage tanks, outdoor storage site and warehouse/indoor storage sites. A hazardous substance/waste is defined as a substance/waste that because of its quantity, concentration or physical, chemical or infectious characteristics, either individually or in combination with other substances, is an existing or potential threat to the environment or human health. This inventory includes information on operator ID, operation name, address, legal land description and operation status.

Government Publication Date: 1980-Aug 2013

Horizontal Wells:

Provincial HORW

Saskatchewan Industry and Resources maintains an inventory of all horizontal wells drilled in the province. The database provides detailed information in regard to well name, owner name, status, licence no., initial and final drilling date, well type, horizon name and pool name.

*Government Publication Date: Aug 1987-Jun 2007**

Hazardous Substance Storage Sites:

Provincial HSSS

This is an inventory of hazardous substance storage sites that must be registered under regulation 25/92, S. 3. The database is a catalog of information on the location of outdoor and warehouse sites, housing hazardous products used by companies in the agricultural, chemical, farming, warehousing, trucking, waste recycling, distribution, service stations/repair shops, bulk stations, autobody, mining, and manufacturing industry. Information is provided on the type of product(s) stored, application date, company name, location, and the type of business service operated on site. For current information, please refer to the HMS database.

Hazardous Substance Storage Tanks:

Provincial HSST

This is an inventory of hazardous substance storage tanks that must be registered under regulation 25/92, S. 3. The database is a compilation of information on aboveground and underground storage tanks that hold substances such as gasoline, diesel, chemicals, heating oil, kerosene and alcohol blended products. Information is provided on the contents and capacity of the tank, company name, location, and the type of business service operated on site. For current information, please refer to the HMS database.

Government Publication Date: 1989-Feb 2006*

Indian & Northern Affairs Fuel Tanks:

Federal IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of all aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Intensive Livestock Operation Approvals:

Provincial ILOA

Under the Agricultural Operations Act, certain types of intensive livestock operations are required to obtain plan approval. Approvals are subject to the size of operation and their proximity to a water source. Those requiring plan approval must submit documentation regarding manure storage, utilization of manure nutrients and disposal method for dead animals. Sask. Agriculture, Food and Rural Revitalization maintains a database of approvals issued over the last three decades, for operations that may or may not be currently operational. An ILO plan approval may have been issued to an intensive livestock operation but never been constructed, been approved and not constructed yet, or it may have been constructed and later discontinued. There is no distinction in the database between operational and non-operational sites. Please note that the value "Sum of Animal Units" is a calculation used to compare different types of livestock operations (each type of animal is rated on a scale). Geographic coordinates were provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the Quarter section only.

Government Publication Date: 1971-Apr 2012

Canadian Mine Locations:

Private MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009

Mineral Occurrences:

Provincial MNR

Saskatchewan Energy and Mines maintains an inventory of 2890 separate mineral occurrences in the "Saskatchewan Mineral Deposit Index" regarding metallic, industrial mineral and coal deposits. Information within the database pertains to the SMDI No., showing name, location, commodity, deposit type, status, classification and geographical reference data. For additional information regarding geological data and exploration history, please contact the office and quote the SMDI No.

Government Publication Date: 1981-2009

National Analysis of Trends in Emergencies System (NATES):

Federal NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

National Defence & Canadian Forces Fuel Tanks:

Federal NDFT

The Department of National Defence and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defence & Canadian Forces Spills:

Federal NDSP

The Department of National Defence and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Aug 2010

National Defence & Canadian Forces Waste Disposal Sites:

Federal NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Environmental Emergencies System (NEES):

Federal NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for all previous Environment Canada spill datasets. NEES is composed of the historic datasets 'or Trends ' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

National PCB Inventory:

Federal NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. All federal out-of-service PCB containing equipment and all PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory:

Federal NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances.

Government Publication Date: 1993-2011

Upstream Oil & Gas Site Spills:

Provincial OGS

Saskatchewan Industry and Resource compiles spill information pertaining to crude oil, produced water and spills on upstream oil and gas facilities. Information includes location, date of spill, substance spilled, total amount spilled and source.

Government Publication Date: 1990-Apr 2013

Oil and Gas Wells:

Private OGW

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-Jun 2014

Canadian Pulp and Paper:

Private PAP

This information is part of the Pulp and Paper Canada Directory. The Directory provides a comprehensive listing of the locations of pulp and paper mills and the products that they produce.

Government Publication Date: 1999, 2002, 2004, 2005, 2009

Parks Canada Fuel Storage Tanks:

Federal PCFT

Canadian Heritage maintains an inventory of all known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

*Government Publication Date: 1920-Jan 2005**

Pesticide Register:

Provincial PES

Saskatchewan Agriculture and Food maintains a database of all vendors of registered pesticides.

Government Publication Date: 1998-Apr 2010

Retail Fuel Storage Tanks:

Private RST

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-Jun 2010

Scott's Manufacturing Directory:

Private SCT

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011

Waste Disposal Site Inventory:

Provincial WDS

This inventory pertains to registered waste disposal sites within the province of Saskatchewan. Specific dates as to when the waste disposal site was activated are not available. The geographic coordinates have been provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the LSD or Quarter section only.

Government Publication Date: 2000-Apr 2012

Water Well Information System:

Provincial WWIS

This database was collected from Saskatchewan Water, Water Resource Administration and contains over 100,000 records. The geographic coordinates have been provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the LSD or Quarter section only.

Government Publication Date: 1900-Jun 2010

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries". All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and were included as reference.



August 7, 2014

Our File: 04-14-300
04-14-301

Jackie Kellington
Golder Associates Ltd.
1721 8th Street East
Saskatoon SK S7H 0T4

**Re: File Search
Environmental Site Assessment
SE 14-36-4-W3, Parcels 153820830 & 165160458
RM of Corman Park, Saskatchewan**

Further to your request for information regarding the above file, I can advise the following:

- The R.M. has no record of storage, handling, spills, leaks or release of hazardous substances or waste dangerous goods at or in the immediate vicinity of the above property. We recommend that Ministry of Environment be contacted in this regard.
- The R.M. does not hold any reports detailing the environmental condition of the properties.
- The R.M. has no record of a landfill or dumpsite within a 500 metre radius of the property.
- Saskatoon Fire and Protective Services provide fire protection service in this area, and we recommend that the department be contacted for records of any fires on or in the vicinity of the above property.
- No environmental concerns have been raised to the R.M. pertaining to properties adjacent to the ones noted above.

I trust this is the information which you require. If you have any questions, please do not hesitate to contact me.

Regards,

Kelby Unseth
Planner I, RM of Corman Park No. 344
Phone: 306-978-6450
Fax: 306-242-6965
Email: kunseth@rmcormanpark.ca

Rural Municipality of Corman Park No. 344
111 Pinehouse Drive, Saskatoon SK S7K 5W1 Phone: (306) 242-9303 Fax: (306) 242-6965
Email: rm344@rmcormanpark.ca Website: www.rmcormanpark.ca



City of
Saskatoon

Fire and Protective Services

125 Idylwyld Dr. South ph 306•975•2520
Saskatoon, SK S7M 1L4 fx 306•975•2589

August 19, 2014

SASK - REC'D AUG 21 2014

Golder Associates Ltd.
1721 8th Street East
Saskatoon, SK S7H 0T4

Attention: Heather Tweedie

**Re: File Search
Information Request SE14-36-04 W3M**

A file search was conducted on the above-mentioned address on August 19, 2014.

We have no file for the above address.

Yours truly,

A handwritten signature in blue ink, appearing to read "Wayne Rodger".

Wayne Rodger
Fire Marshal
Fire Prevention & Investigation



Ministry of
Environment

3211 Albert Street
Regina, Canada
S4S 5W6

August 14, 2014

Heather Tweedie
Golder Associates Ltd.
1721 8th Street East
SASKATOON SK S7H 0T4

SASK
SASK - REC'D
AUG 19 2014

Dear Ms. Tweedie:

Re: Access Request ENV 147/14

Your application for access under *The Freedom of Information and Protection of Privacy Act* was received on August 12, 2014. You requested records of an environmental nature (i.e. environmental site assessments, remediations, permits, violations, spills hazardous material storage etc. for SE 14-36-04 W3M.

This is to advise that we do not have any records for the property queried in your request.

If you wish to request a review of this action, you may do so within one year of this notice. To request a review, please complete a "Request for Review" form which is available at the same location where you applied for access. Your request should be sent to:

Information and Privacy Commissioner
#503 – 1801 Hamilton Street
Regina SK S4P 4B4

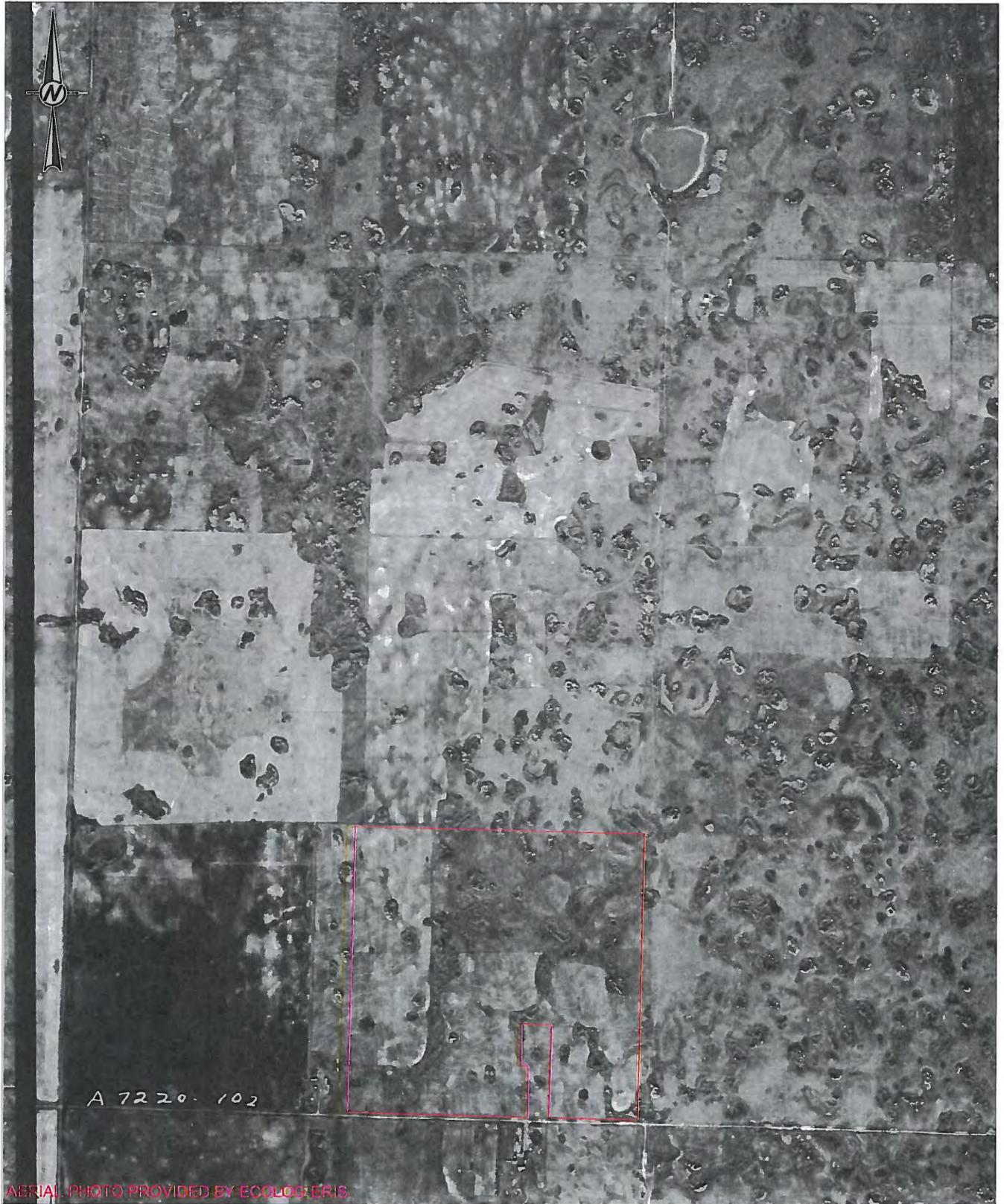
Sincerely,

Erika Ritchie, Access Officer
Freedom of Information



APPENDIX B

Aerial Photographs



AERIAL PHOTO PROVIDED BY ECOLOGERIS

CLIENT
DB VENTURES

PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
RIDGEWOOD ESTATES, SE-14-36-04 W3M, CORMAN PARK
SASKATCHEWAN**

CONSULTANT

YYYY-MM-DD 2014-08-20

PREPARED GAE

DESIGN JK

REVIEW JK

APPROVED DS

TITLE
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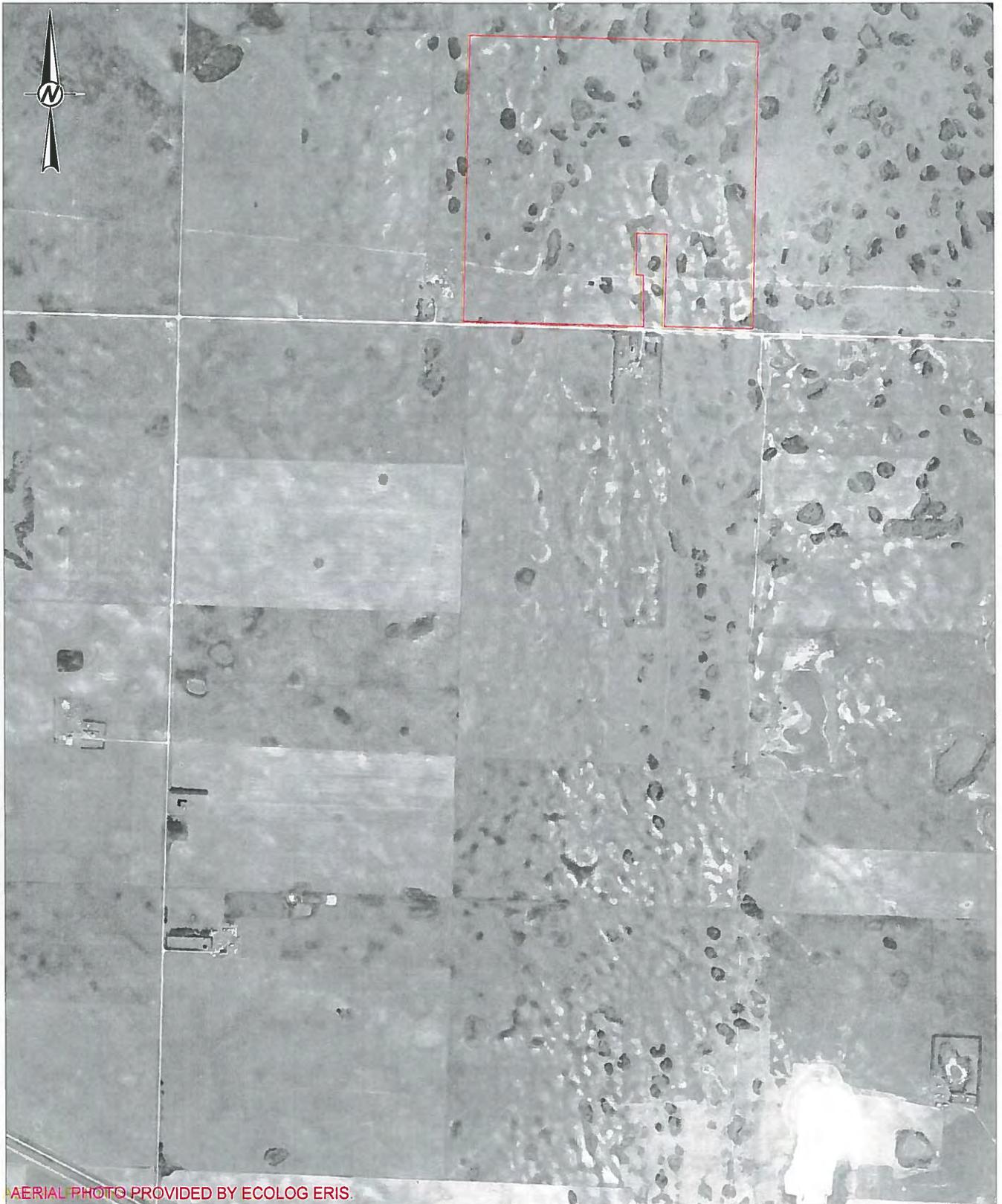
PROJECT No
1406388

CONTROL

Rev.
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FIGURE
B1





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CLIENT
DB VENTURES

PROJECT
PHASE I ENVIRONMENTAL SITE ASSESSMENT
RIDGEWOOD ESTATES, SE-14-36-04 W3M, CORMAN PARK,
SASKATCHEWAN

CONSULTANT

YYYY-MM-DD 2014-08-20

TITLE
AIR PHOTO 1959



PREPARED GAE

DESIGN JK

REVIEW JK

APPROVED DS

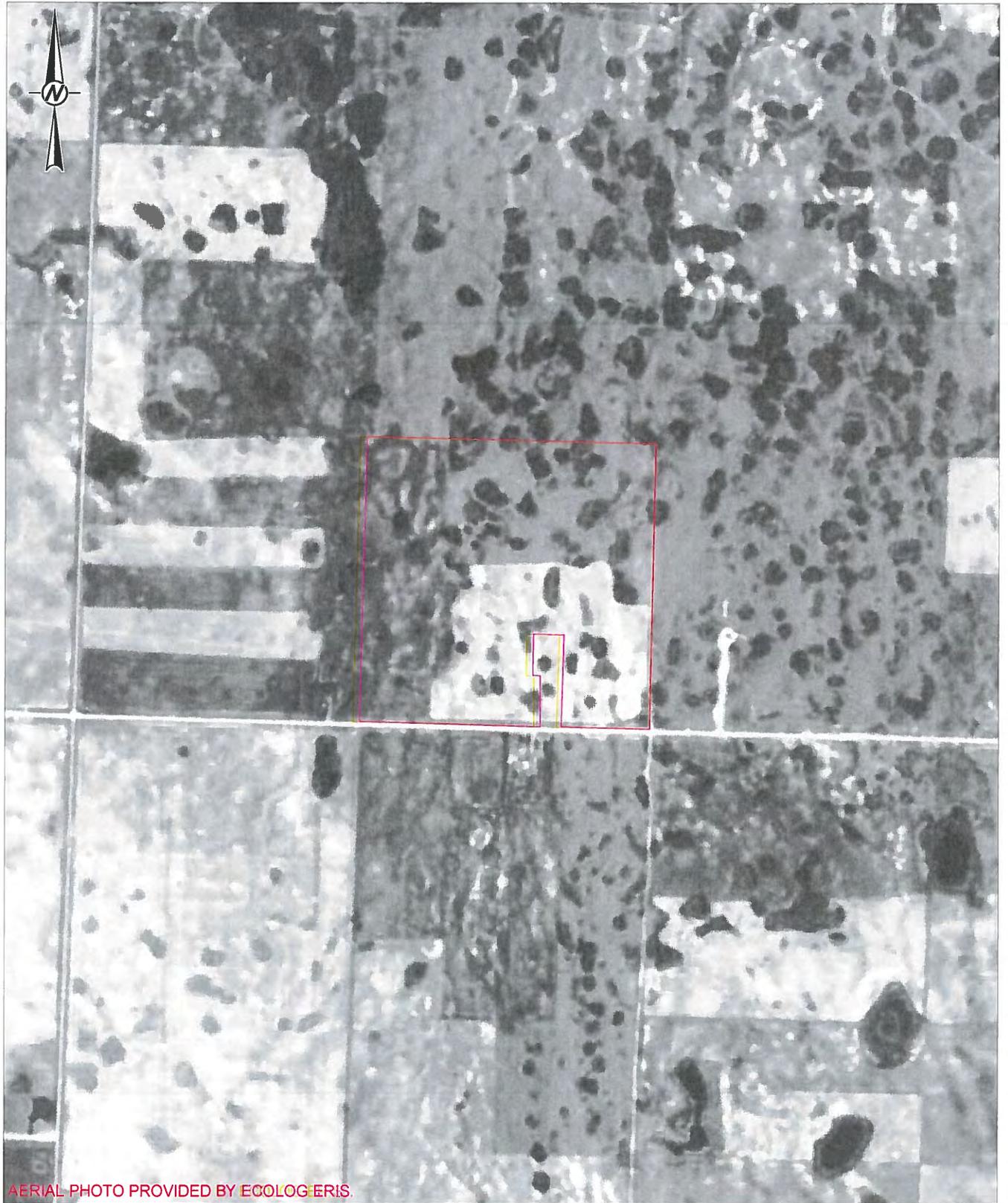
PROJECT No.
1406388

CONTROL

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FIGURE
B2

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



AERIAL PHOTO PROVIDED BY ECOLOGERIS.

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PHASE I ENVIRONMENTAL SITE ASSESSMENT
RIDGEWOOD ESTATES, SE-14-36-04 W3M, CORMAN PARK,
SASKATCHEWAN

CONSULTANT

YYYY-MM-DD 2014-08-20

PREPARED GAE

DESIGN JK

REVIEW JK

APPROVED DS

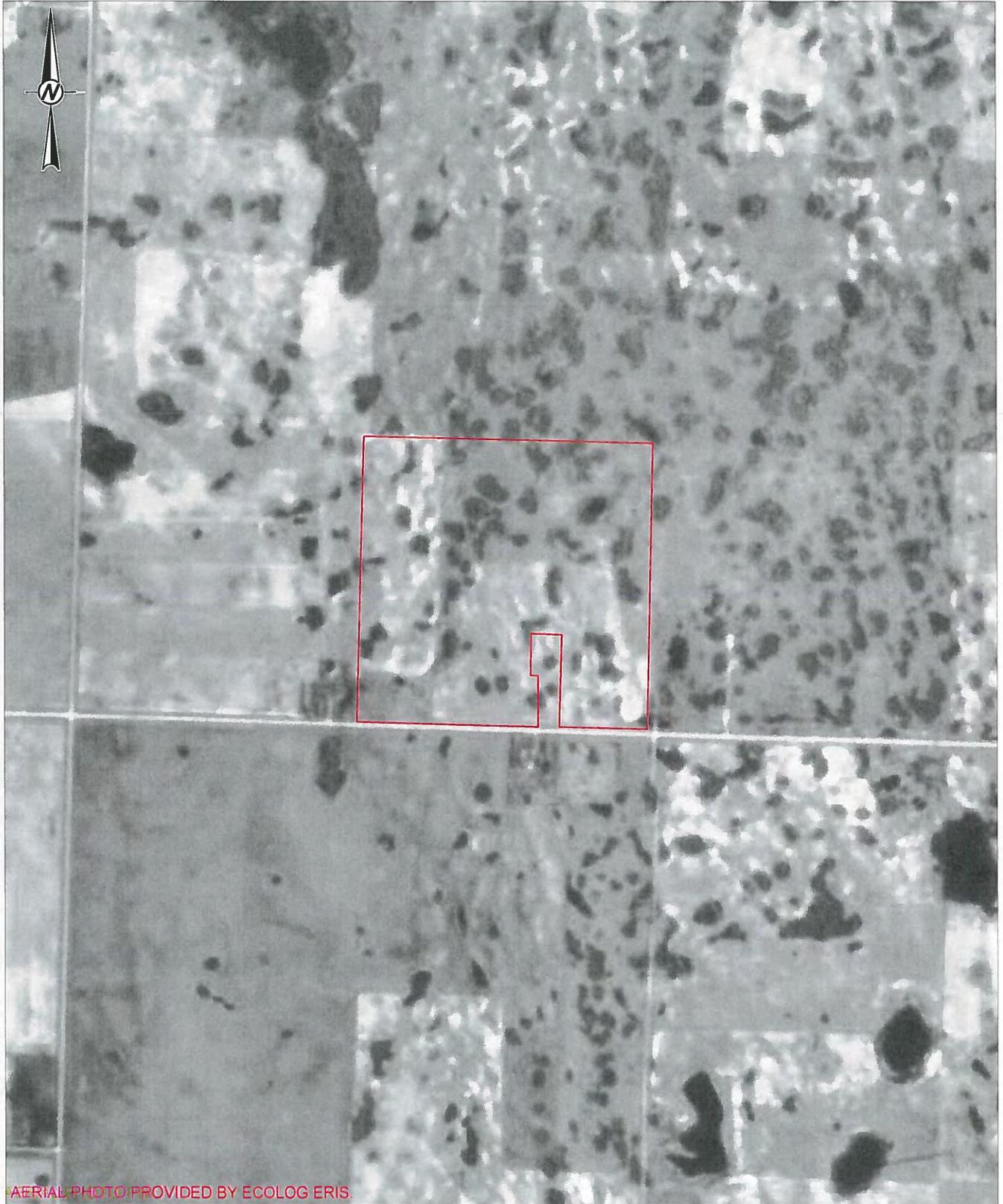
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PROJECT No.
1406388

CONTROL

Rev.
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FIGURE
B3



AERIAL PHOTO PROVIDED BY ECOLOG ERIS.

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CLIENT
DB VENTURES

PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
RIDGEWOOD ESTATES, SE-14-36-04 W3M, CORMAN PARK,
SASKATCHEWAN**

CONSULTANT

YYYY-MM-DD 2014-08-20

PREPARED GAE

DESIGN JK

REVIEW JK

APPROVED DS

TITLE
AIR PHOTO 1985



PROJECT No. CONTROL
1406388

Rev.
0

FIGURE
B4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
25 mm



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PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK,
 SASKATCHEWAN**

CONSULTANT	YYYY-MM-DD	2014-08-20
	PREPARED	GAE
	DESIGN	JK
	REVIEW	JK
	APPROVED	DS

TITLE
AIR PHOTO 2002



PROJECT No. 1406388	CONTROL	Rev. 0	FIGURE B5
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PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK
 SASKATCHEWAN**

CONSULTANT	YYYY-MM-DD	2014-08-20
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	DESIGN	JK
	REVIEW	JK
	APPROVED	DS



TITLE
AIR PHOTO 2007

PROJECT No. 1406388 CONTROL Rev. 0 FIGURE B6

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 25 mm



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PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK,
 SASKATCHEWAN**

CONSULTANT	YYYY-MM-DD	2014-08-20
	PREPARED	GAE
	DESIGN	JK
	REVIEW	JK
	APPROVED	DS

TITLE
AIR PHOTO 2011

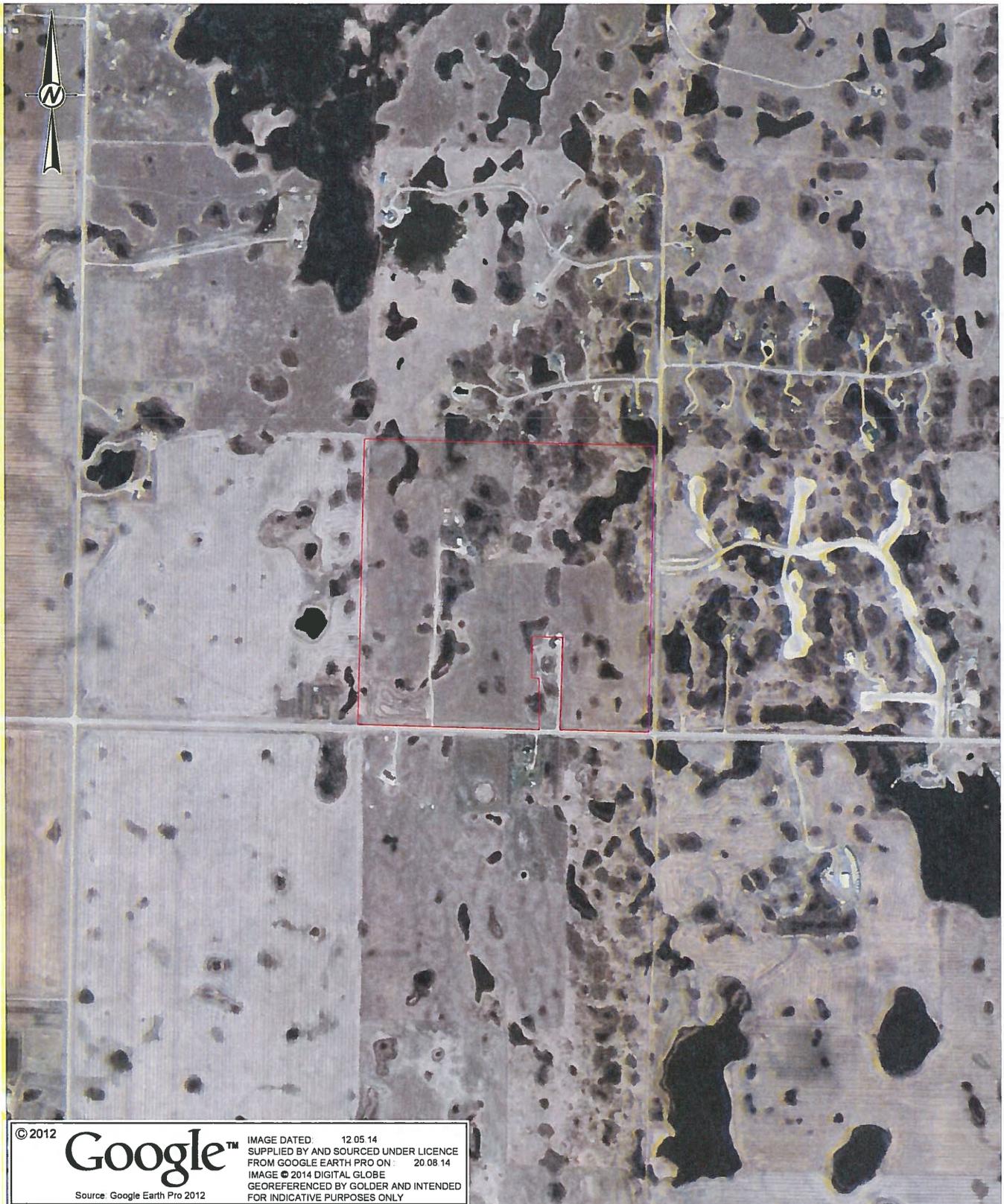


PROJECT No. 1406388 CONTROL Rev 0 FIGURE B7

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26 mm



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CLIENT
DB VENTURES

PROJECT
**PHASE I ENVIRONMENTAL SITE ASSESSMENT
 RIDGEWOOD ESTATES, SE 14-36-04 W3M, CORMAN PARK,
 SASKATCHEWAN**

CONSULTANT	YYYY-MM-DD	2014-08-20
	PREPARED	GAE
	DESIGN	JK
	REVIEW	JK
	APPROVED	DS

TITLE
AIR PHOTO 2014

PROJECT No. 1406388	CONTROL	Rev 0	FIGURE B8
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25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIA



APPENDIX C

Site Photographs



APPENDIX C
Site Photographs



Photograph 1 – View of Shop and House on Site, looking north.



Photograph 2 – View of diesel and gas ASTs, looking south.

Project No.	1406388
Date:	September 2014

Golder Associates

Inputted by:	AB
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APPENDIX C
Site Photographs



Photograph 3 – View of garden area with water ASTs, looking east.



Photograph 4 – Wetland in northeast portion of the Site, looking southeast.

Project No.	1406388
Date:	September 2014

Golder Associates

Inputted by:	AB
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APPENDIX C
Site Photographs



Photograph 5 – View of residential development to the north of Site, looking southwest.



Photograph 6 – View of Patience Lake Road and undeveloped land to the South of Site, looking southwest.

Project No.	1406388
Date:	September 2014

Golder Associates

Inputted by:	AB
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APPENDIX C
Site Photographs



Photograph 7 – Trans Gas Valve Station adjacent to the southeast of the Site, looking east.

Project No.	1406388
Date:	September 2014

Golder Associates

Inputted by:	AB
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At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

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1721 8th Street East
Saskatoon, Saskatchewan, Canada S7H 0T4
Canada
T: +1 (306) 665 7989



Appendix G

**Heritage Resources Impact
Assessment**

Golder Associates



October 2014

Permit No. 14-129

**Ridgewood Estates Subdivision
SE 14-36-4 W3M**

**Heritage Resources Impact
Assessment**

Submitted to:
Mr. Dan Beaulac
Ridgewood Estates
RR 6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

REPORT



**A world of
capabilities
delivered locally**

Report Number: 1406388

Distribution:

- 1 Copy - Ridgewood Estates, Saskatoon, Saskatchewan
- 1 Copy - Heritage Conservation Branch, Regina, Saskatchewan (+CD)
- 2 Copies - Golder Associates Ltd., Saskatoon, Saskatchewan





Credits

Senior ReviewBrad Novecosky, M.A.

Project Manager.....Phil Bruch, M.Sc., P.Eng.

Permit Holder Tam Huynh, M.A.

Report Author..... Tam Huynh, M.A.

..... Katie Zdunich, B.A.

Field Investigator..... Tam Huynh, M.A.

.....Jennifer Rychlo, B.A.

Technical Assistance Lisa Rogers

..... Rachel Kroeger



Executive Summary

This report describes the results of a Heritage Resource Impact Assessment conducted for the proposed Ridgewood Estates subdivision located east of Saskatoon, Saskatchewan. The Project was reviewed by the Heritage Conservation Branch (Ministry of Parks, Culture and Sport) and it was determined that portions of the subdivision are located in potentially heritage sensitive land. Accordingly, a Heritage Resource Impact Assessment was required for the Project, pursuant to Section 63 of *The Heritage Property Act* (1979-80).

The Heritage Resources Impact Assessment was carried out on August 28, 2014 by Golder Associates Ltd. under Archaeological Investigation Permit No. 14-129. Approximately 18 hectares of land were assessed using a combination of pedestrian surface survey and the excavation of 35 shovel probes. No heritage resources were identified in conflict with the Project.

It is recommended that the Project be provided with regulatory approval per Section 63 of *The Heritage Property Act* to proceed as described in this report. This Final Report fulfils the permitting requirements necessary for the completion of this Heritage Resources Impact Assessment.



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1.0 INTRODUCTION

The Ridgewood Estates Subdivision (the Project) is a proposed multi-parcel residential subdivision located east of the City of Saskatoon (Figure 1). The Project, which encompasses Approximately 62 hectares (ha) of land, was submitted to the Heritage Conservation Branch (Ministry of Parks, Culture and Sport) for review (Table 1). It was determined that the Project will impact areas of intact native parkland. As these areas are potentially heritage sensitive, a Heritage Resource Impact Assessment (HRIA) was required pursuant to Section 63 of *The Heritage Property Act* (1979-80).

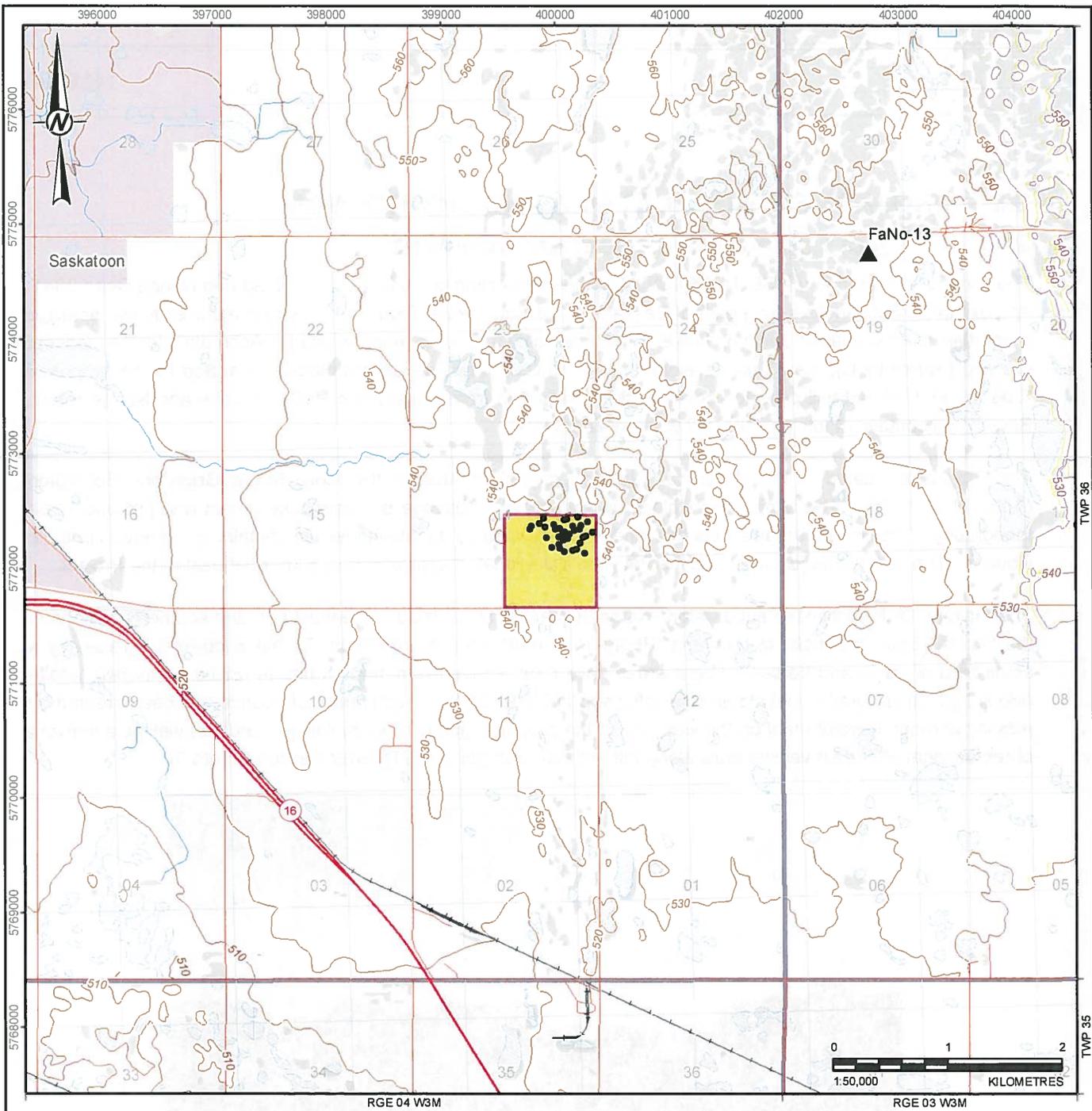
Table 1: Project Details

Legal Land Location	Heritage Conservation Branch File No.	Total Area (ha)	Lots (ha)	Municipal Reserve (ha)	Municipal Buffer (ha)	Roads (ha)	Heritage Sensitivities
SE 14-36-4 W3M	14-1629	62.34	53.26	1.79	0.28	6.67	Portions of Intact Native Parkland Potential for Intact Heritage Resources

No. = number; ha = hectares; SE = southeast; W3M = West of the Third Meridian

The HRIA was conducted on August 28, 2014, under Archaeological Resource Investigation Permit No. 14-129 issued to Tam Huynh (archaeologist, Golder Associates Ltd. [Golder]) to identify, record, and assess any heritage resources that may be impacted by the Project. Recommendations to the Heritage Conservation Branch could then be made regarding appropriate responses to any heritage concerns encountered during the assessment.

This Final Report presents the results of the HRIA. Section 2 will discuss Project location and potential impacts. Section 3 will discuss the objectives of the assessment, while Section 4 will provide an overview of previous archaeological research. The methods and results of the assessment are contained in Section 5. A summary of the HRIA and associated recommendations can be found in Section 6. A glossary of technical terms is located in Appendix A. Shovel probe locations are included in Appendix B, while survey plans are contained in Appendix C.



LEGEND

- ▲ KNOWN HERITAGE RESOURCE
- SHOVEL PROBE
- ASSESSED SUBDIVISION

REFERENCE

HERITAGE RESOURCES: HERITAGE CONSERVATION BRANCH, MINISTRY OF PARKS, CULTURE AND SPORT, 2014.
 CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
 NAD 83 UTM ZONE 13

CLIENT
RIDGEWOOD ESTATES

PROJECT
**RIDGEWOOD ESTATES
 HERITAGE RESOURCE IMPACT ASSESSMENT
 SASKATCHEWAN, CANADA**

TITLE
**LOCATION OF ASSESSED SUBDIVISION, SHOVEL PROBES,
 AND HERITAGE RESOURCES**

CONSULTANT



YYYY-MM-DD	2014-09-30
PREPARED	LMR
DESIGN	KZ
REVIEW	TH
APPROVED	BN

PROJECT	PHASE	Rev.	FIGURE
1406388	5000	0	1

Path: G:\2014\1406388_Ridgewood_Estates\Figures\Phase 5000\Heritage FIG 1 Heritage Resources.mxd

TWP 36
 TWP 35
 25m
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/A



2.0 PROJECT SPECIFIC DETAILS AND ENVIRONMENT

2.1 Project Location and Local Environment

The Project is located in the SE 14-36-4 W3M at the intersection of Patience Lake Road and Range Road 3041, approximately 8 kilometres (km) east of Saskatoon, Saskatchewan (Figure 1). There are currently two acreage properties in this quarter section; however, the remaining area is undeveloped. According to the concept drawing (Appendix C), the 62 ha development will consist of two residential blocks separated by the proposed Ridgewood Trail that will provide access to the subdivision from the existing Patience Lake and Range roads. Block 1 will contain 24 lots and Block 2 will contain 26 lots.

The Project is located in the Minichinas Upland Landscape Area of the Moist Mixed Grassland Ecoregion (Acton et al. 1998). The Minichinas Upland is a morainal landscape of hummocky terrain and pot and kettle topography. The Project area reflects this landscape, typified by undulating terrain containing numerous pothole sloughs. The nearest major water body is Patience Lake located approximately 5 km northeast of the Project.

The majority of the proposed subdivision has been previously modified. The west half and southern portions of the Quarter Section consist of hay land (Photo 1) or modified pasture (Photo 2) that is currently grazed by a small herd of cattle and horses. These areas have been seeded with smooth brome (*Bromus inermis*), alfalfa (*Medicago sativa*), and sweet clover (*Melilotus* spp.) (Golder 2014). Additional disturbance has been created by existing acreage development on the west half of the property (gravel road, buildings, yard), as well as a network of recreational all-terrain vehicle trails along the southern margin of the Quarter Section (Photo 3).



Photo 1: Looking west across hayfield in west half of Project area



Photo 2: Looking east across grazed pasture in south portion of Project area



Photo 3: Looking west across all-terrain vehicle trails in south portion of Project area



The northeast corner of the Project area (approximately 18 ha) supports native grassland vegetation (Photo 4). Dominant species include needle-and-thread (*Stipa comata*), June grass (*Koeleria macrantha*), snowberry (*Symphoricarpos occidentalis*), and Canada goldenrod (*Solidago canadensis*). Woodland areas are dominated by trembling aspen (*Populus tremuloides*) with an understory of shrubs and forbs including chokecherry (*Prunus virginiana*), wild raspberry (*Rubus idaeus* ssp. *strigosus*), current (*Ribes* sp.), Canada anemone (*Anemone canadensis*), and Wood's rose (*Rosa woodsii*) (Golder 2014).



Photo 4: Looking south across rolling native prairie in northeast corner of Project area

2.2 Potential Impacts

Construction activities associated with the development of a new subdivision and related infrastructure will create ground disturbance that has the potential to impact heritage resources if present. Activities include the grading and removal of soils and sediments for lot development and road construction, the excavation of basements, and trenching and installation of future utilities such as natural gas, power, water, and sewer services.

The use of heavy equipment during the various stages of Project development has the potential to negatively impact surface features such as stone circles, cairns, medicine wheels, and historic structures. Disturbance to subsoils and sediments could also negatively impact buried sites such as campsites, bison kills, and human burials. In buried sites such as these, context is important and the value of the archaeological resource may be significantly reduced once it has been impacted. Impacts to heritage resources are permanent and irreversible.



3.0 HERITAGE SCREENING AND OBJECTIVES

The Project was reviewed by the Heritage Conservation Branch (Ministry of Parks, Culture and Sport) for heritage sensitivities. The objective of the screening was to assess the Project's potential to impact known heritage resources and identify areas that have moderate to high potential to contain undocumented heritage resources. For southern Saskatchewan, the Heritage Conservation Branch considers lands to be heritage sensitive if they are:

- in the same Quarter Section (or within 500 metres [m] of) a Site of Special Nature or other previously recorded site(s), unless it is shown to be of low heritage significance;
- within 1 km of permanent watercourses or well-formed valleys containing seasonal or permanent watercourses;
- in proximity to readily identifiable ancient lake shores;
- in hummocky terrain; and
- on escarpments, prominent uplands, and hills/ridges, including eskers.

The Heritage Conservation Branch determined that the Project will impact areas of intact native parkland. Since other heritage resources have been recorded in similar terrain in the region, the intact parcel is considered heritage sensitive. As a result, a HRIA was required for the Project prior to development (File No. 14-1629).

The objectives of the HRIA flow from the principles outlined in *The Heritage Property Act* and are as follows:

- complete appropriate levels of inspection in heritage sensitive areas;
- identify and record heritage resources (if present); and
- recommend appropriate mitigation measures to deal with any recorded heritage resources in conflict.

The results of this HRIA and associated recommendations are contained in Section's 5 and 6 of this report.

4.0 PREVIOUS ARCHAEOLOGICAL RESEARCH

The database for previously recorded heritage resources was queried prior to the initiation of the HRIA field study. The objective of this query was twofold: to determine if any known heritage resources are in conflict with the proposed Project, and to attain a better understanding of what heritage resource site types could be anticipated in the Project area.

The results of the database query indicated that there are 293 known heritage resources recorded on National Topographic System Mapsheets 73B/1 and 73B/2 where the Project is located. However, only four of these heritage resources are within 5 km of the Project (Table 2). These sites consist of Precontact Artifact Find (n = 2) and Artifact scatter (n = 2) sites. None of the sites contain diagnostic tools to indicate a potential age or cultural affiliation.

**Table 2: Heritage Resources within 5 km of the Project Area**

Heritage Resources Borden No.	Site Type	Cultural Affiliation	Permit No.
FaNo-4	Artifact Scatter	Unknown Precontact	78-000:00
FaNo-12	Artifact Find	Unknown Precontact	78-000:00
FaNo-13	Artifact Find	Unknown Precontact	83-021:00
FaNo-15	Artifact Scatter	Unknown Precontact	95-018:00

No. = number.

Two of the sites were identified by local landowners in 1978 prior to enactment of the *Heritage Property Act*. The remaining two were recorded as part of HRIAs. FaNo-13 was identified during assessment of a SaskPower rural gas project in 1983 (SaskPower 1983), and FaNo-15 was recorded as part of a Carghill plant development in 1995 (Stantec 1995). None of the heritage resources are in conflict with the proposed Project.

Other relevant studies in the area include two HRIAs carried out by Golder of adjacent subdivisions. This includes Hidden Ridge subdivision located immediately north of the Project in the NW 14 and NE 13-36-4 W3M (Golder 2004), and Eagle Rise subdivision (now Applewood Estates) located immediately east of the Project in the SW 13-36-4 W3M (Golder 2006). No heritage resources were identified during the course of these assessments.

5.0 ARCHAEOLOGICAL FIELDWORK

5.1 Methods

The HRIA was completed using a pedestrian reconnaissance and visual inspection program complimented with sub-surface testing. Pedestrian surface reconnaissance is the most common method used by archaeologists to identify archaeological sites including surface features within a project area (Ruppé 1966). Visual inspection of the ground is particularly effective in areas with good surface visibility, such as regions of limited soil development and sparse vegetation (Schiffer et al. 1978).

In order to determine the potential presence of buried cultural deposits, shovel probes were judgmentally excavated within the Project boundaries. Not only are shovel probes commonly used by archaeologists to locate and identify subsurface cultural deposits (especially in areas with poor surface visibility), they can also provide important information on the integrity, dimensions, and density of cultural materials found at archaeological sites (Krakker et al. 1983; Nance and Ball 1986; Kintigh 1988).

The HRIA was carried out by two Golder archaeologists. Detailed field notes and digital photographs were taken to document the Project environment, while hand-held global positioning system (GPS) units were used to document surveyed areas and relevant Project features. The Universal Transverse Mercator location of each shovel probe was also recorded with the GPS units. All shovel probes measured approximately 40 centimetres (cm) by 40 cm. Excavated soils from these shovel probes were hand sorted with a trowel and wall profiles were examined for intact palaeosols horizons beneath the sod layer. The results of the assessment are discussed in the following section.



5.2 Fieldwork Results

Upon arriving to the Project area it was confirmed that the majority of the Quarter Section was previously disturbed or modified by agricultural and recreational activities. As a result, the HRIA focussed on the native parkland area in the northeast corner of the Quarter Section (approximately 18 ha). This area consists of undulating to rolling terrain with aspen bluffs in low lying areas (Photos 5). A large slough approximately 275 m long, with an open, grassy ridge along the northwest margin dominates this area (Photo 6).

Pedestrian transects were walked throughout the intact parkland area. Surface visibility ranged from good in well grazed native prairie along the western margins; to moderate in un-grazed areas with shrub cover; to poor in thickly vegetated aspen bluffs. Subsurface exposure was provided by rodent disturbances, cattle trails (Photo 7), and two-track vehicle trails. No artifacts were observed in any exposures, nor were cultural features identified on the surface.



Photo 5: View looking south across rolling native prairie and slough in northeast corner of Project area



Photo 6: View looking across large slough with grassy ridge on far shore



Photo 7: Looking south across grazed native prairie and cattle trails



To determine the presence of buried cultural material, 35 shovel probes were excavated within the assessment area (Figure 1; Appendix B). Shovel probes were judgementally placed in open grassland as well as within aspen bluffs that did not contain standing water. The stratigraphic profile of shovel probes in open grassland areas can be summarized as follows:

- 0 to 2 cm sod;
- 2 to 10 cm dark brown silty loam;
- 10 to 25 cm light brown silty sand; and
- 25 to 35 cm tan sand.

Within the aspen bluffs the stratigraphy can be summarized as follows:

- 0 to 5 cm sod;
- 5 to 13 cm dark brown silty loam;
- 13 to 23 cm gray silty sand; and
- 23 to 35 cm tan silty sand.

Excavated soils from the shovel probes were hand sorted with a trowel for cultural materials and wall profiles were examined for intact paleosols beneath the sod level. No heritage resources were identified in any of the shovel probes.

6.0 SUMMARY AND RECOMMENDATIONS

Golder conducted a HRIA of the proposed Ridgewood Estates Subdivision located in the SE 14-36-4 W3M. This HRIA was completed using standard archaeological procedures for projects of this nature. Approximately 18 ha of land were assessed using a combination of pedestrian surface survey and the excavation of 35 shovel probes. No heritage resources were identified in conflict with the Project.

It is recommended that the Project be provided with regulatory approval per Section 63 of *The Heritage Property Act*. This Final Report fulfils the permitting requirements necessary for the completion of this HRIA.

Even the most thorough investigation may not identify all archaeological materials that may be present. It is advised that if unanticipated archaeological materials or features (including but not limited to lithic, ceramic and faunal artifacts, hearth features, and/or human remains) are encountered as a result of construction activities, all work in the immediate area should cease and the Heritage Conservation Branch contacted for further direction.



7.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Handwritten signature of Tam Huynh in blue ink.

Tam Huynh, M.A.
Archaeologist

Handwritten signature of Brad Novecosky in blue ink.

Brad Novecosky, M.A.
Associate, Senior Archaeologist

TH/BN/rk



8.0 REFERENCES

Acton, D.F., G.A. Padbury, and C.T. Stushnoff

1998 *The Ecoregions of Saskatchewan*. Canadian Plains Research Centre, University of Regina.

Golder Associates Ltd.

2004 Heritage Resource Impact Assessment. Tower Hill Ranch Ltd. Hidden Ridge Subdivision Project. Permit No. 04-090. Final report on file with Heritage Conservation Branch, Regina.

Golder Associates Ltd.

2006 Heritage Resource Impact Assessment. Eagle Rise Development Subdivision. Permit No. 06-168. Final report on file with Heritage Conservation Branch, Regina.

Golder Associates Ltd.

2014 Ridgewood Estates Subdivision. Terrestrial Assessment (Vegetation and Wildlife).

The Heritage Property Act

1979-80 SS cH-2.2. Available at: <http://canlii.ca/t/52367>. Accessed on: September 24, 2014.

Kintigh, K.W.

1988 The Effectiveness of Subsurface Testing: A Simulation Approach. *American Antiquity* 53:686-707.

Kraker, J.J., M.J. Shott, and P.D. Welch

1983 Design and Evaluation of Shovel-Test Sampling in Regional Archaeological Survey. *Journal of Field Archaeology* 10:469-480.

Nance, J.D. and B.F. Ball

1986 No Surprises? The Reliability and Validity of Test Pit Sampling. *American Antiquity* 51:457-483.

Ruppé, R.J.

1966 The Archaeological Survey: A Defense. *American Antiquity* 31:13-333.

SaskPower

1983 Saskatchewan Natural Gas Distribution Program Heritage Resource Impact Assessment (Permit No. 83-021). Final report on file with Heritage Conservation Branch, Regina.

Schiffer, M.B., A.P. Sullivan, and T.C. Klinger

1978 The Design of Archaeological Surveys. *World Archaeology* 10:1-28.

Stantec

1995 Heritage Resource Impact Assessment of the Cargill Ltd. Oilseed Crushing Plant Site 29-35-3-W3M (Permit No. 95-018). Final report on file with Heritage Conservation Branch, Regina.



APPENDIX A

Glossary of Technical Terms



Archaeology	The study of past cultures through the scientific investigation of their material remains.
Artifact	Any object used or modified by people.
Artifact Find	A category for archaeological sites consisting of five or fewer artifacts.
Artifact Scatter	A category for archaeological sites consisting of more than six artifacts.
Artifact/Feature Combo	A category for archaeological sites consisting of a combination of both artefacts and features (e.g., stone circles and debitage).
B.P.	Before present. 1,000 B.P. = 1,000 years before 1950 A.D. or approximately 1,000 A.D.
Cairn	A mound of cobbles, often constructed on a hilltop usually functioning as a burial cover, cache cover, drive line, or landscape marker.
Ceramics	Clay artifacts, such as vessels, that have been intentionally fired.
Core	A stone from which flakes have been intentionally removed.
Debitage	Waste by-products from stone tool manufacture. This includes flakes and shatter.
Faunal Remains	Bones and other animal parts found in archaeological sites. If modified by human activities, they are considered artifacts (e.g., bone awl).
Feature	The remains of any non-portable human activity that can not be removed from a site without disturbing it (e.g., hearth or pit).
Fire Broken Rock	Rock which has been discoloured, cracked, or otherwise altered by exposure to fire. This is frequently characteristic of prehistoric occupation sites and can be associated with hearth features.
Flake	A stone fragment intentionally detached from a source rock during tool manufacture. Three flake types are generally recognized: primary flakes represent early stages of reduction where the original cortex is present on the dorsal surface; secondary flakes represent later stages of reduction where no cortex is present; and tertiary flakes represent the final stages of reduction where small pressure flakes are removed to produce the cutting or scraping edge of a tool.
Hearth	A feature containing ash, charcoal, burned rock, or other evidence of fire created by people.
Heritage Resource	Any human or natural artifact or feature that is of interest for its architectural, historical, cultural, environmental, archaeological, palaeontological, aesthetic or scientific value.
Lithics	A general term used to refer to stone artifacts such as tools, cores, or debitage.
Multiple Feature	A category for archaeological sites consisting of several features of different kinds (e.g., a cluster of stone circles and cairns).
Petroglyph	A rock art site formed by pecking a figure or symbol into a rock face.
Projectile Point	An inclusive term for a hafted arrow, spear, or dart point.
Recurrent Feature	A category for archaeological sites consisting of several features of the same kind (e.g., a cluster of two or more stone circles).



Shatter	A stone fragment unintentionally detached from a core during stone tool manufacture. Shatter is often less well defined than the more purposefully removed flakes.
Shovel Probe	A 40 cm by 40 cm subsurface test where the excavated soils and sediments are hand trowelled for cultural materials.
Shovel Test	A 50 cm by 50 cm subsurface test where the excavated soils and sediments are passed through a 6 mm mesh screen.
Site	Any location with detectable evidence of past human activity.
Single Feature	A category for archaeological sites consisting of one feature, (e.g., a single stone circle).
Stone Circle	A Feature consisting of stone cobbles set out in a roughly circular outline. They are generally thought to have resulted from the use of stones to secure the edges of circular hide dwellings (tipis), although the stones may also have been used in constructing ceremonial structures.
Stratigraphy	The depositional layers within a site.



APPENDIX B

Location of Shovel Probes

**Location of Shovel Probes**

Probe	Zone (NAD 83)	Easting	Northing	Cultural Materials	Palaeosols
J01	13U	400139	5772025	No	No
J02	13U	400102	5772116	No	No
J03	13U	400070	5772071	No	No
J04	13U	400039	5772059	No	No
J05	13U	399966	5772044	No	No
J06	13U	399924	5772075	No	No
J07	13U	399919	5772109	No	No
J08	13U	399855	5772088	No	No
J09	13U	399961	5772144	No	No
J10	13U	399920	5772172	No	No
J11	13U	399932	5772251	No	No
J12	13U	399890	5772242	No	No
J13	13U	399975	5772214	No	No
J14	13U	399970	5772326	No	No
J15	13U	399669	5772246	No	No
J16	13U	399754	5772296	No	No
J17	13U	399805	5772266	No	No

NAD = North American Datum.



APPENDIX C

Survey Plans



LEGEND

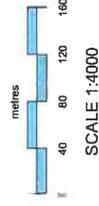
- Proposed Development Area
62.346 ha (154.06 ac)
- Legal Description :
SE14-Twp. 36-Rge04-W3M
- TransGas High Pressure Gas
Line- 30 m Setback

Residential- Acreage Lots

- Lot Size Range (1.06 ac - 8.95 ac)
- Average Lot Size (2.6 ac)
- DUGA - 0.33

Land Use Summary

Roads (including widening)	6.67 ha (16.49 ac)
Municipal Reserve	1.79 ha (4.43 ac)
Municipal Buffer	282 ha (696 ac)
Lot Area	53.26 ha (132.45 ac)
Total	62.346 ha (154.06 ac)



**Concept Drawing
w/ Satellite Image**

RidgeWood Estates

AECOM

Figure 9

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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Appendix H

Mailout Package, November 2013

Mailout Package, June, 2016

June 21st , 2016

Attention: Registered Landowner(s)

Regarding: Meadow Ridge Estates – Multi Parcel Country Residential Application

You have received this correspondence as a **Public Consultation Mail-out Package** sent by RM of Corman Park staff on behalf of Mr. Dan Beaulac for the proposed Meadow Ridge Estates development.

The RM of Corman Park has established an application approval process requiring public consultation with landowners within 1 mile of a proposed development site. You are listed as a landowner within 1 mile of the proposed property **SE-14-36-04-W3** (north-west corner of Patience Lake Road and Range Road 3041).

Please take some time to review the enclosed information and respond with any comments you may have regarding the proposed development:

1. Proposed Development Summary
2. Regional Context Plan
3. Conceptual Layout Plan
4. Conceptual Layout Plan with Satellite Image
5. Comment Form

For further information, the complete **Comprehensive Development Review (CDR)** report, supporting documentation and mapping is available to view in digital or hardcopy. If you require further details or would like to view a digital or hard copy of the CDR report please contact the developer by email or phone and you will be provided with a CDR report.

Your comments can be returned by any of the following methods:

- Mail using the enclosed, stamped and addressed envelope
- Returned in-person to the RM of Corman Park office Planning Department
- Digitally returned to the email address provided below
- Made available to be picked-up by the developer (please call the number provided to notify and arrange an appropriate time)
- Return to developer during an in-person meeting

If you have no comments regarding this proposed development please return the blank form (if possible) or provide a very brief response via phone or email that you have received the package and will not be returning comments.

If you have questions regarding the information or content, please call or email Mr. Dan Beaulac for further clarification.

Sincerely,



Dan Beaulac
Email: dan@dbventures.ca
Ph: 306-227-5597

RR #6 Site 601
Box 103
Saskatoon, SK
S7K 3J9

1. Proposed Development Summary

1.1 CDR Introduction

The Comprehensive Development Review (CDR) provides the supporting documentation for approval consideration of a proposed Multi-Parcel Country Residential (MPCR) development in the Rural Municipality of Corman Park (RMCP), and is submitted in accordance with the procedural requirements of the municipality with respect to MPCR subdivision development. The CDR document provides a compilation of information relevant to the subdivision and development of a country residential subdivision on SE 14-36-04-W3. In addition, the CDR outlines the design rationale and development objectives that will ensure this is a high quality development for the RMCP.

The conceptual plan development proposal, originally titled “Ridgewood Estates”, received a successful score from council, ranking in the ‘High Category’ and was selected to proceed to the CDR stage. Additional studies, design, community consultation, engineering, research and review have now taken place.

The developer has a very strong knowledge of the land development process. Mr. Beulac currently has two other existing land development projects in Saskatchewan that are successfully underway. Southshore Estates at Emma Lake (www.southshoreestates.ca) is a 66 lot recreational subdivision and Westpark Village in the City of Moose Jaw (www.westparkvillage.ca) is a large urban scale development. As well, the developer has sound knowledge of the local area and has existing relationships with many of the neighbouring property owners. Mr. Beulac is a University of Saskatchewan Bachelor of Commerce graduate having a Major in Finance and a Minor in Marketing. By applying this educational and practical background with direct experience, he is well suited for this type and scale of land development project.

Specifically for Meadow Ridge Estates, the developer has retained the professional services of Environmental Engineers (P.Eng, P.Ag.), Geotechnical Engineers (P.Eng., FCSCE), Professional Planning (RPP, MCIP), Civil Engineering (P.Eng.), Transportation Engineering (P.Eng., PTOE), and Land Surveyors (S.L.S.) to ensure the development is constructed in an efficient and proper manner.

1.2 Layout Design Rationale

The **purpose** of this development is to provide **51** high quality and desirable residential estate lots to supply buyers who are seeking a more compact CR lot at an attainable market price level. The intent is to provide a variety of lot sizes less than 2 acres with approximately 25% overall being larger lots in a range of 2.0-8.9 acres.

As a **general summary**, Meadow Ridge Estates is proposed to be an attractive MPCR development that suits market demand for residential housing in a natural setting. Meadow Ridge Estates recognizes the benefit of being adjacent well-established and maintained roads on two sides of the parcel. This takes advantage of the comfortable and short commute to services and/or employment in Saskatoon or other commercial centers in the area.

The natural combination of open space, tree stands and ponds is a primary beneficial design characteristic creating a **unique feel** and theme for Meadow Ridge Estates. The conceptual design has aligned the internal road system to showcase the natural topography and attractive features such as: meaningful end-point vistas; feature views of ponds; pleasurable sensations from sight distance and natural vegetation; and, enclosures with tree lined flankage along portions of the roadway. A very efficient road layout has also minimized the construction length and thereby has reduced the overall cost and amount of required future road maintenance.

Lot lines (boundaries) have been carefully selected to provide **attractive building envelopes** which accommodate easements and the valuable character of natural vegetation. The majority of lots include one, or more, forms of natural amenity and views. Lot boundaries have been adjusted to create attractive building sites using the natural landscape as a contiguous backdrop.

The site has an appealing and **desirable proximity** to many required services available in Saskatoon approximately 7km west along the well-established and paved Patience Lake Road to the Stonebridge business park, Lakewood Suburban Centre and Rosewood commercial developments in Saskatoon. Other services and amenities are available in nearby towns. While being far enough to be considered a rural setting, the site is still reasonably near urban centers, reducing travel time, cost, and emissions.

The natural rolling topography is well suited for large lot residential development that has sufficient open space for a building footprint, yard, and will mostly include other natural amenities on each lot. The site fits directly with the developer's concept to meet a demand for this type of residential property.

The development site is outside the Planning District Boundary, outside the Future Urban Growth Overlay area, outside the Planning for Growth (P4G) Study Area boundary and beyond the Perimeter Highway Corridor Overlay.

1.3 Official Community Plan Compliance

The RMCP Official Community Plan (OCP) establishes objectives and policies to accommodate high quality country residential developments in a planned manner in locations that minimize disruption to the agricultural sector, and where infrastructure readily supports this level of development.

The CDR identifies and summarises how the current proposed design satisfies the intent of RMCP OCP within: Sections 5.1 *Country Residential Objectives*; Section 5.2.1 *General Country Residential Policies*; and, Section 5.2.3 *Multi Parcel Country Residential Subdivision Policies*.

This development will not significantly reduce the amount of available productive agricultural land within the RM. The Canada Land Inventory classifications for this site are Class 3 and Class 5 with limitations on both soil and water. There is minimal tilled crop on the site with the majority used as pasture for grazing cattle, producing small amount of privately used hay and natural areas. The Terrestrial Report also notes that the land is characterised as knob and kettle moraine, with an undulating topography and numerous pothole sloughs surrounded by natural tree stands of shrubs and aspen.

Developing the land as a MPCR site will provide far greater potential for grasses, wildlife habitats and vegetation to continue in the existing form than if it were to be used for tilled agricultural purposes.

The Phase 1 **Environmental Site Assessment** (see Appendix F) includes correspondence from RM Corman Park, City of Saskatoon, and Ministry of the Environment that no environmental concerns are on file for this site.

The conceptual design proposes a very efficient internal road design of **one continuous loop**. This is efficient because lots in all parts of the property can be accessed with the loop and there is only one internal intersection required for the Meadow Ridge Place extension.

No federal or listed **plant species** were observed on the site during the environmental field reviews. The Terrestrial Report states that most listed species have unique habitat that are not present on this site. (See Appendix E)

No federal or listed **wildlife species** were observed and the habitat suitability for these species is low to moderate. While collectively the site has moderate non-listed wildlife potential, the surrounding landscape has been heavily modified by agriculture, infrastructure development and acreage development, along with well-developed roads which all reduce the quality of habitat in the area. (See Appendix E)

The **Heritage Resources Impact Assessment** states that "no new heritage sites were observed therefore this office has no further concerns with this project proceeding as planned. This Final Report fulfils the permitting requirements necessary for the completion of the HRIA". (See Appendix G).

Traffic Impact Assessment (TIA) is complete and can be reviewed at Appendix C. The key findings of the TIA support the development of this site and that no concerns are raised for the immediate road system or relevant intersections in the area. There are minimal traffic volume impacts generated at peak hours for this site. The Rosewood neighbourhood plan amendments and the new perimeter highway will have considerably greater impact to the area than this low density residential subdivision.

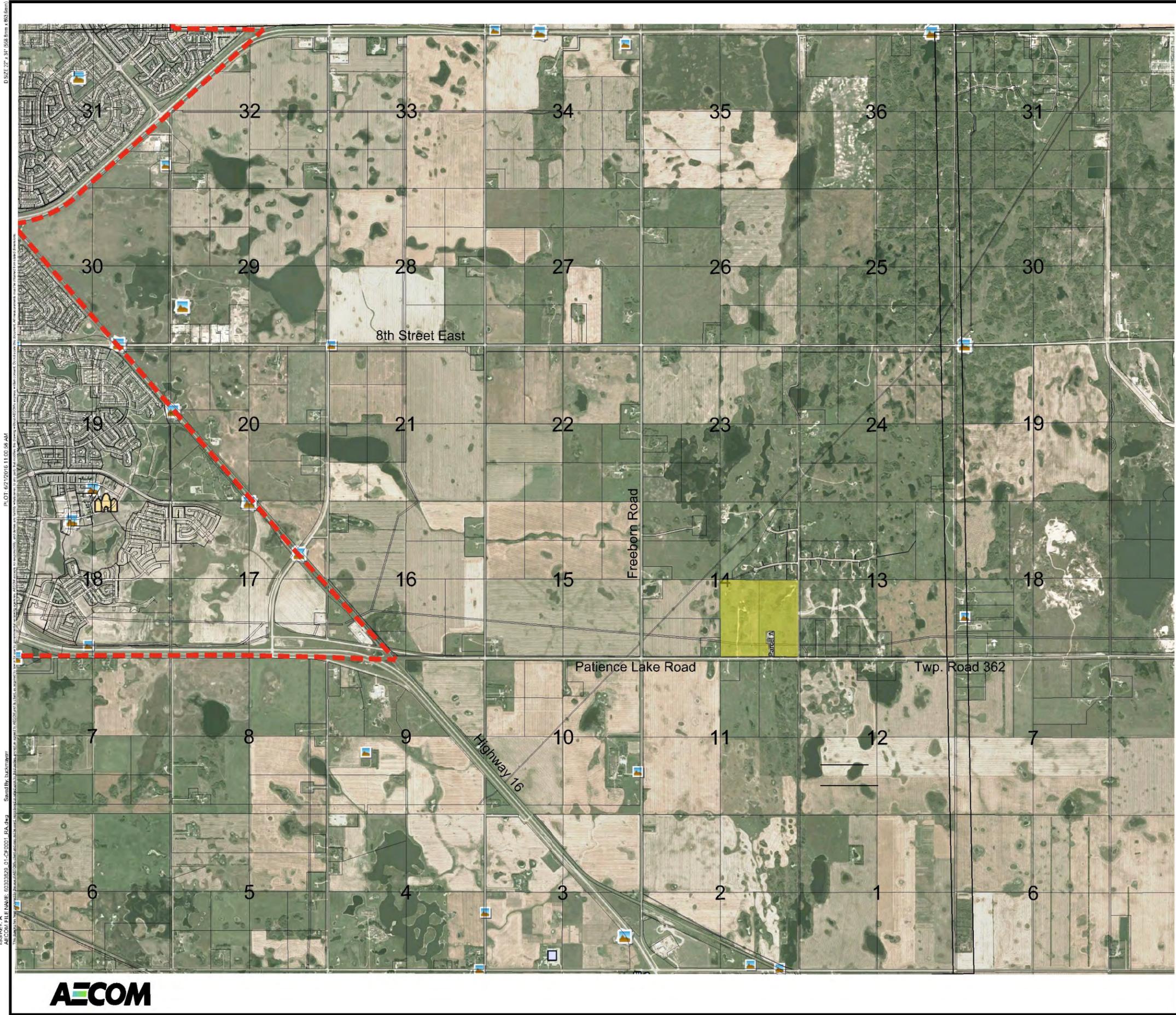
1.4 Description of Proposed Development

The primary intent of this subdivision is to create a quiet, calm low density residential area. Future activities on the properties will be regulated by the RMCP OCP, relevant Bylaws and National Building Code.

No public facilities are proposed for this development.

Table 1 Landuse Calculations

Development Consideration	Rural Municipality Zoning Bylaw Requirements	Meadow Ridge Estates
Total Site Area	Maximum – 64.8 ha 160 acres	62.346 ha 154.06 acres
Total Lot Area – Residential Development		53.26 ha 132.4 acres
Lot Size	Minimum – 1 acre, Maximum - 10 acres	Minimum – 1.01 acres, Maximum – 8.9 acres
Overall average lot size	Minimum 2.47 acres	2.6 acres
Total Area of Roadways		6.67 ha 16.49 acres
Total Area – Municipal Reserve	10 %	Cash in Lieu
Total Area – Municipal Buffers		0.75 ha 1.84 acres



ISSREV. A
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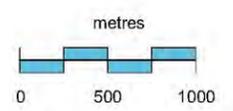
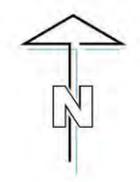
LEGEND



Meadow Ridge Estates
SE14-Twp.36-Rge04-W3M



Saskatoon City Limits



SCALE 1:40,000

Regional Context

Meadow Ridge Estates

Figure 1

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LEGEND

- Proposed Development Area
62.346 ha (154.06 ac)
- Legal Description :
SE14-Twp. 36-Rge04-W3M
- - - TransGas High Pressure Gas
Line- 30 m Setback

Residential- Acreage Lots

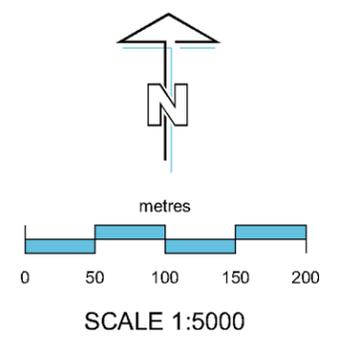
- 5 Lot Size Range (1.01 ac - 8.90 ac)
Average Lot Size (2.6 ac)
DUGA - 0.33

Land Use Summary

Roads (including widening)	6.67 ha (16.49 ac)
Municipal Reserve	n/a
Municipal Buffer	0.75 ha (1.84 ac)
Lot Area	53.26 ha (132.45 ac)
Total	62.346 ha (154.06 ac)

Open Space

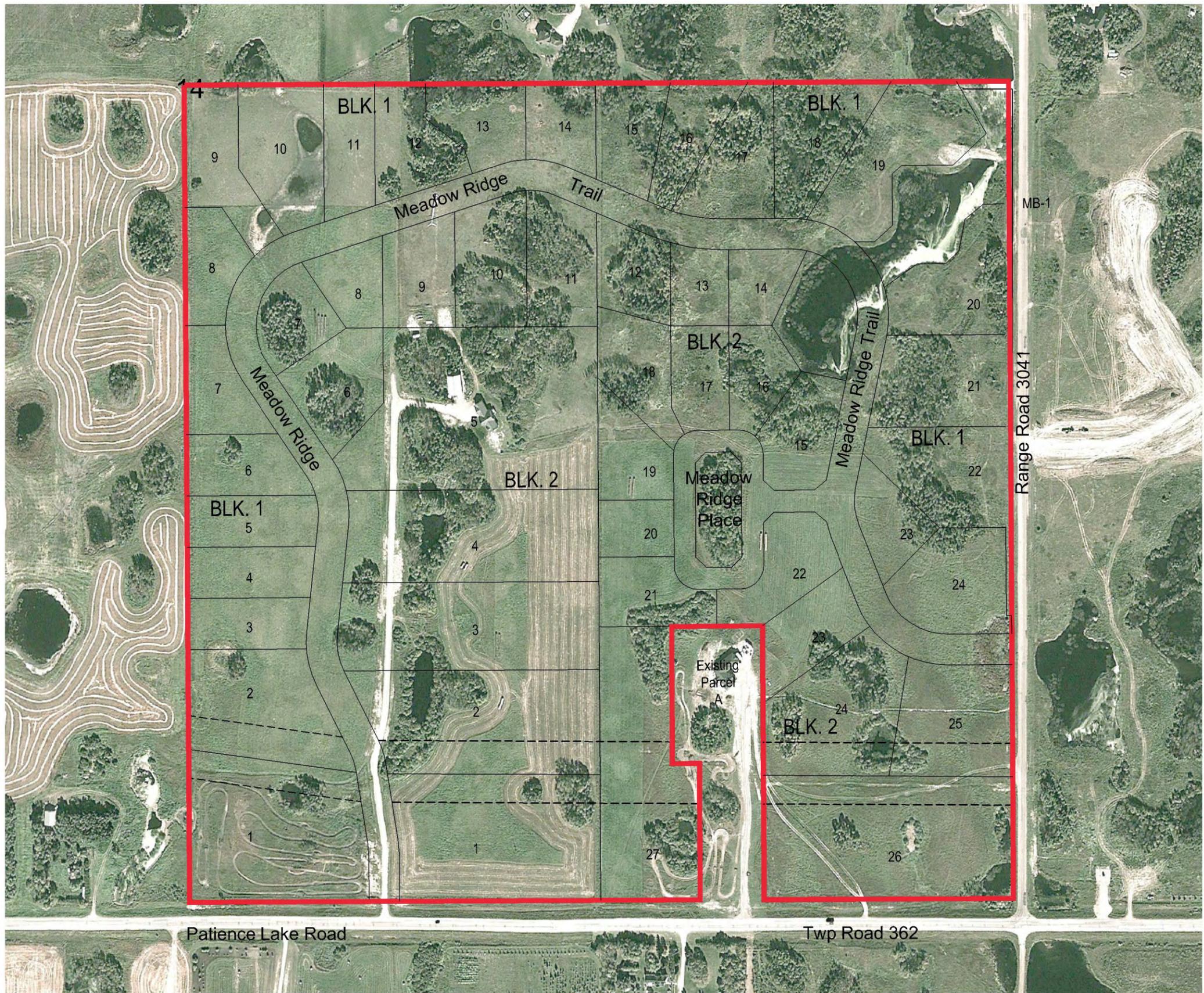
- Drainage Easement - (1.89 ha / 4.67 ac)
- Municipal Buffer (0.75 ha / 1.84 ac)



Concept Drawing

Meadow Ridge Estates

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LEGEND

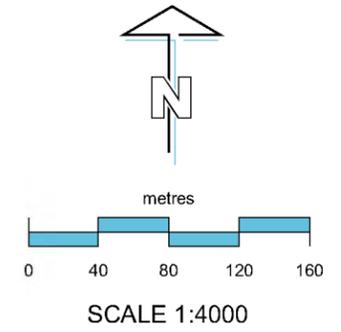
- Proposed Development Area
62.346 ha (154.06 ac)
- Legal Description :
SE14-Twp. 36-Rge04-W3M
- TransGas High Pressure Gas Line- 30 m Setback

Residential- Acreage Lots

- 5 Lot Size Range (1.01 ac - 8.90 ac)
Average Lot Size (2.6 ac)
DUGA - 0.33

Land Use Summary

Roads (including widening)	6.67 ha (16.49 ac)
Municipal Reserve	0 ha (0 ac)
Municipal Buffer	0.75 ha (1.84 ac)
Lot Area	53.26 ha (132.45 ac)
Total	62.346 ha (154.06 ac)



Concept Drawing w/ Satellite Image

Meadow Ridge Estates

Meadow Ridge Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park
Public Consultation Comment Form

1. Please provide your comments regarding the proposed development:

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: _____ Time: _____ Location: _____

Printed Name: _____ Signature: _____

Local Land Description: _____

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Meadow Ridge Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY Friday July 15th, 2016

November 18th, 2013

Attention of Local Land Owner:

**Regarding: Ridgewood Estates: Proposed Multi-Parcel Country Residential,
 SE-14-36-04-W3, within RM of Corman Park**

Introduction

This letter provides an overview regarding a proposed Multi-Parcel Country Residential development within 1 mile of your property in the RM of Corman Park. Please review this letter and the enclosed figure and Comment Form. Please complete the comment form and return for our records.

In May 2013 the RM of Corman Park invited proposals for future Multi Parcel Country Residential development. The Call for Proposals outlined a three stage approach for all development applications received: Preliminary Screening Stage, Public Consultation Stage, Comprehensive Development Stage. This proposed development within 1 mile of your property has been rated high in the Preliminary Screening Stage and has advanced to this second stage for Public Consultation.

Stage 2 Explanation

As part of the Second Stage, all registered landowners within 1 mile of this proposed development will have opportunity to provide comment and speak directly to the developer as part of a layered public consultation process. This package is included in an RM of Corman Park mail-out that will be sent to your current contact address on file with the RM administration. Additionally, if preferable or requested, the developer is personally available for phone calls or in-person meetings to discuss the project and receive comments. This will provide further opportunity for landowners to submit comments or request a separate material delivery method. The provided comment form can be completed and returned during these meetings as well, if preferable to the landowner.

Please review the enclosed information and complete the Comment Form. If you have no comment at this time, please sign and return the blank form.

The Comment Form can be returned by any of the following methods:

- Mail back using the enclosed, stamped and addressed envelope
- Returned in person to the contact name provided
- Digitally Scanned and returned to the email address provided
- Made available for pick-up by the developer (please call the number provided to notify and arrange an appropriate time)
- Return during an in-person meeting

Material, comments and contact information will be kept in confidence and used solely for the purpose of this development application process through the RM.

Returned comments and discussion notes will be compiled and provided to the RM as part of the Stage 2 submission. The developer's intent is to provide a clear understanding of the comments from local land owners.

During the Stage 3 Comprehensive Development Review process, you will have further opportunity for comment as part of the actual rezoning and subdivision approvals consultation and public hearing event.

Development Overview

Ridgewood Estates is proposed to be an attractive development to suit market demand for larger lot rural residential housing in a natural setting. The site is directly adjacent Patience Lake Road, and Range Road 3041, a primary grid. Hwy 16 and Hwy 316 are also approximately 3km from the site. Conceptual plans have minimized the amount of internal roads and municipal maintenance has been kept in mind during development. Access to Patience Lake Road is intended to service as the primary access. Access from Range Road 3041 is intended to be the secondary access/egress point at approximately 250m north of the Patience Lake Road.

The site would potentially attract a broad spectrum of age groups (employed singles, young families, middle-age and retired people). This development is not specifically appropriate for formalized pedestrian/bicycle trails systems. However, there are many available routes inherent to the local area for walking and cycling. The road layout is also designed with traffic calming and sightlines in mind. There are two naturalized MR areas proposed. No further formalized public gathering spaces, or facilities are planned and remaining MR will be Cash-in-Lieu to reduce long term maintenance costs. This can be amended if the RM has a desire for further open space at this site.

The concept layout was designed to integrate the development with existing subdivisions. Only the west border is adjacent agriculture and the open views are considered a benefit to these lots. Municipal servicing has been considered in the design e.g. Road design for efficient snow clearing and maintenance, use of local water line to concentrate infrastructure.

Landscaping and buffering has been included through use of existing natural tree stands and elevations. A guiding design principle was to retain natural vegetation and maximize vistas for housing and roads, for instance entry to Ridgewood Place, views of MR areas, view to west etc. Building site locations have been considered by applying the natural and regulated setbacks.

Sincerely,



Dan Beaulac
Ph: 306-227-5597
RR #6 Site 601
Box 103
Saskatoon, SK
S7K 3J9

Encl.: Comment Sheet; Figure 3-Labelled Location Map

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: _____ Time: _____ Location: _____

Printed Name: _____ Signature: _____

Local Land Description: _____

Contact information (OPTIONAL): Phone: _____ Email: _____

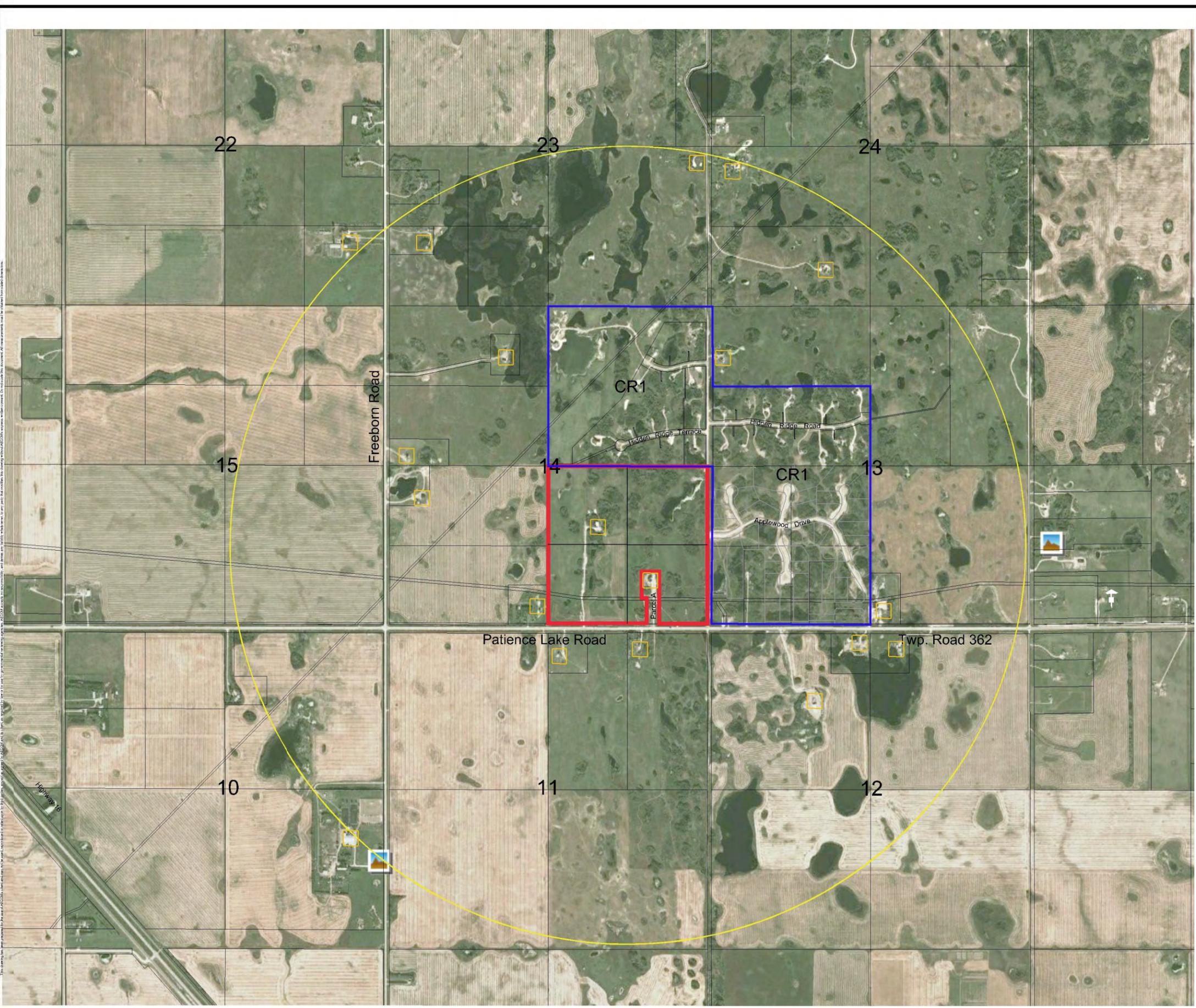
Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9
Email: dan@dbventures.ca
Phone: 306-227-5597

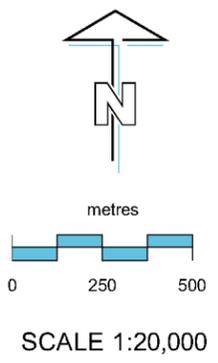
PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

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LEGEND

-  **Study Area Boundary**
SE14-Twp.36-Rge04-W3M
-  **Country Residential Area**
-  **Radius = 1 mile**
-  **Residences and Farmsteads**



Existing Landuse & Labeled Location Map

RidgeWood Estates

Figure 3

Appendix I

Certificate of Titles

*Province of Saskatchewan
Land Titles Registry
Title*

Title #: 140572852 As of: 28 Aug 2013 20:12:41
Title Status: Active Last Amendment Date: 18 Apr 2011 16:11:46.650
Parcel Type: Surface Issued: 18 Apr 2011 16:11:45.927
Parcel Value: \$20,000.00 CAD
Title Value: \$20,000.00 CAD Municipality: RM OF CORMAN PARK NO. 344
Converted Title: 76S40857
Previous Title and/or Abstract #: 130058030

Daniel Beulac and JESSICA BEAULAC are the registered owners, as joint tenants, of Surface Parcel #165160458

Reference Land Description: SE Sec 14 Twp 36 Rge 04 W3 Extension 2

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000*.

Registered Interests:

Interest #: 154808668 CNV Pipeline Easement Value: N/A
Reg'd: 15 Apr 1958 01:13:03
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Expiry Date: N/A

S1/2-14
Holder:
TRANSGAS LIMITED
700 - 1777 Victoria Ave
Regina, SK, Canada S4P 4K5
Client #: 105200985
Int. Register #: 103808639
Converted Instrument #: FP4383
Feature #: 100077612

Interest #: 154808679 CNV Caveat Value: N/A
Reg'd: 06 Oct 1964 01:46:59
Interest Register Amendment Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

S1/2 - 14

Holder:

Potash Company of America

Ferguson et al No 1 Bank of Commerce Bldg

Saskatoon, Saskatchewan, Canada

Client #: 106603983

Int. Register #: 103808640

Converted Instrument #: 64S19199

Interest #:
154808680

CNV Pipeline Easement

Value: N/A

Reg'd: 28 Jun 1965 01:48:33

Interest Register Amendment

Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

S1/2-14

Holder:

Potash Corporation of Saskatchewan Inc.

N/A, Saskatchewan, Canada

Client #: 106015340

Int. Register #: 103808651

Converted Instrument #: 65S12542

Feature #: 100064483

Interest #:
154808691

Public Utility Easement

Value: N/A

Reg'd: 21 Jan 2004 15:12:38

Interest Register Amendment

Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

Holder:

RURAL MUNICIPALITY OF CORMAN PARK NO. 344

111 PineHouse Drive

Saskatoon, Saskatchewan, Canada S7K 5W1

Client #: 101591580

Int. Register #: 108592993

Interest #:
154808703

Public Utility Easement

Value: N/A

Reg'd: 21 Oct 2009 13:33:05

Interest Register Amendment

Date: N/A
Interest Assignment
Date: N/A
Expiry Date: N/A

Holder:
RURAL MUNICIPALITY OF CORMAN PARK NO. 344
111 PineHouse Drive
Saskatoon, Saskatchewan, Canada S7K 5W1
Client #: 101591580
Int. Register #: 115905438

Addresses for Service:

Name	Address
Owner: Daniel Beaulac	231 Adolph Way Saskatoon, Saskatchewan, Canada S7N 3K2
Client #: 106208917	
Owner: JESSICA BEAULAC	231 ADOLPH WAY SASKATOON, Saskatchewan, Canada S7N 3K2
Client #: 119393185	

Notes:

Parcel Class Code: Parcel (Generic)

[Back](#)

*Province of Saskatchewan
Land Titles Registry
Title*

Title #: 129965888 As of: 28 Aug 2013 20:16:03
Title Status: Active Last Amendment Date: 22 Nov 2005 09:48:50.180
Parcel Type: Surface Issued: 22 Nov 2005 09:48:48.617
Parcel Value: \$100,000.00 CAD
Title Value: \$100,000.00 CAD Municipality: RM OF CORMAN PARK NO. 344
Converted Title: 76S40857
Previous Title and/or Abstract #: 126819513

DWAYNE THEODORE PITKA is the registered owner of Surface Parcel
#153820830

Reference Land Description: Blk/Par APlan No 101847810 Extension 0

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000*.

Registered Interests:

Interest #: 130269179 CNV Pipeline Easement Value: N/A
Reg'd: 15 Apr 1958 01:13:03
Interest Register Amendment
Date: N/A
Interest Assignment
Date: N/A
Expiry Date: N/A

S1/2-14
Holder:
TRANSGAS LIMITED
700 - 1777 Victoria Ave
Regina, SK, Canada S4P 4K5
Client #: 105200985
Int. Register #: 103808639
Converted Instrument #: FP4383
Feature #: 100077612

Interest #: 130269180 CNV Caveat Value: N/A
Reg'd: 06 Oct 1964 01:46:59
Interest Register Amendment
Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

S1/2 - 14

Holder:

Potash Company of America

Ferguson et al No 1 Bank of Commerce Bldg

Saskatoon, Saskatchewan, Canada

Client #: 106603983

Int. Register #: 103808640

Converted Instrument #: 64S19199

Interest #:

130269191

CNV Pipeline Easement

Value: N/A

Reg'd: 28 Jun 1965 01:48:33

Interest Register Amendment

Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

S1/2-14

Holder:

Potash Corporation of Saskatchewan Inc.

N/A, Saskatchewan, Canada

Client #: 106015340

Int. Register #: 103808651

Converted Instrument #: 65S12542

Feature #: 100064483

Interest #:

130269203

Public Utility Easement

Value: N/A

Reg'd: 21 Jan 2004 15:12:38

Interest Register Amendment

Date: N/A

Interest Assignment

Date: N/A

Expiry Date: N/A

Holder:

RURAL MUNICIPALITY OF CORMAN PARK NO. 344

111 PineHouse Drive

Saskatoon, Saskatchewan, Canada S7K 5W1

Client #: 101591580

Int. Register #: 108592993

Addresses for Service:

Name

Address

Owner:

DWAYNE THEODORE PITKA

351 Carleton Drive Saskatoon, Saskatchewan, Canada

S7H 3P2

Client #: 116041238

Notes:

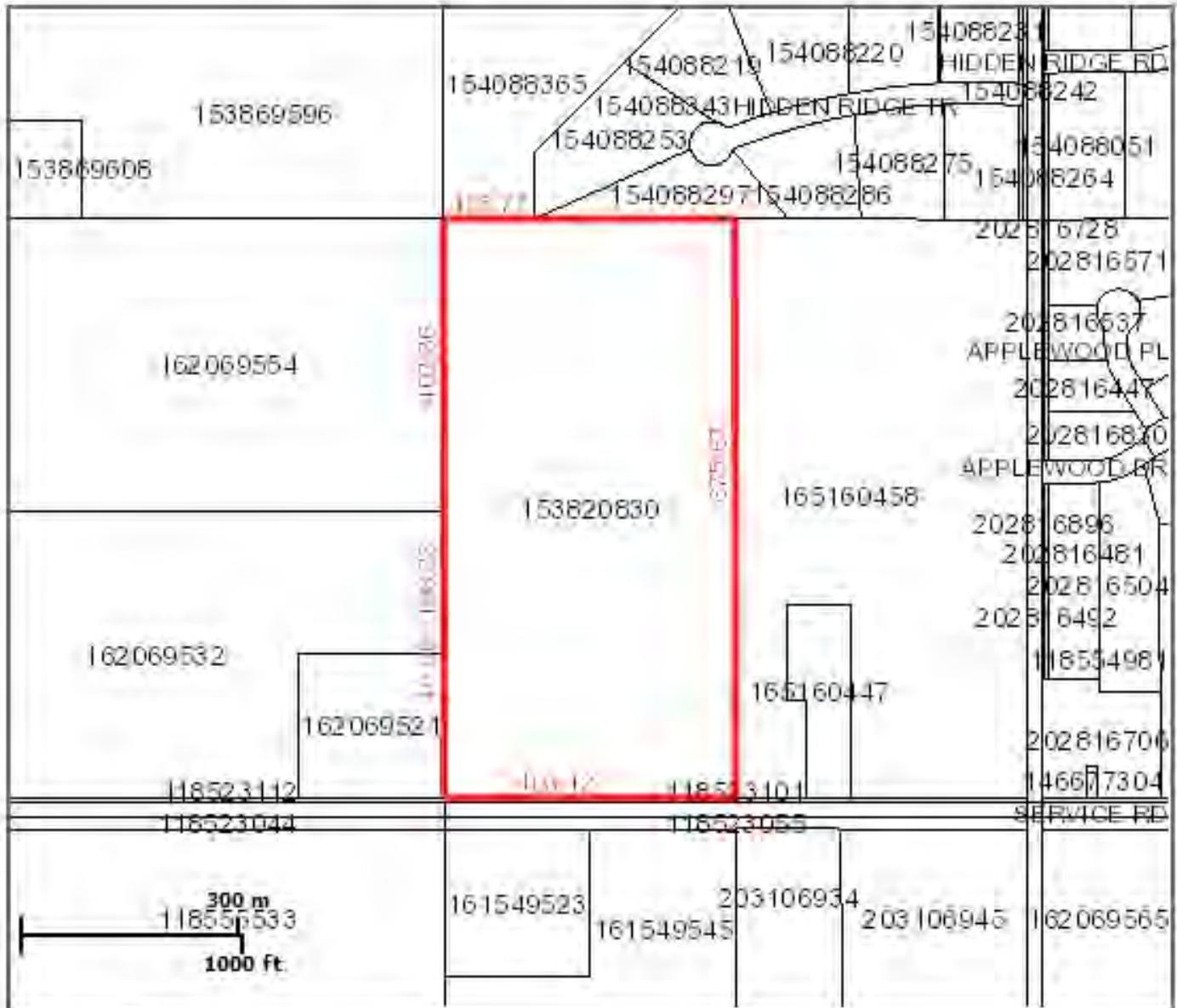
Parcel Class Code: [Parcel \(Generic\)](#)

[Back](#)



Surface Parcel Number: 153820830

REQUEST DATE: Tue Jan 19 11:12:53 GMT-0600 2016



Scale: 1:18056

Owner Name(s): Pitka, Dwayne Theodore, Pitka, Renee Lisa

Municipality: RM OF CORMAN PARK NO. 344

Area: 32.183 hectares (79.53 acres)

Title Number(s): 147133234

Converted Title Number: 78S40857

Parcel Class: Parcel (Generic)

Ownership Share: 1:1

Land Description: Blk/Par A-Plan 101847810 Ext 0

Source Quarter Section: SE-14-36-04-3

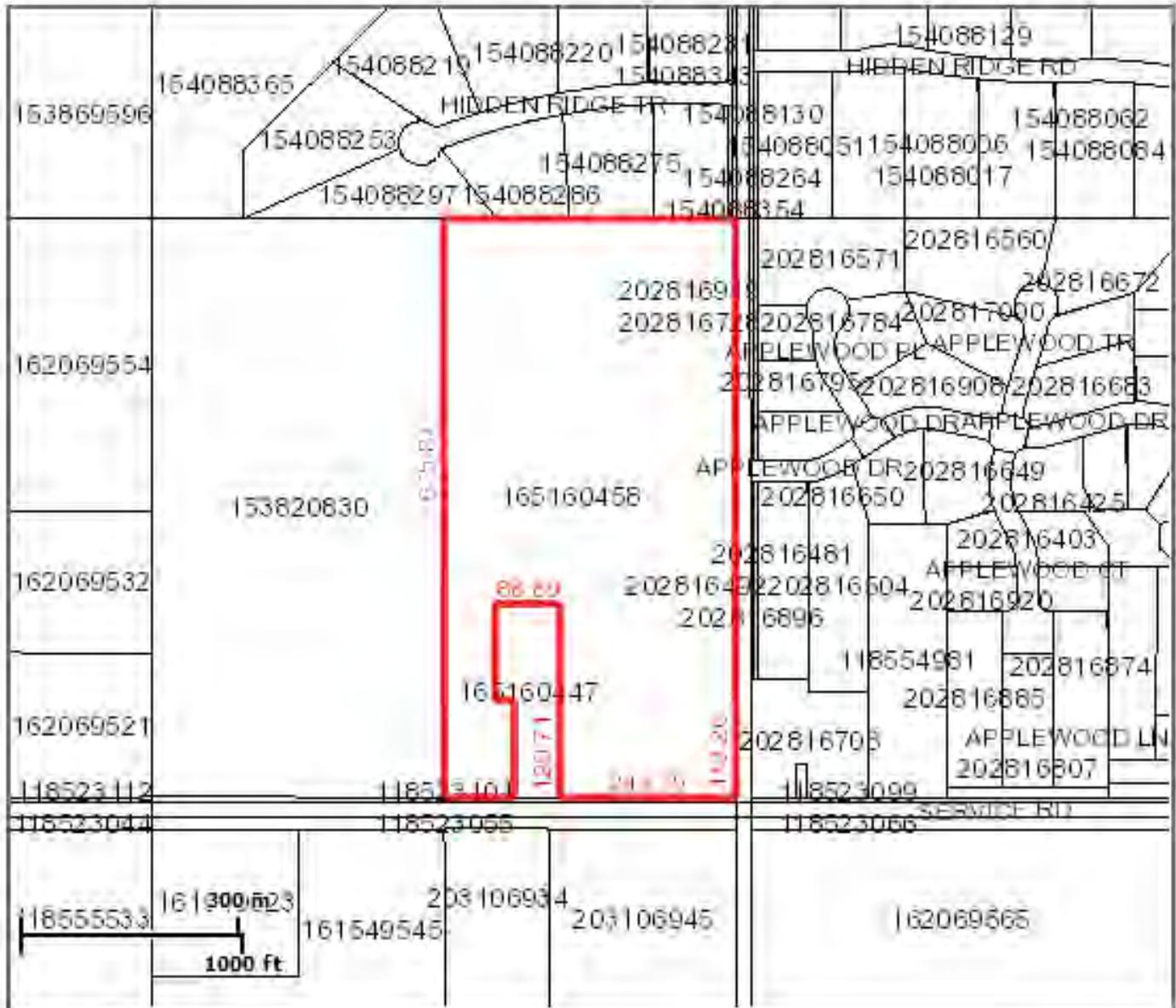
Commodity/Unit: Not Applicable

DISCLAIMER: THIS IS NOT A PLAN OF SURVEY. It is a consolidation of plans processed in identifying the location, size and shape of a parcel in relation to other parcels. Errors, boundaries and area may have been adjusted to fit with adjacent parcels. To determine the actual boundaries, dimensions or area of any parcel, refer to the plan, or consult a surveyor.



Surface Parcel Number: 165160458

REQUEST DATE: Tue Jan 19 11:10:00 GMT-0600 2016



Scale: 1:18056

Owner Name(s): Beaulac, Daniel, BEAULAC, JESSICA

Municipality: RM OF CORMAN PARK NO. 344

Area: 30.163 hectares (74.53 acres)

Title Number(s): 140572852

Converted Title Number: 76S40857

Parcel Class: Parcel (Generic)

Ownership Share: 1:1

Land Description: SE 14-36-04-3 Ext 2

Source Quarter Section: SE-14-36-04-3

Commodity/Unit: Not Applicable

Appendix J

SaskPower Supply

Customer Services

November 02, 2015

B D VENTURES
RR 6 SITE 601 BOX 103
SASKATOON SK S7K 3J7
CANADA

Notification # 301579999

Quotation # 96802

Service Order # 20180806

Subject: 51 Lot Development - Ridgewood Estates - SE-14-36-04w3

Thank you for requesting electrical service at the above noted location. SaskPower is pleased to provide you with the following quotation:

Design:

SaskPower has designed underground distribution to provide 120/240-volt, single-phase, three-wire services to 200-amp mains. Service will be provided underground to a freestanding pedestal complete with attached metering/splitter box. The point of delivery will be the metering/splitter box.

Enclosed is a copy of our map/drawing showing the proposed routing/location of SaskPower facilities required for these services.

NOTES:

- The secondary cable from the freestanding pedestal will be the responsibility of the lot owner. (see notes on construction map)
- It is the developer's responsibility to make sure any real estate agent's or lot purchaser's are aware of the information mentioned above

Cost:

A construction charge of **\$262,176.01 plus \$13,108.80 GST**, for a total cost of **\$275,284.81** is required for this service. A down payment in the amount of **\$68,750.00** is required. The remainder of the construction charge will be invoiced upon completion of the work.

NOTE: If a payment option is preferred, complete the enclosed financing option application and return it with your 25% down payment and all other requested documentation.

NOTE: This construction charge is eligible for rebate in whole or in part, should the extension be utilized by another customer within a five year period from the date of service. The rebate amount will be calculated on a "shared cost of shared line principle", proportional to the individual loads.

Approvals:

To proceed, please return the following items:

- Signed quotation letter
- Signed approval of SaskPower map/drawing
- Authorized "Permission to Construct" form
- Payment of **\$68,750.00** OR 25% down and your application for financing

Customer Services
November 02, 2015

Conditions:

- This agreement, and any services provided hereunder, is governed by SaskPower's Terms and Conditions of Service.
- This quotation is contingent on SaskPower receiving all necessary approvals.
- Any necessary approvals and/or easements must be obtained and a registered Plan of Survey showing easement Right-of-Way provided. Transfer of ownership is not to be processed until the easement is registered. In the event that SaskPower incurs additional costs due to the developer transferring lots prior to registration of the easement, SaskPower will have the right to recover said costs from the developer.
- Customer is responsible for locating and day lighting all customer owned facilities along SaskPower's staked trench route. - The subdivision must be to final grade before we install our facilities. Any costs associated with the relocation/alteration of facilities due to improper grades and/or changes to lot layout, etc., requiring additional labour and material, will result in additional charges to the developer.
- **This quotation is valid until December 2, 2015. "This quotation is also subject to requote, if the requested work doesn't proceed within a period of one year after acceptance of the contract."**

Construction Scheduling:

Upon receipt of your approvals and all necessary permissions, material and manpower will be scheduled to complete the installation of service.

On behalf of SaskPower, I would like to thank you for your business and we look forward to serving you in the future. If you require additional information, please contact our design team at 1-888-757-6937 (option 4).

Respectfully yours,



Justin Bloor
Business Manager, Saskatoon Region
JB/jpm

Enclosure

Customer Approval:

Accepted by: _____ Date: _____
Name of customer

Date Service Required: MM ____ /DD ____ /YY ____

Permission for Credit Check (Commercial)

To confirm your application for financing, please sign and return this page, along with your signed letter of quote. SaskPower will contact you to confirm your financing application. If you qualify for financing a detailed application will be required.

[Financing Option] 25% Down payment of **\$68,821.20** included. On approved SaskPower New Connect Financing, the balance of **\$206,463.61** will appear in monthly instalments on your SaskPower bill. Please read the following statement:

By my signature below, I hereby authorize SaskPower to complete a credit check for SaskPower New Connect Financing against both the company and any signing officers for the Company listed in this application. Credit check(s) shall include, without limitation, the acquisition, retention and review of a credit report from a credit-reporting agency, which will contain credit information, personal information or both. I acknowledge that SaskPower requires consent pursuant to The Credit Reporting Act to complete such credit checks, and I hereby consent to SaskPower obtaining and utilizing a credit report in connection with the extension of credit to the Company and / or the collection of any resulting debt from the Company. Provision of loan security for the new connect financing shall be in a form and amount satisfactory to SaskPower.

To apply for SaskPower financing, please provide the following:

Registered Name _____ ("the Company")

Street Address _____

City/Town _____ **Prov** _____ **Postal Code** _____

(if different than registered name)

Operating Name _____

Existing SaskPower Account # _____

Signing Officers for the Company

#1 Name (print) _____ **Title** _____

Signed _____ **Date** _____

Home Address _____

Previous Address _____

(if less than 2 years at current address)

Driver's license # _____ **Date of Birth (dd/mm/yy)** ____/____/____

Email _____

Daytime ph# _____ **Cell #** _____

#2 Name (print) _____ **Title** _____

Signed _____ **Date** _____

Home Address _____

Previous Address _____

(if less than 2 years at current address)

Driver's license # _____ **Date of Birth (dd/mm/yy)** ____/____/____

Email _____

Daytime ph# _____ **Cell #** _____

Service to be installed at above address (yes or at _____

*Once final invoice is created, financing option is no longer available

	Term of Loan					
	1-Year	2-Year	3-Year	4-Year	5-Year	10-Year
Loan rate for loans up to \$25,000	7.55%	7.70%	7.90%	8.05%	8.20%	8.85%
Loan rate for loans \$25,001 - \$2,000,000	6.95% plus \$150 admin. fee	7.10% plus \$150 admin. fee	7.30% plus \$150 admin. fee	7.45% plus \$150 admin. fee	7.60% plus \$150 admin. fee	8.25% plus \$150 admin. fee

CONSENT AND AGREEMENT
WITH RESPECT TO ACQUISITION OF AND COMPENSATION
FOR EASEMENT OF RIGHT-OF-WAY
URBAN ELECTRICAL DISTRIBUTION

WHEREAS Saskatchewan Power Corporation, hereinafter called SPC, requires an Easement for right-of-way for the purpose of a powerline on, over, under and/or through the parcel of land described as follows:

SE-14-36-04-3 Ext 2; Parcel #165160458

Width of Easement 3.3X3 Metres

NOW THEREFORE, Beaulac, Daniel and Beaulac, Jessica, hereinafter called the Owner, of the postal address of RR 6, Site 601, Box 103, Saskatoon, being the registered owner(s)/purchaser(s) under agreement for sale of the said parcel of land, do/does hereby consent and agree to the acquisition by SPC of the said easement to consist of the right to SPC by itself, its employees and/or agents to enter upon the said land for the purpose of constructing, placing, laying, operating, maintaining, inspecting, altering, removing, replacing, and/or repairing poles, anchors, kiosks, transformers and pads, wires, cables, conduits and other conductors, apparatus and equipment as SPC may consider necessary or convenient in connection with the operation of an electrical distribution system on, over, under, and/or through the said right-of-way together with the right of ingress and egress to and from the said parcel of land for the employees, agents, vehicles, supplies and equipment of SPC for all purposes necessary or incidental to the exercise and enjoyment of the rights hereby acquired, on the following terms and conditions:

- (1) The easement acquired hereunder will be evidenced at the Land Titles Registry either by registration of a Power Corporation Act Easement (s.23) or by the filing of a miscellaneous interest.
- (2) The consideration for the said easement shall be the sum of One Dollar (\$1.00), the receipt whereof is hereby acknowledged.
- (3) It is hereby agreed that whenever SPC breaks or opens up the said right-of-way for any purpose, SPC shall diligently and expeditiously complete the work for which such breaking or opening up was required, and shall, at the expense of SPC, restore the ground so broken and opened up as nearly as possible to its former condition forthwith upon the said work being completed.
- (4) SPC shall exercise its rights with due care and attention with a view to avoiding any unnecessary damage to trees, shrubs, plants, flower beds, lawns or fences located within the said easement.
- (5) The owner shall be allowed free access to and use of the said parcel of land hereinbefore described, except insofar as it may be necessary for SPC to use the same for the purposes hereinbefore specified; provided further that the owner shall not, without the prior written consent of SPC, excavate, drill, install or erect or permit to be excavated, drilled, installed or erected on or under the said parcel of land any pit, well, trench, foundation, pavement, building, or other structure or installation.
- (6) Upon the discontinuance of the said right-of-way and the exercise of the rights hereby acquired, SPC shall restore the said land to the same condition, so far as it is practicable to do so, as the same was in prior to the entry thereon by SPC and the exercise by it of the rights hereby acquired.
- (7) Nothing herein contained shall be deemed to vest in SPC any title to mines, ores, metals, coal, slate, oil, gas or other minerals in or under the said parcel of land, except only the parts thereof that are necessary to be dug, carried away or used in the laying down, construction, operation, maintenance, inspection, alteration, removal, replacement, reconstruction, and/or repair of the said powerline, works, apparatus and equipment of SPC.

DATED this _____ day of _____, 20_____

Witness _____

Owner's Signature _____

(Print Name and Signing Authority)

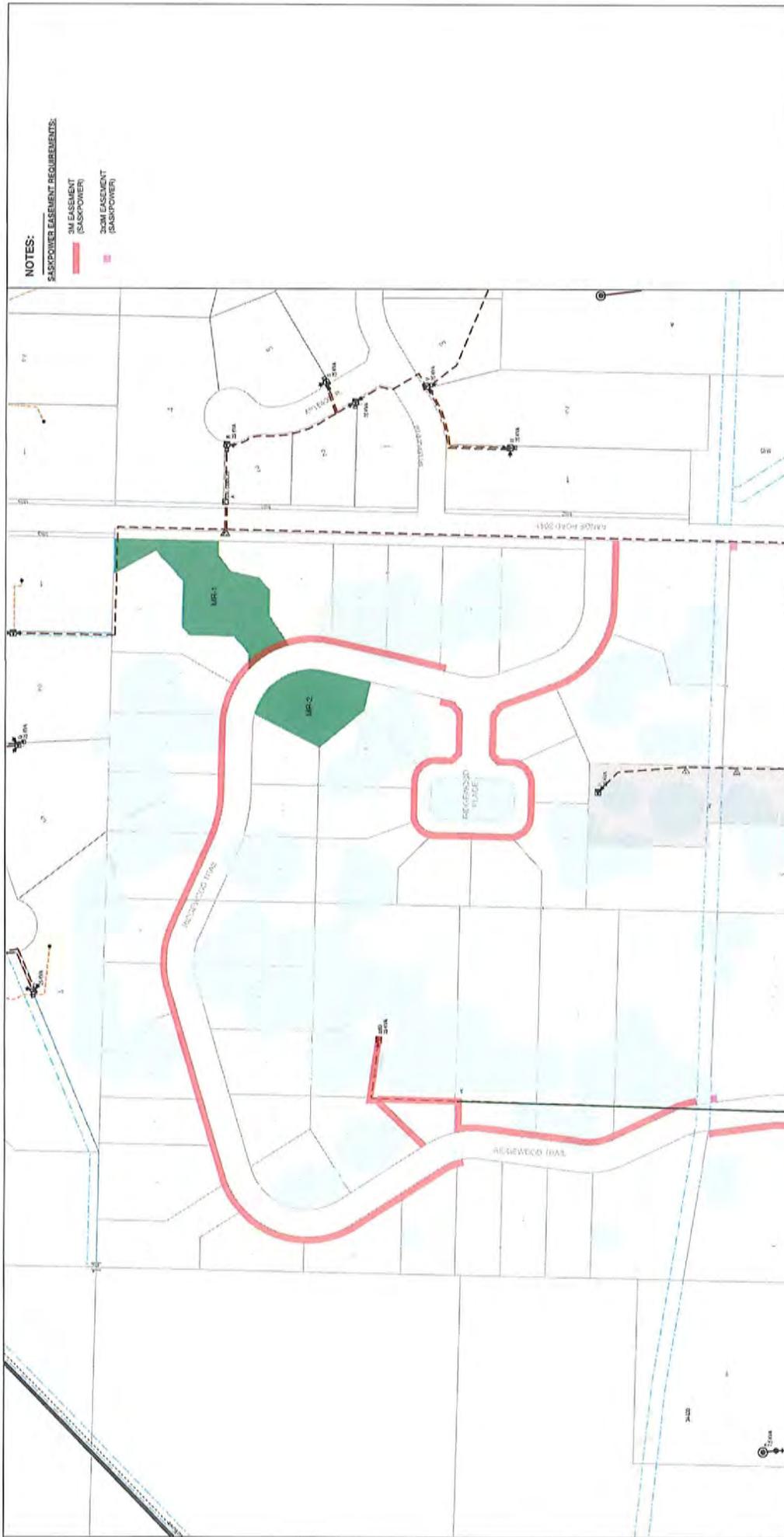
Address _____

Owner's Signature _____

(Print Name and Signing Authority)

Order No. 20180806

s:\corpform\land&urban\corporate



NOTES:
SASKPOWER EASEMENT REQUIREMENTS:
 3M EASEMENT (SASKPOWER) ———
 30M EASEMENT (SASKPOWER) ———

PROJECT NAME	RRU RIDGEWOOD ESTATES S1 LOTS SE1438043
PROJECT NO.	20180806
DATE	2018-08-06
DESIGNER	DAN BEALJAC
CELL	306-227-5977
PROJECT ADDRESS	RRU RIDGEWOOD ESTATES S1 LOTS SE1438043
PROJECT NO.	20180806
DATE	2018-08-06
PROJECT NAME	RRU RIDGEWOOD ESTATES S1 LOTS SE1438043
PROJECT NO.	20180806
DATE	2018-08-06

Preliminary DO NOT BUILD
 07/20/2018 2:24:15 PM

SaskPower

THIS MAP IS A VISUAL REPRESENTATION ONLY AND NOT TO BE USED FOR LOCATING FACILITIES. CONTACT SASK POWER AT 1-866-484-2277.

DATE: _____

Appendix K

SaskEnergy Supply



Customer Service
PO Box 8670
408-36th Street East
Saskatoon, SK S7K 6K8
Phone: (306) 975-8573
Fax: (306) 975-8558
Email: kcameron@saskenergy.com

January 14, 2015

WR# 221869

Dan Beaulac
Ridgewood Estates
RR 6, Site 1
Box 103
Saskatoon, SK S7K 3C9

Dear Dan:

RE: Natural Gas Service For 51 lot Subdivision located at SW 14 - 36 - 04 W3 near Clavet, SK

SaskEnergy has completed the design to provide natural gas service to the above location. It is our goal to provide cost effective customer solutions while meeting SaskEnergy's business criteria.

Please review this offer carefully and in particular the General Servicing Conditions and Rates section in this letter, which outlines potential additional costs.

Servicing Plan

Under SaskEnergy's Terms and Conditions of Service Schedule (the "Terms and Conditions of Service"), an applicant or customer who authorizes construction for a new service installation will be responsible for all SaskEnergy construction costs and service fees associated with that new service unless otherwise agreed to by SaskEnergy in a written service agreement.

This design includes a main extension only and is designed to provide a maximum load of 6.0 m³/hr per lot with one point of delivery per lot and 1.75 Kpa delivery pressure to each lot.

Your Contribution - Summer 2015

Your required contribution is \$152,311.39, plus 7,615.57 GST for a total customer contribution of \$159,926.96. SaskEnergy's GST number is 119 429 751.

Full SaskEnergy investment on all proposed lots has been deferred until such time as a request to install service lines is received by SaskEnergy. The cost of the service line and meter has not been included in the overall costs below, and will be charged at the time of installation request.

The customer contribution quoted above includes ONE crew mobilization. If SaskEnergy has to dispatch the construction crew several times due to delays in your ability to have the property ready for servicing (i.e. survey pins, obstacles in the natural gas route, other utilities needing to go in first etc.) you will be charged for the additional crew mobilization(s). You may also be responsible for any increased construction costs related to any changes you make in the original design, or as a result of the re-mobilization(s).

If SaskEnergy cannot complete this project prior to winter construction coming into effect, due to the property not being ready for servicing at the time requested, we will contact you with two servicing options:

1. SaskEnergy will re-estimate the cost of this job with winter construction and re-quote you this amount, or
2. Defer construction of this project to next spring.

Methods of Payment

Payment of the required customer contribution may be provided as follows:

- An immediate single payment, cash or cheque, for the total amount of \$159,926.96.
- A cheque or cash deposit of 25% of the total amount of \$39,981.74, and the balance of \$119,945.22, as follows:
 - In the form of a cheque posted for May 31, 2015
 - Invoiced upon project completion,
 - Paid through SaskEnergy financing, and included on your monthly SaskEnergy bill.

If you are interested in SaskEnergy financing, please check off Option 3 on the customer confirmation sheet attached, and provide the required information. If your loan is approved, you will be contacted and advised of the monthly payment and terms.)

General Servicing Conditions and Rates

This customer offer is based on the following conditions:

1. SaskEnergy is able to obtain all required easements and approvals.
2. Route is to final grade, clear of obstruction, and ready for service prior to construction.
3. Native material can (in SaskEnergy's opinion) be used for backfill of all excavations.
4. The work can be performed under summer working conditions
5. SaskEnergy will prepare and forward the required easement agreement(s) for the right-of-way plan, which Dan Beaulac will execute and return. SaskEnergy will advise Dan Beaulac when the easement(s) has been registered. Dan Beaulac will not sell or transfer the parcel or individual lots in Ridgewood Estates SW 14 - 36 - 04 W3 before the easement(s) has been registered. Dan Beaulac will be responsible for any and all costs incurred by SaskEnergy to acquire the easement(s) in the event that Dan Beaulac fails to comply with said obligation.

The offer is open for acceptance for thirty (30) days from the date of this letter. A deposit or payment in full is required on acceptance, as outlined in this offer. Where financing is requested, this letter agreement shall be subject to financing approval and the provision by you of an executed financing agreement, where applicable.

These conditions are for the sole benefit of SaskEnergy and may be waived by SaskEnergy. In the event these conditions are not met (or waived in writing), or an accepted offer is not received by the date provided, no binding contract shall exist.

All Services are subject to SaskEnergy's Terms and Conditions of Service. SaskEnergy's Terms and Conditions of Service are available at www.saskenergy.com or at your local SaskEnergy office.

What Happens Next?

In order to better secure a place in the current year construction season's schedule, please execute and return the attached Customer Confirmation as indicated. Your commitment is needed as soon as possible. If SaskEnergy receives your commitment for this offer by February 13, 2015, we will target installation for May 31, 2015. This is a target installation date only. Within this time period, SaskEnergy will forward you a routing approval drawing indicating SaskEnergy's easement requirements, for your approval.

By accepting this offer below, you agree to execute and deliver such further documents and consents and do such further acts and things as SaskEnergy may reasonably request to evidence, carry out and give full effect to the terms, conditions, intent and meaning of this letter.

Sincerely,

SASKENERGY INCORPORATED

A handwritten signature in black ink, appearing to read "Kelly Cameron".

Kelly Cameron
Business Supervisor, Saskatoon Area

KC*

Enclosure (4)

cc: Saskatoon East/West Rural Operations, Project File



January 14, 2015

WR# 221896

Customer Confirmation - Summer 2015

To confirm your acceptance, please sign and return this page and include a cheque in the total amount of \$159,926.96 OR a down payment of \$39,981.74, with the balance of \$119,945.22 provided as follows:

SaskEnergy's GST number is 119 429 751.

- [Option 1]** Cheque for the balance of \$119,945.22, post-dated for May 31, 2015 or
- [Option 2]** Invoice the balance of \$119,945.22 upon installation of the system, or
- [Option 3]** On approved SaskEnergy Customer Financing, the balance of \$119,945.22 will appear in instalments on your SaskEnergy bill. Please read the following statement.

By checking Option 3 above, and by my signature below, I hereby authorize SaskEnergy to complete a credit check for SaskEnergy Customer Financing. Credit check(s) shall include, without limitation, the acquisition, retention and review of a credit report from a credit reporting agency, which report will contain credit information, personal information or both. I acknowledge that SaskEnergy requires consent pursuant to The Credit Reporting Act, and I hereby consent to SaskEnergy obtaining and utilizing a credit report in connection with the extension of credit to myself and/or the collection of any resulting debt. Provision of loan security for gas line financing shall be in a form and amount satisfactory to SaskEnergy. The Cost of Credit Disclosure Act, 2002 disclosure, where required, will be provided by letter with your financing agreement.

Driver's license # _____ Date of Birth (mm/dd/yy) ____/____/____

Signed _____ Date _____

Name (print) _____ For _____

Address _____

Community _____ Postal Code _____

Service to be installed at above address or _____

By my signature above I declare I am authorized to sign on behalf of _____

Please return to:

SaskEnergy
Attention: Kelly Cameron
PO Box 8670
408 - 36th Street East
Saskatoon, SK S7K 6K8



ROUTE & GRADE APPROVAL

January 14, 2015

WR# 221896

Service Location: SW 14 - 36 - 04 W3

Project Contact: Kelly Cameron
Customer Service
408-36th Street East
Saskatoon, SK S7K 6K8

Phone: (306) 975-8573

Fax: (306) 975-8558

Email: kcameron@saskenergy.com

Two copies of the proposed gas main extension sketch for the above location are attached. We appreciate your assistance in supplying us with the following:

- a) Plans indicating existing and proposed sewer and water mains (if applicable).
- b) Location of facilities affecting our construction; i.e. - power, telephone, cables, etc.
- c) Normal cover is 1.0 meters in easements and lanes, 1.2 meters in streets and intersections a plan or description showing these final grades would be appreciated.

Please sign and return one original main extension sketch along with any comments as soon as "final grade" of the service area is determined.

Your service request cannot be scheduled for construction until the route and grade approval is received.

Thank you for your assistance in this matter.

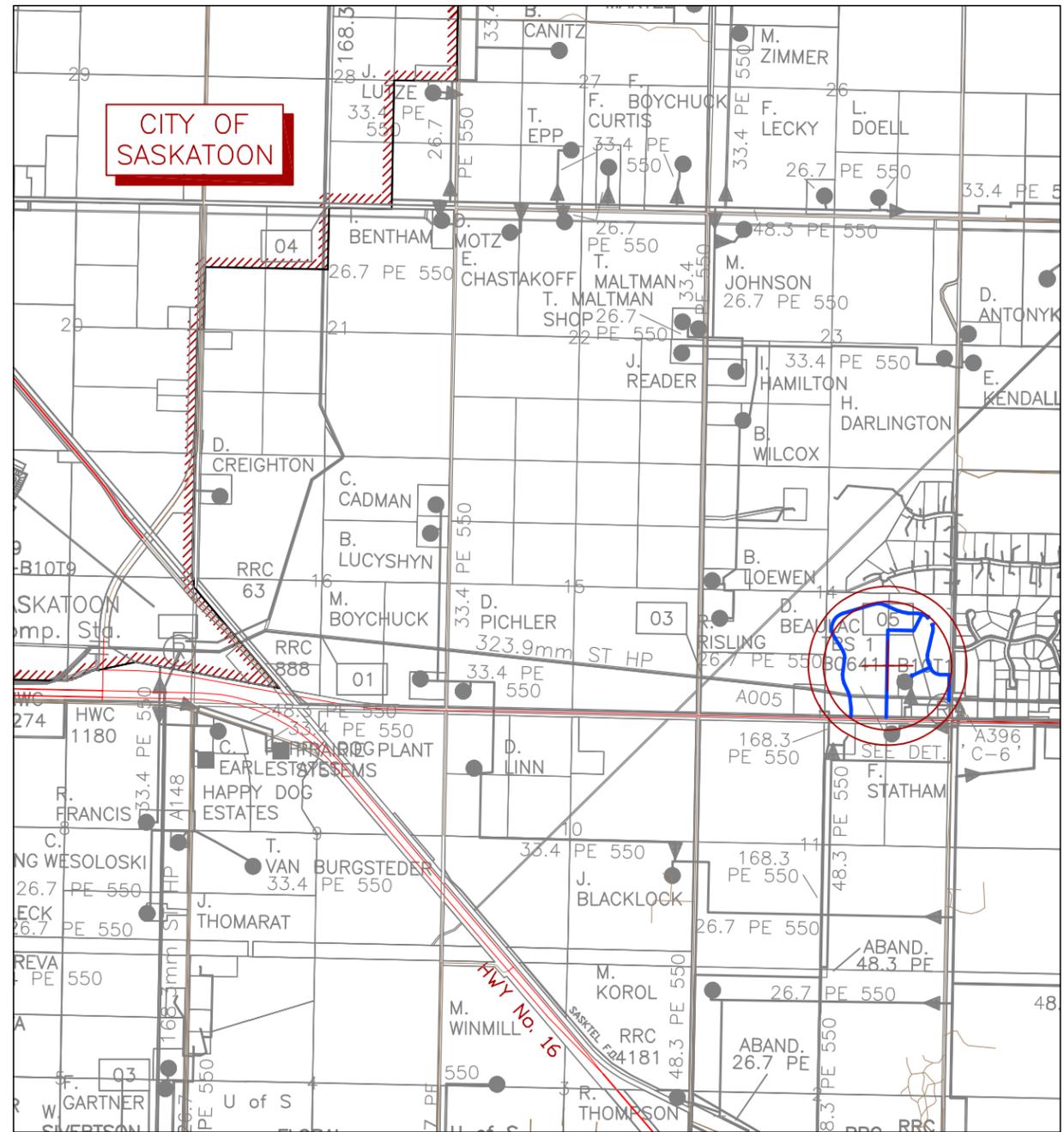
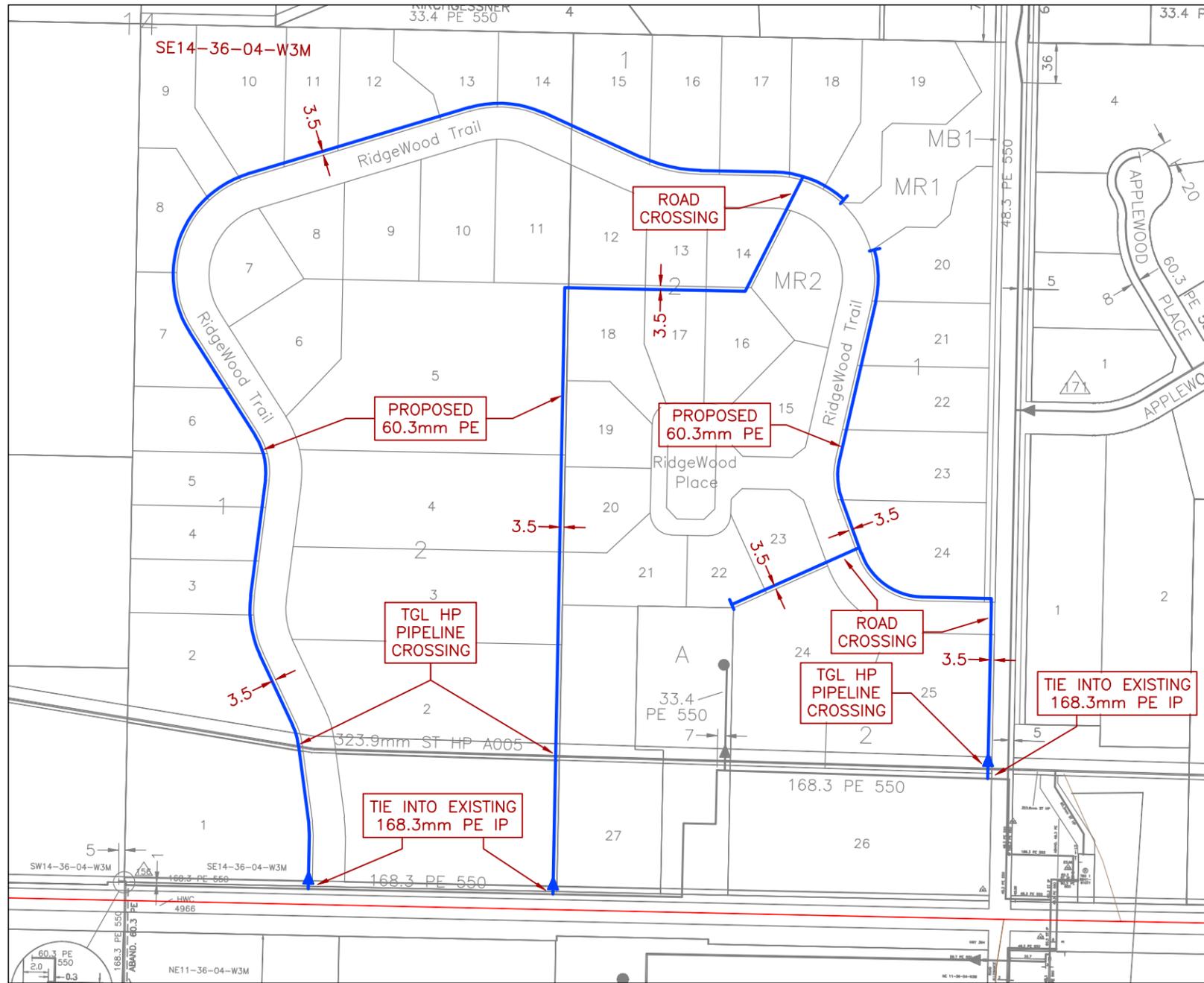
Sincerely,

SASKENERGY INCORPORATED

Kelly Cameron
Business Supervisor, Saskatoon Area

KC:

cc: Saskatoon East/West Rural Operations, Project File



RGE 04 - W3M

PRESSURE TESTING REQUIREMENTS

1. Test Pressure Requirements:
 - a.) Rural Plastic Distribution systems shall be tested with air or nitrogen and comply with SaskEnergy SPI D-08-02.1
 - b.) Urban Distribution Systems shall be tested with air or nitrogen and comply with SaskEnergy SPI D-08-02.2
2. Test Records and Reports to be completed in accordance with SaskEnergy SPI D-08-03.1, D-08-03.2 and forwarded to Distribution Engineering.
3. Modifications to above only with WRITTEN authorization of Distribution Engineering.

ROADS
PROPOSED
EXISTING
NOTES



**DISTRIBUTION ENGINEERING
APPROVED FOR
CONSTRUCTION**

Signature _____
Date _____

PROPOSED

W:\DRAFTING\2014wo\PG 18\211869\221869.dwg

SaskEnergy DISTRIBUTION ENGINEERING		CONSTRUCTION DRAWING	
NORTH PROJECT: RIDGEWOOD ESTATES		REVISION	
LOCATION :	SE14-36-04-W3M	A	
ACCT# :	2014-33-3000 W.R.# 221869 SCALE : N.T.S.	B	
DATE :	2014/12/15 LOCAL DISTRICT #: 3302 - SASKATOON E/W	C	
PIPE REQUIREMENTS	REFERENCE	APPROVALS	
~2850m OF 60.3mm PE	PG: 18-N	DRAFTING: L. BLAIS	
	550 kPa	ENGINEERING: S. DAVIDOVIC	
	PROPOSED PLAN OF SURVEY	PHONE: 8585	

Appendix L

Sasktel Supply Letter

Rutten, Brent

From: Donna Roller <donna.roller@sasktel.com>
Sent: March-09-15 1:33 PM
To: Rutten, Brent
Subject: Re: Ridgewood Estates - Request for Service

Brent,

SaskTel is no longer blanket servicing subdivisions. We are now asking for a JU easement with SPC for 4 ½ m in place of the normal 3m easement. This additional space will allow us to trench at a later date as people are applying for service. Applicants will be serviced on an individual basis. People will be required to call into our business office and a construction job will be issued to provide them with service. At this time the charge to the applicant is \$475.00.

There is no charge to the developer.

Please provide me with a CAD file so that this subdivision can be drawn in our mapping system.

Any questions please feel free to contact myself.

Thank-you.

On Mon, Mar 9, 2015 at 11:33 AM, Rutten, Brent <Brent.Rutten@aecom.com> wrote:
Hello Donna,

On behalf of our Client, Dan Beaulac, AECOM is requesting a quote to provide communication services to the proposed Ridgewood Estates subdivision located at SE14-36-4-W3M. Please advise of the extent of new infrastructure required and cost to the developer for standard lot services.

Thank you,

Brent Rutten, P.Eng.
Civil Engineer, Community Infrastructure, Water
D 306.657.8925 C 306.220.8367
Brent.Rutten@aecom.com

AECOM
200 - 2100 8th Street East, Saskatoon, SK S7H 0V1
T 306.955.3300 F 306.955.0044
www.aecom.com

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--

Donna Roller
Engineering Assistant
Technology Development & Engineering
t: 306.931.6254
c: 306.227.3742
Engineering Assistant
Technology Development & Engineering



NOTICE: This confidential e-mail message is only for the intended recipients. If you are not the intended recipient, be advised that disclosing, copying, distributing, or any other use of this message, is strictly prohibited. In such case, please destroy this message and notify the sender.

Appendix M

Lost River Water Supply

Gehl, Andy

From: Dan Beaulac <dan@dbventures.ca>
Sent: Wednesday, September 30, 2015 1:33 PM
To: Gehl, Andy
Subject: Fwd: Water Info For CDR

Dan Beaulac
306.227.5597

Sent from my iPhone

Begin forwarded message:

From: ROB RISLING <robert.r@shaw.ca>
Date: June 9, 2014 at 7:59:57 AM CST
To: Dan Beaulac <dan@dbventures.ca>
Subject: Water Info For CDR

Where is the potable water supply sourced and what is it's capacity?

It will be sourced from the main truck of the Hidden Ridge 4" water line. There is 20 imperial gallons per minute extra capacity now and more in the future if needed. You need .33-.40 igmp per house so this is plenty of water capacity.

Is it sufficient to provide for fire suppression on individual lots?

That is a question with a big answer depending on too many variables to answer in an email. Each house should have at least a 1000 imperial gallon storage tank in the basement. That will put out a medium sized grass/brush fire. It will obviously not control a 3 story 6000 square foot house that is on fire. Also depending on the time of day our test hydrant has lots of flow and pressure, other times not.

What onsite storage is required?

A 1000 imperial gallon blue, green or black tank is required. I have a contract for you that outlines the mechanical part of the water system.

Identify and describe the entity responsible for the supply, repairs, and maintenance of water supply lines within the development? I know the supply is Lost River Water but do you repair and maintain it as well?

We do all the maintenance and repair of the water line.

I need to attach a template agreement defining the relationship between the water supplier and end user.

I have a contract and can send it to you. It has been reworked over the years at considerable time and lawyers fees.

Need to attach confirmation of supply from water supplier**

I can send you something formal in the next couple of days.

Dan you mentioned we should put something in writing. How does this sound? For the first half of the lots when title is transferred from developer to the individual lot owner then a hook up payment of \$5000 is due. Once the title is transferred on the first lot of the 2nd half of the lots then the total connection payment will be due for all remaining lots.

This should answer most of the CDR questions.

Call if you have any questions or concerns.

Robert

Gehl, Andy

From: Dan Beaulac [dan@dbventures.ca]
Sent: August 29, 2013 5:00 PM
To: Gehl, Andy
Cc: Mr. Dwayne Pitka

Andy, I just spoke to Rob Rissling who is the President of Lost River Water Ltd. and he confirmed that they have enough capacity to supply us water. Their supply line borders our property.

Sent from my iPhone

Gehl, Andy

From: Rutten, Brent
Sent: Wednesday, January 20, 2016 3:16 PM
To: Gehl, Andy
Subject: RE: Ridgewood Estates - Request for Potable Water

From: ROB RISLING [<mailto:robert.r@shaw.ca>]
Sent: April-16-15 12:59 PM
To: Rutten, Brent
Subject: Re: Ridgewood Estates - Request for Potable Water

Hello Brent,

Lost River Water Corporation has excess potable water volume and pressure available for the proposed Ridgewood Estates subdivision located at SE14-36-4-W3M. We have excess water flow now for 10 houses and are increasing the volume in 2016 for all the proposed lots.

Please call if you have any other questions or concerns.

Kind regards.

Robert Risling
Operations Manager
Lost River Water
306-222-6035

From: "Brent Rutten" <Brent.Rutten@aecom.com>
To: "Robert R" <Robert.R@shaw.ca>
Sent: Monday, March 9, 2015 11:10:40 AM
Subject: Ridgewood Estates - Request for Potable Water

Robert,

On behalf of our Client, Dan Beaulac, AECOM is requesting confirmation from Lost River Water Corporation that a source of potable water is available for the proposed Ridgewood Estates subdivision located at SE14-36-4-W3M. Please provide confirmation of water volumes and pressures that can be made available in 2016 and upon full build-out when all 51 proposed lots are connected.

Thank you,

Brent Rutten, P.Eng.
Civil Engineer, Community Infrastructure, Water
D 306.657.8925 C 306.220.8367
Brent.Rutten@aecom.com

AECOM
200 - 2100 8th Street East, Saskatoon, SK S7H 0V1
T 306.955.3300 F 306.955.0044
www.aecom.com

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259 Beechmont Crescent
Saskatoon, SK.
S7V 1C8
robert.r@shaw.ca

Lost River Water Utility

R.M. of Corman Park No. 344

May 12, 2016

Lost River Water Utility has an agreement with the developer to supply water for their Meadow Ridge development in the RM of Corman Park.

Please contact me should you have any questions or concerns.

Kind regards,

Robert Risling
Operations Manager
Lost River Water Co Ltd.
306-222-6035

Lost River Water Utility
259 Beechmont Crescent
Saskatoon, SK
S7V 1C8

November 15, 2013

Dear Mr. Beaulac,

This letter is to confirm Lost River Water Utility has excess capacity in the main waterline located adjacent to the east property line of your proposed Ridgewood Estates. This main waterline has the capacity to supply water to 120 residences. At this time there are only 34 residences being supplied by this main waterline.

The capacity of this main waterline can also be increased in the future to supply as many as 200 houses.

Kind regards,

Robert Risling
Lost River Water Utility

Appendix N

Saskatchewan Health Region

Gehl, Andy

From: Rutten, Brent
Sent: Friday, January 22, 2016 7:58 AM
To: Gehl, Andy
Subject: FW: reviews of subdivisions for Community Planning

From: Engele-Carter, Kari SktnHR [<mailto:Kari.Engle-Carter@saskatoonhealthregion.ca>]
Sent: January-21-16 5:12 PM
To: Rutten, Brent
Subject: reviews of subdivisions for Community Planning

We as Saskatoon Health Region will offer comment on subdivisions applications as requested by Community Planning.

https://www.saskatoonhealthregion.ca/locations_services/Services/Health-Inspection/Pages/Subdivisions.aspx

Kari Engele-Carter

Senior Public Health Inspector
Environmental Public Health Department
Population and Public Health Services
Saskatoon Health Region | 306-655-4459 phone | 306-682-4155 phone | 306-682-7134 fax

Website: <http://www.saskatoonhealthregion.ca>
https://www.saskatoonhealthregion.ca/locations_services/Services/Health-Inspection/Pages/Home.aspx

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Appendix O

Fire Protection Services

Gehl, Andy

From: Kotelmach, Andy (Fire) <Andy.Kotelmach@Saskatoon.ca>
Sent: Thursday, January 21, 2016 3:56 PM
To: Gehl, Andy
Subject: Corman Park responses

Andy;

As discussed, our automatic response to the report of a structure fire in Corman Park is two Engine companies, a Brush Truck and a Tanker (3000 US gallons).

If you require any further information, please do not hesitate to contact me.

Regards,

Andy Kotelmach | tel 306.975.2520

Deputy Chief – Emergency Operations Division
Saskatoon Fire Department
125 Idylwyld Drive South | Saskatoon, SK S7M 1L4
andy.kotelmach@saskatoon.ca
www.saskatoon.ca

*If you receive this email in error, please do not review, distribute or copy the information.
Please contact the sender and delete the message and any attachments.*

Appendix P

TransGas

Gehl, Andy

From: KBrogden@transgas.com on behalf of engfax@transgas.com
Sent: Friday, January 29, 2016 9:52 AM
To: Gehl, Andy
Subject: Re: AECOM SE14-36-04-W3M - Country Residential Subdivision - Meadow Ridge Estates

Good morning Andy,

Thank you for the opportunity to provide feedback early on in the planning process. The majority of the development looks great, only a few concerns regarding the TransGas line.

The proposed Meadow Ridge trail that crosses over the TGL easement will need further investigation. Most likely this crossing will require an inspection of our pipe. With the increase in vehicles and frequency we have to ensure our facilities and the public remain safe. In the event that our pipeline has to be lowered or upgraded - the cost would belong to the developer. Once the application comes through community planning we can have an investigation done to determine what steps are necessary in order to grant you a permanent road agreement.

TransGas does not allow any permanent structures within the Right Of Way, in some cases we have put bollards/signs up along the ROW to ensure our presence is known. When your application goes through community planning could you include any plans you have in regards to the 30m setback? Is it staying natural or is there a plan for any grass etc.?

Once the utility plans (water, power etc) are in place we can also provide permits/comments to ensure the crossings meet all our minimum requirements.

We look forward to working with you on this development and please don't hesitate to call if you have any questions. Once you move past the development review we can work with you to obtain all the permits that you will require to work in proximity of the TransGas pipeline.

Thank you

Kim

TransGas Crossing Coordination
600-1777 Victoria Ave
Regina SK S4P 4K5

306-777-9666 Phone
306-777-9146 Fax
engfax@transgas.com

From: "Gehl, Andy" <Andy.Gehl@aecom.com>
To: "engfax@transgas.com" <engfax@transgas.com>,
Cc: "Rutten, Brent" <Brent.Rutten@aecom.com>

Date: 01/22/2016 03:39 PM

Subject: AECOM SE14-36-04-W3M - Country Residential Subdivision - Meadow Ridge Estates

TransGas Representative,

AECOM is currently preparing the Comprehensive Development Review (CDR) for a Multi Parcel Country Residential subdivision labeled Meadow Ridge Estates .

The developer would like to be proactive in the process and obtain preliminary comments from TransGas regarding this development.

This application still must proceed through the RM of Corman Park rezoning process and the Ministry of Government Relations Subdivision process which will circulate the application to your office again at that time.

The proposed site is approximately 3 miles east of the southeast corner of Saskatoon in the RM of Corman Park. SE14-36-04-W3M.

This development will create 50 residential lots, an internal road loop, along with utilities.

The only landuse on this site will be Country Residential use.

The intent is to conduct site construction this spring and summer, for house construction in the fall 2016/spring 2017.

In order to accommodate the TransGas easement we have applied the following 4 design features:

1. Lots are oriented to allow building footprints outside a 30m setback.
2. Larger lots have been located to minimize the amount along the easement.
3. Lots are oriented so side property line is parallel and along the easement. (except Lot 27 which was shaped to accommodate owners of 'Parcel A')
4. The internal road is aligned to cross the easement only once; at the point of the existing crossing currently used by the farm access. (and also to maintain the same established access to Patience Lake Road)
5. The current design of the water connection requires a connection extension below the gas line. There are alternate servicing options to have the waterline stubbed and service lots 1 & 1 from the east.

We have prepared and attached information for your use:

Figure 1 – Site Location

Figure 8 & 9 – Conceptual Layout Plan

Please provide any preliminary comments you may have for the developer planning purposes and we will wait for official review at the Subdivision review stage.

Please contact myself or Brent Rutten if you have any questions.

Andy Gehl, MCIP, RPP
Principal

Design, Planning+Economics
T 306.955.3300
andy.gehl@aecom.com
AECOM

[attachment "60303829-MRE-CDR-Figure 08.pdf" deleted by Kim Brogden/SET/SaskEnergy/CA] [attachment "60303829-MRE-CDR-Figure 09.pdf"

deleted by Kim Brogden/SET/SaskEnergy/CA] [attachment "60303829-MRE-CDR-Figure 01.pdf" deleted by Kim Brogden/SET/SaskEnergy/CA]CONFIDENTIALITY WARNING: The information in this email is confidential, and is intended only for the use of the individual or entity it is addressed to or their authorized agent. If you have received this email in error, please notify me immediately by telephone or fax and delete all copies of the original email and do not retain, distribute or copy this email. If you no longer wish to receive email from this service, please forward this email, including history, to Unsubscribe@SaskEnergy.com or Unsubscribe@TransGas.com complete with information including your name, email address and a phone number where we can contact you in order to process your request.

You can contact SaskEnergy/TransGas by mail at 1777 Victoria Ave, Regina, SK, S4P 4K5 or visit one of our websites saskenergy.com or transgas.com

Appendix Q

Loraas Supply



Aecom Engineering
200-2100 8th St E
Saskatoon, SK S7H0V1

January 201/2016

Attn: Andy Gehl

Please accept this letter as confirmation in providing Waste Removal Services in future for the proposed acreage development of Meadow Ridge Estates. SE 14 36 04 W3.

Any further questions please feel free in contacting us.

Thank you,

A handwritten signature in blue ink, appearing to read "J. Magnusson", is written below the "Thank you," text.

Saskatchewan Owned & Operated Since 1965
INDUSTRIAL • COMMERCIAL • RESIDENTIAL

Appendix R

PCS Comments

Gehl, Andy

From: Trevor.Berg@potashcorp.com
Sent: Thursday, February 18, 2016 8:44 AM
To: Gehl, Andy
Subject: RE: SE14-36-04-W3M - Residential Subdivision PCS comments Request

Hi Andy,

The feedback that I am getting is that this is NOT within our lease area. Possibly we made a mistake but where did you find this was part of our lease? This is what I was given. Please let me know if you have different information. Potash mineral rights for parcel SE14-36-04-W3M are held as part of a North Atlantic Potash Inc. Mineral Exploration Permit (Crown Permit # KP388).

Thank you.

Trevor Berg
General Manager
Potash Corporation of Saskatchewan Inc.
Cory and Patience Lake
T: (306) 657-5100
www.potashcorp.com



From: "Gehl, Andy" <Andy.Gehl@aecom.com>
To: "Trevor.Berg@potashcorp.com" <Trevor.Berg@potashcorp.com>
Date: 02/17/2016 04:34 PM
Subject: RE: SE14-36-04-W3M - Residential Subdivision PCS comments Request

Two weeks sounds great.

Please respond when you have a chance.

If it helps, there is similar information included in the 'Tuscan Ridge CDR' that PCS had responded to in 2014 where they had included a 'Lease Map' and a 'Drift(tunnel) Map' if that rings a bell.

Andy Gehl, MCIP, RPP
AECOM

From: Trevor.Berg@potashcorp.com [<mailto:Trevor.Berg@potashcorp.com>]
Sent: Wednesday, February 17, 2016 4:04 PM
To: Gehl, Andy
Subject: RE: SE14-36-04-W3M - Residential Subdivision PCS comments Request

Hi Andy,

We were discussing on the site this week. This is outside the known information I have at my disposal so I have passed off to our head office group to respond. I have touched base with them just again today to start the process. Sorry for delay. Can I get back to you in two weeks?

Trevor Berg

General Manager
Potash Corporation of Saskatchewan Inc.
Cory and Patience Lake
T: (306) 657-5100
www.potashcorp.com



From: "Gehl, Andy" <Andy.Gehl@aecom.com>
To: "trevor.berg@potashcorp.com" <trevor.berg@potashcorp.com>
Date: 02/17/2016 03:22 PM
Subject: RE: SE14-36-04-W3M - Residential Subdivision PCS comments Request

Trevor,

I had sent you the request below to obtain any concerns PCS Patience Lake may have regarding this 160 acre residential development.

The RM of Corman Park requires I attempt to gather comments as they informed me PCS may have subsurface interest in the site. This is just a quick follow-up to ask if any response has come back that I could include in our report.

Thank-you again for any comments that may be provided.

Andy Gehl, MCIP, RPP
AECOM

From: Gehl, Andy
Sent: Wednesday, January 20, 2016 4:25 PM
To: 'trevor.berg@potashcorp.com'
Subject: SE14-36-04-W3M - Residential Subdivision PCS comments Request

Trevor,

AECOM is currently preparing the Comprehensive Development Review (CDR) for a Multi Parcel Country Residential subdivision labeled Meadow Ridge Estates.

As discussed, we are required by the CDR process to obtain consultation comments from PCS regarding this development and any existing concerns.

The proposed site is approximately 3 miles east of the southeast corner of Saskatoon in the RM of Corman Park.
SE14-36-04-W3M.

This development will create 50 residential lots and an internal rural cross-section road, along with typical utilities. The only landuse on this site will be Country Residential use.

We have prepared and attached information for your use:

Figure 1 – Site Location

Figure 8 & 9 – Conceptual Layout Plan

FYI - Proposed development name was recently changed from "Ridgewood Estates" to "Meadow Ridge Estates"

Please contact me if you have any questions.

Andy Gehl, MCIP, RPP
Principal
Design, Planning+Economics
T 306.955.3300
andy.gehl@aecom.com
AECOM

[attachment "Figure 8.pdf" deleted by Trevor Berg/PatienceLake/Potash/PCS] [attachment "Figure 9.pdf" deleted by Trevor Berg/PatienceLake/Potash/PCS] [attachment "Figure 1.pdf" deleted by Trevor Berg/PatienceLake/Potash/PCS]

Appendix S

Ministry of Highways

Gehl, Andy

From: Gehl, Andy
Sent: Wednesday, January 20, 2016 1:49 PM
To: 'andrew.nicholls@gov.sk.ca'
Subject: SE14-36-04-W3M - Country Residential Subdivision - Meadow Ridge Estates
Attachments: Figure 1.pdf; Figure 8.pdf; Figure 9.pdf; RPT-2015-09-29 Ridgewood Estate Traffic Impact Study_60303829.pdf

Andrew,

AECOM is currently preparing the Comprehensive Development Review (CDR) for a Multi Parcel Country Residential subdivision labeled Meadow Ridge Estates.

As discussed, we are required by the CDR process to obtain consultation comments from MHI regarding this development.

The proposed site is approximately 3 miles east of the southeast corner of Saskatoon in the RM of Corman Park. SE14-36-04-W3M.

We have prepared and attached information for your use:

Figure 1 – Site Location

Figure 8 & 9 – Conceptual Layout Plan

Traffic Impact Assessment

FYI - Proposed development name was recently changed from "Ridgewood Estates" to "Meadow Ridge Estates"

Please contact me if you have any questions.

Andy Gehl, MCIP, RPP
Principal
Design, Planning+Economics
T 306.955.3300
andy.gehl@aecom.com
AECOM



July 20, 2016

Our File: C.S. 16-20-44 Sub

Dan Beaulac
c/o Meadow Ridge Estates
RR#6, Site 601, Box 103
Saskatoon, SK S7K 3J9

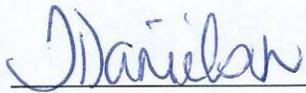
Dear Mr. Beaulac,

RE: Ministry Comments on Meadow Ridge Estates Public Consultation

The Ministry of Highways and Infrastructure has reviewed the Public Consultation Comment Form, our Ministry has the following concerns:

1. The development must be:
 - a) At least 60 m from centreline of Highway No. 16-20-44 (Patience Lake Road);
 - b) Outside a triangle formed by measuring the following distances from the intersection of the roadway centrelines and joining the points so obtained:
 - 265 metres (870 feet) along the Patience Lake Road centerline;
 - 80 metres (263 feet) along the centreline of the intersecting grid road.
2. Any new access to Highway 16-20-44 (Patience Lake Road) will require a permit from this Ministry. Access shall be via the existing access to Highway 16-20-44 (Patience Lake Road) and the existing municipal road.
3. The Ministry assumes no responsibility for the diminution in property value, resulting to the remaining property, due to proximity to buildings and loss of utility to the remainder, except in such instances where right-of-way expansion for future highway widening is extended beyond the distance indicated in point 1(a).
4. The applicant may be required to complete a Traffic Impact Assessment (TIA) at the time of subdivision or development. The TIA is intended to address any traffic operations and safety issues the proposed development will have on the transportation network. The applicant is responsible for the implementation of the improvements identified in the TIA.
5. The applicant will be responsible for any alteration of utilities required as a result of this development.

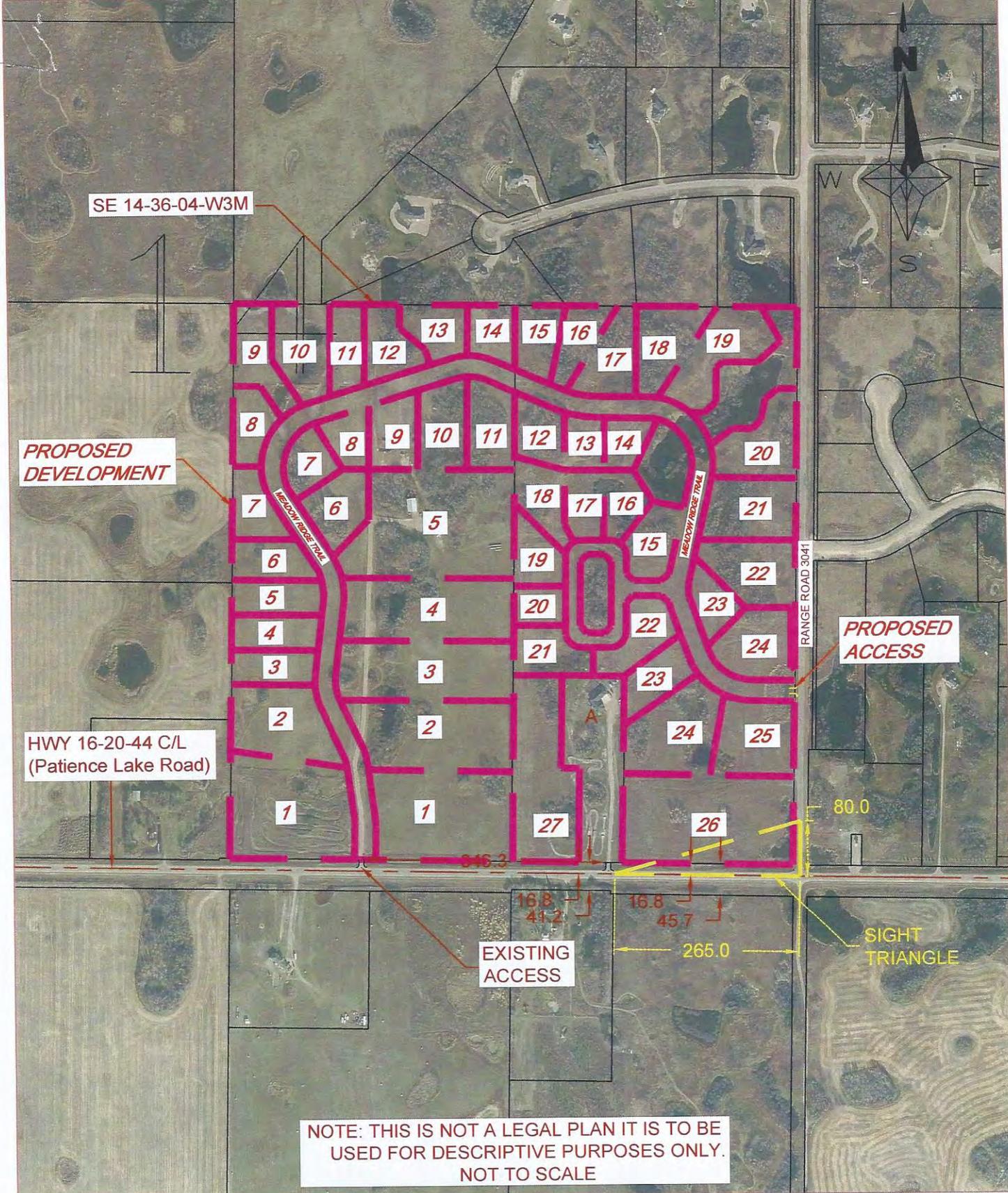
Authorized,



Tracy Danielson, P. Eng.
Acting Director, Traffic Engineering and Development
Central Region

cc: John Moynham, District Operations Manager, Saskatoon
Mike Moore, SO, Saskatoon East
Chad Watson, RM of Corman Park No. 344

Ministry Contact: Jill Postnikoff, Phone (306) 933-5184, Fax (306) 933-5805



PROPOSED ROADSIDE DEVELOPMENT

HWY 16-20-44 (Patience Lake Road)

SE 1/4 14-36-04-W3M

km 4.8

DRAWN BY	J. POSTNIKOFF	DATE	16/04/04	CS	16-20-44	TAB NO	A4-ROADSIDE
DESIGNED BY		DATE		CONTRACT		SHEET	1 OF 1

Central, Roadside HI

From: Michelle Longtin <mlongtin@rmcormanpark.ca>
Sent: Friday, June 24, 2016 8:33 AM
To: Central, Roadside HI
Cc: Fertuck, Jennifer HI
Subject: Public Consultation - SE 14-36-4-W3, Meadow Ridge Estates
Attachments: RPT-60303829-Meadow Ridge Estates-Mailout-21Jun2016.pdf; 60303829-MRE-CDR-Figure 01-21Jun2016.pdf; 60303829-MRE-CDR-Figure 8-21Jun2016.pdf; 60303829-MRE-CDR-Figure 9-21Jun2016.pdf; 60303829-MRE-Mailout Comment Form-21Jun2016.pdf

Good Morning,

As part of the Comprehensive Development Review (CDR) process for the R.M. of Corman Park, the developers of Meadow Ridge Estates, a multi-parcel country residential subdivision in the SE 14-36-4-W3, are requesting your comments on their proposal. Attached is various information and maps on the proposal and a comment form. If you are able to supply any comments to the developer on this proposal by July 15, 2016 that would be appreciated.

If you have questions for the R.M. on this proposal, please contact Chad Watson at cwatson@rmcormanpark.ca or 306-975-1663.

Regards,

Michelle Longtin

Planning Technician

Direct (306) 978-6465

Main Office (306) 242-9303

Fax (306) 242-6965

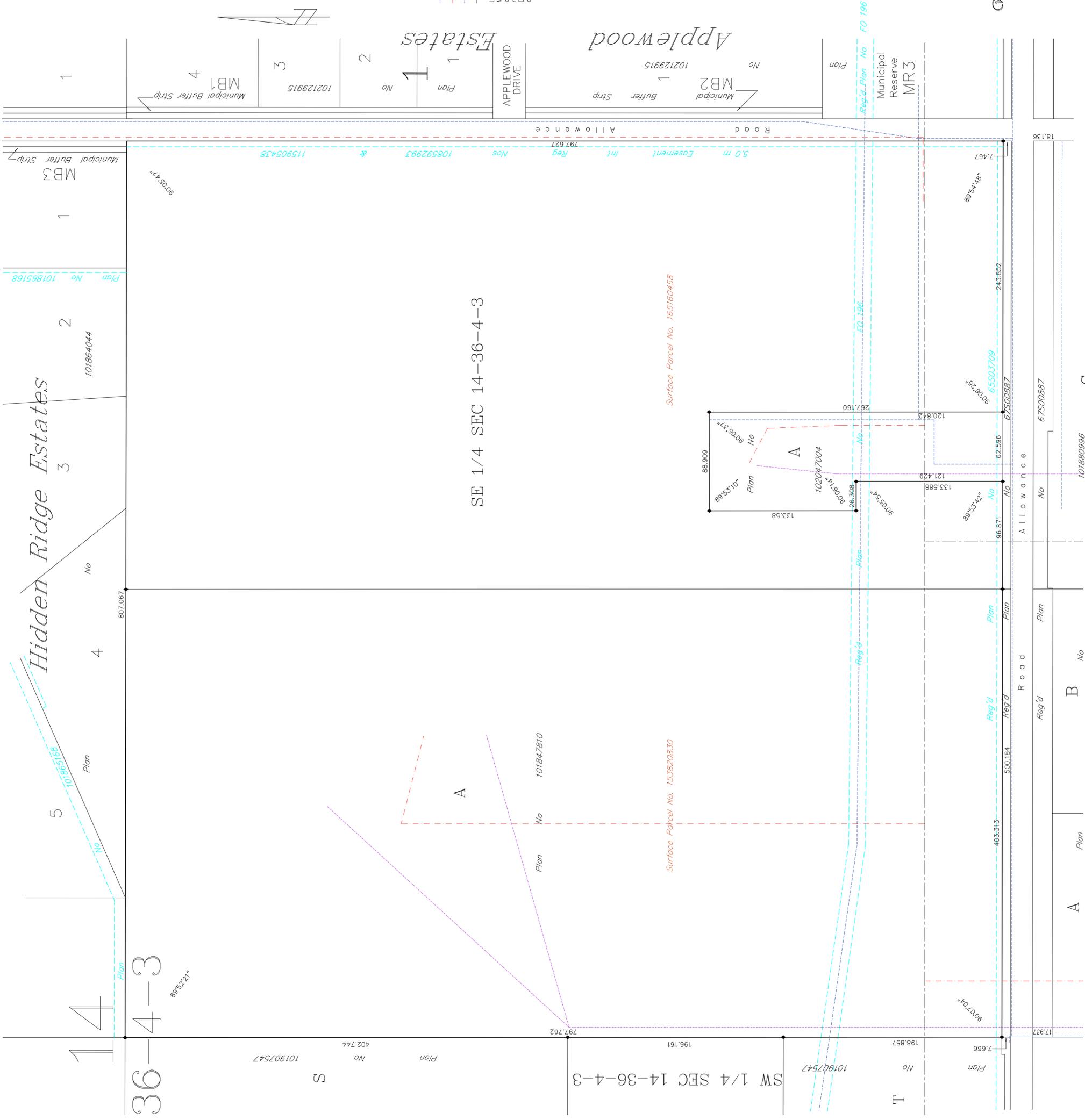


www.rmcormanpark.ca

**The information contained here is for the intended recipient only; if you have received this by mistake, please inform the sender immediately and delete any/all copies of this email.*

Appendix T

Survey Base Plan



BASE PLAN
 S.E. 1/4 SEC. 14-
 TWP. 36- RGE. 4-
 W. 3rd MER.
 RM OF CORMAN
 PARK NO 344
 SASKATCHEWAN
 SCALE 1:2000



T.R. Webb, December 2014
 Saskatchewan Land Surveyor Seal

- ◆ indicates survey monument at property corner
- Buried gas line
- - - Buried electrical line
- - - Buried telephone line
- Overhead electrical line

Locations of utilities are provided by Magna Electric Corporation and are approximations only. No lines were marked on the ground. Dimensions shown are in metres and decimals thereof.



Hidden Ridge Estates

SW 1/4 SEC 14-36-4-3

SE 1/4 SEC 14-36-4-3

Surface Parcel No. 153820830

Surface Parcel No. 165160458

A

B

C

Road

APPLEWOOD DRIVE

Appplewood

Municipal Reserve MR3

MB3

101864044

36-4-3

14

5

4

3

1

1

4

3

2

1

Estates

MB1

102129915

108592993

115905438

101865168

903547

807.067

101865168

Plan

No

3

2

Plan No 101865168

1

903547

Municipal Buffer Strip

4

102129915

2

1

Plan

No

MB2

Municipal Buffer Strip

102129915

No

Plan

Reg'd Plan No FO 196

T

No

101907547

196.161

198.857

Plan

No

7.666

17.937

Reg'd

No

67500887

18.136

Plan

No

101880096

18.136

Allowance

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Plan

No

102047004

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80°54'49"

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Appendix U

**Community Consultation
Comments**

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

I support the development.

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: 4 Dec, 2013 Time: _____ Location: 239 Werschner Cres

Printed Name: Hengying Yang Signature: [Handwritten Signature]

Local Land Description: SE Sec 13 Twp 36 Rge 04 W3 Extension 114

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: 239 Werschner Cres

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9
Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Via email & mail

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

See attached

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views? NO

- this form is very limiting & timeline too tight

4. If you have comments, do you feel they have been, or will be, addressed? - NO

Date: Nov. 29/13 Time: 7:00 Am Location: Hidden Ridge

Printed Name: Murray Long + Donna Zaleschak Signature: D. Zaleschak 

Local Land Description: #11 Hidden Ridge Rd, Lot 6 Blk 3, NW Sec 13 TWP 36 Rng 4-W 3

Contact information (OPTIONAL): Phone:  Email: 

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

Page 1/2

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Via email +
mail

November 29, 2013

Our comments regarding the proposed Ridgewood Estates are as follows:

- The information provided for this proposal is so general that it leaves us with as many questions as concerns.
- The map provided is so poor it does not show the exact location of the development. Nor does it show the number of lots planned and location of access roads.
- It is astounding to us that this development reached the 2nd phase when there is absolutely no real construction yet at Applewood. It would be very disturbing to see another quarter of land ripped and carved up only to sit stagnant for who knows how long. What type of market research was done to support yet another acreage development next to Hidden Ridge?
- We are very concerned about what would be the demand on the our local supply; increase traffic on the roads, both on Patience Lake road and the main road to Hidden Ridge.

It is very difficult to make an informed decision and comments given that the information provided to us is so general and vague.

Murray long and Donna Zaleschuk
#11 Hidden Ridge Road
Lot 6, BLK 3, NW Sec 13, TWP 36, RNG 4 - W3

Page 2/2

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

THE MAP IS VERY UNCLEAR AS TO WHERE ^{THE DEVELOPMENT} ~~IT~~ WILL BE
WE WOULD LIKE TO HAVE THE NATURAL LANDSCAPE INTACT
INSTEAD OF MORE EMPTY LOTS

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views? NO

4. If you have comments, do you feel they have been, or will be, addressed? NO

Date: Nov 26/13

Time: 8:45am

Location: HIDDEN RIDGE

Printed Name: Janie Peirce
MURRAY DEIBERT

Signature: Janie Peirce

Local Land Description: LOT 3, BLK 1; QTR NW, SEC 15; TWP 36; RNG 4; MER W3; PLAN 101864044

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: RR# 5 SITE 515 BOX 22 SASKATOON SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

We were unable to find any information on this proposed development, the development overview is so generic it is of little use. It is hard to comment with so little information.
This area is developing too fast, perhaps it would be wise to wait for Applewood estates* to get started before breaking new ground.
* AND TUSCAN RIDGE

2. Do you feel you have a clear understanding of the proposed development? NOT REALLY
3. Have you had sufficient opportunity to express your views? THIS IS THE FIRST OPPORTUNIT
4. If you have comments, do you feel they have been, or will be, addressed?

Date: 26/11/13 Time: _____ Location: AT HOME

Printed Name: MARK SMITH Signature: [Signature]

Local Land Description: Parcel A SW 13 36 4 W3

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: BOX 25 RRS SASKATOON SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

Short Notice!



PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

We would be opposed to the subdivision at this time as it is our view that there is an excess of inventory of country residential lots now available in the RM of Corman Park and further development at this time would be adverse to the existing owners/developers. We will present a more detailed brief at the public hearing which will be called in the event that the application for subdivision proceeds.

2. Do you feel you have a clear understanding of the proposed development?

No. We have never heard of it before.

3. Have you had sufficient opportunity to express your views?

4. This is the first communication we have had with respect to this development.
If you have comments, do you feel they have been, or will be, addressed?

We have no idea.

Date: Nov. 26/13 Time: _____ Location: Saskatoon

Printed Name: Robert Emigh

Signature: 

Applewood Estates

Local Land Description: SW 13-36-4 W3RD

Contact information (OPTIONAL): Phone: _____ Email: 

Address: 301-3rd Avenue South, Saskatoon, SK S7K 1M6

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

Looks like a well thought out Development

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: Nov 20th Time: 5:00 pm Location: SAS/2atdoh SK
Printed Name: Rob Risling Signature: [Signature]
Local Land Description: NW 12 36 4 Wat 3rd
Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]
Address: 259 Beechmont Crescent

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

lot sizes? # of lots? How many acres of
land will the development include? Do they intend to
tie into the existing "trickle" water system?

2. Do you feel you have a clear understanding of the proposed development? *NO*

3. Have you had sufficient opportunity to express your views? *not opportunity*

4. If you have comments, do you feel they have been, or will be, addressed? *Not sure. I will have to wait + see.*

Date: *Nov 26/13* Time: *10 00 am* Location: _____

Printed Name: *Kevin Thurston* Signature: *[Signature]*

Local Land Description: *SW 24-36-4 W3*

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Ridgewood Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

No comments at this time.

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: _____ Time: _____ Location: _____
Printed Name: WAYNE STATHAM Signature: *Wayne Statham*
Local Land Description: NW, SE, SW 11/36/4/W3
Contact information (OPTIONAL): Phone: _____ Email: _____
Address: 1725 PLATCRES, N. VANCOUVER, B.C. V7T1X9

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Ridgewood Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

You did not provide information on the number and size of lots, therefore hard to comment.

Your map was also hard to make out. I presume the plan is for your 80 acres, not the whole quarter section.

2. Do you feel you have a clear understanding of the proposed development?

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: Dec 12, 2013 Time: 8 PM

Location: Saskatoon

Printed Name: John Clarke

Signature: J Clarke

Local Land Description: Parcel B NE13 36 4 W3

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: Site 515 RR5 Box 29 Saskatoon S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Dan Beaulac

From: Rob/Shannon Jakes <[REDACTED]>
Sent: Saturday, November 30, 2013 6:17 PM
To: Dan Beaulac
Cc: planning@rmcormanpark.ca
Subject: Ridgewood Estates proposal

Categories: Red Category

Mr. Beaulac:

In speaking with the RM, the Nov-29 deadline you have suggested as a deadline for us to provide feedback to you, as you have already heard from others, is insufficient lead time for us to provide initial feedback. Given your deadline of Dec 2 by the RM, we understand they will accept our comments beyond November 29.

1. Comments

- a. Since you provided no stamp on the return envelope (indicating there was one), and while it seems to be a very trivial detail, it provides us insight as to the developer's attention to detail. Further, you were afforded much more time to gather this initial information (according to the RM), so this communication of the proposal is lacking in a number of ways. We wonder about the true concern for your "neighbors" and their concerns, and suggest you are simply fulfilling a required step imposed on you by the RM.
- b. While we understand the RM suggested you only need to provide general information to us, you can understand it is impossible to comment on what you are proposing, given you have provided so few details. In short, this lack of information is disappointing, and frustrating in so many ways. For example, you speak of "Ridgewood Place" in your letter – where/what is that?
- c. Your suggestion this subdivision will meet current market demand is dated and questionable - and your market research may be flawed, given non-development of the adjacent Applewood Estates development thus far. They, too, were driven by the same perceived market conditions you speak of, and they appear to be struggling to attract sufficient buyers to move the project forward. We suspect having two choices across the street from each other will not make for easy sales. Further, the addition of yet another proposed subdivision currently under consideration (Tuscan Ridge) within 1 mile will further saturate the acreage market. It has been three years since the Applewood Estates development was approved, and it is an eyesore in so many ways. Adding more houses to this area will further stress the natural environment, wildlife, water and sewer systems, and ultimately the lifestyle of those already here. It is one thing to attempt to hide a house amongst the trees; but yet quite another to buffer the additional noise created. People chose this location as they desired peace and quiet – not additional quads, mowers, vehicles, chainsaws, and grass whippers. The additional burden on Range Road 3041 cannot be tolerated with increased traffic. The secondary access status you suggest will be whatever is convenient for the residents, and not your expectations. The same goes for heavy equipment flow during the years of construction.
- d. Applewood made promises of "should" and "may", and "potentially" – all of which have not been fulfilled. Your general comments and lack of disclosure do not leave us with any comfort as to what "might" be done.

Further comments will be provided at a later date.

2. No, we do not have a clear understanding of the proposed development.
3. No, we have not had sufficient opportunity to express our views.
4. Having not been provided with full information nor having any background about the developer, we have no assurance our concerns will be addressed.

Rob and Shannon Jakes
Lot 5 Block 1 NW 13-36-4 W3

Dan Beaulac

From: Mary Lou Zelinski <[REDACTED]>
Sent: Friday, November 29, 2013 9:37 PM
To: Dan Beaulac
Cc: Derwin
Subject: Ridgewood Estates

Categories: Red Category

Regarding the proposed development, our concerns are that we had little to no information other than the questionnaire form sent earlier this week.

It would be interesting to see the plot plan indicating the number of lots, size of lots, and street configuration.

Derwin/Marylou Zelinski
#7 Hidden Ridge Road

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

It should not be allowed based on the volume of lots in Appewood across the road that basically has zero development after 2 years. ~~That is not~~ If this were to be approved the density of housing would significantly reduce the value of country living that is currently in place. Our water line will not sufficiently supply another development. Traffic will increase substantially on our currently quiet roads

2. Do you feel you have a clear understanding of the proposed development?

yes/no - enough to know
I disagree with it

3. Have you had sufficient opportunity to express your views?

no

4. If you have comments, do you feel they have been, or will be, addressed?

no, Appewood development proceeded even though we objected

Date: Nov 27/13 Time: 12:00pm Location: Saskatoon

Printed Name: Ashley Probert Signature: [Signature]

Local Land Description: NW 13-36-4 W3

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: Box 24 site S1S RRS Saskatoon SK
13 Hidden Ridge Rd

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

This development will negatively impact our housing density in Hidden Ridge. When we bought our lot in 2005, the RM informed us that no new developments could be built within 1 mile of Hidden Ridge. There is already Applewood + Tuscan Ridge adjacent to Hidden Ridge, with a proposed 35-40 lots per development!

2. Do you feel you have a clear understanding of the proposed development? No

3. Have you had sufficient opportunity to express your views? No

4. If you have comments, do you feel they have been, or will be, addressed?

Hopefully.

Date: Nov 11 Time: 5pm Location: Hidden Ridge.

Printed Name: Kirsten Maruca Signature: [Signature]

Local Land Description: lot 11 Block 2 sect. 14 Twp 36 R4

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: Box 6 Site 515 RR5 Saskatoon S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Proposed Multi-Unit Residential
SE 14-36-4-W3
R.M. of Corman Park

1 Please provide your comments regarding the proposed development:

TOO PREMATURE

Applewood Estates has taken 2 years
to service.

Only 5 lots sold there. (all owners)
23 lots left there.

Do you feel you have a clear understanding of the proposed development?

Have you had sufficient opportunity to express your views?

If you have comments, do you feel they have been, or will be, addressed?

NO

NO

NO!

Date: Nov. 29/13 Time: 2:06pm Location: Hidden Ridge

Printed Name: Leanne Myirfa Signature: [Signature]

Legal Land Description: Lot 1-B1K1-NW1/4-Sec 13-TWP 36-RN 64-MER 1

Contact information (OPTIONAL): Phone: _____ Email: [Redacted]

Address: RR 5 Site 515 Box 9 Saskatoon

S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

See attached.

2. Do you feel you have a clear understanding of the proposed development? No!

3. Have you had sufficient opportunity to express your views? Is this it?

4. If you have comments, do you feel they have been, or will be, addressed? ?

Date: _____ Time: _____ Location: _____
Printed Name: A. Anholt Signature: (A. Anholt)
Local Land Description: 13-36-4 W3rd (#16 Hidden Ridge Rd)
Contact Information (OPTIONAL): Phone: _____ Email: _____
Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

There has not been enough information provided. The map provides no information whatsoever. What are the proposed lot sizes?

While we are not opposed to residential development, we are opposed to small acreage lots. The topography of the land does not bode well for small lots. The amount of water which has been accumulating in the low areas over the past few years proves that small lots will not work on this terrain. A small lot leaves the builder with very little choice in where to place a home that will not be affected by water during wet years. One only has to drive through Applewood Estates to see the number of small lots which were half under water this year. This may be why there is basically no development happening in that area. It will take a few dry years before potential home-owners unknowingly select these lots only to find themselves as future flood victims.

This is the FOURTH development in this small area: Hidden Ridge, Applewood Estates, Tuscan Ridge (proposed) and now Ridgewood Estates. We will be beyond hamlet status – it will be more like a village or town! We, along with our Hidden Ridge neighbors, moved to the country to avoid over-populated areas and frankly the approval of Tuscan Ridge and Ridgewood Estates could potentially ruin the country lifestyle we have grown to love.

Note that we do not oppose lots of five acres or greater. This would allow the developments to seamlessly blend in together and keep the population density of the land equal.

Dan Beulac

From: Hecker, Markus [REDACTED]
Sent: Friday, November 29, 2013 10:47 AM
To: rm344@rmcormanpark.ca; Dan Beulac
Cc: Ulrike hecker
Subject: FW: Your Attachment
Attachments: Document.pdf

Hello Dan;

Please find attached our responses regarding the new development "Ridgewood Estates".

We appreciate to be given the opportunity for feedback and raising our concerns (please note that there is an attachment to the main form with more details regarding questions and concerns we have).

Thanks,
Markus

--

Markus Hecker, PhD

Associate Professor & Canada Research Chair School of the Environment & Sustainability University of Saskatchewan

Visiting Professor
Chinese Academy of Medical Sciences & Peking Union Medical College, Tianjin, China

Guest Professor
Xiamen University, Xiamen, China

Editor
Environmental Science & Pollution Research

44 Campus Drive
Toxicology Centre
Saskatoon, SK S7N 5B3

[REDACTED]

On 2013-11-29 10:39 AM, [REDACTED] wrote:

>
> This document was digitally sent to you using an HP Digital Sending device.

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

See attachment.

2. Do you feel you have a clear understanding of the proposed development? no

3. Have you had sufficient opportunity to express your views? somewhat given the limited information we were

4. If you have comments, do you feel they have been, or will be, addressed? not sure; concerns were not always addressed in the past

Date: Nov 29, 2013 Time: 10:31 am Location: Saskatoon

Printed Name: MARKUS HECKER Signature: [Handwritten Signature]

Local Land Description: NE 14-36.04 W3 Hidden Ridge Trail # 19

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: RR5, Site 515, Rex 18 ; Saskatoon, SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9
Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Attachment to Comments to Proposed Ridgewood Estates Multi-Parcel Country Residential Development

Thank you for giving us the opportunity to comment to the proposed development of the Ridgewood Estates Multi-Parcel Development. However, given the little information including in the information package sent out by the RM, it will be difficult to provide any specific or detailed comments or concerns, and it would be appreciated if you could provide us with a more detailed description of the proposed development including lot size, house-density, planned services, road access, etc. Regardless, with this letter we wish to provide some general comments concerning currently proposed developments in the planning zone including the above referenced Ridgewood Estates.

At the time the currently existing rural development "Hidden Ridge" was established the RM of Corman Park's bylaws prohibited any additional new developments within a one-mile radius of an existing development. Interestingly, this bylaw was removed as soon as the Hidden Ridge development neared completion, resulting in the initiation of the current development of "Applewood Estates". The latter has now been ongoing for numerous years without any actual houses being built (with exception of one basement that was started to being constructed over a year ago with no significant progress). In fact, the planning, establishment of roads, etc. was apparently not thought through very well as a large proportion of the planned lots are literally under water, rendering them non-useable for development without significant filling and changing of the current drainage landscape. One of the reasons for this seems that the natural hydrology (drainage landscape) of the developed area was not considered when placing roads, and many of the proposed lots should have never been dedicated as building land. We assume that this together with other factors such as high prices resulted in the lack of buyers for available lots. Other issues include promises such as that all construction traffic and associated heavy vehicles would access the construction site from the Patience Lake Division paved road and not through the recently chip-sealed Hidden Ridge Rd. to avoid further degradation of the already deteriorated road. However, until very recently all construction traffic accessed the Applewood Estates through the Hiddenridge Road, and you will understand that this did not add to trust by the Hidden Ridge community that promised conditions would be adhered to. Most importantly, it is unclear to us why - with no or almost no lots sold at Applewood Estates - there are now not only one but TWO new proposals for multi-parcel developments in the same area (the here referenced development would literally be right next to Applewood Estates). I am not an economist but even to us this seems a non-healthy competition to an already poorly accepted development with no or at best very little interest by potential buyers.

Even more concerning to us are the potential environmental impacts and changes in the natural landscape that are likely to occur as a consequence of the proposed developments. As clearly demonstrated by the ongoing Applewood Estates development, changes in drainage landscape have already significantly

impacted local hydrology, and given the current surface topography this is likely to become a much greater issue with each additional development and the associated changes to the landscape. Another major concern is the increasing sewage pressure to the area given the greater densities of houses and septic fields. In fact, this is one of my fields of professional expertise, and based on a number of recent and ongoing studies we are conducting on rural wastewater disposal in Saskatchewan, impacts of unregulated (higher density residential drainage fields and lagoon systems) effluent disposal is a significant issue from a water quality and security standpoint.

In conclusion, we are very concerned about the current plans of the RM to increase the number of residential (or any other) developments in the targeted area surrounding the current Hidden Ridge community for the reasons listed above. Also, after reviewing your evaluation criteria form for such new developments it seems apparent to me that many of criteria are poorly or not at all fulfilled (e.g. proximity to amenities, use of natural resources, market analysis, contribution to area, etc.).

Thank you for considering our comments and concerns!

Sincerely,

A handwritten signature in black ink, appearing to read 'Markus Hecker', written in a cursive style.

Markus Hecker, Ph.D.

Via email & mail

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

See attached

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views? NO

- this form is very limiting!
+ time line too tight.

4. If you have comments, do you feel they have been, or will be, addressed? - NO

Date: Nov. 29/13 Time: 7:00 Am Location: Hidden Ridge

Printed Name: Murray Long + Donna Zaleschuk Signature: D. Zaleschuk

Local Land Description: #11 Hidden Ridge Rd, Lot 6 Blk 3, NW Sec 13 TWP 36
RNG 4-W 3

Contact information (OPTIONAL): Phone: [Redacted] Email: [Redacted]

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beulac Email: dan@dbventures.ca
Ridgewood Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Page 1/2

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Via email +
mail

November 29, 2013

Our comments regarding the proposed Ridgewood Estates are as follows:

- The information provided for this proposal is so general that it leaves us with as many questions as concerns.
- The map provided is so poor it does not show the exact location of the development. Nor does it show the number of lots planned and location of access roads.
- It is astounding to us that this development reached the 2nd phase when there is absolutely no real construction yet at Applewood. It would be very disturbing to see another quarter of land ripped and carved up only to sit stagnant for who knows how long. What type of market research was done to support yet another acreage development next to Hidden Ridge?
- We are very concerned about what would be the demand on the our local supply; increase traffic on the roads, both on Patience Lake road and the main road to Hidden Ridge.

It is very difficult to make an informed decision and comments given that the information provided to us is so general and vague.

Murray long and Donna Zaleschuk
#11 Hidden Ridge Road
Lot 6, BLK 3, NW Sec 13, TWP 36, RNG 4 - W3

Page 2/2

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

while we are not conceptually opposed to rezoning to country residential, there is not enough detail available to comment meaningfully. Key areas of interest will be lot size, density, buffer zones, which will presumably be available in the future and we would be available to comment at that time. Lots of 1-2 acres in size are inconsistent with the 4-5 acre lots in Hidden Ridge and negatively impact the value of the Hidden Ridge properties, which presumably the RM does not want to do.

2. Do you feel you have a clear understanding of the proposed development? *No as detail not yet available.*
3. Have you had sufficient opportunity to express your views? *No, given lack of detail.*
4. If you have comments, do you feel they have been, or will be, addressed? *Too early to tell, in absence of comments.*

Date: Nov. 28, 2013 Time: 7:00 p.m.

Location: Lot 4 BIK 2 Qtr NE 14-36-4-W3

Printed Name: Jan Lahti
Todd Lahti

Signature: Jan P. Lahti

Local Land Description: Lot 4 BIK 2 Qtr NE 14-36-4-W3

Contact information (OPTIONAL): Phone: [REDACTED]

Email: [REDACTED]

Address: Box 27 RR#5 Site 515 Saskatoon, SK, S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

- How many sites, road locations, lot size - None of this information was made available with the mail-out

- Road surface construction - what have you decided?

- lot size + number of lots - no information given

- in fact, no information given of any real relevance, perhaps submitter should re-evaluate proposal + start over!

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views?

4. If you have comments, do you feel they have been, or will be, addressed?

Date: 25 Nov 13 Time: 1700 hrs Location: Saskatoon (Hidden Ridge)

Printed Name: M. T. CLANCY

Signature: [Handwritten Signature]

Local Land Description: NE 14-36-04-03

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

1. Increased traffic on Rd. 3042. Is Rd 3041 going to open for access to 8th Street? And if so when?
2. Not enough notice - Received letter 2 days ago + got a phone call last night from Dwayne Pitka.

2. Do you feel you have a clear understanding of the proposed development? No

3. Have you had sufficient opportunity to express your views? No

4. If you have comments, do you feel they have been, or will be, addressed?

Date: 11/28/13 Time: 11:15 Location: Residence

Printed Name: Rene Digneau Signature: R. Digneau

Local Land Description: SW 14-36-4 W3

Contact information (OPTIONAL): Phone: [REDACTED] Email: [REDACTED]

Address: Site 515, Box 21, R.R.5 Saskatoon SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J8

Email: dan@dbventures.ca
Phone: 306-227-5597

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

- how many lots will there be & what are their sizes?
- how many people/families are you planning for?
- how will the use of existing services (like water) impact current users?
- has traffic been considered - especially heavy traffic during construction?
- have any noise assessments been completed?
- are there building restrictions (i.e. height) for the development?
- why isn't the request for this input coming from the RM? When will they be involved?

2. Do you feel you have a clear understanding of the proposed development? not really
3. Have you had sufficient opportunity to express your views? NO - this is the 1st time we've been aware of development.
4. If you have comments, do you feel they have been, or will be, addressed?
unknown.

Date: Nov 29/13 Time: 15:00 Location: Saskatoon
Printed Name: Franz Kress Tressel Signature: [Signature]
Local Land Description: RM 14-36-4 W3M Parcel B.
Contact information (OPTIONAL): Phone: _____ Email: _____
Address: RR 9 Site 908 Camp 25, Saskatoon, S7K 1P3

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9
Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

NOT ENOUGH INFO!
- where exactly is this located - map is unclear!
- how many units / type of development
- did not provide contact info for RM -
- will our feedback get to the RM??
- no tentative layout proposed ie: size of
lots, # of lots etc

2. Do you feel you have a clear understanding of the proposed development? NO!
3. Have you had sufficient opportunity to express your views?
4. If you have comments, do you feel they have been, or will be, addressed? NO!

Date: _____ Time: _____ Location: _____
Printed Name: BARRY LINDA GRANI Signature: [Signature]
Local Land Description: HIDDEN RIDGE
Contact information (OPTIONAL): Phone: _____ Email: _____
Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Ridgewood Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

- How many developments/parcels?
- Average cost.
- Required building specs? i.e. Not small under budget homes in comparison to our homes
- What effect will a general center line issue for us?
- Our road is poorly maintained already what will this do with increased traffic?

2. Do you feel you have a clear understanding of the proposed development? No, the details are too vague.
3. Have you had sufficient opportunity to express your views? No, this was mailed with 2 days to respond including the time for delivery to us.
4. If you have comments, do you feel they have been, or will be, addressed?

Date: Nov 16/13 Time: _____

Location: Hudson Ridge Rd.

Printed Name: Simon Wengert

Signature: *Simon Wengert*

Local Land Description: _____

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

see attached

2. Do you feel you have a clear understanding of the proposed development? NO
3. Have you had sufficient opportunity to express your views? NO
4. If you have comments, do you feel they have been, or will be, addressed? NO

Date: 25 Nov 2013 Time: 10:55 AM

Location: Saskatoon, SK

Printed Name: John P. Olesy
SUSAN E OLESY

Signature: Susan E Olesy

Local Land Description: N1/2 of NW Sect 13 Twp 36 Range 04 W3

Contact information (OPTIONAL): Phone: [REDACTED]

Email: [REDACTED]

Address: RRS Site 519 Box 19

Saskatoon SK S7K3J8

Thank you for your input. Please return this sheet to

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential

1. Please provide your comments regarding the proposed development:

We are deeply disappointed and frustrated in the manner in which the request for comments is being handled by both the RM of Corman Park and the developer. The methods used are devious, underhanded and inept. Firstly, we received a map and even with a magnifying glass, could not find the parcel indicated for development. Secondly, we received the letter on Monday, November 25 and comments are due by November 29. We seriously feel that the RM should legislate a standard period for comments which should certainly be more than four days! For this reason, it appears that the developer is deceitful and has purposely tried to hinder Hidden Ridge residents and other neighbors from commenting. Thirdly the developer has provided no information on which to comment. Once again, it gives the impression that he is acting in an underhanded manner and trying to sneak something through. For example, how can we comment when we don't know the number of lots proposed, road placement, utilities, architectural guidelines, etc? We have absolutely no understanding of the proposed development and do not have a sufficient opportunity to express our views due to the lack of information provided. In our opinion, this is unethical and we are dubious that any comments provided will be addressed. The manner in which the developer has communicated gives those involved an immediate feeling of distrust.

We will provide some general comments, but until we get further information, this seems to be futile as we can only guess what may eventually be designed. The RM development guidelines state that new development should be consistent with existing neighborhoods. We are guessing that the density will be much higher than in Hidden Ridge and in our opinion, this is not consistent. Applewood Estates is divided into much smaller lots than Hidden Ridge and to the best of our knowledge, not one lot has been sold. If they are failing to sell in Applewood, I don't see that they will sell in Ridgewood Estates. Applewood Estates was poorly designed with some lots in the middle of a lake. The development has scarred the landscape and will be an eyesore of unsold lots for years to come. If the RM provides similar lack of oversight on the Ridgewood proposal, it will certainly be another failure. As proved by the lack of interest in Applewood, we feel that smaller lots will not sell as people want to live in the country to escape being on top of their neighbors. The developer should sell larger lots which will create more interest and profit.

One must also consider uses of adjoining land. Neighbors have built dirt bike racing tracks which will directly abut Ridgewood Estates. The kids are out there every day in the spring, summer, and fall. The noise and dust are truly excessive. Nobody in their right mind would buy a lot next to such a nuisance. Once again, the lots will remain unsold and the land will be scarred forever.

We also need more information regarding utilities and services, specifically water and sewer. In fact our foremost and major concern is water. Our water pressure now is extremely low and when the water level in our tank is down, it sometimes takes more than a day to refill. It often stays at the half tank level for a week at a time. We have completely run out of water on several

occasions and therefore must be very judicious using our sprinkler system or we will be certain to run out of water. It makes no sense to have a sprinkler system if we cannot use it. The current system cannot handle any more residences as it will result in even lower pressure. Hidden Ridge residences will be at the end of the line and the potential threat of running out of water is a serious health and safety issue. We also need more information on the sewage utility as we don't feel the land can support 30-40 septic systems. The developer has provided no specific engineering information regarding the capacity of the water system and water pressure and we believe this has not been taken into account. There are numerous wetlands on the property and we feel very strongly that they should be preserved and not drained. Water will simply return to these low areas.

All Ridgewood Estates ingress and egress should be off Patience Lake Road. If the RM requires two entrances, the road should form a loop and they should both be off Patience Lake Road. Patience Lake Road is built for heavy traffic and the Range Road is not. The Hidden Ridge developer provided a bond to the RM to pave Range Road 30-41 and there has subsequently been catastrophic road failure. We are deeply disappointed that the RM did such a shoddy paving job and it is for this reason we feel that the road absolutely cannot handle any more traffic. Major sections of the road completely crumbled within two years of when it was paved and other sections are in extremely poor condition.

The developer has not effectively communicated the scope of the project or any specific plans to those in the immediate area. The RM of Corman Park should consider this poor communication factor when making a final decision regarding this potential development.

John and Sue Giesy
November 28, 2013

RR 5 Site 515 Box 15
Saskatoon, SK S7K 3J8

[REDACTED]
[REDACTED]

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

As a five year home and land owner in Hidden Ridge Estates, I am 100% opposed
to any further developments to and in our adjacent property. I believe the map sent
with this package is generic and vague by design. It shows no details whatsoever.
There are lots with homes in Hidden Ridge now, which should of never been sold in the
first place. This has already caused significant drainage issues. The Ridgewood
development will only serve to accentuate these already existing problems.
Absolutely NO to Ridgewood Estates!

2. Do you feel you have a clear understanding of the proposed development? NO
3. Have you had sufficient opportunity to express your views? NO
4. If you have comments, do you feel they have been, or will be, addressed? Time will tell.

Date: NOV 28/13 Time: 9: AM Location: Saskatoon

Printed Name: MURRAY LUX

Signature: 

Local Land Description: NE Quarter-14-36-4 W3

Contact Information (OPTIONAL): Phone: _____ Email: 

Address: Site 515 Box 25 RR5 Saskatoon, SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Ridgewood Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park

1. Please provide your comments regarding the proposed development:

It is difficult to provide comments on every aspect of this development with so little information provided. When we purchased our lot we were told no multi-parcel subdivisions would be built within one mile of our existing subdivision. With Applwood & Tracom Ridge (possible) there is over an additional 60 new possible lots within one mile & that isn't including the proposed Ridgewood. We feel like we will be in the middle of Montgomery!

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views? This is our first opportunity.

4. If you have comments, do you feel they have been, or will be, addressed? n/a?

Date: Nov 27/13 Time: 9:02pm Location: residence

Printed Name: Erin Stuart Signature: Erin Stuart

Local Land Description: NE 14-36-4 W^{3rd}

Contact information (OPTIONAL): Phone: [REDACTED] Email: [REDACTED]

Address: Box 32, RR5 Site 515, Saskatoon SK S7K 3J8.

Thank you for your input. Please return this sheet to:

Dan Beaulac
Ridgewood Estates
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9
Email: dan@dbventures.ca
Phone: 306-227-5597

PLEASE SUBMIT ALL COMMENTS BY November 29th, 2013

Meadow Ridge Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park
Public Consultation Comment Form

1. Please provide your comments regarding the proposed development:

- what water system is planned for the development
- will it be on last River Water system or other?
- how will sewage be managed?
- what development will be undertaken on perimeter of proposed project? Fencing, vegetation?
- what will the line of sight be like towards the development from all directions (i.e. what will I see from the W approaching the developer)

2. Do you feel you have a clear understanding of the proposed development?
yes

3. Have you had sufficient opportunity to express your views?
yes

4. If you have comments, do you feel they have been, or will be, addressed?
depends if above questions are answered.

Date: Aug 22/16 Time: 14:30 Location: NW 14-36-4W3

Printed Name: Enn Tressel Signature: Enn Tressel

Local Land Description: NW 14-36-4 W3

Contact information (OPTIONAL): Phone: [redacted] Email: [redacted]

Address: _____

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Meadow Ridge Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY Friday July 15th, 2016

Dan Beaulac

From: Rob/Shannon Jakes <[REDACTED]>
Sent: Sunday, July 17, 2016 7:58 PM
To: Dan Beaulac
Cc: planning@rmcormanpark.ca
Subject: Meadow Ridge development proposal

Follow Up Flag: Follow up
Flag Status: Flagged

Mr. Beaulac,

Included in this email is our response to your initial proposal in 2013. One reason for this is for brevity, and another to point out some of our issues that haven't changed in the 1 1/2 years since that email.

1. Concern: market value of our homes will be negatively affected.

As you state in your CDR:

The developer has conducted ongoing market analysis and he is confident that Meadow Ridge Estates will offer a desirable product for new homes. There is strong market support for these sites and some of the lots have already been pre-selected and reserved for potential future buyers indicating they will purchase and build as soon as lots are available.

First, note that Applewood has not sold any lots other than to its own development group. How the RM can allow your proposal to proceed at this time in this market place is unbelievable.

Note that Applewood were also confident the market was needing/wanting the types of lots and living they proposed. To date, they have 1 home built, with 37 empty lots. The economy and housing market is not as it was over the last couple of years, and is not expected to normalize for at least a year.

Second, note that Tuscan Ridge is progressing and will be in competition for your market space. While you have provided professional commentary about such things as the environment, water, land composition, etc. in your CDR, there is no evidence your market analysis was done by a professional group. With all due respect, we suggest that until the lots are actually sold, your purchasers are indeed only "potential", and not "actual". There is nothing legally binding about future (lot) promises. You have provided no comfort to the fact many of your lots will sit empty, which will affect our land/house prices.

Interesting to note that you no longer reside in this proposal, but have sold and moved to the city.....

2. Concern: water pressure at our end of the line.

While there seems to be assurances from the water company that there is sufficient supply, we in Hidden Ridge have suffered from issues of lack of pressure enough times to question this promise. Not having water is a serious issue.

3. Concern: Noise

Adding even more to our community will create more noise. Smaller lots with very little to no significant vegetation will result in more mowing, edging, and the like because there isn't the natural treed areas in most of your lots.

4. Concern: Road condition.

More traffic on 3041 will cause even more deterioration, even though it will only be for the last few hundred meters.

5. Concern: Density is too high.

Your development does not fit the character nor consistency of the existing lots. Applewood has 38 lots on 150 acres; you want 51 (with one at 8.9 acres). This is not the feel of a quiet, rural setting.

To sum up our thoughts: We are definitely not in favour of this proposal.

Dan Beulac

From: Dan Beulac
Sent: Monday, July 04, 2016 12:36 PM
To: Todd Lahti
Subject: Re: Meadow Ridge

Hey Todd, I answered your questions below. Call me anytime to discuss if you have further questions.
Thanks,

Dan Beulac
306.227.5597

Sent from my iPhone

On Jul 4, 2016, at 11:21 AM, Todd Lahti <[REDACTED]> wrote:

Dan,

I received the Meadow Ridge information and have the following questions.

- I thought this was already approved as Wood Ridge, why is there another consultation?

The process requires minimum 2 public consultations and I changed the name since there was another business using the name Ridgewood.

- What is the difference between this and the prior proposal?

The main difference is all the design for Phase 1 has been completed and is available upon request. The layout is very similar to the concept plans.

- You had previously indicated that the east 80 acres would be developed first. Is that still the plan?
That is still the plan.

- What is the timeline?

To begin construction late fall or early spring on phase 1.

- You had previously provided a right of first refusal to purchase the lots adjacent to our property. Is that still the case?

It is still the case but the lots you were interested in are in phase 2. The design for phase 2 will not be finalised till phase 1 is 70- 80 percent sold out.

Todd Lahti
24 Hidden Ridge Trail
[REDACTED]

Dan Beaulac

From: Todd Lahti <[REDACTED]>
Sent: Monday, July 04, 2016 12:23 PM
To: Dan Beaulac
Subject: Meadow Ridge

Follow Up Flag: Follow up
Flag Status: Flagged

Dan,

I received the Meadow Ridge information and have the following questions.

- I thought this was already approved as Wood Ridge, why is there another consultation?
- What is the difference between this and the prior proposal?
- You had previously indicated that the east 80 acres would be developed first. Is that still the plan?
- What is the timeline?
- You had previously provided a right of first refusal to purchase the lots adjacent to our property. Is that still the case?

Todd Lahti
24 Hidden Ridge Trail
[REDACTED]

Meadow Ridge Estates
Proposed Multi-Parcel Country Residential
SE 14-36-4 W3
R.M. Of Corman Park

Public Consultation Comment Form

1. Please provide your comments regarding the proposed development:

Thank you for the opportunity to submit comments regarding the above-noted proposed multi-parcel country residential.

As per the newest by-laws, consolidated April 22, 2016, – Corman Park – Saskatoon District Official Community Plan:*

5.7 Multi-parcel Country Residential Servicing and Development Policies:

2. When reviewing multi-parcel country residential subdivision proposals, Council shall consider the current demand for and existing inventory of undeveloped multi-parcel country residential lots.

Our concern: There is excess inventory of available lots across the road in Applewood Estates. This is not an opinion, it is a fact. Land is ripped apart and sits empty and stagnant, despite infrastructure being in place for the last three years. The new development of Tuscan Ridge is also in close proximity to the proposed development of Meadow Ridge Estates.

Subject to the policies herein, Council shall determine the number and arrangements of lots on a case by case basis and shall have consideration for:

- a. the carrying capacity of the lands proposed for development and the surrounding area based on site conditions, environmental considerations and potential impacts, and other factors that may warrant consideration in the design of the proposal;*
- c. the compatibility of the proposed subdivision design with that of the surrounding area.*

Our concern: Figure 9 of the Concept Drawing with Satellite Image (provided in the public consultation mail out package) reveals that the tree removal for lots 16, 18, 21 and 22 in Block 1 are substantial. Also much of the brush and trees on lot 10, 11 and 12 will have to be removed, as there is no place for the house to go without vastly altering the natural landscape.

9. New multi-parcel country residential subdivision proposals shall incorporate environmentally sustainable subdivision design principles including but not limited to:

- a. The subdivision design and the placement of lots shall respond to and incorporate existing natural resources including wildlife corridors and habitat, topographic features and environmentally sensitive lands , with particular attention to surface water and groundwater systems.*

Our concern: In regards to the above-noted by-laws, we are concerned of our increased risk of flooding. In 2014, our house was at risk of flooding, and Sask Water Agency provided a contract for us to protect our home. A permanent berm, directly behind our house, to the

south and west side of our home was constructed. (See attached google map.) In the spring of 2016, despite very little moisture and precipitation, our pond level rose 18 inches due to the drainage from the east and north side of Hidden Ridge. It is evident the water is not going away any time soon, and keeps increasing even after a dry year. Water will simply flow to low areas. Because there is a natural low area behind our home which borders Meadow Ridge Estates, the new subdivision will negatively effect us, due to the importation of water on 51 lots and subsequent water drainage to septic fields which will saturate the area, and flow downhill to us. Hidden Ridge has significant surface and ground water issues, and we feel the densely populated Meadow Ridge Estates development will accentuate these already existing problems.

How can the environment sustain that many septic fields? The potential impact of our lot due to drainage of water and septic systems (as we are down hill) is huge. At least in the city water and sewage goes into the pipes and not into the surrounding ground adding more water load on an area.

“Canadians currently use an average of 329 litres of water per person, per day”. (2009, August)

www.nationalpost.com/rss/study+calls+average+water+Canadians+alarming/1402591/story.html. This will go into the ground, and with the densely populated proposed subdivision of 51 lots, will cause problems, and the water will all flow to us, the lower lying property owners. There are 27 proposed lots in the back 1/3 of the development next to Hidden Ridge. All that water load will come to our property.

We have reviewed the Comprehensive Design Review, and after reading the report are interested to obtain a copy of the CDR for Hidden Ridge to review what the engineers reported on drainage in our subdivision. We would bet that according to the engineers consulted for the Hidden Ridge development no potential water problems were noted. How do we believe that the engineer report for Meadow Ridge will be more accurate than the engineer plans for Hidden Ridge. Many property owners in Hidden Ridge development are dealing with surface and ground water issues.

The drainage easement shown on the map provided by Mr. Beaulac in the proposed plan, is almost at capacity and is directly hooked to our pond on our lot. We note that Meadow Ridge Trail road runs through the existing drainage easement. This will require a large amount of fill. This will further reduce the capacity raising the water levels again and directly negatively impacting our property.

5. Where a multi-parcel country residential subdivision is proposed on lands abutting an existing multi-parcel residential development, Council shall require the proposed development to be designed to complement the existing development including measures such as visual buffering, building site separation, complementary lot sizing or any other measures necessary to achieve compatible land use and development.

Our concern: Meadow Ridge Estates proposal does not complement the existing development of Hidden Ridge. There are 4 lots in Hidden Ridge abutting Meadow Ridge's 11 lots along the north side. This is not a compatible ratio. Applewood Estates revised their initial plans, and have 4 lots abutting 8 Hidden Ridge lots. (See attached Applewood Estates map). If we compare the direct ratio of what the east residents of Hidden Ridge residents were given against Applewood there would be 2 Meadow Ridge lots for our 4. The proposed development does not seamlessly blend with the existing Hidden Ridge Estates. We moved to the country to escape being on top of our neighbours.

The acreage size of the lots in the Meadow Ridge Estates proposal is not similar to the lot size of the lots they are abutting in Hidden Ridge, therefore are not complementary or compatible, as per the by-law. The average size of the lots in Hidden Ridge backing Meadow Ridge is 4.41 acres. No information is provided regarding the actual lot sizes abutting Hidden Ridge, however appear to be about one acre lots and therefore are not compatible. We question why the provided proposed development map does not disclose lot sizes. We absolutely require larger lots so said lots seamlessly blend together and keep the population density of the land equal.

If you note, as per plans provided by developer, all the small lots are on the north side of the proposed development, next to Hidden Ridge.

Based on comments and concerns received from residents of Hidden Ridge Estates, Applewood has a 30 meter Development Control Easement incorporated parallel the north boundary. This easement reduces negative reactions to the development by adjacent residents. (See attached Applewood Estates map). Out of fairness, we would request a similar easement for the residents on the west side portion of Hidden Ridge, as was given to the east side residents of Hidden Ridge.

We note that Rural Municipality zoning by-law requires a 10% total area municipal reserve. Why is Meadow Ridge Estates able to provide cash in lieu of an existing by-law? Who determines this, and how can this decision be justified? This implies that a bylaw can be paid to be ignored?

In summary, the lot load abutting Hidden Ridge is excessively high. If we wanted to see this many houses and/or roof lines, we would have remained in the city. We were originally told by the Hidden Ridge developer, upon purchase of our lot, that according to by-laws, there would not be another multi-parcel development within three miles of Hidden Ridge. We require, at a minimum, that the development of Meadow Ridge Estates be required to meet the agreement of the Hidden Ridge East and Applewood border. e.g. A 30 meter buffer with the same ratio of lots. This is an established precedent, and should not be ignored. Why can the east side of Hidden Ridge, next to Applewood, be shielded from high density housing, and yet the water saturated lots on the west side of Hidden Ridge not be afforded the same rights.

2. Do you feel you have a clear understanding of the proposed development? Not to our satisfaction, unless not being required to follow existing by-laws is the understanding part.

3. Have you had sufficient opportunity to express your views? Not until now, previous information provided in November of 2013, was vague and lacking, both in time allowance and information.

4. If you have comments do you feel they have been, or will be, addressed? They have not been addressed, but potentially could be addressed, if the existing by-laws are adhered to, as per written.

Date: July 15, 2016

Time: 7 p.m.

Location: 18 Hidden Ridge Trail

Printed Name: Erin & Darren Stoudt

Signature:

Local Land Description: NE-14-36-4 W3

Contact information: Phone: [REDACTED]

Email: [REDACTED]

Address: Box 32 Site 515 RR 5, Saskatoon, SK S7K 3J8

* Definition of a by-law: **By-law:** a law or regulation or rule (with force of law) of a local government such as that of a town or city; also a governance rule adopted by a corporation. "A by-law is not an agreement but a law binding on all persons to whom it applies whether they care to be bound by it or not. They by-law has the same effect within its limits and with respect to the persons upon whom it lawfully operates as an Act of Parliament has upon the subjects at large."

Dan Beulac

From: Dan Beulac
Sent: Thursday, July 07, 2016 3:32 PM
To: Sproule, Ryan
Subject: Re: Meadow Ridge Estates

<https://sendfiles.aecom.com/download.aspx?ID=ee478b13-93d7-461a-8aef-dc286aec2045>

Hi Ryan, if you have issues opening this link or if you have any questions do not hesitate to call.

Thanks,

Dan Beulac
306.227.5597

Sent from my iPhone

On Jul 7, 2016, at 8:03 AM, Sproule, Ryan [REDACTED] wrote:

Hi Dan,

I live in Hidden Ridge Estates and received your package for the proposed Meadow Ridge Estates development. I would be interested in reviewing a digital copy of the CDR report. Can you please provide?

Thank you,

Ryan Sproule, CAIB
Branch Manager/Account Executive
Hub International Insurance Brokers
#3, 702 - 1st Ave. N
Saskatoon, SK. S7K 1Y1

[REDACTED]

This communication (and any information or material transmitted with this communication) is confidential, may be privileged and is intended only for the use of the intended recipient. If you are not the intended recipient, any review, retransmission, conversion to hard copy, copying, circulation, publication, dissemination, distribution, reproduction or other use of this communication, information or material is strictly prohibited and may be illegal. If you received this communication in error, please notify us immediately by telephone or by return email, and delete this communication, information and material from any computer, disk drive, diskette or other storage device or media. Thank you.

Dan Beaulac

From: Michelle Shepherd <[REDACTED]>
Sent: Thursday, July 07, 2016 2:22 PM
To: Dan Beaulac
Subject: RE:

Thanks!

From: Dan Beaulac [<mailto:dan@dbventures.ca>]
Sent: Thursday, July 07, 2016 2:20 PM
To: Michelle Shepherd
Subject: Re:

Thank you Michelle. As for the timelines, I plan to begin construction with in the next 12 months for phase 1.

You can call me anytime to discuss any other questions.

Thanks,

Dan Beaulac
306.227.5597

Sent from my iPhone

On Jul 7, 2016, at 12:33 PM, Michelle Shepherd <[REDACTED]> wrote:

Hi,
Here is the form you requested,
Michelle

<201607071541.tif>

Public Consultation Comment Form

1. Please provide your comments regarding the proposed development:

_____ would be nice to have timelines

- 2. Do you feel you have a clear understanding of the proposed development? Yes
- 3. Have you had sufficient opportunity to express your views? Yes.
- 4. If you have comments, do you feel they have been, or will be, addressed?

Date: July 7/16 Time: 1330 Location: _____

Printed Name: Michelle Shepherd Signature: [Signature]

Local Land Description: _____

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: 13 Holden Rd

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Meadow Ridge Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY Friday July 15th, 2016

Hi,
Here is the form you requested,
Michelle

From: Michelle Shepherd
Subject: No Subject
Date: July 7, 2016 at 1:33 PM
To: Dan Beaulac dan@dbventures.ca

Meadow Ridge Estates RECEIVED JUL 13 2016
Proposed Multi-Parcel Country Residential
SE 14-36-4-W3
R.M. of Corman Park
Public Consultation Comment Form

1. Please provide your comments regarding the proposed development:

- how will an additional 51 residences affect our Sask water supply?
- how will an additional 51 residences handle their sewage??
- relative to adjacent developments this is a very HIGH density development that will reduce the potential for natural wildlife habitat to extent as already observed by adjacent landowners
- how does the RM substantiate another development in this area when an adjacent development has yet to show any buildings/residences proceeding? (Applewood Estates)

2. Do you feel you have a clear understanding of the proposed development? NO

3. Have you had sufficient opportunity to express your views? ??

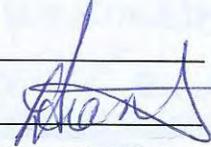
4. If you have comments, do you feel they have been, or will be, addressed? ??

SOUNDS LIKE THE RM,
HAS ALREADY DECIDED TO
APPROVE THIS
DEVELOPMENT ??

Date: JULY 12/16 Time: _____

Location: _____

Printed Name: LINDA GRANT

Signature: 

Local Land Description: LOTS BLOCK 2 NE 14360403

Contact information (OPTIONAL): Phone: _____ Email: _____

Address: BOX 14 SITE 515 RR 5 SASKATOON SK S7K 3J8

Thank you for your input. Please return this sheet to:

Dan Beaulac Email: dan@dbventures.ca
Meadow Ridge Estates Phone: 306-227-5597
RR#6, Site 601, Box 103
Saskatoon, SK
S7K 3J9

PLEASE SUBMIT ALL COMMENTS BY Friday July 15th, 2016

- if the goal is to have a higher density development with more affordable lots what are the building requirements? Lower valued developments will reduce the value of nearby existing properties
- as this is a high density development is the Rm committed to proper maintenance of adjacent & access roadways as there will be a significant increase in traffic?
- ~~as~~ as an adjacent landowner, we have seen in the spring where several of the proposed "lots" have been covered with standing water (and now have reeds/cattails growing) - so they are obviously in low-lying areas → WHERE WILL THIS WATER GO?? - we are very concerned this will be directed away from the development potentially onto our property raising water tables that could result in flooding - WHO will be responsible to pay for the damage this may cause? the Rm?? the developer??

THANK YOU

Dan Beaulac

From: Goran Jablan <[REDACTED]>
Sent: Friday, July 15, 2016 1:26 AM
To: Dan Beaulac; planning@rmcormanpark.ca
Subject: Re:

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Dan,

I have already sent the same comments to the Corman Park planing department. There is no need for any further discussions. My concerns are not addressed in the engineering report. I am not sure if the engineering Company is aware of what happened with Hidden Ridge during flooding in 2011 and 2013. If the engineering Company was asked to prepare report as how the Meadow Ridge development would affect Hidden Ridge development I think the report would look much different. I did not see any reference or connection between Meadow ridge and Hidden ridge development. I am sure if I hire engineering company to prepare the plan for subdividing my 4 acres into two lots they would prepare report but if I do not tell them that there is no drainage from Hidden ridge they are not going to worry about anything passed my property line. I have read many engineering reports in the past and they are all prepared based on information provided to the engineering firm The reason that affected parties get involved with this process is to hear everybody's comments and learn about how other people will be affected by the development. That way Corman Park can make an educated decision. I am glad to see that RM is asking for these reports now I wish they have done the same for Hidden ridge. Again the study has to involve Hidden Ridge, Apple Wood, and Meadow ridge and how they affect each other. Severe weather and other factors have to be taken in consideration. Talking to neighbors I would not be surprised if we hire different engineering company to perform study that I am talking about. I have been asked to provide my comments. I have reviewed your proposal including engineering report and I have submitted my comments as per the process. Looking at other neighbors comments I think that nobody is happy with how Apple Wood turned out and having additional 50 plus lots in the close proximity was not in the cards when I purchased my lot. I see your partner's house is far away from the Patience Lake road where he can enjoy privacy with his family. I can see 5 to 6 acreages would fit nice but over fifty is really unreasonable for numerous reasons, traffic, sewer, water drainage, damaged roads, lack of privacy, noise and totally defeating purpose of moving to an acreage. The logical question is what I am paying my tax for. There is no need to reply to my emails. As I said I am providing comments as required.

Best Regards

Goran Jablan

Best Regards

Goran

On 15 July 2016 at 00:11, Goran Jablan <[REDACTED]> wrote:
Hi Dan,

I have reviewed this engineering report before I've sent my comments. I thought you've sent me something different.

Thanks

Goran

On 14 July 2016 at 15:57, Dan Beaulac <dan@dbventures.ca> wrote:

Hi Goran,

Thank you for letting me know about all concerns. I am enclosing a link for the CDR / comprehensive design review the RM now requests all developments to submit prior to approvals are granted. Please review and if your questions are not answered in this document please call me to discuss.

[60303829-MRE-CDR-w appendix-22Jun2016.pdf](#) 61,892KB

Thanks,

Dan Beaulac

Partner

Meadow Ridge Estates

dan@dbventures.ca

RR 6, Site 601, Box 103

Saskatoon, SK S7K 3J9

PH: [306.227.5597](tel:306.227.5597)

PRIVILEGE AND CONFIDENTIALITY NOTICE:

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From: Goran Jablan [mailto: [REDACTED]]
Sent: Thursday, July 14, 2016 9:44 AM
To: Dan Beaulac
Subject: Meadow ridge ates proposal

Good morning Dan,

I am sending these comments regarding Meadow Ridge Estates.

My understanding was that Meadow Ridge development would not be even considered until more than half lots of Apple wood estates are sold.

I did not have a clear understanding of your proposal until now and even now I am not 100 percent clear. I am very familiar with the land for the development and when I look at water catchment from the proposal I can not see how those catchments are going to work. In case of flash flooding or severe storms water will flow towards the lowest point which is the pond by Stoups property. There is already a small berm that is just about to overflow after every winter. If that would happen drainage for my and Kelvin's property would be blocked. Drainage for Scots property would be blocked as well. Consequentially water from Scotts would flow to Dean's and he almost flooded two years ago. Dean have pumped out a huge amount water last year to reduce water level in his pond. Kelvin, Darren and Dean have spent significant amount of money to protect our properties.

Unfortunately there is no drainage for Hidden Ridge development and adding over 50 properties with city water supply is unreasonable. That water has to percolate the dirt and go somewhere. Increasing water levels in the area that was already affected is just adding problems for Hidden ridge and Apple Wood development.

There are some moral issues here. If I knew that Corman Park did not figure drainage from Hidden Ridge before lots were sold I would not have ever purchased my lot. I have invested my and my wife life savings into the house that can flood any day. To me Corman Park should have never allow Hidden Ridge development without providing the water drainage or pumping system.

The water situation around my house cost me lot of time. energy and and also my health.

If I knew that Apple-wood development would take place I would have never moved here. First people get attracted by large space and quite country leaving invest their hard earned cash only to listen to heavy duty machinery, deal with the damaged road, more traffic and the Apple-wood development that in all honesty is simply sad. I can not see who would pay that kind of money for those lots. Just across the Patience Lake road water level is one foot under the surface. The owner of the storage bins can not build a house on his land due to high water levels.

Mel's sump was going 24/7 during last 3 years and people close to him almost lost their house. The original developer if the Hidden ridge lost his house due to flooding which is very sad but it only shows how poorly this development was planned.

With all respect to the engineering firm for Meadow Ridge development I am sure in small print it will say they do not accept any responsibility in case of natural flooding storms and similar.

Without proper pumping system where water will get removed and pumped towards Patience lake or the Saskatchewan River no development should take place in this area.

I am planing to sue Corman Park for poor planning of the Hidden Ridge development, suffering and financial damage caused to my family and our neighbors. Giving building permits without adequate assessment of the water drainage. Passing their responsibilities to the Water Security Agency. Inadequately and unprofessionally run RM.

I do not have any monetary gains in mind.

Dan if I remember correctly Darren have asked the owner of the pond by their house to put the the berm to protect his house. Even my 12 year old child can see that Stouds are in trouble. That lot should have never

been sold in the first place. I do not see any solution for Stouds family if the Meadow Ridge proposal. That is not fair.

In conclusion if the Corman Park or developers would invest in the proper sewage and water drainage system for all developments meaning pumping water and sewage away I would welcome new developments. Until then I would say we do not need Meadow ridge or similar developments. We have enough problems as it is.

Best Regards

Goran Jablan P.Eng.

Meadow Ridge Estates
Public Consultation Comments
July 12, 2016

1. Please provide your comments regarding the proposed development.

The concerns and questions we expressed to Dan Beaulac in November, 2013 to the then proposed Ridgewood Development remain the same for his changed proposal to Meadow Ridge Development.

Market demand

- Despite our comments two and a half years ago, it continues to astound us that Meadow Ridge (aka Ridgewood) has reached the next phase for adding more acreages to the vicinity when there has been no construction at Applewood, besides one house, and Tuscan Ridge is just beginning construction. It remains very disturbing to see another quarter of land ripped and carved up only to sit stagnant for who knows how long. As long as these areas remain undeveloped, it impacts the aesthetics and value of our existing homes in the area.

High Density

- We are very concerned about the high density of having 51 additional lots added to our water supply.

Road Access

- We are very concerned with the combined traffic on Range 3041 from Hidden Ridge, Applewood and the proposed Meadow Ridge, especially if this road remains the primary access road for mail delivery. Range Road 3041 is the only exit out for Hidden Ridge residents.

Change in Development Plans

- The development plan is significantly different from the Ridgewood plan we reviewed and provided comments on in 2013. The size of the development has doubled, and lot sizes are smaller resulting in a higher density. How was the developer allowed to make such drastic changes and remain within the RM's CDR's process, rather than starting with a new proposal plan?

Meadow Ridge Review Consultation Report

- We reviewed the report and find that there is still a lot of vague information and not enough details as to the impact this development will have on families who already live in Hidden Ridge. Section 3.2.1 includes only a selected list of comments/responses that were positive or neutral to the development. It excluded our phone call with comments that were not supportive of the Ridgewood plan in 2013.

2. Do you feel you have a clear understanding of the proposed development?

NO. Even after reviewing the Meadow Ridge Review Consultation Report, there is confusion between what was initiated in the Ridgewood plan to what is in the Meadow Ridge plan, mostly because the plan has had such a drastic change.

3. Have you had sufficient opportunity to express your views?

NO. The report and mail-out package only provide limited information as to how Meadow Ridge will impact the families living in Hidden Ridge. There needs to be a face-to-face community consultation with all of us.

4. If you have comments, do you feel they have been or will be, addressed?

NO. I (Donna) am skeptical given my previous phone call in November, 2013 with Dan Beaulac about his Ridgewood proposal, to which he stated in a rather dismissive tone that he "had land here first before Hidden Ridge".

Date: July 12, 2016

Time: 6:00 p.m.

Murray Long and Donna Zaleschuk
Box 8 Site 515 RR5, Saskatoon, SK S7K 3J8
Lot 6, BLK 3, NW Sec 13, TWP 36, RNG 4 – W3
Tel: [REDACTED]

Appendix V

Prairie Spirit School Division

Gehl, Andy

From: Kerry Donst <kerry.donst@spiritsd.ca>
Sent: Tuesday, February 23, 2016 1:09 PM
To: Gehl, Andy
Subject: RE: New Subdivision - School Division Capacity Request

Andy,

Thank you for submitting your proposal.

Prairie Spirit School Division will provide capacity to accommodate student enrollment for the proposed development.

Thanks,
Kerry

From: Gehl, Andy [<mailto:Andy.Gehl@aecom.com>]
Sent: Wednesday, February 17, 2016 11:41 AM
To: Kerry Donst <kerry.donst@spiritsd.ca>
Subject: New Subdivision - School Division Capacity Request

Kerry,

Thank-you for returning my call.
I have been away from the office so just replying now.
Please let me know if you have any further questions.

AECOM is currently preparing the Comprehensive Development Review (CDR) for a Multi Parcel Country Residential subdivision labeled Meadow Ridge Estates.

As I mentioned, we are required by the CDR process to obtain any available comments from the School Division regarding capacity to service this development.

The proposed site is approximately 3 miles east from the southeast corner of Saskatoon in the RM of Corman Park. Approximately 5 minutes east of the city adjacent Hidden Ridge and Applewood Estates subdivisions on Patience Lake Road.

Land description is SE14-36-04-W3M.

The new subdivision will potentially accommodate 50 new homes.

Projections for the number of potential students from this area and whether they would attend school in Clavet or other options, is somewhat imprecise.

However, using the Statistics Canada school age youth per household of 0.55, there could roughly be 28 potential total students (age 6-17) from this development at full buildout.

This development will likely be constructed in 2016 and most housing sold in 2017 depending on market absorption.

We have prepared and attached information for your use:

Figure 1 – Site Location

Figure 8 & 9 – Conceptual Layout Plan

Can you please provide any comments or considerations that the school division has capacity to service student enrolment when developed?

Please contact me if you have any questions.

Andy Gehl, MCIP, RPP
Principal
Design, Planning+Economics
T 306.955.3300
andy.gehl@aecom.com
AECOM

Appendix W

Septic System Feasibility Report

Imagine Contracting Inc.

Septic System Feasibility Report

for

**Meadow Ridge Estates
SE 14-36-04-W3M
52.0929, -106.4679
RM of Corman Park No. 344
Saskatchewan**

Completed on behalf of :

DB Ventures
Dan Beaulac
RR #6, Site 601, Box 103
Saskatoon, SK S7J 3J9

Site Assessment & Soils Analysis

Completed: June 20, 2016

Report Completed:

June 28, 2016

Site Investigation & Report Completed by:

Aleena Pawlik



June 28, 2016

Per the proposed subdivision/development of Meadow Ridge Estates located at: SE 14-36-04-W3M, RM of Corman Park No. 344, Saskatchewan, Aleena Pawlik of Imagine Contracting Inc., investigated the site constraints and soils conditions on the site to determine whether private septic systems would be feasible on several of the proposed lots. The investigation was completed on June 20, 2016, and soil samples were collected and submitted for testing at a certified lab.

Henceforth, the proposed properties will be referred to as the "Lot #16" and "Lot #20".

Test pits were excavated and fully evaluated on each of the two sites. Test Pit #1, on Lot #20, was excavated to a depth of 6'6". Test Pit #2, on Lot #16, was excavated to a depth of 7'6"

A restrictive layer was found at 37" deep in Test Pit #1 (Lot #20), and at 27" deep in Test Pit #2 (Lot #16). This indicates that the sites will require either Type II Mounds or Above-Ground Enviro-Septic Systems. Detailed analysis' for each system are on the following pages.

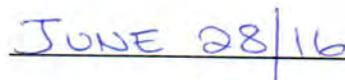
Septic System Feasibility Report
Meadow Ridge Estates
SE 14-36-04-W3M
52.0929, -106.4679
RM of Corman Park No. 344
Saskatchewan

June 28, 2016

I, Aleena Pawlik, of Imagine Contracting Inc. certify that all information included in this report is accurate per my findings during my evaluation on June 20, 2016, and the subsequent lab report from ALS Labs.



Signature



Date

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LOT #20 - TEST PIT 1

Depth	Soil Type	Limiting / Restrictive	Secondary Loading Rate
0—12"	Loam		0.63
12—17"	Silt Loam (SL)	Limiting	0.60
17—37"	Silt Loam (SiL)		0.60
37—51"	Silty Clay Loam (SiCL)	Restrictive — High % of Coarse Fragments	0.45
51" - 78"	Silty Clay Loam (SiCL)		0.45

LOT #16 - TEST PIT 2

Depth	Soil Type	Limiting / Restrictive	Secondary Loading Rate
0—9"	Loam		0.63
9—15"	Sandy Loam (SL)	Limiting	0.60
15—27"	Loam		0.63
27—90"	Sandy Clay Loam	Restrictive — High % of Coarse Fragments	0.45

An evaluation to determine the appropriate type and size of system was requested to determine whether the smaller lot sizes (less than 1.5 acres) would have sufficient space to support an appropriate private septic system and the approximate size of said system.

The location of the restrictive layers at both Lot #16 and Lot #20 indicated that above-grade treatment systems will be required, limiting the appropriate systems to a Type II Mound or an above-grade Advanced Enviro-Septic System.

The area that the Secondary Sand Mound or Enviro-Septic system for each lot will require will be dependent on the size of the residence built.

Initial calculations for Lot #20, result in requirements of between 2144 and 3885 square feet of total system area for a residence with standard water features of between 4 and 6 bedrooms. This system can be installed directly at grade, as the site has 37" of vertical separation.

Initial calculations for Lot #16, result in requirements of between 2385 and 4372 square feet of total system area for a residence with standard water features of between 4 and 6 bedrooms. This system will need to have an additional 9" of system sand below the laterals in order to achieve the minimum 36" of vertical separation. This system will also need to be installed at the top of the slope of the lot due to the vicinity of an adjacent water feature.

These sizes are based on a standard home configuration and fittings for a residence . Comprehensive evaluation of the water needs of the home will be required to ensure that the septic system is sized appropriately, once the proposed future development is initiated. These calculations are also based on placement of the septic system in the area adjacent to the applicable Test Pit, should the homeowner select a site elsewhere on the property, additional site evaluation would be required to ensure that the system is designed for the correct soils type.



Lot #	System Type	House Size	Configuration	Length (ft)	Width (ft)	Total Square Footage Required
16	Type II Mound	4 Bedroom	Standard	67	35.5	2379
16	Type II Mound	4 Bedroom	Linear	97	32.5	3153
16	Type II Mound	6 Bedroom	Standard	89.5	36.5	3267
16	Type II Mound	6 Bedroom	Linear	134.5	32.5	4371
16	Enviro-Septic	4 Bedroom	Standard	85	31.1	2644
16	Enviro-Septic	4 Bedroom	Linear	153	31.75	4858
16	Enviro-Septic	6 Bedroom	Standard	85	35.3	3001
16	Enviro-Septic	6 Bedroom	Linear	153	34.1	5217
20	Type II Mound	4 Bedroom	Standard	67	32	2144
20	Type II Mound	4 Bedroom	Linear	101	27.75	2803
20	Type II Mound	6 Bedroom	Standard	89.5	32	2864
20	Type II Mound	6 Bedroom	Linear	140	27.75	3885
20	Enviro-Septic	4 Bedroom	Standard	63	31.1	1959
20	Enviro-Septic	4 Bedroom	Linear	153	27.1	4146
20	Enviro-Septic	6 Bedroom	Standard	63	35.3	2224
20	Enviro-Septic	6 Bedroom	Linear	153	29.2	4468

Based on the site constraints and soils conditions of the proposed subdivision/development of Meadow Ridge Estates, it appears that all sites have adequate space available for above-ground septic treatment systems.

This assumption however, requires that all systems are adequately sized and meet all of the setbacks below per the Saskatchewan Onsite Wastewater Disposal Guide (SOWDG).

Setbacks for Septic Tank:

Basement / Building	3 ft (1m)
Cistern	10 ft (3m)
Cut / Embankment	10 ft (3m)
Ground Water Table	0 ft (0m)
Large Tree	10 ft (3m)
Property Boundary	10 ft (3m)
Walk / Driveway	5 ft (1.5m)
Water Course	30 ft (9m)
Water Source	30 ft (9m)

Setbacks for Type II Mound or Advanced Enviro-Septic System:

Basement / Building	30 ft (9m)
Cistern	N/A
Cut / Embankment	10 ft (3m)
Ground Water Table	5 ft (1.5m)
Large Tree	N/A
Property Boundary	10 ft (3m)
Walk / Driveway	5 ft (1.5m)
Water Course	50 ft (15m)
Water Source	50 ft (15m)

The area intended for the septic system on each property in the Meadow Ridge Estates development should remain as un-touched as possible to ensure that the soil structure is not compromised prior to system installation.





Test Pit 1

Test Pit 2



Test Pit 1



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1786906-1 TP#1 @ 17-37" (C) Sampled By: CLIENT on 20-JUN-16 @ 12:00 Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	23.6 52.4 24.0 Silt loam			% % %	22-JUN-16 22-JUN-16 22-JUN-16 22-JUN-16	23-JUN-16 23-JUN-16 23-JUN-16 23-JUN-16	R3487703 R3487703 R3487703 R3487703
L1786906-2 TP#2 @ 15-27" (C) Sampled By: CLIENT on 20-JUN-16 @ 12:00 Matrix: SOIL Particle Size Analysis:Mini-Pipet Method % Sand (2.0mm - 0.05mm) % Silt (0.05mm - 2um) % Clay (<2um) Texture	37.9 45.1 17.0 Loam			% % %	22-JUN-16 22-JUN-16 22-JUN-16 22-JUN-16	23-JUN-16 23-JUN-16 23-JUN-16 23-JUN-16	R3487703 R3487703 R3487703 R3487703

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Site Meadow Ridge Estates
 Date 20-Jun-16
 Time 7:30pm

Weather Conditions	Sunny	Cloudy	Rainy	Snow		
Temperature	-11 to -15 C	-6 to -10 C	-1 to -5 C	0 to 5 C	6 to 10 C	
	11 to 15 C	16 to 20 C	21 to 25 C	26 to 30 C	31 to 35 C	
GPS Coordinate	N52 05 21.340	W106 27 42.779				
Test Pit Number	1 - Lot #20			dark brown		

Horizon Depth	1 to 12in					
Colour	2.5Y3/2	Very Dark Grayish Brown				
Texture	Loam (L)	Clay Loam (CL)	Silty Loam (SiL)	Sandy Loam (SL)	Loamy Sand (LS)	
	Clay (C)	Sandy Clay (SC)	Sandy Clay Loam (SCL)	Silty Clay (SiC)	Silty Clay Loam (SiCL)	
Structure	Massive	Granular	Platey	Columnar		
	Blocky	Angular Blocky	Sub-Angular Blocky	Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry	Loose	Soft	Hard	Extremely Hard	
	Moist	Loose	Friable	Very Friable	Firm	Very Firm
	Wet	Non-Sticky	Sticky	Very Sticky		
	Plastic					
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Test Pit Number	12 to 17in					
Colour	2.5Y4/3	Olive Brown				
Texture	Loam (L)	Clay Loam (CL)	Silty Clay Loam (SiCL)	Sandy Loam (SL)	Loamy Sand (LS)	
	Clay (C)	Sandy Clay (SC)	Sandy Clay Loam (SCL)	Silty Clay (SiC)	Silt Loam (SiL)	
Structure	Massive	Granular	Platey	Columnar		
	Blocky	Angular Blocky	Sub-Angular Blocky	Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry	Loose	Soft	Hard	Extremely Hard	
	Moist	Loose	Friable	Very Friable	Firm	Very Firm
	Wet	Non-Sticky	Sticky	Very Sticky		
	Plastic					
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Horizon Depth	17 to 37in					
Colour	2.5Y6/4	Light Yellowish Brown				
Texture	Loam (L)	Clay Loam (CL)	Silty Loam (SiL)	Sandy Loam (SL)	Loamy Sand (LS)	
	Clay (C)	Sandy Clay (SC)	Sandy Clay Loam (SCL)	Silty Clay (SiC)	Silty Clay Loam (SiCL)	
Structure	Massive	Granular	Platey	Columnar		
	Blocky	Angular Blocky	Sub-Angular Blocky	Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry	Loose	Soft	Hard	Extremely Hard	
	Moist	Loose	Friable	Very Friable	Firm	Very Firm
	Wet	Non-Sticky	Sticky	Very Sticky		
	Plastic					
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Test Pit Number	1 - Lot #20					
Horizon Depth	37 to 51in					
Colour	2.5Y4/3	Olive Brown				
Texture	Loam (L)	Clay Loam (CL)	Silty Loam (SiL)	Sandy Loam (SL)	Loamy Sand (LS)	
	Clay (C)	Sandy Clay (SC)	Sandy Clay Loam (SCL)	Silty Clay (SiC)	Silty Clay Loam (SiCL)	
Structure	Massive	Granular	Platey	Columnar		
	Blocky	Angular Blocky	Sub-Angular Blocky	Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry	Loose	Soft	Hard	Extremely Hard	
	Moist	Loose	Friable	Very Friable	Firm	Very Firm
	Wet	Non-Sticky	Sticky	Very Sticky		
	Plastic					
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Test Pit Number	51 to 78in					
Colour	2.5Y4/3	Olive Brown				
Texture	Loam (L)	Clay Loam (CL)	Silty Loam (SiL)	Sandy Loam (SL)	Loamy Sand (LS)	
	Clay (C)	Sandy Clay (SC)	Sandy Clay Loam (SCL)	Silty Clay (SiC)	Silty Clay Loam (SiCL)	
Structure	Massive	Granular	Platey	Columnar		
	Blocky	Angular Blocky	Sub-Angular Blocky	Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry	Loose	Soft	Hard	Extremely Hard	
	Moist	Loose	Friable	Very Friable	Firm	Very Firm
	Wet	Non-Sticky	Sticky	Very Sticky		
	Plastic					
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	Fine	Medium	Large			
Mottle Type	Faint	Distinct	Coarse			
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

APPENDIX 7 – TYPE II MOUND: AREA SIZING

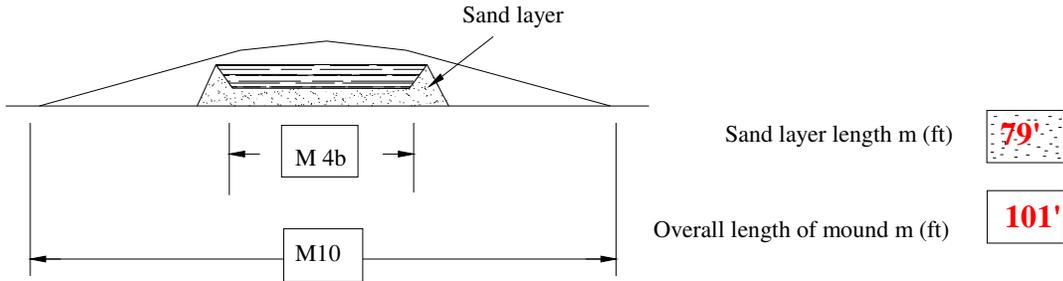
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

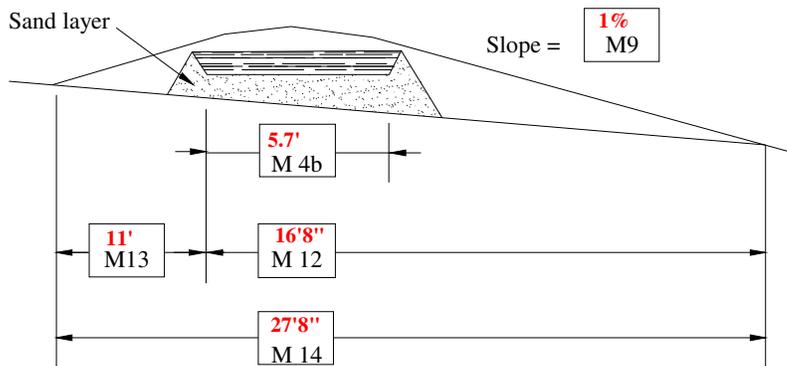
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

450 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate		Treatment Area Required For Sand Layer
450 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	÷	= 450 sq.ft. m ³ (ft ²) M2
<i>From M1 this worksheet.</i>			

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	or	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)		450 sq.ft. m ² (ft ²)	450 sq.ft. m ² (ft ²) M3
<i>The minimum area of the sand Layer is 37.16 m² (400 ft²).</i>		<i>From M2 this worksheet.</i>	<i>The greater of 37.16 m² (400 ft²) or M2.</i>

Step 4) Calculate the length of the sand layer:

Area of Sand Layer		Width of Sand Layer	Length of Sand Layer
450 sq.ft. m ² (ft ²)	÷	5.7 ft m (ft)	= 79 ft m (ft) M4
M4a <i>From M3 this worksheet.</i>		M4b <i>Select a width to a Maximum of 3 m (10 ft).</i>	

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.6 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>450 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.6 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>X</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>525 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
525 sq.ft. m ² (ft ²)	79 ft m (ft)	÷	6.7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.	From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

	Slope of Installation Site
	1 %
	M9

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement		Width of Required Infiltration Area Within Berms		Toe to Toe Width of Mound
27.7 ft m (ft)	or	6.7 ft m (ft)		27.7 ft m (ft)
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.		M10 The greater of M10a or M10b.

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of**:

- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)

M12a
 Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width
m (ft)

M12b
 From M4b worksheet.

m (ft)

M12c
 4:1 Slope Requirement.

or

m (ft)

M12d
 From M8 to this worksheet.

Width of Sand Layer And Downslope Berm

m (ft)

The greater of M12c or M12d.

M12

Step 13) Determine the width of the upslope berm:

Width Based on 4:1 Slope Requirement
 Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

Width of Upslope Berm

m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer	(from M4b this worksheet)	5.7 ft	m (ft)
Length of Sand Layer	(from M4 this worksheet)	79 ft	m (ft)
Slope of Installation Site	(from M9 this worksheet)	1	%
Toe to Toe Width of Mound	(from M10 or M14 this worksheet)	27'8"	m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

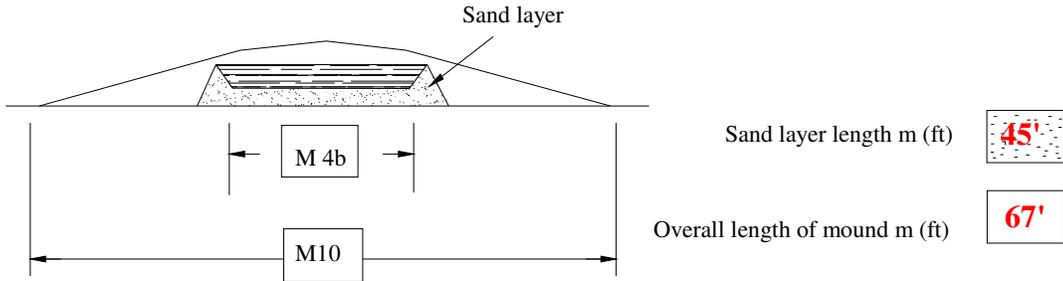
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

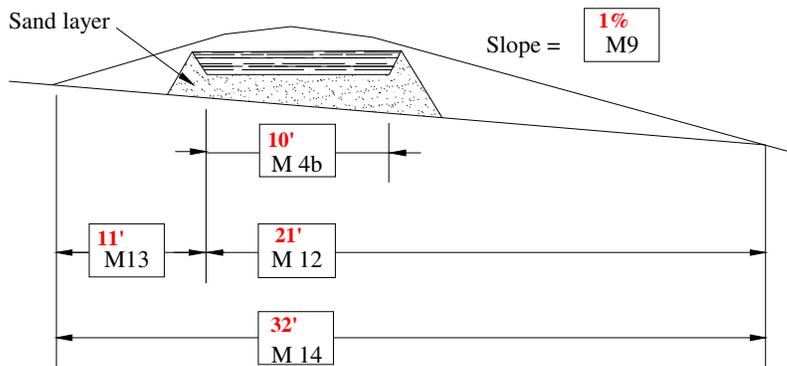
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

450 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate	Treatment Area Required For Sand Layer
450 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	450 sq.ft. m ³ (ft ²)
÷	=	M2

From M1 this worksheet.

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)	450 sq.ft. m ² (ft ²)	450 sq.ft. m ² (ft ²)
or		M3

The minimum area of the sand Layer is 37.16 m² (400 ft²).

From M2 this worksheet.

The greater of 37.16 m² (400 ft²) or M2.

Step 4) Calculate the length of the sand layer:

Area of Sand Layer	Width of Sand Layer	Length of Sand Layer
450 sq.ft. m ² (ft ²)	10 ft m (ft)	45 ft m (ft)
÷	=	M4

M4a
From M3 this worksheet.

M4b
Select a width to a Maximum of 3 m (10 ft).

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.6 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>450 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.6 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>525 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
525 sq.ft. m ² (ft ²)	45 ft m (ft)	÷	11.7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.	From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

Slope of Installation Site

1	%	M9
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Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement	or	Width of Required Infiltration Area Within Berms	Toe to Toe Width of Mound	
32 ft m (ft)		11.7 ft m (ft)	32 ft m (ft)	M10
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.	<i>The greater of M10a or M10b.</i>	

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of:**
 - the width as determined by the 4:1 slope requirement, **or**
 - the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)

M12a
 Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width m (ft)

M12b
 From M4b worksheet.

m (ft)

M12c
 4:1 Slope Requirement.

or

Width Required Infiltration Area Under Sand Layer And Downslope Berm

m (ft)

M12d
 From M8 to this worksheet.

Width of Sand Layer And Downslope Berm

m (ft)

The greater of M12c or M12d.

M12

Step 13) Determine the width of the upslope berm:

Width Based on 4:1 Slope Requirement
 Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

Width of Upslope Berm

m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer	(from M4b this worksheet)	10 ft	m (ft)
Length of Sand Layer	(from M4 this worksheet)	45 ft	m (ft)
Slope of Installation Site	(from M9 this worksheet)	1	%
Toe to Toe Width of Mound	(from M10 or M14 this worksheet)	32 ft	m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

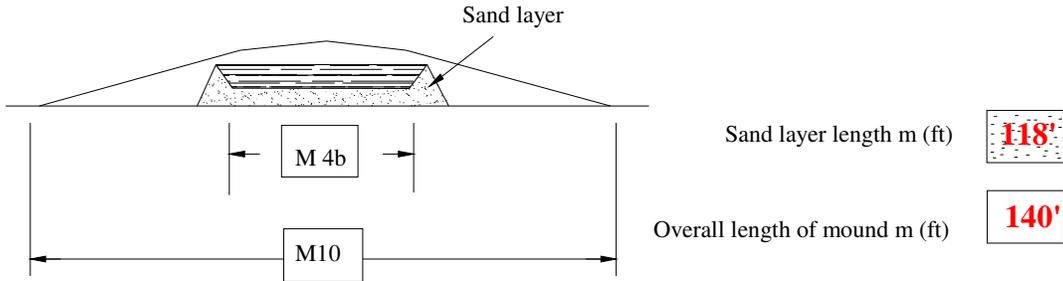
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

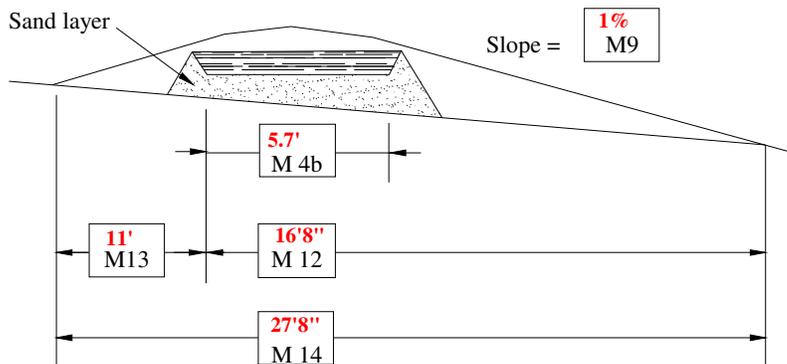
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

675 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate		Treatment Area Required For Sand Layer
675 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	÷	= 675 sq.ft. m ³ (ft ²) M2
<small>From M1 this worksheet.</small>			

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	or	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)		675 sq.ft. m ² (ft ²)	675 sq.ft. m ² (ft ²) M3
<small>The minimum area of the sand Layer is 37.16 m² (400 ft²).</small>		<small>From M2 this worksheet.</small>	<small>The greater of 37.16 m² (400 ft²) or M2.</small>

Step 4) Calculate the length of the sand layer:

Area of Sand Layer		Width of Sand Layer	Length of Sand Layer
675 sq.ft. m ² (ft ²)	÷	5.7 ft m (ft)	= 118 ft m (ft) M4
<small>M4a From M3 this worksheet.</small>		<small>M4b Select a width to a Maximum of 3 m (10 ft).</small>	

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.6 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>675 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.6 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>787.5 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">787.5 sq.ft.</div> m ² (ft ²)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">118 ft</div> m (ft)	÷	=	<div style="border: 1px solid black; padding: 2px; display: inline-block;">6.7 ft</div> m (ft)
<i>(Including Reduction Factors.) From M7 this worksheet.</i>	<i>From M4 this worksheet.</i>			M8

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

	Slope of Installation Site
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div> %
	M9

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement		Width of Required Infiltration Area Within Berms		Toe to Toe Width of Mound
<div style="border: 1px solid black; padding: 2px; display: inline-block;">27.7 ft</div> m (ft)	or	<div style="border: 1px solid black; padding: 2px; display: inline-block;">6.7 ft</div> m (ft)	=	<div style="border: 1px solid black; padding: 2px; display: inline-block;">27.7 ft</div> m (ft)
M10a <i>4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.</i>		M10b <i>From M8 this worksheet.</i>		M10
				<i>The greater of M10a or M10b.</i>

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of**:

- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)

M12a

Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width m (ft)

M12b

From M4b worksheet.

m (ft)

M12c

4:1 Slope Requirement.

or

m (ft)

M12d

From M8 to this worksheet.

m (ft)

M12

The greater of M12c or M12d.

Step 13) Determine the width of the upslope berm:

Width of Upslope Berm

Width Based on 4:1 Slope Requirement

Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer	<i>(from M4b this worksheet)</i>	5.7 ft	m (ft)
Length of Sand Layer	<i>(from M4 this worksheet)</i>	118 ft	m (ft)
Slope of Installation Site	<i>(from M9 this worksheet)</i>	1	%
Toe to Toe Width of Mound	<i>(from M10 or M14 this worksheet)</i>	27'8"	m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

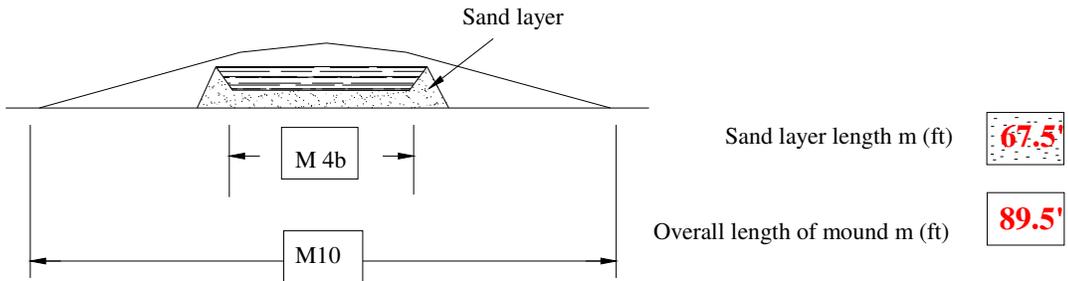
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Use only Imperial units of measurement throughout.

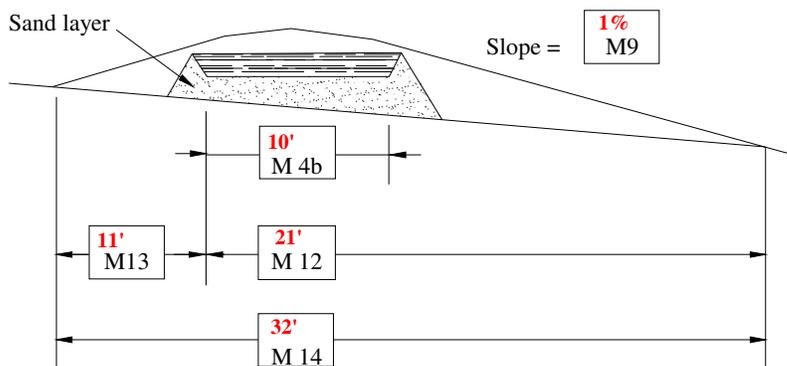
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

675 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate	Treatment Area Required For Sand Layer
675 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	675 sq.ft. m ³ (ft ²)
÷	=	M2

From M1 this worksheet.

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)	675 sq.ft. m ² (ft ²)	675 sq.ft. m ² (ft ²)
or		M3

The minimum area of the sand Layer is 37.16 m² (400 ft²).

The greater of 37.16 m² (400 ft²) or M2.

Step 4) Calculate the length of the sand layer:

Area of Sand Layer	Width of Sand Layer	Length of Sand Layer
675 sq.ft. m ² (ft ²)	10 ft m (ft)	67.5 ft m (ft)
÷	=	M4

M4a
From M3 this worksheet.

M4b
Select a width to a Maximum of 3 m (10 ft).

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.6 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

Expected Volume of Sewage per Day <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 675 Imp. Gallons L/day (gal/day) </div> <i>From M1 this worksheet.</i>	\div	Soil Effluent Loading Rate <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 0.6 sq.ft. L/m² (gal/ft²) per day </div> <i>From M5 this worksheet.</i>	$=$	Preliminary Infiltration Area <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1125 sq.ft m² (ft²) </div> <i>(Required for Soil. Before Reduction Factors.)</i>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

Infiltration Area Required for Soil <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1125 sq.ft m² (ft²) </div> <i>(Before Reduction Factors.) From M6 this worksheet.</i>	\times	Reduced Area Factor <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 0.7 </div> <i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i>	$=$	Required Infiltration Area <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 787.5 sq.ft. m² (ft²) </div> <i>(Including Reduction Factors.)</i>
--	----------	---	-----	---

M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">787.5 sq.ft.</div> m ² (ft ²)

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

Slope of Installation Site

1	%	M9
---	---	-----------

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

<p>Toe to Toe Width Based on 4:1 Slope Requirement</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">32 ft</div> m (ft)
--

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of:**
 - the width as determined by the 4:1 slope requirement, **or**
 - the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)

M12a

Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width m (ft)

M12b

From M4b worksheet.

m (ft)

or

m (ft)

M12d

From M8 to this worksheet.

m (ft)

M12

M12c

4:1 Slope Requirement.

The greater of M12c or M12d.

Step 13) Determine the width of the upslope berm:

Width of Upslope Berm

Width Based on 4:1 Slope Requirement

Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer	(from M4b this worksheet)	10 ft	m (ft)
Length of Sand Layer	(from M4 this worksheet)	67.5 ft	m (ft)
Slope of Installation Site	(from M9 this worksheet)	1	%
Toe to Toe Width of Mound	(from M10 or M14 this worksheet)	32 ft	m (ft)

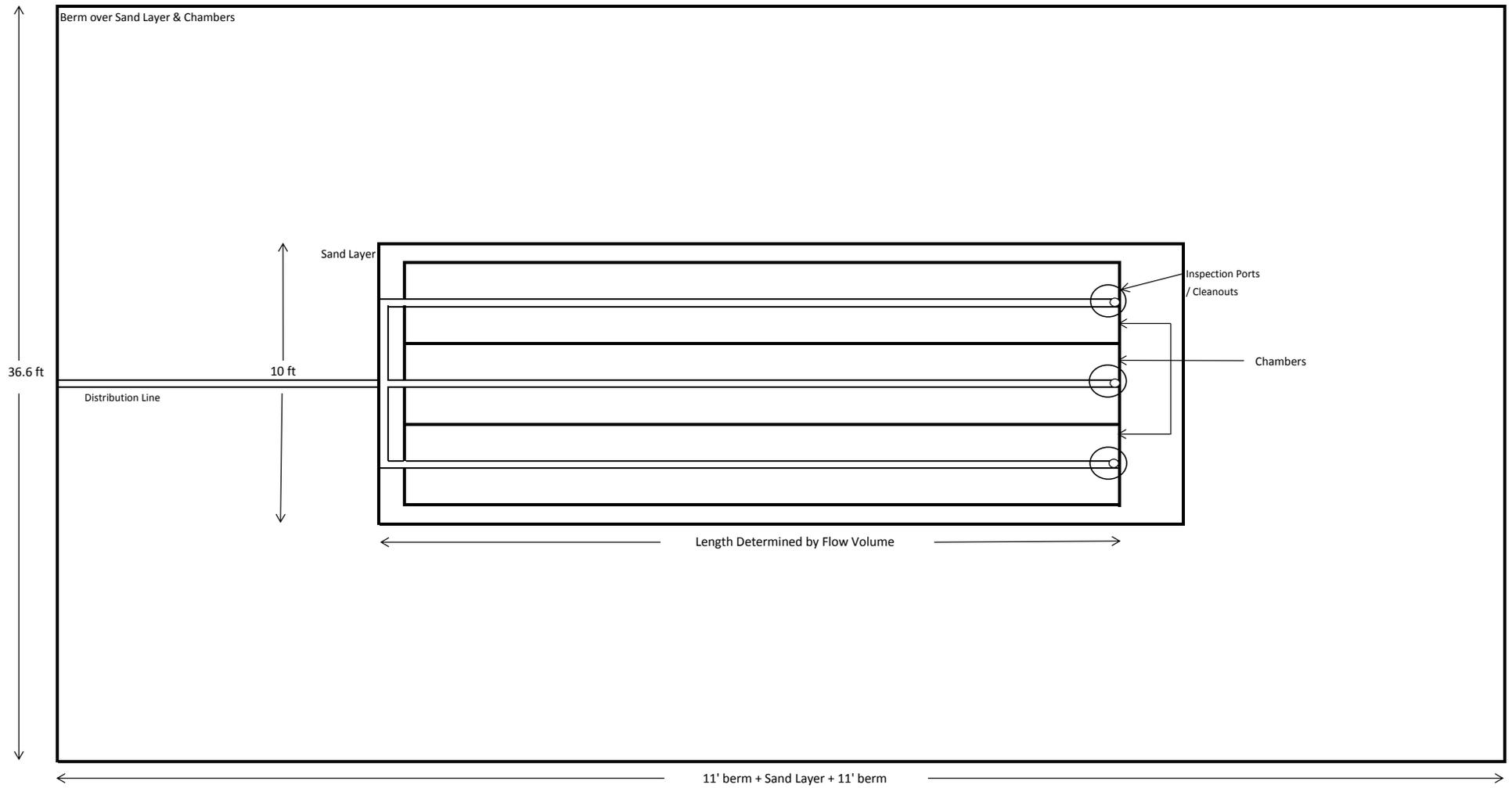
Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

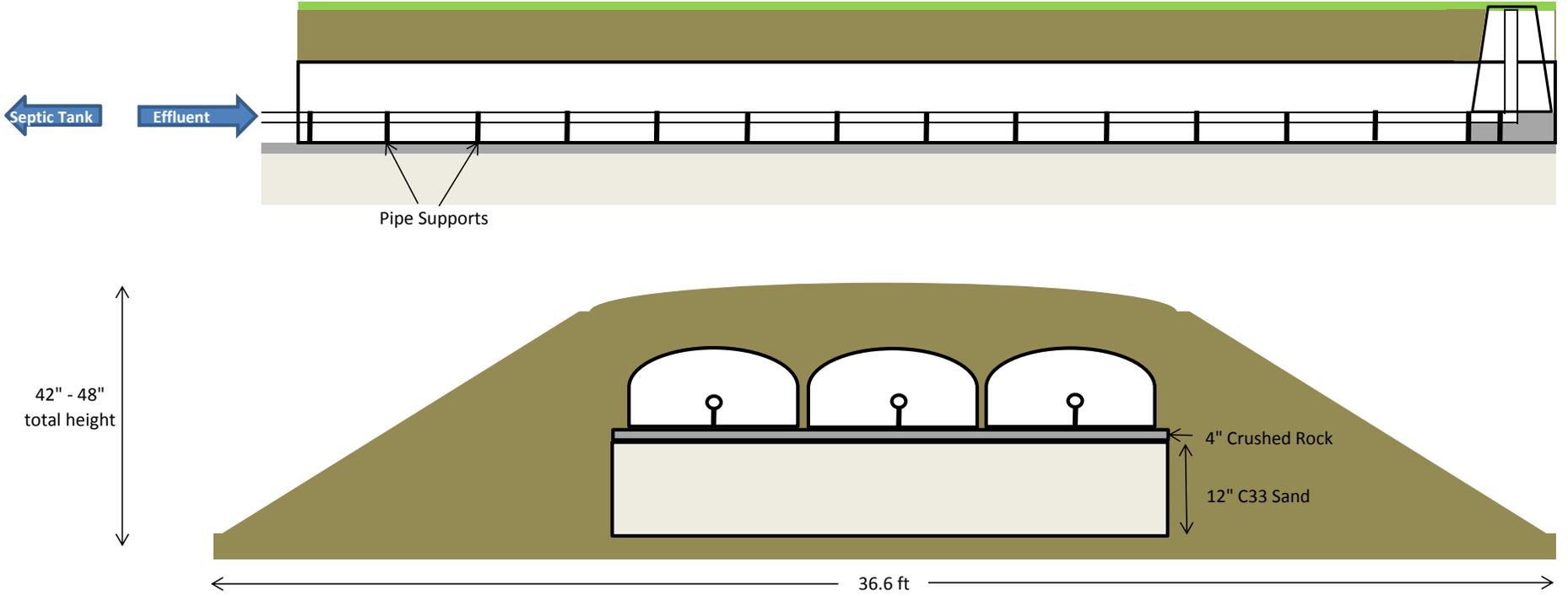
Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

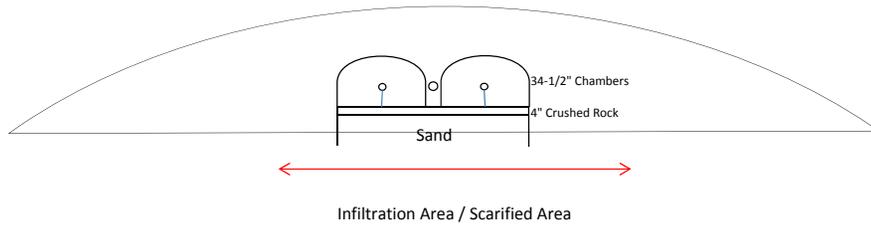
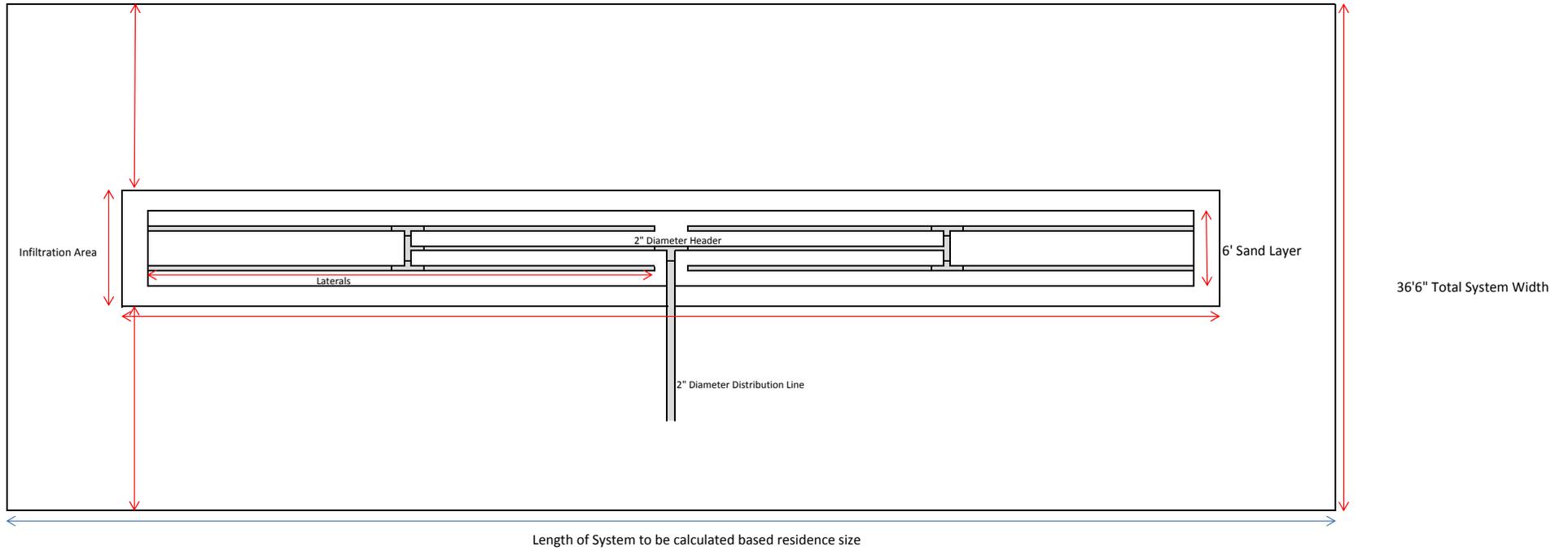
Sand Mound - Lot #20



Sand Mound Cutaways



Lot # 20 Linear Loading Design Template



Site Meadow Ridge Estates
 Date 20-Jun-16
 Time 7:30pm

Weather Conditions	Sunny	Cloudy	Rainy	Snow		
Temperature	-11 to -15 C	-6 to -10 C	-1 to -5 C	0 to 5 C	6 to 10 C	
	11 to 15 C	16 to 20 C	21 to 25 C	26 to 30 C	31 to 35 C	
GPS Coordinate	N 52 05 26.820	W106 27 36.492				
Test Pit Number	2 - Lot# 16					

Horizon Depth	1 to 9in					
Colour	2.5Y3/1	Very Dark Gray				
Texture	Loam (L) Clay (C)	Clay Loam (CL) Sandy Clay (SC)	Silty Loam (SIL) Sandy Clay Loam (SCL)	Sandy Loam (SL) Silty Clay (SiC)	Loamy Sand (LS) Silty Clay Loam (SiCL)	
Structure	Massive Blocky	Granular Angular Blocky	Platy Sub-Angular Blocky	Columnar Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry Moist Wet Plastic	Loose Loose Non-Sticky	Soft Friable Sticky	Hard Very Friable Very Sticky	Extremely Hard Firm	Very Firm
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Horizon Depth	9 to 15in					
Colour	2.5Y4/4	Olive Brown				
Texture	Loam (L) Clay (C)	Clay Loam (CL) Sandy Clay (SC)	Silty Loam (SIL) Sandy Clay Loam (SCL)	Sandy Loam (SL) Silty Clay (SiC)	Loamy Sand (LS) Silty Clay Loam (SiCL)	
Structure	Massive Blocky	Granular Angular Blocky	Platy Sub-Angular Blocky	Columnar Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry Moist Wet Plastic	Loose Loose Non-Sticky	Soft Friable Sticky	Hard Very Friable Very Sticky	Extremely Hard Firm	Very Firm
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Horizon Depth	15 to 27in					
Colour	2.5Y4/3	Olive Brown				
Texture	Loam (L) Clay (C)	Clay Loam (CL) Sandy Clay (SC)	Silty Loam (SIL) Sandy Clay Loam (SCL)	Sandy Loam (SL) Silty Clay (SiC)	Loamy Sand (LS) Silty Clay Loam (SiCL)	
Structure	Massive Blocky	Granular Angular Blocky	Platy Sub-Angular Blocky	Columnar Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry Moist Wet Plastic	Loose Loose Non-Sticky	Soft Friable Sticky	Hard Very Friable Very Sticky	Extremely Hard Firm	Very Firm
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

Comments

Horizon Depth	27 to 90in					
Colour	2.5Y4/2	Dark Grayish Brown				
Texture	Loam (L) Clay (C)	Clay Loam (CL) Sandy Clay (SC)	Silty Loam (SIL) Sandy Clay Loam (SCL)	Sandy Loam (SL) Silty Clay (SiC)	Loamy Sand (LS) Silty Clay Loam (SiCL)	
Structure	Massive Blocky	Granular Angular Blocky	Platy Sub-Angular Blocky	Columnar Prismatic		
Ped Size	None	Fine	Medium	Coarse		
Moisture/Consistence	Dry Moist Wet Plastic	Loose Loose Non-Sticky	Soft Friable Sticky	Hard Very Friable Very Sticky	Extremely Hard Firm	Very Firm
Roots	None	Some	Many			
Root Size	N/A	Fine	Medium	Coarse		
% Coarse Fragments	0 to 1%	2 to 5%	5 to 10%	11 to 15%	15 to 20%	20% +
Effervescence	None	Weak	Strong			
Precipitates	None	Yellow	White	Orange	Red	
Mottles	None	Few	Some	Many		
Mottle Size	None	Fine	Medium	Large		
Mottle Type	None	Faint	Distinct	Coarse		
Inclusions	None	Coal Flecks	Coal Chunks	Shale Stones	Sandstones	
Staining	None	Colours				

APPENDIX 7 – TYPE II MOUND: AREA SIZING

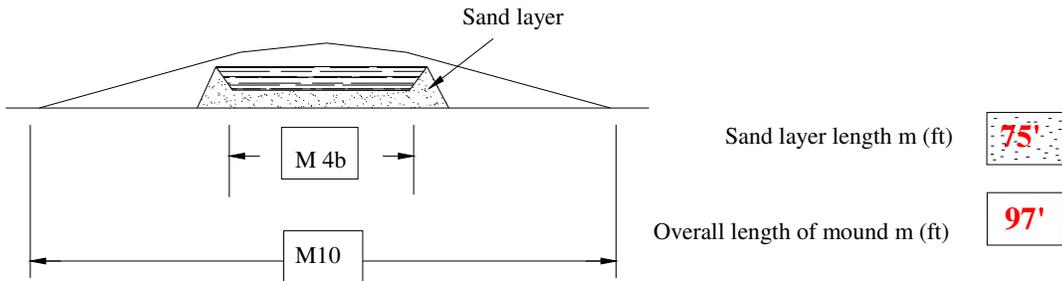
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

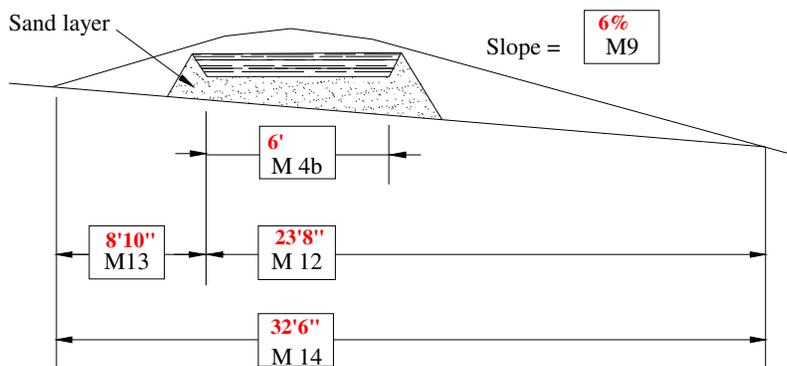
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

450 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate		Treatment Area Required For Sand Layer
450 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	÷	= 450 sq.ft. m ³ (ft ²) M2
<i>From M1 this worksheet.</i>			

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	or	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)		450 sq.ft. m ² (ft ²)	450 sq.ft. m ² (ft ²) M3
<i>The minimum area of the sand Layer is 37.16 m² (400 ft²).</i>		<i>From M2 this worksheet.</i>	<i>The greater of 37.16 m² (400 ft²) or M2.</i>

Step 4) Calculate the length of the sand layer:

Area of Sand Layer		Width of Sand Layer	Length of Sand Layer
450 sq.ft. m ² (ft ²)	÷	6.0 ft m (ft)	= 75 ft m (ft) M4
M4a <i>From M3 this worksheet.</i>		M4b <i>Select a width to a Maximum of 3 m (10 ft).</i>	

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.60 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>450 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.60 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>525 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
525 sq.ft. m ² (ft ²)	75ft m (ft)	÷	7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.	From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

Slope of Installation Site

6	%	M9
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Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement	or	Width of Required Infiltration Area Within Berms	Toe to Toe Width of Mound
m (ft)		m (ft)	m (ft)
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.	M10 The greater of M10a or M10b.

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of:**

- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)
17'8"

M12a

Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width
6 m (ft)

M12b

From M4b worksheet.

23 ft 8 in m (ft)

M12c

4:1 Slope Requirement.

or

7 ft m (ft)

M12d

From M8 to this worksheet.

Width of Sand Layer And Downslope Berm

23 ft 8 in m (ft)

M12

The greater of M12c or M12d.

Step 13) Determine the width of the upslope berm:

Width of Upslope Berm

Width Based on 4:1 Slope Requirement

Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

8 ft 10 in m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

23 ft 8 in m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

8 ft 10 in m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

32'6" m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer (from **M4b** this worksheet)

6.0 ft m (ft)

Length of Sand Layer (from **M4** this worksheet)

75 ft m (ft)

Slope of Installation Site (from **M9** this worksheet)

6 %

Toe to Toe Width of Mound (from **M10** or **M14** this worksheet)

32'6" m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

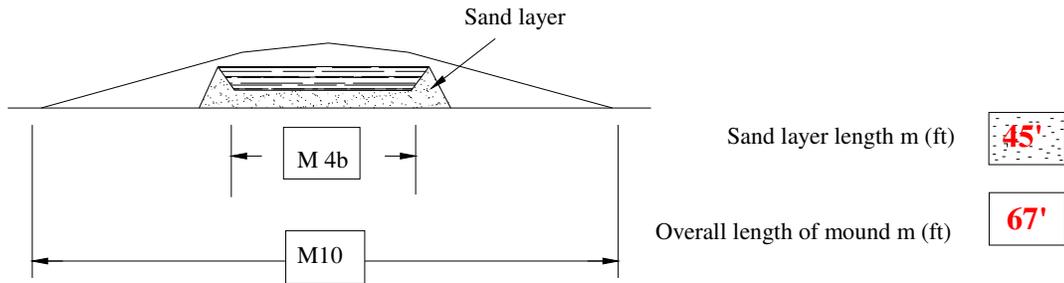
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

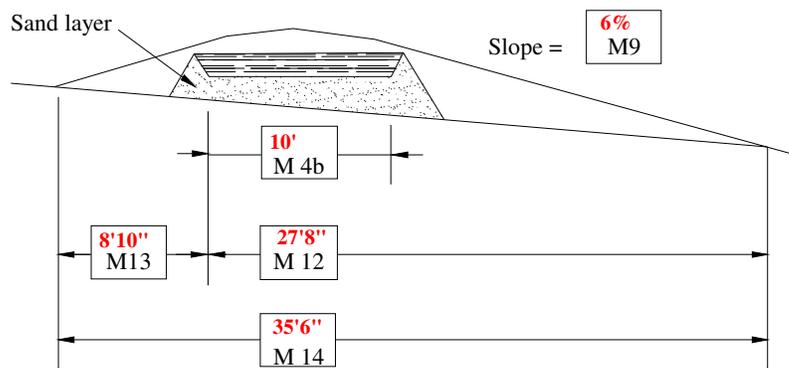
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

450 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate	Treatment Area Required For Sand Layer
450 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	450 sq.ft. m ³ (ft ²)
÷	=	M2

From M1 this worksheet.

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)	450 sq.ft. m ² (ft ²)	450 sq.ft. m ² (ft ²)
or		M3

The minimum area of the sand Layer is 37.16 m² (400 ft²).

From M2 this worksheet.

The greater of 37.16 m² (400 ft²) or M2.

Step 4) Calculate the length of the sand layer:

Area of Sand Layer	Width of Sand Layer	Length of Sand Layer
450 sq.ft. m ² (ft ²)	10 ft m (ft)	45 ft m (ft)
÷	=	M4

M4a
From M3 this worksheet.

M4b
Select a width to a Maximum of 3 m (10 ft).

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.60 Imp Gal / sq.ft.
 L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>450 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.60 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>750 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>525 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area		Length of Sand Layer	=	Width of Required Infiltration Area	
525 sq.ft. m ² (ft ²)	÷	45 ft m (ft)	=	11.7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.		From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

Slope of Installation Site	
6 %	M9

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement	or	Width of Required Infiltration Area Within Berms		Toe to Toe Width of Mound	
m (ft)	or	m (ft)		m (ft)	M10
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.		The greater of M10a or M10b.	

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of:**
 - the width as determined by the 4:1 slope requirement, **or**
 - the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)
17 ft 8 in

M12a
 Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width
10 ft m (ft)

M12b
 From M4b worksheet.

27 ft 8 in m (ft)

M12c
 4:1 Slope Requirement.

or

11.7 in m (ft)

M12d

From M8 to this worksheet.

Width of Sand Layer And Downslope Berm

27 ft 8 in m (ft)

The greater of M12c or M12d.

M12

Step 13) Determine the width of the upslope berm:

Width Based on 4:1 Slope Requirement
 Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

Width of Upslope Berm

8 ft 10 in m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

27 ft 8 in m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

8 ft 10 in m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

36 ft 6 in m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer (from **M4b** this worksheet)

10 ft m (ft)

Length of Sand Layer (from **M4** this worksheet)

45 ft m (ft)

Slope of Installation Site (from **M9** this worksheet)

6 %

Toe to Toe Width of Mound (from **M10** or **M14** this worksheet)

35 ft 6 in m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

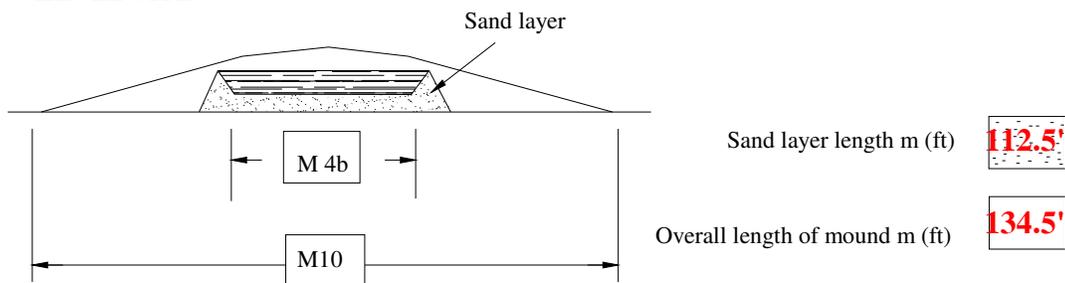
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

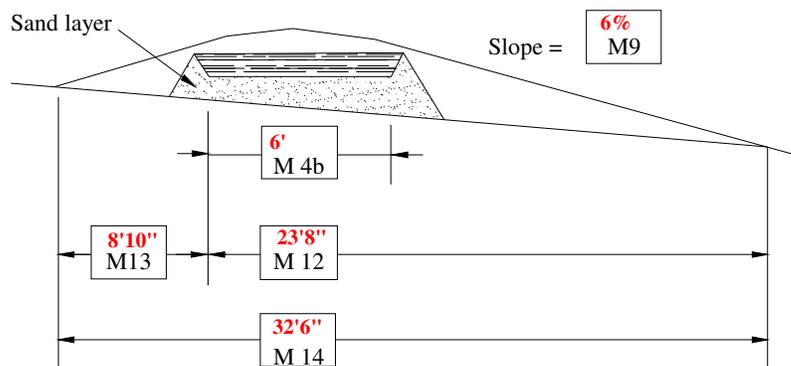
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

675 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate	Treatment Area Required For Sand Layer
675 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	675 sq.ft. m ³ (ft ²)
÷	=	M2

From M1 this worksheet.

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)	675 sq.ft. m ² (ft ²)	675 sq.ft. m ² (ft ²)
or		M3

The minimum area of the sand Layer is 37.16 m² (400 ft²).

The greater of 37.16 m² (400 ft²) or M2.

Step 4) Calculate the length of the sand layer:

Area of Sand Layer	Width of Sand Layer	Length of Sand Layer
675 sq.ft. m ² (ft ²)	6.0 ft m (ft)	112.5 ft m (ft)
÷	=	M4

M4a
From M3 this worksheet.

M4b
Select a width to a Maximum of 3 m (10 ft).

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.60 Imp Gal / sq.ft.
L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>675 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.60 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.)</i> <i>From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>787.5 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
787.5 sq.ft. m ² (ft ²)	1125 ft m (ft)	÷	7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.	From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

	Slope of Installation Site
	6 %
	M9

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement		Width of Required Infiltration Area Within Berms		Toe to Toe Width of Mound
m (ft)	or	m (ft)		m (ft)
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.		M10 The greater of M10a or M10b.

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of**:

- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)
17'8"

M12a
 Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width
6 m (ft)

M12b
 From M4b worksheet.

23 ft 8 in m (ft)

M12c
 4:1 Slope Requirement.

or

7 ft m (ft)

M12d

From M8 to this worksheet.

23 ft 8 in m (ft)

The greater of M12c or M12d.

M12

Step 13) Determine the width of the upslope berm:

Width of Upslope Berm

Width Based on 4:1 Slope Requirement
 Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

8 ft 10 in m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

23 ft 8 in m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

8 ft 10 in m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

32'6" m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer (from **M4b** this worksheet)

6.0 ft m (ft)

Length of Sand Layer (from **M4** this worksheet)

112.5 ft m (ft)

Slope of Installation Site (from **M9** this worksheet)

6 %

Toe to Toe Width of Mound (from **M10** or **M14** this worksheet)

32'6" m (ft)

Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

APPENDIX 7 – TYPE II MOUND: AREA SIZING

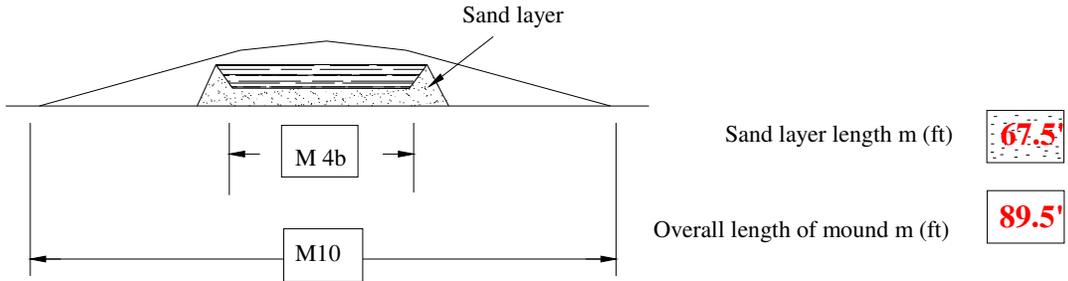
This worksheet is for use to: size the sand layer, mound base area and berm dimensions as required in the construction of a Type II mound.
 It can be used for the design of a Type II mound.

Use only Imperial units of measurement throughout.

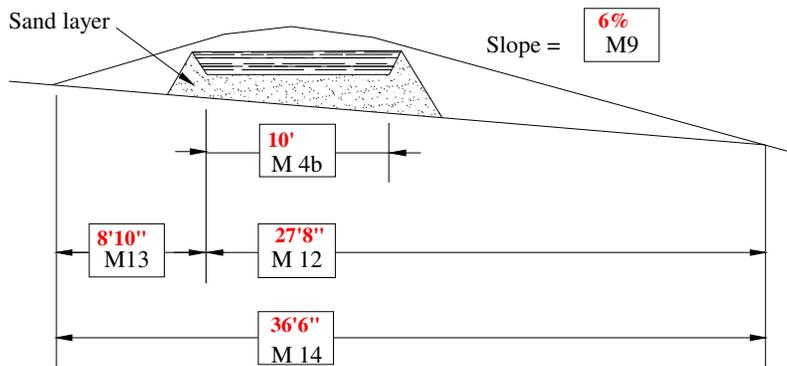
Use the following Worksheet to determine the minimum required dimensions for a Type II mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

TYPE II MOUND DIMENSIONS

LEVEL SITE



SLOPING SITE



APPENDIX 7 – TYPE II MOUND: AREA SIZING

WORKSHEET 1 – TYPE II MOUND

Step 1) Determine the expected volume of sewage per day:
 Note: Use Appendix 2 as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

675 Imp.Gallons/Day L/day (gal/day) **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day	Sand Layer Effluent Loading Rate	Treatment Area Required For Sand Layer
675 Imp. Gallons m ³ (gal)	50 L/ m² (or 1 gal/ft²) per day	675 sq.ft. m ³ (ft ²)
÷	=	M2
<i>From M1 this worksheet.</i>		

Step 3) Determine the minimum allowable sand layer area:

Minimum Sand Layer	Area of Sand Layer for Treatment	Area of Sand Layer
37.16 m² (400 ft²)	675 sq.ft. m ² (ft ²)	675 sq.ft. m ² (ft ²)
or		M3
<i>The minimum area of the sand Layer is 37.16 m² (400 ft²).</i>	<i>From M2 this worksheet.</i>	<i>The greater of 37.16 m² (400 ft²) or M2.</i>

Step 4) Calculate the length of the sand layer:

Area of Sand Layer	Width of Sand Layer	Length of Sand Layer
675 sq.ft. m ² (ft ²)	10 ft m (ft)	67.5 ft m (ft)
÷	=	M4
M4a <i>From M3 this worksheet.</i>	M4b <i>Select a width to a Maximum of 3 m (10 ft).</i>	

Note: The width of the sand layer will influence the total width of the Type II mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required. See Table A.15

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 5) Determine the (design) soil effluent loading rate:

Soil Effluent Loading Rate

Note: Effluent loading rate can be determined from soil texture Classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates for soils between 5 and 120 minutes per inch perc rates.

0.60 Imp Gal / sq.ft.
L/m² (gal/ft²) per day

M5

Step 6) Calculate the preliminary infiltration area of soil before area reduction factors:

<p>Expected Volume of Sewage per Day</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>675 Imp. Gallons L/day (gal/day)</p> </div> <p><i>From M1 this worksheet.</i></p>	<p>÷</p>	<p>Soil Effluent Loading Rate</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.60 sq.ft. L/m² (gal/ft²) per day</p> </div> <p><i>From M5 this worksheet.</i></p>	<p>=</p>	<p>Preliminary Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Required for Soil. Before Reduction Factors.)</i></p>
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M6

Step 7) Calculate the required infiltration area including allowed area reduction factors:

<p>Infiltration Area Required for Soil</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>1125 sq.ft m² (ft²)</p> </div> <p><i>(Before Reduction Factors.) From M6 this worksheet.</i></p>	<p>×</p>	<p>Reduced Area Factor</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>0.7</p> </div> <p><i>A reduction of up to 30% (1 – 0.70) can be applied to Type II mounds.</i></p>	<p>=</p>	<p>Required Infiltration Area</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>787.5 sq.ft. m² (ft²)</p> </div> <p><i>(Including Reduction Factors.)</i></p>
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M7

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 8) Calculate the required width of the infiltration area:

Required Infiltration Area	Length of Sand Layer		Width of Required Infiltration Area	
787.5 sq.ft. m ² (ft ²)	67.5 ft m (ft)	÷	11.7 ft m (ft)	M8
(Including Reduction Factors.) From M7 this worksheet.	From M4 this worksheet.			

Step 9) Determine the slope criteria of the installation site:

*If the slope of the installation site exceeds 1%, proceed to Step 12.
 If the slope is 1% or less, proceed to Step 10.*

Slope of Installation Site

6	%	M9
---	---	-----------

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or Less, Use Steps 10 to 11

Step 10) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 4:1 Slope Requirement	or	Width of Required Infiltration Area Within Berms	Toe to Toe Width of Mound
m (ft)		m (ft)	m (ft)
M10a 4:1 Slope Requirement Refer to Berm Dimensions Diagram this Worksheet, or determine by calculation.		M10b From M8 this worksheet.	M10 The greater of M10a or M10b.

Step 11) Proceed to Step 16:

Steps 12 to 15 are used only for installations where the slope exceeds 1%.

APPENDIX 7 – TYPE II MOUND: AREA SIZING

For Slopes Exceeding 1%, Use Steps 12 to 15

Step 12) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the **greater of:**

- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based on 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 m (ft)
17'8"

M12a

Refer to Berm Dimensions Diagram this worksheet.

+

Sand Layer Width
10' m (ft)

M12b

From M4b worksheet.

27'8" m (ft)

M12c

4:1 Slope Requirement.

or

11.7' m (ft)

M12d

From M8 to this worksheet.

27'8" m (ft)

M12

The greater of M12c or M12d.

Step 13) Determine the width of the upslope berm:

Width of Upslope Berm

Width Based on 4:1 Slope Requirement

Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

8'10" m (ft)

M13

Step 14) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm

27'8" m (ft)

From M12 this worksheet.

+

Width of Upslope Berm

8'10" m (ft)

From M13 this worksheet.

=

Toe to Toe Width of Mound

36'6" m (ft)

M10

Step 15) Proceed to Step 16:

APPENDIX 7 – TYPE II MOUND: AREA SIZING

Step 16) Summarize the information:

Width of Sand Layer	(from M4b this worksheet)	10 ft	m (ft)
Length of Sand Layer	(from M4 this worksheet)	67.5 ft	m (ft)
Slope of Installation Site	(from M9 this worksheet)	6	%
Toe to Toe Width of Mound	(from M10 or M14 this worksheet)	36'6"	m (ft)

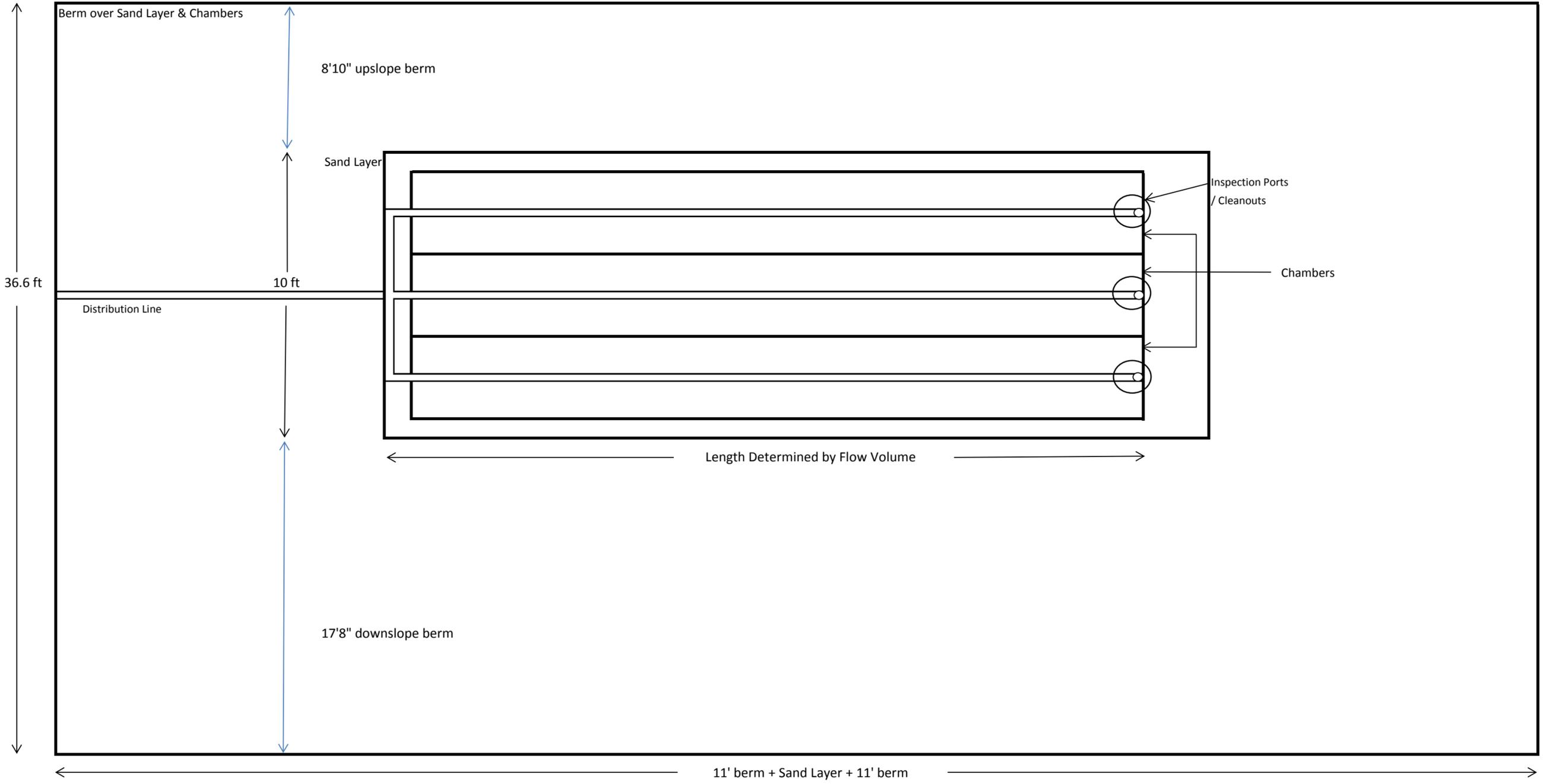
Step 17) Complete the berm diagram dimensions on first page.

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

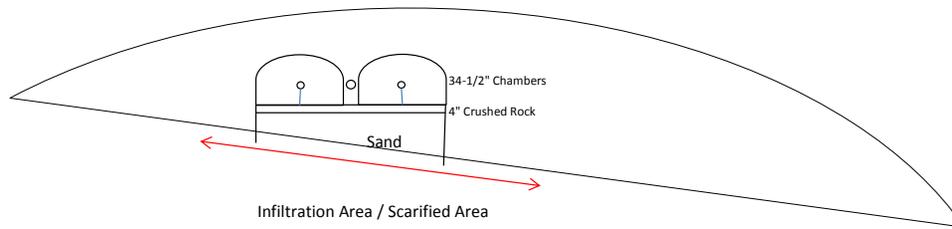
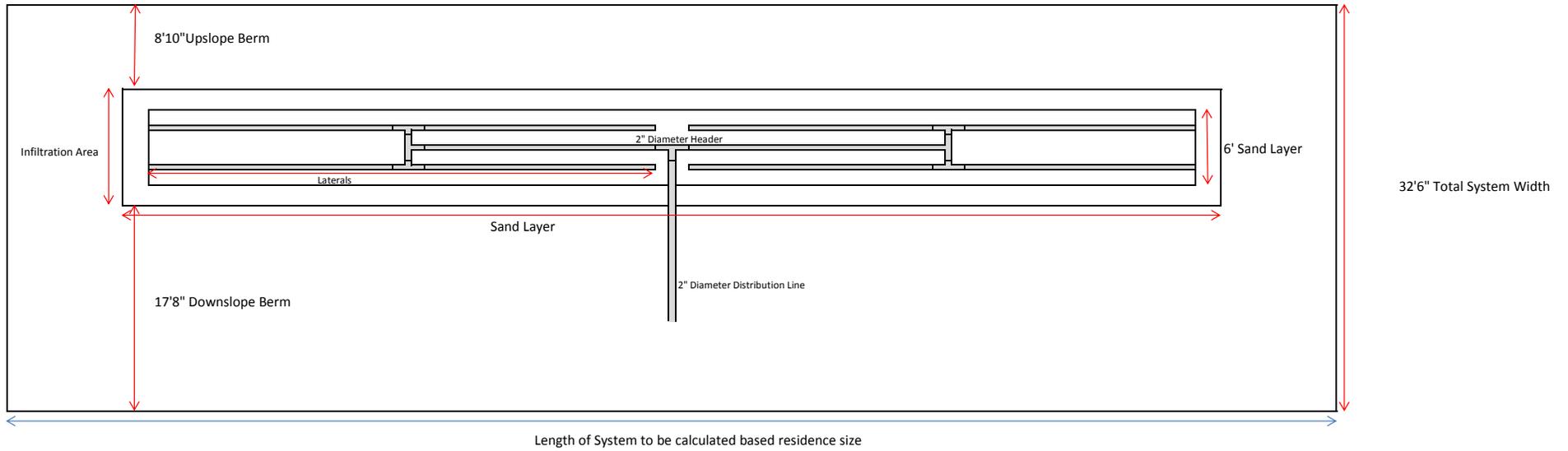
Step 18) Confirm the design complies with the Guide.

*This worksheet does NOT consider all the requirements of the Guide.
Please work safely and follow safe practices near trenches and open excavations.*

Sand Mound - Lot #16



Lot # 16 Linear Loading Design Template



Enviro-Septic Worksheet - Saskatchewan

Step 1	volume of wastewater	
calculate the peak daily flow (number of bedrooms x 1.5 x 75)		<input type="text" value="450"/> imp gal

step 2	total number of Enviro-Septic pipes	
A) peak daily flow (step 1) ÷ 20 = minimum number of pipes	<input type="text" value="22.5"/>	2a
B) round up to the nearest whole number evenly divisible by the number of rows selected in step 4	<input type="text" value="24"/>	2b

step 3	number of pipes per row	
choose the number of pipes per row (up to a maximum of 6)	<input type="text" value="6"/>	

step 4	number of rows	
number of rows selected (step 2B ÷ step 3)	<input type="text" value="4"/>	

step 5	loading rate	
soil loading rate (in gallons/ft ² /day) (from appendix 15 of SOWDG)	<input type="text" value="0.6"/>	

step 6	infiltrative surface area	
total surface area required. (step 1 ÷ step 5 x .7) (the .7 reduction is allowed for secondary treatment)	<input type="text" value="525"/> ft ²	

step 7	length of field bed	
length of total surface area required (step 3 x 10 + 3)	<input type="text" value="63"/> ft	

step 8	width of field bed	
width of total surface area required (step 6 ÷ step 7)	<input type="text" value="8.3"/> ft	

Enviro-Septic Worksheet - Saskatchewan page 2

step 9 spacing of pipes

distance from centre of pipe to centre of pipe (step 8 ÷ step 4)

step 10 spacing of pipes from edge of field bed

space required from centre of pipe to edge of field bed (step 9 ÷ 2) min 1.5 ft

step 11 **ONLY IF STEP 10 IS LESS THAN 1.5'

$1.5' - \underset{\text{answer from step 10}}{\text{1.1}} = \underset{\text{11a}}{\text{0.4}} \times 2 = \underset{\text{11a}}{\text{0.8}}$

$\underset{\text{answer from 11a}}{\text{0.8}} + \underset{\text{8.3 ft}}{\text{step 8}} = \underset{\text{11b}}{\text{9.1}}$ new total width of bed

** adjust total square footage of area. Step 7 X 11b ^{11c}

step 12 volume of sand

((greater of answers from step 6 or 11c) x 2.3 ÷ 27) ^{12A} yds³

step 13 inlet end caps

total number of inlet end caps (= step 4)

step 14 outlet end caps

total number of outlet caps (= step 4)

step 15 pipe couplings

total number of pipe couplings (step 2B - step 4)

Enviro-Septic Worksheet - Saskatchewan

Step 1	volume of wastewater	
calculate the peak daily flow (number of bedrooms x 1.5 x 75)		<input type="text" value="675"/> imp gal

step 2	total number of Enviro-Septic pipes	
A) peak daily flow (step 1) ÷ 20 = minimum number of pipes	<input type="text" value="33.75"/>	2a
B) round up to the nearest whole number evenly divisible by the number of rows selected in step 4	<input type="text" value="36"/>	2b

step 3	number of pipes per row	
choose the number of pipes per row (up to a maximum of 6)	<input type="text" value="6"/>	

step 4	number of rows	
number of rows selected (step 2B ÷ step 3)	<input type="text" value="6"/>	

step 5	loading rate	
soil loading rate (in gallons/ft ² /day) (from appendix 15 of SOWDG)	<input type="text" value="0.6"/>	

step 6	infiltrative surface area	
total surface area required. (step 1 ÷ step 5 x .7) (the .7 reduction is allowed for secondary treatment)	<input type="text" value="787.5"/> ft ²	

step 7	length of field bed	
length of total surface area required (step 3 x 10 + 3)	<input type="text" value="63"/> ft	

step 8	width of field bed	
width of total surface area required (step 6 ÷ step 7)	<input type="text" value="12.5"/> ft	

Enviro-Septic Worksheet - Saskatchewan page 2

step 9	spacing of pipes	
	distance from centre of pipe to centre of pipe (step 8 ÷ step 4)	<input style="width: 80%;" type="text" value="2.1"/>

step 10	spacing of pipes from edge of field bed	
	space required from centre of pipe to edge of field bed (step 9 ÷ 2)	<input style="width: 80%;" type="text" value="1.1"/> min 1.5 ft

step 11	**ONLY IF STEP 10 IS LESS THAN 1.5'	
	$1.5' - $ <input style="width: 80%;" type="text" value="1.1"/> $ = $ <input style="width: 80%;" type="text" value="0.4"/> $ \times 2 = $ <input style="width: 80%;" type="text" value="0.8"/>	11a
	<small>answer from step 10</small>	
	<input style="width: 80%;" type="text" value="0.8"/> $ + $ 12.5 ft $ + $ step 8 $= $ <input style="width: 80%;" type="text" value="13.3"/>	11b
	<small>answer from 11a</small>	<small>new total width of bed</small>
	** adjust total square footage of area. Step 7 X 11b	<input style="width: 80%;" type="text" value="838"/>
		11c

step 12	volume of sand	
	((greater of answers from step 6 or 11c) x 2.3 ÷ 27)	<input style="width: 80%;" type="text" value="72"/> yds ³
		12A

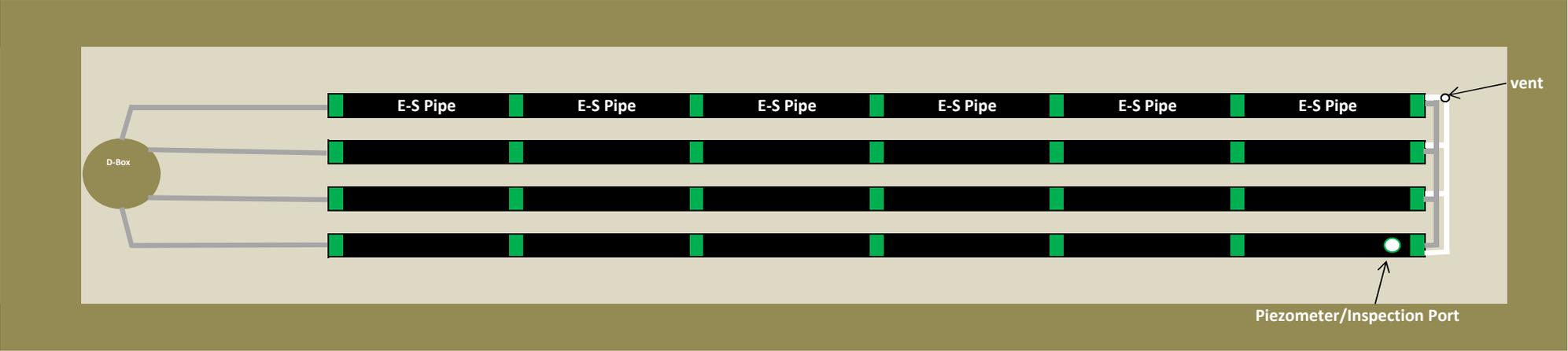
step 13	inlet end caps	
	total number of inlet end caps (= step 4)	<input style="width: 80%;" type="text" value="6"/>

step 14	outlet end caps	
	total number of outlet caps (= step 4)	<input style="width: 80%;" type="text" value="6"/>

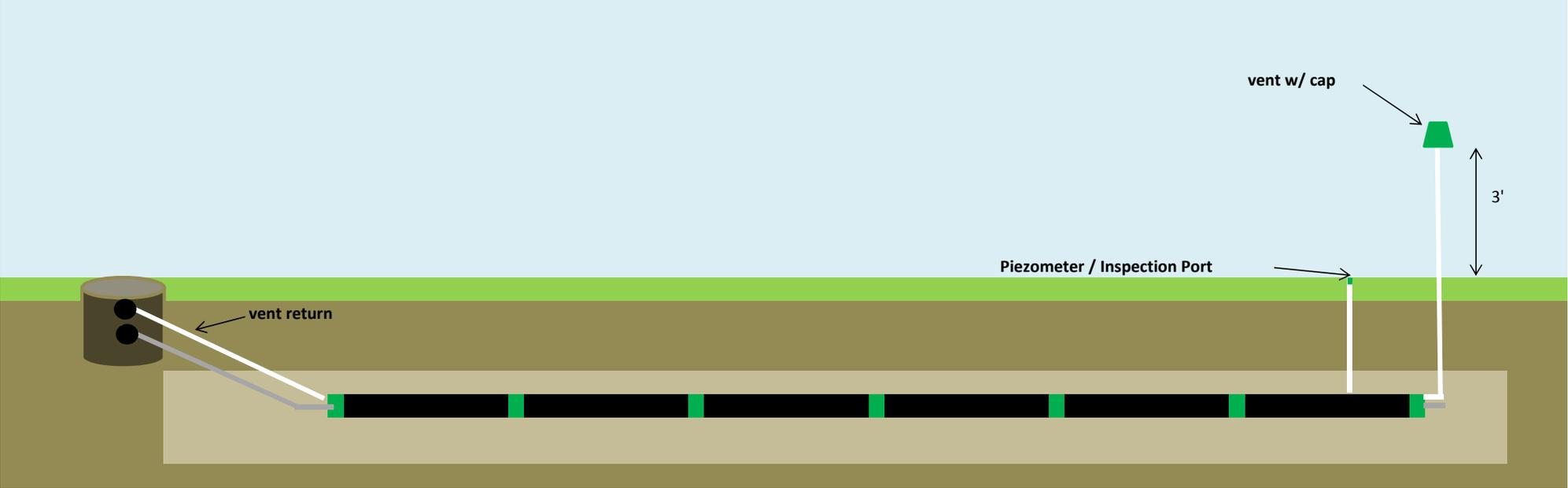
step 15	pipe couplings	
	total number of pipe couplings (step 2B - step 4)	<input style="width: 80%;" type="text" value="30"/>

4 Bedroom Enviro-Septic

Aerial Drawing



Elevation Drawing



Enviro-Septic® Wastewater Treatment and Dispersal System

Enviro-Septic® is manufactured in 10 foot lengths, but may easily be cut to any length with a sharp knife in order to work around site limitations or obstacles. It can also be bent up to 90 degrees allowing a variety of useful system shapes such as curved, trapezoidal, L, S, or U-shaped. Enviro-Septic®'s flexibility allows for more pleasing landscaping possibilities as pipe sections can be installed to match terrain, even sloping sites, reducing the amount of fill required and eliminating unsightly septic mounds. Pipe sections, couplings and end caps are all available as part of the system's components.



Enviro-Septic® installed in a below-ground seepage bed.
Daily Flow Rate is 2,700 litres



Enviro-Septic® installed in a below-ground seepage bed.
Daily Flow Rate is 1,080 litres

Type of Installations

The Enviro-Septic® System can be used for all these types of installation:

- Trench based drain (leach) field
- Sand Lined Trench drain (leach) field
- Above-ground drain (leach) field (a.k.a raised mound)
- Seepage or Area Bed drain (leach) field
- Sloping land using anyone of the above drain (leach) field types.

The pipes have a 30 centimeter diameter and are 3 meters long. Their interior volume can receive up to 220 liters of wastewater and each 3 meter long pipe will treat 90 litres per day of residential strength sewage wastewater.



Enviro-Septic[®] System Components

There are 5 main components to the Enviro-Septic[®] System and these are:

1. Pre-Tank
2. Distribution to the Enviro-Septic[®] pipes
3. Enviro-Septic[®] pipes
4. System Sand
5. Air Ventilation Pipeworks.



Pre-Tank for the Enviro-Septic® System

The raw sewage leaves the building and enter a 2 compartment Pre-Tank configured the same as a septic tank with a retention time of not less than 2 days and not more than 3 days of the design daily sewage flow. The design daily sewage flow is determined in accordance to regulations. No effluent filter is required.

Distribution to the Enviro-Septic® Pipes

If the Pre-Tank effluent will enter a Distribution Box or pipe header to distribute the effluent evenly into each row of Enviro-Septic® pipes. If using a Distribution Box, flow equalizers should be used.

If the effluent needs to flow up to the Enviro-Septic® pipes, then a pump would used to deliver the effluent to the Distribution Box or header.

Enviro-Septic® Pipes

Placing the Enviro-Septic® pipes in a series of rows, they are joined together with a non-mechanical coupling and end caps placed at the end of each row.



System Sand for the Enviro-Septic® System

Place the Enviro-Septic® pipes on a 300 mm bed of sand that meets the sand specifications needed for the Enviro-Septic® pipes, place the system sand between the Enviro-Septic® pipes and a 100 mm layer of system sand on top. Backfill with appropriate top soil and grass.

Air Ventilation for the Enviro-Septic® System

Placing an air vent pipe at the end of the rows using a header allow atmospheric air to enter and flow through the Enviro-Septic® pipes, Distribution Box, Pre-Tank and the building vent stack.

This allows for air to maintain the aerobic treatment, biomat layer in the Enviro-Septic® pipes and system sand.

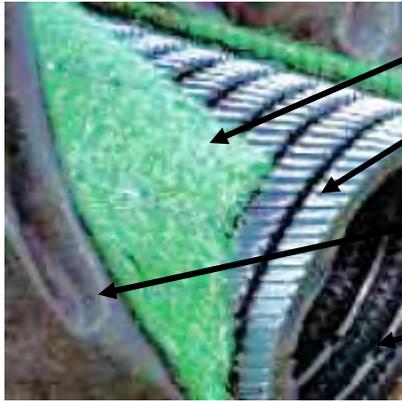
Surprisingly, the aerobic air mixture and dilution of the septic tank off gases and the venting system does not create an odour problem.



Distribution Box Pump Line from Pre-Tank

System Sand

Enviro-Septic® pipe is made from 3 unique component layers:



Random Fibre for attached growth for the biomat.

Ribbed Enviro-Septic® pipe to allow for air flow through pipe and outside of pipe through to the random fibre and system sand.

Geo-textile Fabric to wrap and hold random fibre in place and allow water and air to pass through unrestricted.

360 degrees around inside of the pipe, holes to allow water and air to pass through

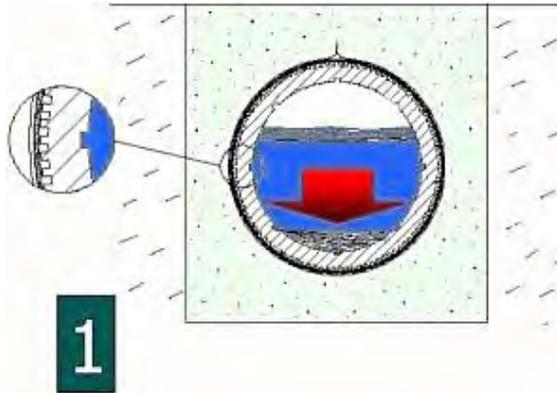
1. A cylinder-shaped pipe, made out of high density polyethylene, with a corrugated design proven to increase the surface of thermal exchange. The pipe is also perforated to let the effluent out. Each of the outer wall ridges is notched, creating a unique airflow system essential to the propagation of the bacteria responsible for the treatment of wastewater.
2. A non-braided polypropylene fiber membrane covers the pipe and facilitates an oxygen supply supporting the biomass.
3. A non-woven, polypropylene geotextile fabric, sewn around the fibrous membrane, keeps the earth particles from migrating into the pipe.

Unlike other leaching systems, effluent that enters Enviro-Septic® does not directly contact the underlying soil. Instead materials present in the effluent are contained and treated inside the Enviro-Septic pipe, reducing the potential for contamination of soil and groundwater. The system allows the drainage of wastewater into the ground through an infiltration process. By protecting the infiltration surface, the Enviro-Septic® systems helps protect the environment. Their unique internal design treats wastewater, protecting drainage fields and the water table.

Operating Principles

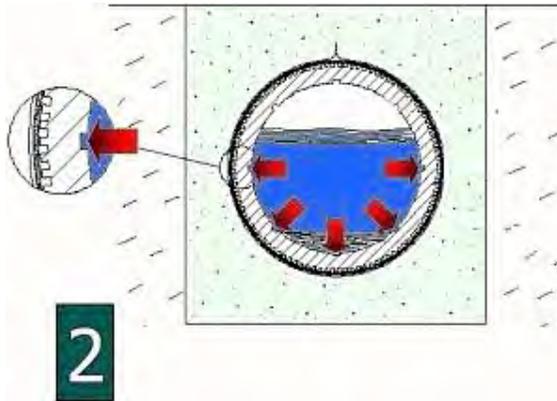
When they leave a septic tank, the effluents contain suspended material, neutral-solubility fats, as well as other pollutants. The presence of these elements end up causing the clogging of classic leaching fields. The Enviro-Septic® system facilitates the treatment of pollutants by using the natural contribution of bacteria in a more efficient way. The bacterial activity around the membranes allow for the breaking up of suspended material that went through the septic tank. The combination of air flow and liquid level variations (day/night) into the pipe increase the effectiveness of bacterial activity in the membranes. Over time, these events lead the system to an interior balance, prolonging the lifespan of the pipes and allowing the system to treat the wastewater before it is evacuated into the environment.

4-Step Process

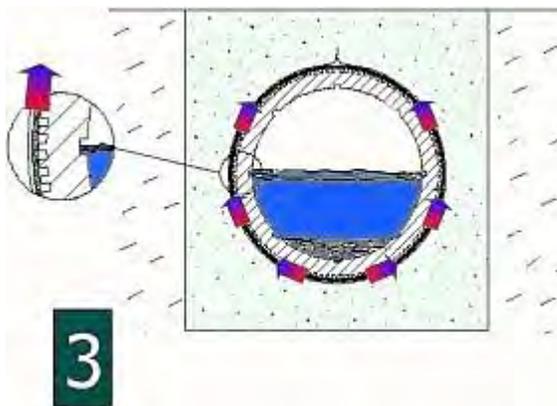


1. As the effluent enters the Enviro-Septic™ pipe, it is cooled down to ground temperature. The ridges and oblique notches facilitate the process while providing an increased surface for thermal exchange when compared to classic systems. The system acts in a way that could resemble that of an underground radiator.

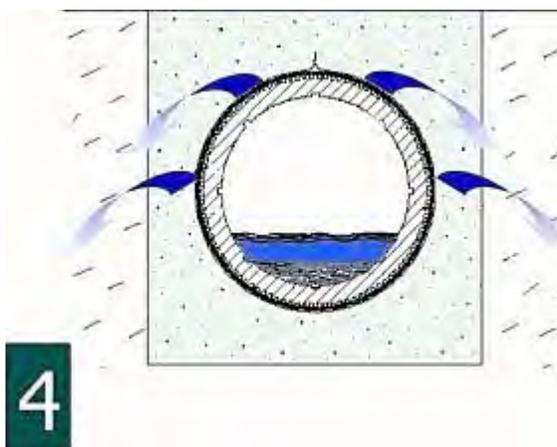
The cooling down then promotes the separation of fats and suspended material. The lighter solid particles float up to the surface as scum and the heavier ones sink to the bottom of the pipe to form sludge. These solids are held inside the pipe to prevent the clogging of the reception surface of the soil.



2. The effluent then leaves the pipe through its perforations. They then work their way through the fiber membrane where bacteria has settled to treat an additional amount of suspended solids. The fiber membrane is conditioned by the variation of the liquid level inside the pipe, caused by the peak periods of water use. This aerobic/anaerobic conditioning promotes the propagation of bacteria responsible for the treatment process. This process is similar to the rotting of a wood picket fence. The rotting always starts at ground level where the humidity level change daily and where the bacteria is most active.



3. The effluent then moves through the geotextile membrane, where another layer of bacteria is formed on the inner surface. By capillary action, the geotextile membrane and the surrounding sand gather and distribute the effluents on the pipe circumference, which then facilitates the evacuation of water into the ground. This process can be compared to an oil lamp wick that automatically fuels the lighted tip.



4. The treatment continues as the effluent seeps through the filtering sand surrounding the Enviro-Septic™ pipe. When the water finally reaches the soil, it is almost completely free of contaminants. It then infiltrates the soil much more easily as it is evacuated into the environment.

Enviro-Septic[®] Septic Systems:

- cost less
- last longer
- require less area
- install more quickly
- use recycled plastics
- assist natural processes
- adjust easily to sites and slopes
- use sand instead of crushed stone

For a Quote or More Information, please Contact Us

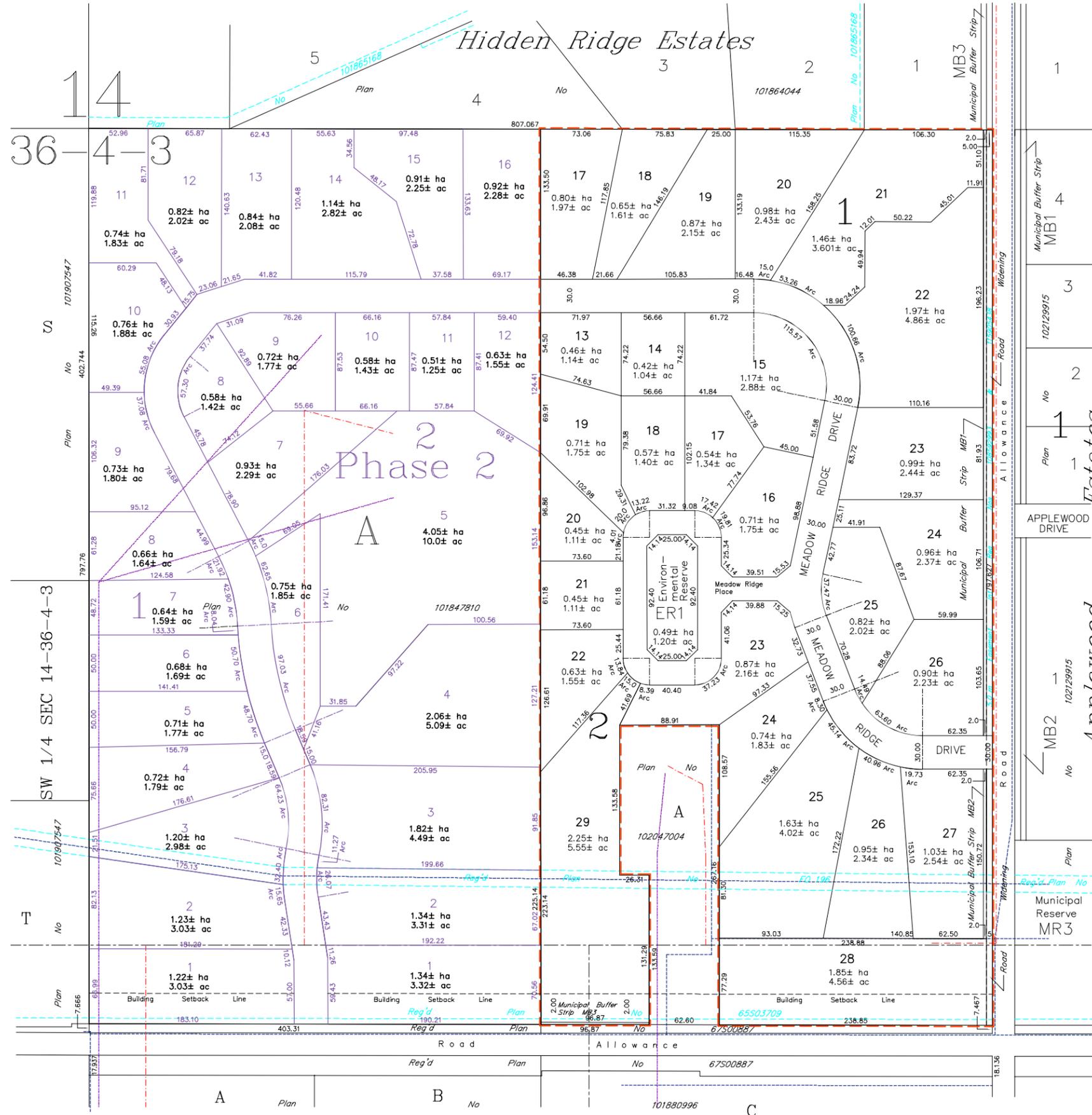
Email sales@frpmfg.com

Call Toll Free 1-866-722-6246

Appendix X

**Plan of Proposed Subdivision
(PPS)**

Webb Surveys



PLAN OF PROPOSED
SUBDIVISION OF
S.E. 1/4 SEC. 14-
TWP. 36- RGE. 4-
W. 3rd MER.
RM OF CORMAN
PARK NO 344
SASKATCHEWAN
SCALE 1:2000

Dimensions and elevations shown are in metres and decimals thereof.
Elevations are Geodetic.

Portion of this plan to be subdivided is outlined in red with a bold,
dashed line and contains 30.16± ha (74.52± ac) which includes
2.89± ha (7.13± ac) for roadway.
Dimensions shown are approximate and may vary from the final plan
of survey by 1± metre.

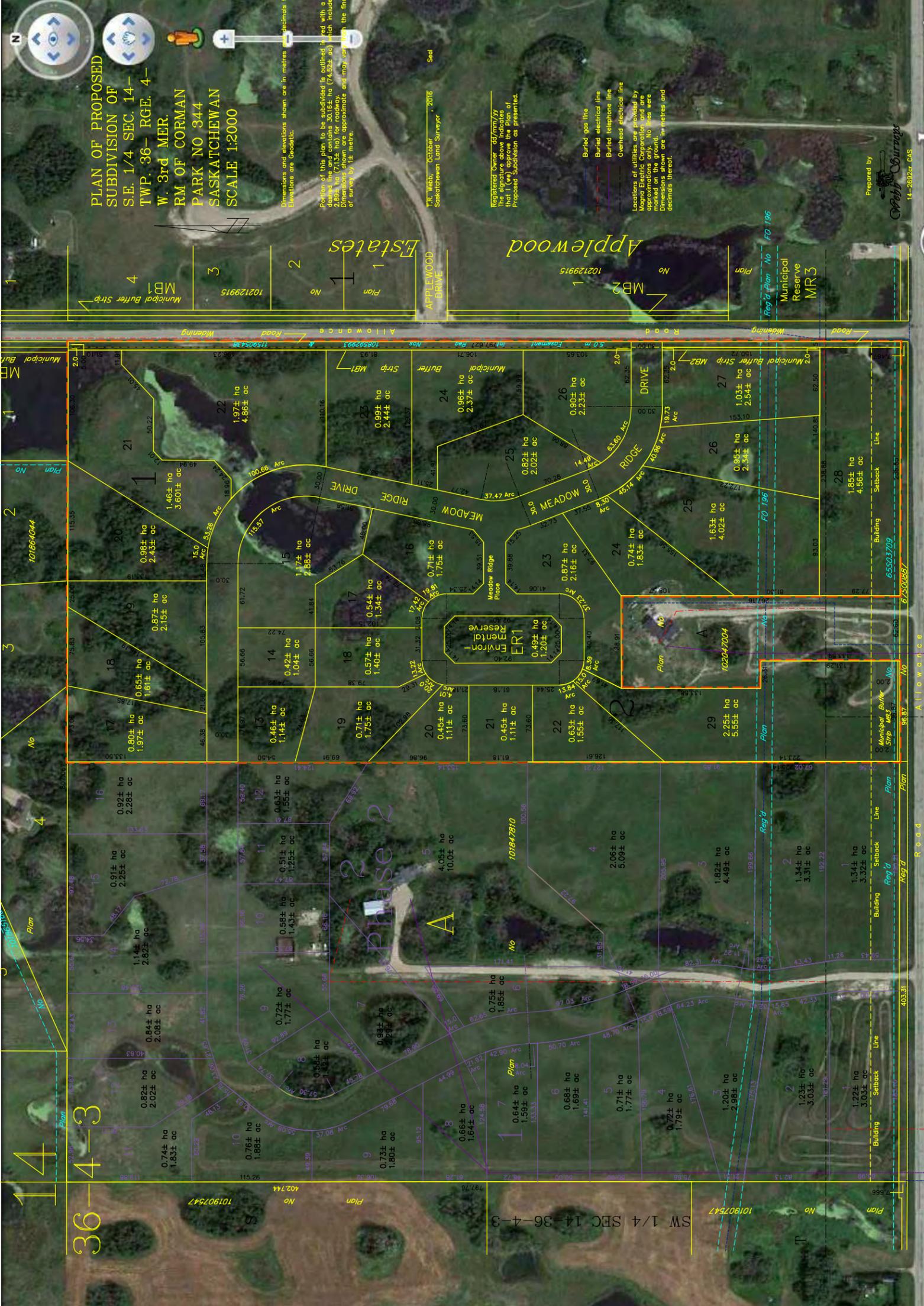
T.R. Webb, November 2016 Seal
Saskatchewan Land Surveyor

Registered Owner dd/mm/yy
The signature above indicates
that I (we) approve the Plan of
Proposed Subdivision as presented.

- Buried gas line
- Buried electrical line
- Buried telephone line
- Overhead electrical line

Locations of utilities are provided by
Magna Electric Corporation and are
approximations only. No lines were
marked on the ground.
Dimensions shown are in metres and
decimals thereof.

Prepared by
Webb Surveys
14-2692r CAS



PLAN OF PROPOSED
SUBDIVISION OF
S.E. 1/4 SEC. 14-
TWP. 36- RGE. 4-
W. 3rd MER.
RM OF CORMAN
PARK NO 344
SASKATCHEWAN
SCALE 1:2000

Dimensions and elevations shown are in metres and decimals thereof.
Elevations are Geodetic.

Portion of this plan to be subdivided is outlined in red with a bold
dashed line and contains 30.16± ha (74.52± ac) which includes
2.89± ha (7.13± ac) for roadway.
The signature above indicates that I (we) approve the Plan of
Proposed Subdivision as presented.

J.R. Webb, October
Saskatchewan Land Surveyor, 2016

Registered Office: 387/10th St
The signature above indicates
that I (we) approve the Plan of
Proposed Subdivision as presented.

Locations of utilities are provided by
Magna Electric Corporation and are
approximations only. No eas were
shown for these utilities.
Dimensions shown are in metres and
decimals thereof.

- Buried gas line
- Buried electrical line
- Buried telephone line
- Overhead electrical line
- Overhead telephone line

Prepared by
Cory Curragh
14-2682r CAS

Google earth

Imagery Date: 8/24/2015 52°05'20.79" N 106°27'45.76" W elev 1768 ft eye alt 6258 ft

Hidden Ridge Estates

Applewood Estates

36-4-3

SW 1/4 SEC 14-36-4-3

1042 ft

Block	Lot	ha	ac
1	1	1.22	3.03
	2	1.23	3.03
	3	1.2	2.98
	4	0.72	1.79
	5	0.71	1.77
	6	0.68	1.69
	7	0.64	1.59
	8	0.66	1.64
	9	0.73	1.8
	10	0.76	1.88
	11	0.74	1.83
	12	0.82	2.02
	13	0.84	2.08
	14	1.14	2.82
	15	0.91	2.25
	16	0.92	2.28
	17	0.8	1.97
	18	0.65	1.61
	19	0.87	2.15
	20	0.98	2.43
	21	1.46	3.6
	22	1.97	4.86
	23	0.99	2.44
	24	0.96	2.37
	25	0.82	2.02
	26	0.9	2.23
2	1	1.34	3.32
	2	1.34	3.31
	3	1.82	4.49
	4	2.06	5.09
	5	4.05	10
	6	0.75	1.85
	7	0.93	2.29
	8	0.58	1.42
	9	0.72	1.77
	10	0.58	1.43
	11	0.51	1.25
	12	0.63	1.55
	13	0.46	1.14
	14	0.42	1.04
	15	1.17	2.88
	16	0.71	1.75
	17	0.54	1.34
	18	0.57	1.4
	19	0.71	1.75
	20	0.45	1.11
	21	0.45	1.11
	22	0.63	1.55
	23	0.87	2.16
	24	0.74	1.83
	25	1.63	4.02
	26	0.95	2.34
	27	1.03	2.54
	28	1.85	4.56
	29	2.26	5.6
		55.07	136.05

Appendix Y

**Summary of Property Servicing
Worksheets**

Comprehensive Development Review Reports

Comprehensive Development Review reports (CDR) are required by municipal bylaw to be prepared and submitted in support of any application to rezone or subdivide land for multi-parcel country residential, commercial, industrial, or intensive recreational purposes and also where residential development in excess of three building sites on a ¼ section is proposed on severed parcels within agricultural districts.

CDRs are intended to provide the Council and Administration with a complete overview of how the proposed development successfully integrates itself physically, socially, and financially with existing properties, owners, and development in the immediate vicinity. In addition to addressing matters of land use integration, a CDR is intended to assess the capacity of the supportive municipal and provincial infrastructure as it relates the demand created by the proposed development.

This document is provided as a companion to the Official Community Plan and Zoning Bylaw and is intended to itemize and summarize the various topics to be covered within the report but is not intended to remove or replace these established bylaws. The original bylaws, policies, and regulations should be consulted for official interpretations.

The geographical area and extent of analysis considered within the CDR will be determined by the Municipality based upon the complexity of the application and the potential offsite effects of the proposed development but at a minimum must encompass all adjacent properties including all properties contained within existing adjacent multi-parcel subdivisions.

The attached checklist is intended to guide the preparation of the CDR by identifying the key topics to be included within the report. The report itself should be broken into two sections the first section containing the bulk of the written narrative regarding the proposed development followed by a series of appendices comprising all of the technical reports commissioned as part of the technical review and records of consultation with the public and with the various regulatory bodies. The headings provided in the checklist maybe utilized for the report headings.

The first section of the CDR should summarize the proposed development and draw conclusions from the technical reports and consultations appended to the end of the report. These technical reports are not simply required as a means of satisfying the municipal submission requirements but they should provide the basis for supporting the development concept. It is the expectation of the Municipality that the evolution of the development concept would follow closely with the acquisition of technical information through these required studies. It is important that the studies are appended to the final report but it is equally important that the applicant makes reference to these reports within the first section of the report clearly summarizing the recommendations from these reports and communicating to the Council how the development concept has responded to these technical conclusions.

Once a preliminary draft CDR has been prepared, you are encouraged to submit it to the Planning Department so an initial review may be undertaken prior to submitting the final report.

Upon conclusion of the initial review and as part of the formal submission for Council's consideration, the following materials are required to be submitted:

1. A minimum of 13 bound copies of the final CDR;
2. A single complete digital copy of the CDR in a PDF format;
3. A digital copy of an Executive Summary (1st section of the report) in a PDF format capable of being posted on the municipal website or distributed electronically;
4. A completed rezoning application along with the applicable fee if required;
5. An AutoCAD file containing the Plan of Proposed Subdivision if required; and
6. A signed and dated Plan of Proposed Subdivision in a PDF format.

In addition to the items identified above, the attached Summary of Servicing Worksheet should be completed and submitted with the final report. This worksheet is intended to provide a summary and specifications for the property servicing. Cost estimates are to be included for the purposes of calculating the financial security that will be required within a development and servicing agreement.

CDR Report Checklist

1. Background:

Introduction:

This section of the report is intended to briefly and generally introduce the intended development to familiarize the reader with what is proposed.

- What is the purpose of the development?
- What is the proposed land use including anticipated zoning?
- How many lots are proposed within the development?
- Provide a general summary or description of the development.
- Briefly introduce/identify any unique or significant aspects of the development that are pertinent for reviewing the application.

Land use context:

This section focuses on identifying the legal and geographic location of the proposed development, existing development in the subject area, as well as identifying the opportunities and challenges created for existing land uses by the proposed development.

- Where is the development located within the municipality?
- How is the location chosen significant to the development?
- Summarize the existing land uses within the vicinity of the development.
- How will the development relate to existing land uses in the direct vicinity (include opportunities and challenges created)?
- Provide a legal description of the property along with a map clearly identifying adjacent land uses in a geographic context.

Policy context:

This section is intended to identify the various municipal policies pertaining to the proposed development along with a summary of how the proposed development responds to these policies.

- Clearly identify the sections of the Official Community Plan which pertain to the development
- Itemize each OCP policy statement and provide statements of how the proposed development satisfies these policy statements.
- Where specific professional expertise is required, attach all reports as an appendix to the submission and provide an executive summary within the body of the CDR.

2. Inventory and Analysis:

+ Existing land use:

This section is intended to describe the lands intended for development including existing use, significant topographical features such as vegetation, surface water, proximity of major utilities, municipal facilities.

- What is the total land area intended for development?
- What is the current principal use of the land intended for development?
- Describe and identify graphically the general topography of the property.
- Describe and identify graphically the location of major utility systems, municipal facilities and buildings or structures on the property.

+ Description of proposed development:

This section is intended to provide a detailed description of the proposed development.

Lot Development and Phasing:

- Attach a final PPS including all lots, dimensions, phasing and indicating the locations of all dedicated lands, and existing and proposed easements on the lands.
- What is the breakdown for the various land uses in the development area (measured in hectares and acres) – especially significant for residential developments to determine MR requirements and development density.
- Identify the anticipated stages or phases for the development of the lands if applicable.
- The report should include a preliminary geotechnical investigation to determine building restrictions and suitability of the lands to accommodate the intended development.
- Describe and assess how the subdivision of land and/or the proposed development physically and functionally integrates with existing subdivision/development.
 - integration of natural and constructed buffers within and between developments

Servicing:

- Describe and identify graphically the principal **municipal roadways** to which the development may affect or depend on?
- Assess the current capacity of existing municipal roadways to adequately service the property after development has been completed
(Note: in some instances a traffic impact analysis maybe required)
 - describe the type, frequency and pattern of traffic anticipated to be generated by the development
- Identify the roadway standard for all newly constructed roadways serving the development including basic specifications and surfacing.
- Provide a total length of new roadway to be constructed

- Has the application been referred to the Ministry of Highways and Infrastructure? Are there any traffic restrictions in the development area? Attach correspondence from the Ministry.
- What is the source of **potable water supply** intended for the development?
 - Where is it sourced?
 - What is its capacity?
 - Is it sufficient to provide for fire suppression on individual lots?
 - What onsite storage is required?
 - Identify and describe the entity responsible for the supply, repairs and maintenance of water supply lines within the development?
 - Has the developer attached a template agreement defining the relationship between water supplier and end user?
- *Need to attach confirmation of supply from water supplier if not the developer
- What form of **wastewater collection** and processing system is being proposed?
 - residential developments require confirmation of approval for the system proposed by the appropriate regulatory agency – attach to report
 - residential developments require the establishment of a utility to monitor these systems – report should outline management strategy for this purpose
- How does the development propose to manage **drainage** from a 1:100 year storm event?
 - Engineered report should include a graphic representation of the predevelopment drainage patterns as well as post development drainage patterns, including the location and method of onsite containment and method of discharge so that post development offsite drainage does not exceed predevelopment rate of offsite flows.
 - The report should include a statement unequivocally stating that as designed, the engineered strategy will accommodate a 1:100 year storm event.
 - What percentage of each lot within the development is anticipated contain impermeable compacted surfacing? How is this managed in the engineered design?
 - What easements are needed to facilitate the system? (indicate on PPS)
 - What is the proposed ownership of the lands containing these facilities?
 - If the facilities cross or are contained on private lands, how are they to be maintained and protected? (If by easement, attach a copy of the terms of agreement restricting development and protecting the utility)
 - If these facilities cross or are contained on public lands, what is the anticipated lifespan of the facilities? What are the operation and maintenance requirements assumed by the R.M. upon dedication? For example, storm water pond maintenance requirements to maintain capacity and water quality
- How does the development propose to manage **solid waste** generated from the land uses within the development?
- Describe and assess the availability of various **shallow utilities** including but not limited to natural gas, electricity, telephone, and internet.
- What **public facilities** or amenities are intended to be constructed within the development? Describe the amenity or facility and identify the planned administrative or management strategy for these facilities?
 - Management structure

- Operational details
- Maintenance requirements
- Insurance requirements
- What is the intended soft and hard **landscaping** for public areas?
- What **lighting** is intended for public areas?
- Is the development adequately serviced by existing **schools, fire services and other supportive services**? How is this to be managed? Attach correspondence from the applicable school division, fire department and police service.

Natural and Heritage Resources:

- Have the appropriate provincial agencies been contacted to determine whether the lands contain or the development may affect an existing natural, historical or heritage resources?
 - Heritage Branch
 - Saskatchewan Environment
 - Saskatchewan Watershed Authority
- *Need to attach confirmation of consultation
- What strategy is proposed to mitigate the effects of the development on these resources, or seek to integrate these resources into the development?
- Identify any significant sustainable development or environmental management practices intended to be employed within the development.
- Do the development lands exhibit any natural or manmade hazardous conditions? How are these intended to be mitigated?
 - flooding
 - slope instability
 - ground contamination

3. **Public Consultation:**

This section is intended to identify the applicant's public consultation plan as well as report on the results of the consultation.

- What form of consultation program has been chosen?
- Has the consultation program and material been reviewed and approved by the Administration?
 - mail-out content
 - questionnaires
 - presentation materials
 - contact lists
 - number and location of meetings if applicable
- Has the applicant accurately tracked and reported the input from the meetings
- The applicant should provide a response to any comments made concerning the development that arises as a result of the consultation. How can the concern be mitigated? If warranted, how can the concern or comment be integrated into the development?

4. Map Checklist:

- Context map identifying the subject property along with identification of adjacent land uses, significant public roadways
- Plan of Proposed Subdivision including all necessary lot dimensions, built structures, easements and utilities, public lands and development phasing
- Pre-development drainage plan including topographic contours and drainage patterns
- Post development drainage plan including topographic contours, drainage facilities and patterns of flow
- Utilities plan showing existing and proposed extensions of shallow utilities in the development area
- Landscape plan and cross section of public lands if applicable showing plantings, hard landscaping, property screening and lighting

5. Technical Reports/Agency Responses:

- Preliminary Geotechnical Investigation
- Wildlife habitat inventory – Saskatchewan Environment
- Archeological survey – Heritage Branch
- Engineered drainage report
- Ground and surface water evaluation – Saskatchewan Watershed Authority
- Traffic Impact Study*
- Review of wastewater treatment system– Sask Environment or Sask Health Region
- Confirmation of service - major utilities including gas, electricity, telephone, water
- Confirmation of service – local school district, fire and protective services
- Evidence of consultation – Ministry of Highways and Infrastructure
- Phase 1 Environmental Impact Assessment* where the previous use of land may pose a risk to occupants and new land development
- Rare Plant Survey* to confirm there are no rare plants or pant habitat found on development property

Summary of Property Servicing



Development Name: MEADOW RIDGE ESTATES

Developer Name: DAN BEAULAC

Legal Land Location: SE14-36-04-W3

The purpose of these worksheets is twofold. Firstly, the worksheets are intended to provide the Municipality with a summary of the various services which are being constructed included any technical specifications. The second reason for these worksheets is to aid the developer in itemizing the various costs of servicing the development for the purpose of calculating the amount of financial security to be provided to the Municipality.

Summary of Property Servicing Worksheet 1: Roadways

To be submitted by an applicant for the purposes of summarizing the design standards for a development and calculation of financial security. **Complete a separate worksheet for each type of roadway being constructed or upgraded for the development.**

1. Type of roadway:

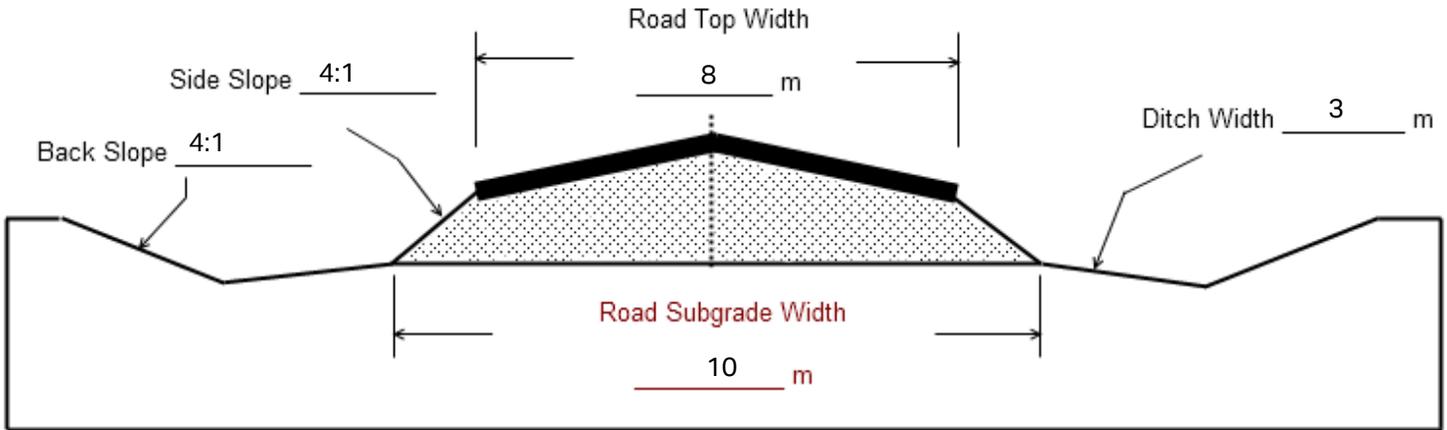
- Residential internal subdivision road
- Municipal road – main farm access
- Primary haul road
- Industrial/Commercial internal subdivision road

2. Specifications:

- a. length of road to be constructed or upgraded: 2,200 metres
- b. right of way width 30 metres
- c. road sub-grade width: 10 metres
- d. road top width: 8 metres
- e. back slope : 4H:1V
- f. side slope: 4H:1V
- g. ditch width: 3 metres
- h. method of erosion control: GRASS DITCHES & CULVERTS C/W ARMoured INLETS
- i. anticipated design speed 50 km/hr
- j. estimated road lifespan: 25 years
- k. culvert locations (attach site plan) and sizes:
 - number: _____ type: _____ size: _____ mm
 - number: _____ type: _____ size: _____ mm

Comments: SEE DRAINAGE PLAN. CULVERTS REQUIRED AT EACH DRIVEWAY ACCESS AND ROAD DRAINAGE CROSSING LOCATIONS.

- l. road surfacing:
 - Gravel Chip seal Asphalt Other
- surface thickness: _____ m³/km



3. **Cost estimates:** Provide cost estimate for each component of construction attaching quotes and contracts where necessary to verify estimates.

a. land acquisition	<u>\$ 120,000</u>
b. Design and engineering	<u>\$ 145,000</u>
c. preliminary earthwork & sub grade construction	<u>\$ 350,000</u>
d. road construction	<u>\$ 190,000</u>
e. surfacing	<u>\$ 350,000</u>
f. culverts	<u>\$ 255,000</u>
g. signage	<u>\$ 5,000</u>
h. line painting, curbing etc...	<u>\$ 0</u>
i. re-vegetation and erosion controls	<u>\$ 305,000</u>

TOTAL ESTIMATED COST \$ 1,720,000

For Office Use Only:

Date of receipt of preliminary construction plans: _____ / _____ / _____ (d/m/y)
 Date of approval of preliminary construction plans: _____ / _____ / _____ (d/m/y)
 Date of receipt of as-built drawings: _____ / _____ / _____ (d/m/y)
 Date of final inspection: _____ / _____ / _____ (d/m/y)

Summary of Property Servicing Worksheet 2: Water Supply Lines

To be submitted by an applicant for the purposes of summarizing the design standards for a development and calculation of financial security. **Complete a separate worksheet for each type of waterline being constructed or upgraded for the development.**

4. Type of waterline:

- Potable
 Non potable
 Fire suppression

5. Specifications:

- | | | |
|---|-----------|--------|
| a. length of water supply line constructed: | 2,000 | metres |
| b. water supply line diameter: | 50 | mm |
| c. depth of line: | 3.0 | metres |
| d. water supply line material : | HDPE DR11 | |
| e. # fire hydrants: | 0 | |
| f. # curb stops: | 49 | metres |
| g. minimum water supply line depth: | 2.85 | metres |

6. Cost estimates: Provide cost estimate for each component of construction attaching quotes and contracts where necessary to verify estimates.

- | | |
|---------------------------------------|-------------------|
| a. land acquisition and /or easements | \$ 0 |
| b. Design and engineering | \$ 41,000 |
| c. materials & labour | |
| d. trenching and or drilling | |
| e. installation | \$410,000 |
| f. backfill and re-vegetation | |
| g. hydrants and pump stations | \$ 0 |
| TOTAL ESTIMATED COST | \$ 451,000 |

For Office Use Only:

- | | | |
|---|----------------|---------|
| Date of receipt of preliminary construction plans: | ____/____/____ | (d/m/y) |
| Date of approval of preliminary construction plans: | ____/____/____ | (d/m/y) |
| Date of receipt of as-built drawings: | ____/____/____ | (d/m/y) |
| Date of final inspection: | ____/____/____ | (d/m/y) |

Summary of Estimated Costs

Roadways:	\$	<u>\$ 1,450,000</u>
Waterlines:		<u>\$ 410,000</u>
Shallow Utilities:		<u>\$ 460,000</u>
Drainage Works/Lot Preparation:		<u>\$ 100,000</u>
Other:		<u>\$ 580,000 (Contingency and misc items)</u>
Total Estimated Costs:		<u><u>\$ 3,000,000 (Excluding Engineering Fees)</u></u>

Appendix Z

Application to Subdivide Land

Hidden Ridge Estates

PLAN OF PROPOSED
SUBDIVISION OF
S.E. 1/4 SEC. 14-
TWP. 36- RGE. 4-
W. 3rd MER.
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Dimensions and elevations shown are in metres and decimals thereof.
Elevations are Geodetic.

Portion of this plan to be subdivided is outlined in red with a bold, dashed line and contains 30.16± ha (74.52± ac) which includes 18.88± ha (46.83± ac) for roadway. Dimensions shown are approximate and may vary from the final plan of survey by 5± metres.

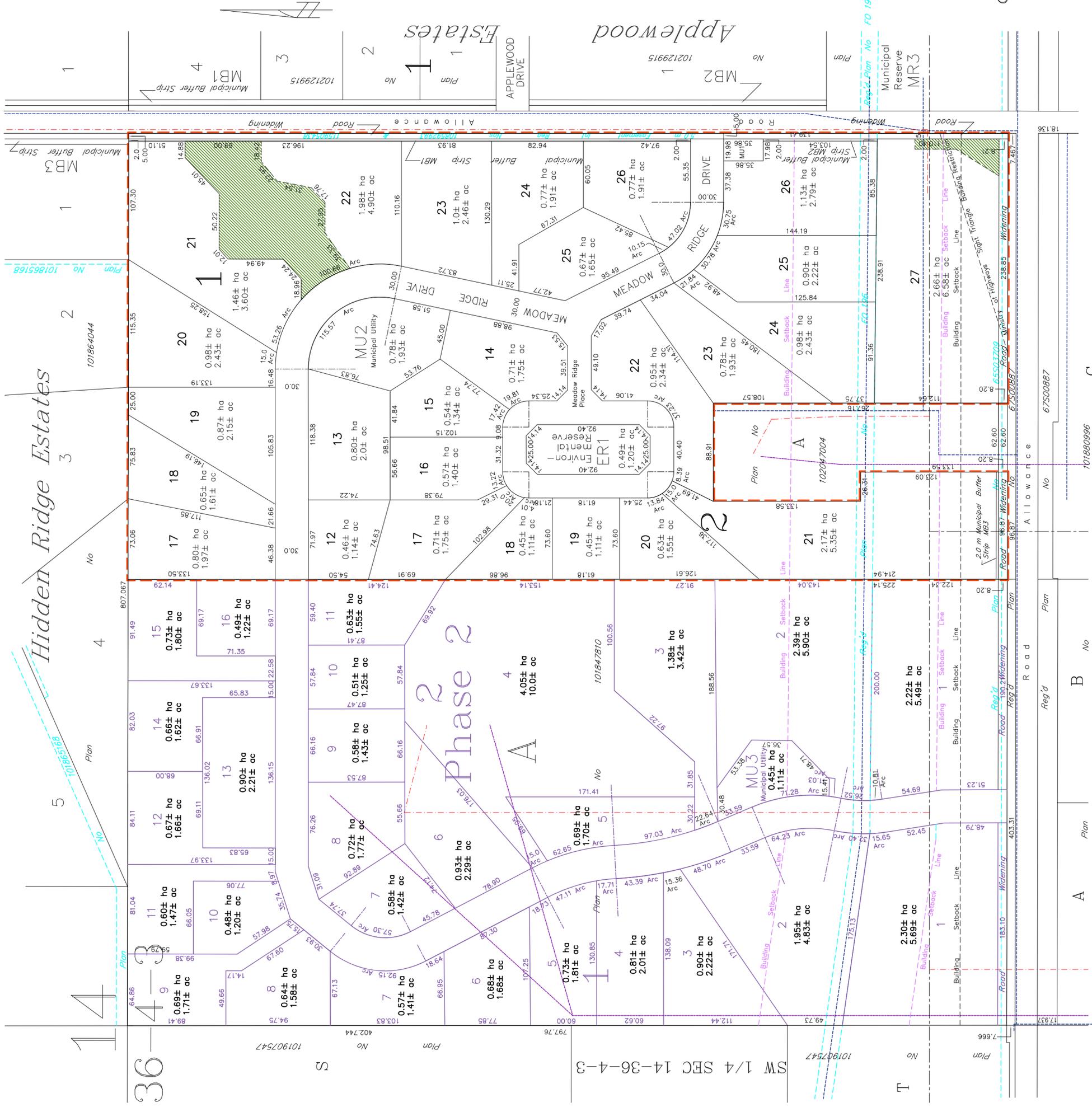
T.R. Webb, May 1, 2017
Saskatchewan Land Surveyor

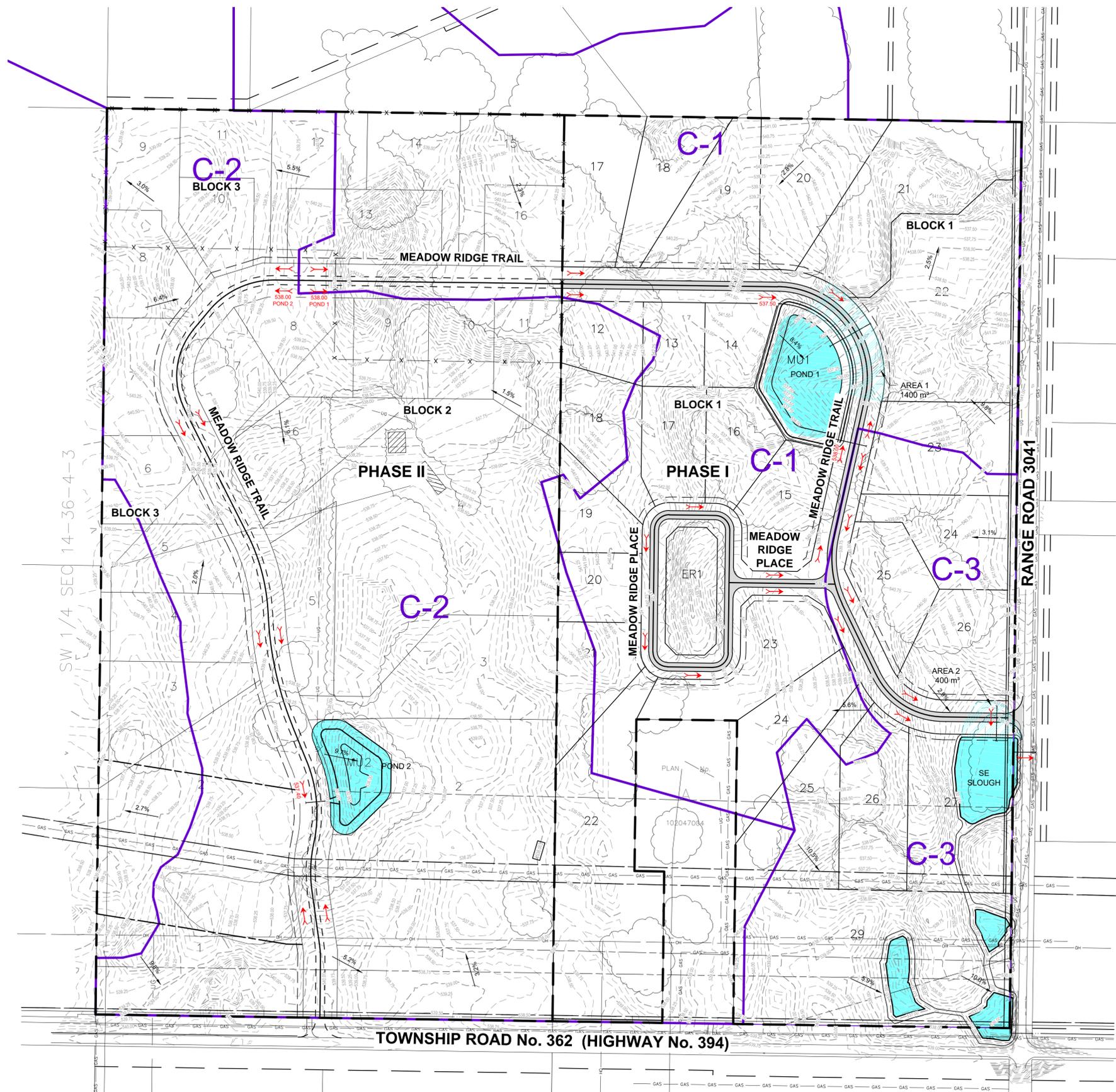
Seal

Registered Owner: dd/mm/yy
The signature above indicates that I (we) approve the Plan of Proposed Subdivision as presented.

-  Proposed drainage easement
-  Buried gas line
-  Buried electrical line
-  Buried telephone line
-  Overhead electrical line

Locations of utilities are provided by Monop Electric Corporation and are approximations only. No lines were marked on the ground. Dimensions shown are in metres and decimals thereof.





LEGEND

	EXISTING	PROPOSED
SITE BOUNDARY	---	---
UTILITY EASEMENTS	---	---
TRANSGAS SETBACK	---	---
HIGHWAY SETBACK	---	---
MAJOR GROUND CONTOUR	---	---
MINOR GROUND CONTOUR	---	---
WATER LINE	---	---
TYPICAL FITTINGS	▽ □ C	▽ □ C
GAS LINE	--- GAS ---	--- GAS ---
OVERHEAD UTILITY LINE	--- OH ---	--- OH ---
UNDERGROUND UTILITY LINE	--- UG ---	--- UG ---
TELEPHONE LINE	--- T ---	--- T ---
POWER LINE	--- P ---	--- P ---
ROADS	---	---
RIGHT DITCH BOTTOM	---	---
LEFT DITCH BOTTOM	---	---
CULVERT	---	---
BUILDING FOOTPRINT	▨	▨
FENCELINE	X X	X X
TREE LINE	~	~
FOUND IRON PIN	⊕	⊕
ROAD SIGNS	⊙	⊙
TEST HOLE	⊕	⊕
SURFACE WATER FLOW DIRECTION	→	→
CATCHMENTS BOUNDARY	---	---

NOTES:

- POND 2 HAS NO OUTLET. IT WILL SPILL OVER TO POND 1 VIA ROADSIDE DITCHES ONCE WATER ELEVATION IN PHASE II EXCEEDS 538.00 m.
- POND 1 WILL BE A DETENTION POND DISCHARGING TO SOUTHEAST SLOUGHS IN CATCHMENT AREA 3.
- SOUTHEAST SLOUGHS WILL SPILL THROUGH A NEW CULVERT UNDER RANGE ROAD 3041 IF STORAGE CAPACITY IS EXCEEDED.
- MINIMUM SAFE BUILDING ELEVATION FOR EACH CATCHMENT AREA IS AS FOLLOWS:
 C1 - 539.00 m
 C2 - 539.50 m
 C3 - 538.50 m
- WATER SPILL OVER ELEVATION.
 - PHASE I TO EAST OF RANGE ROAD 3041 - 537.50 m.
 - PHASE II TO PHASE I - 538.00 m.

	Pond 1	Pond 2	Southeast Slough
High Water Level (m)	538.00	538.00	537.50
Normal Water Level (m)	537.40	--	--
Current Water Level (m)	--	536.00	536.50
Pond Bottom (m)	535.40	535.50	536.00
Pond Capacity (cu.m.)	3,350	7,500	6,550

Storm	Rainfall Depth (mm)	Runoff Volumes (m ³)								
		Catchment C-1			Catchment C-2			Catchment C-3		
		Pre-Dev	Post-Dev	Change	Pre-Dev	Post-Dev	Change	Pre-Dev	Post-Dev	Change
1:2 yr 1 hr	16.50	234	503	269	279	686	407	56	188	132
1:5 yr 1 hr	28.71	847	1,282	435	995	1,697	702	263	527	264
1:25 yr 1 hr	46.20	4,651	4,890	239	5,624	6,499	875	1,315	1,958	643
1:100 yr 1 hr	54.12	6,682	6,764	82	8,128	9,033	905	1,842	2,672	830
1:100 yr 12 hr	82.92	6,882	7,412	530	8,441	10,027	1,586	1,779	2,817	1,038
1:100 yr 24 hr	89.90	1,295	2,791	1,496	1,546	3,804	2,258	313	1,043	730



PROJECT
 Meadow Ridge Estates Subdivision

CLIENT
 Dan Beulac Holdings Ltd.
 RR No.6, Site 601, Box 103
 Saskatoon, SK S7K 3J9

CONSULTANT
 AECOM
 200-2100 8th Street East
 Saskatoon, SK S7H 0V1
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NOT FOR CONSTRUCTION

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REGISTRATION

IN PROGRESS
 Date: 2017-02-23

ISSUE/REVISION

NO	DATE	DESCRIPTION
C	2017-02-15	Issued for Review
B	2016-06-10	Issued For Review
A	2016-04-20	Issued For Review

KEY PLAN

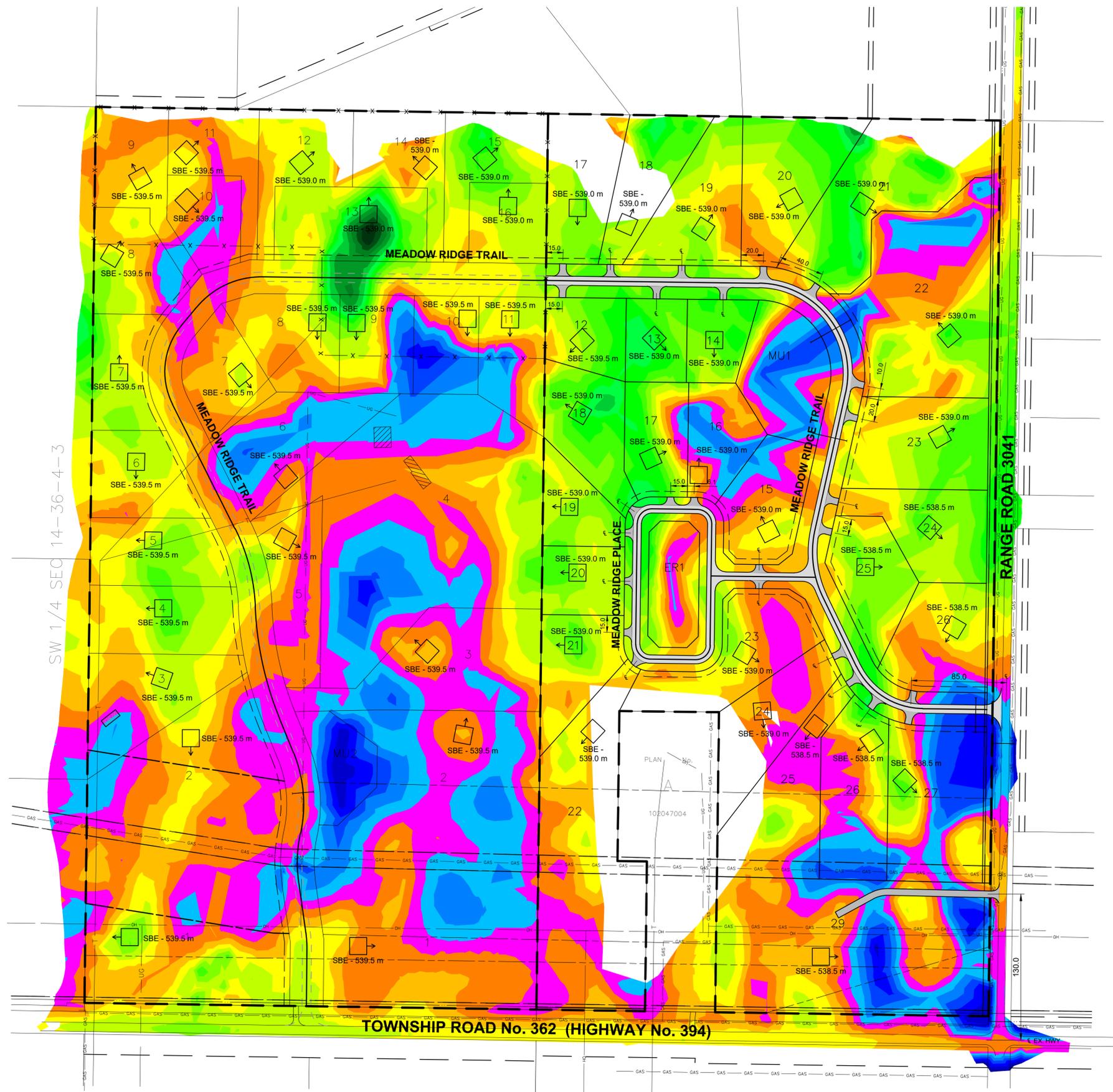
PROJECT NUMBER
 60492462

SHEET TITLE
 Site Plan
 Drainage & Grading Plan

SHEET NUMBER
 0001-C-1004

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 Project Management Initials: Designer: _____ Checked: _____ Approved: _____
 ANS I D 864mm x 559mm



LEGEND

HOUSE FOOTPRINT (DIRECTION OF WALKOUT) EXISTING PROPOSED

Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	534.50	535.00	0.00	Dark Blue
2	535.00	535.50	66.19	Blue
3	535.50	536.00	1425.50	Light Blue
4	536.00	536.50	5777.21	Very Light Blue
5	536.50	537.00	11680.92	Lightest Blue
6	537.00	537.50	25471.05	Lightest Blue
7	537.50	538.00	56386.84	Lightest Blue
8	538.00	538.50	84199.62	Lightest Blue
9	538.50	539.00	97757.24	Lightest Blue
10	539.00	539.50	91038.90	Lightest Blue
11	539.50	540.00	89628.58	Lightest Blue
12	540.00	540.50	76804.95	Lightest Blue
13	540.50	541.00	48627.76	Lightest Blue
14	541.00	541.50	30818.01	Lightest Blue
15	541.50	542.00	17159.10	Lightest Blue
16	542.00	542.50	4624.22	Lightest Blue
17	542.50	543.00	1397.81	Lightest Blue
18	543.00	543.50	1433.44	Lightest Blue
19	543.50	544.00	445.21	Lightest Blue
20	544.00	544.50	261.98	Lightest Blue
21	544.50	545.00	166.41	Lightest Blue
22	545.00	545.50	11.83	Lightest Blue

FLOODING POTENTIAL
 HIGH AND DRY

NOTES:
 SURFACE DATA REPRESENTS EXISTING TOPOGRAPHY ONLY. ROADWAY AND POND EXCAVATION DESIGN HAVE NOT BEEN SHOWN.



PROJECT
 Meadow Ridge Estates Subdivision

CLIENT
 Dan Beulac Holdings Ltd.
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REGISTRATION

IN PROGRESS
 Date: 2017-05-08

ISSUE/REVISION		
NO.	DATE	DESCRIPTION
B	2017-05-08	Issued For Review
A	2017-02-15	Issued For Review
I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER
 60492462

SHEET TITLE
 Site Plan
 Drainage & Grading Plan
 (Elevation Banding)

SHEET NUMBER
 0001-C-1017

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REGISTRATION

IN PROGRESS

Date: 2017-05-08

ISSUE/REVISION

IR	DATE	DESCRIPTION
C	2017-05-08	Issued For Review
B	2016-06-10	Issued For Review
A	2016-04-20	Issued For Review

KEY PLAN

PROJECT NUMBER

60492462

SHEET TITLE

Details
Roadways

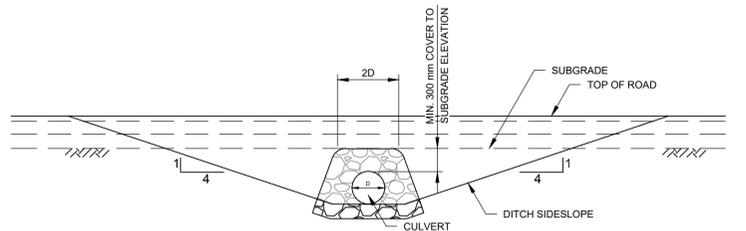
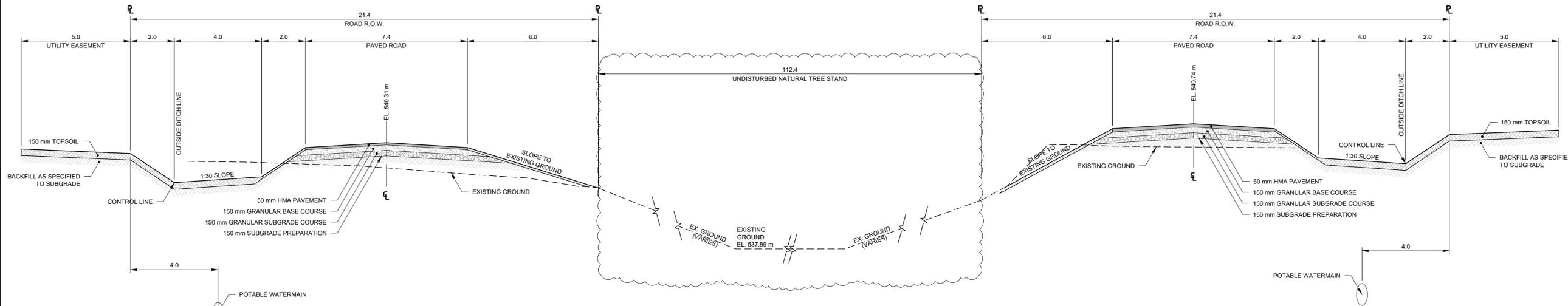
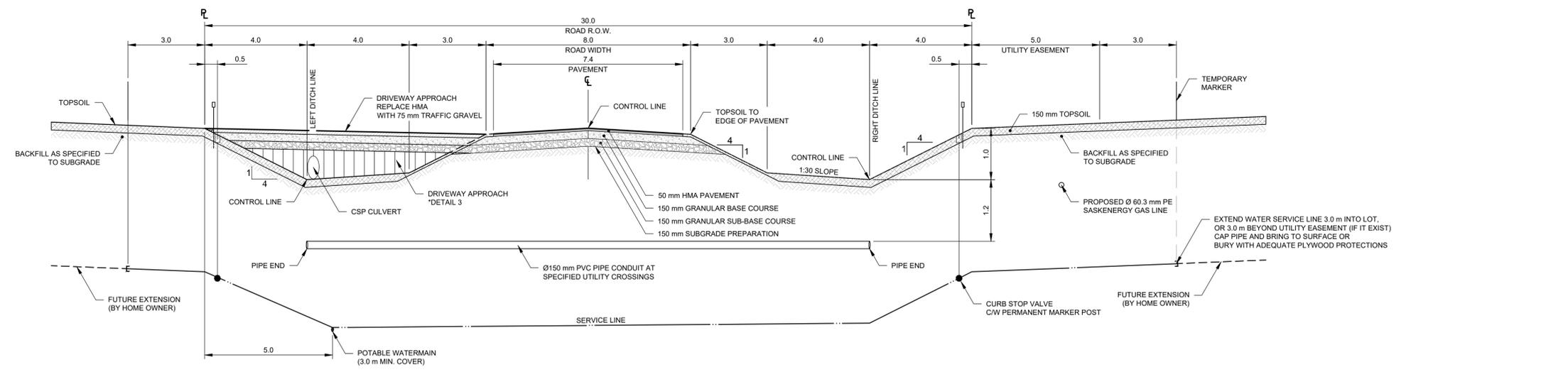
SHEET NUMBER

0001-C-1014

ANSI D 864mm x 559mm

Project Management Initials: Designer: _____ Checked: _____ Approved: _____

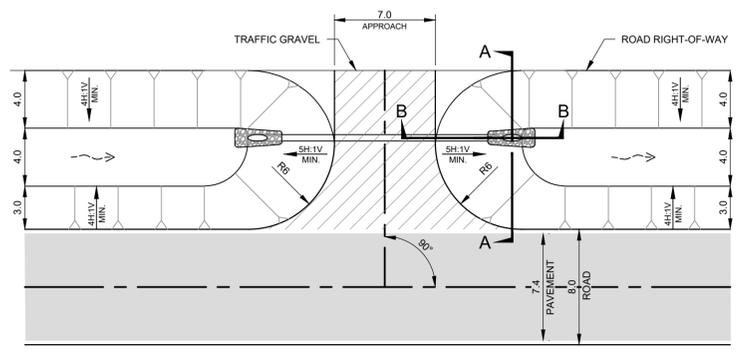
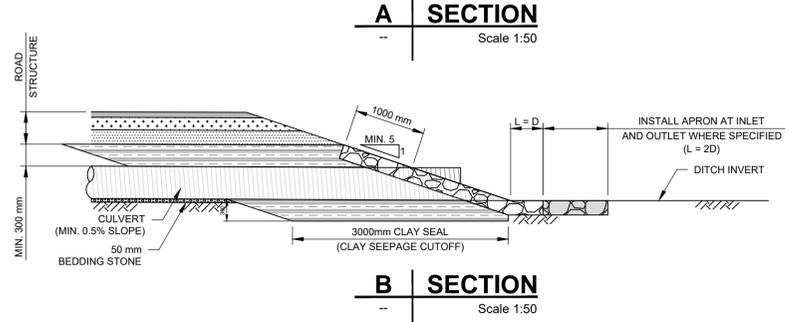
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ESTIMATED RIPRAP SURFACE AREAS

PIPE DIAMETER (mm)	AREA OF ONE END EXCLUDING APRON (m ²)	AREA OF ONE END INCLUDING APRON (m ²)	AREA OF ONE END INCLUDING OUTLET APRON (m ²)
500	2	3	4
600	3	5	6
700	4	6	7
800	5	8	9
900	6	10	11

- NOTES:**
- ROCKS AND BOULDERS SHALL BE SELECTED AS NEARLY CUBICAL IN FORM AS PRACTICAL AND SHALL HAVE AT LEAST MINIMUM DIMENSION OF 200 mm. THE STONES SHALL BE PLACED WITH THEIR BEDS AT RIGHT ANGLES TO THE SLOPE. THE LARGER STONES BEING USED IN THE BOTTOM COURSES AND THE SMALLER STONES AT TOP. THEY SHALL BE LAID IN SUCH A MANNER THAT THE WEIGHT OF THE STONE IS CARRIED BY THE EARTH AND NOT BY THE ADJACENT STONES. THE FINISHED WORK SHALL PRESENT AN EVEN, TIGHT AND REASONABLY PLANE SURFACE, VARYING NOT MORE THAN 75 mm FROM THE REQUIRED CONTOUR.
 - WHERE NO SPECIAL TREATMENT IS REQUIRED, CULVERT INVERT ELEVATIONS ARE TYPICALLY SET ABOUT 0.15x DIAMETER BELOW THE DRAINAGE COURSE ELEVATION.
 - A CLAY SEAL IS TO BE PLACED AT BOTH ENDS OF THE CULVERT FOR A LENGTH OF 3 m TO CUT OFF SEEPAGE. THE CLAY SEAL SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300 mm ABOVE THE CROWN OF THE PIPE, AND FOR THE FULL WIDTH OF THE EXCAVATION.
 - WHERE APRONS ARE REQUIRED DUE TO HIGH VELOCITY FLOW OR EROSION PRONE SOIL. TYPICALLY THE MINIMUM INLET APRON IS 1.5x DIAMETER LONG WHILE THE MINIMUM OUTLET APRON (WHERE WATER VELOCITY IS HIGHER) IS 2x DIAMETER LONG.



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DATE July 4, 2017**PROJECT No.** 1406388**TO** Dan Beaulac**FROM** Laurie Stang; Phil Bruch**EMAIL** laurie_stang@golder.com;
phil_bruch@golder.com**MEADOW RIDGE ESTATES HYDRO-GEOTECHNICAL INVESTIGATION – 2017 UPDATE (REV. 1)**

This technical memorandum presents the results of groundwater monitoring conducted by Golder Associates Ltd. (Golder) at the proposed Meadow Ridge (formerly Ridgewood) Estates subdivision located in SE14-36-4-W3M, approximately 5 km east of the City of Saskatoon. The site location is shown on Figure 1. In addition to the name change for the development, some changes have been made to the individual lot boundaries, and it is understood that the project will be developed in two phases. Phase 1 is the east half of the development, and Phase 2 is the west half. The updated lot layout and borehole locations are shown on Figure 2.

This memorandum should be read in conjunction with "Information and Limitations of this Report" included in Appendix A. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

Previous Work

Golder conducted a subsurface field investigation between July 23 and 25, 2014. The investigation consisted of drilling twelve (12) boreholes (RW-14-001D to RW-14-012D) and installing a deep monitoring well in each borehole. Shallow monitoring wells were installed in seven (7) of the borehole locations (RW-14-001S to RW-14-005S, RW-14-011S, and RW-14-012S) on August 13, 2014. The subsurface field investigation is described in more detail in the Golder report entitled "Ridgewood Estates, Hydro-Geotechnical Investigation", Report Number 1406388, dated August 2015 (Golder 2015).

Routine laboratory testing was conducted on select soil samples recovered during the field investigation. Laboratory testing was conducted at Golder's Saskatoon Laboratory and included unconfined compression tests, water content analysis, and Atterberg limits. Selected soil samples were submitted to the ALS Laboratory in Saskatoon (ALS) to determine the grain size distribution of the soil of selected samples using the Mini-Pipet method. Test results are included in Golder 2015.

Groundwater levels in the monitoring wells installed during the field investigation were measured on September 11, 2014. On September 12 and 16, 2014, falling head hydraulic conductivity tests were completed to determine the bulk hydraulic conductivity of the soil surrounding the well screen. The results of hydraulic conductivity tests are included in Golder 2015.

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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Groundwater Conditions

Groundwater depths in the monitoring wells installed in 2014 were measured on April 19, 2017. A summary of the measured groundwater elevations recorded on September 11, 2014 and April 19, 2017 is presented in Table 1. It was noted that the depth to groundwater in the 2015 report was incorrect, although the reported groundwater elevations were correct. The corrected groundwater depths are shown in Table 1.

Table 1: Groundwater Elevation

Monitoring Well	Ground Surface Elevation (mASL)	Recorded Groundwater Elevation (mASL) Sept 11, 2014	Groundwater Depth (mBGS) Sept 11, 2014	Recorded Groundwater Elevation (mASL) April 19, 2017	Groundwater Depth (mBGS) April 19, 2017
RW-14-001S	539.74	537.85	1.90	537.04	2.70
RW-14-001D	539.74	538.58	1.17	537.74	2.00
RW-14-002S	540.05	537.54	2.52	dry	dry
RW-14-002D	540.05	538.17	1.89	536.82	3.23
RW-14-003S	539.54	537.19	2.35	537.04	2.50
RW-14-003D	539.54	537.34	2.20	537.00	2.54
RW-14-004S	539.36	537.32	2.04	537.93	1.43
RW-14-004D	539.36	537.41	1.96	537.01	2.35
RW-14-005S	538.63	537.35	1.28	536.32	2.31
RW-14-005D	538.63	537.00	1.63	535.83	2.80
RW-14-006D	538.73	535.08	3.65	534.54	4.19
RW-14-007D	540.04	536.75	3.29	535.63	4.41
RW-14-008D	540.45	538.32	2.13	537.59	2.86
RW-14-009D	540.54	538.02	2.53	537.30	3.24
RW-14-010D	539.82	537.73	2.09	537.81	2.01
RW-14-011S	538.99	536.41	2.59	535.91	3.08
RW-14-011D	538.99	537.26	1.73	536.50	2.49
RW-14-012S	539.54	dry	dry	dry	dry
RW-14-012D	539.54	536.90	2.64	536.25	3.29

mASL = metres above sea level; mBGS = metres below ground surface.

The depth to groundwater measured on September 11, 2014 ranged from approximately 1.2 to 3.6 metres below ground surface (mBGS). The depth to groundwater measured on April 19, 2017 ranged from approximately 1.4 to 4.4 mBGS. On average, the groundwater elevations measured on April 19, 2017 were approximately 0.6 m lower than the groundwater elevations measured on September 11, 2014. Groundwater gradient contours were drawn based on the groundwater elevations measured in the deep monitoring wells (RW-14-001D to RW-14-012D) (Figure 3). The apparent groundwater flow direction is towards the south at an average gradient of 0.002.

Following groundwater level measurements, the monitoring wells were purged. Groundwater samples were collected from select monitoring wells (RW-14-003D, RW-14-005S, RW-14-006D, RW-14-007D, RW-14-010D and RW-14-011D) the following day, and submitted to ALS for geochemical groundwater testing. The results of groundwater testing conducted in 2014 and 2017 are summarised in Table 2. The Certificates of Analysis for testing conducted in 2014 are included in Golder 2015; the Certificates of Analysis for testing conducted in 2017 are included in Appendix B. The Saskatchewan Environmental Quality Guidelines (Government of Saskatchewan) for potable water in residential areas are included in Table 2 for comparison purposes only. Geochemical groundwater parameters exceeding the guidelines are highlighted with gray.

Table 2: Groundwater Geochemical and Bacteriological Results

Parameter	Units	Lower limit	RW-14-001S (2014)	RW-14-001D (2014)	RW-14-002S (2014)	RW-14-003S (2014)	RW-14-003D (2017)	RW-14-004S (2014)	RW-14-005S (2017)	RW-14-006D (2014)	RW-14-006D (2017)	RW-14-007D (2014)	RW-14-007D (2017)	RW-14-008D (2014)	RW-14-008D (2017)	RW-14-010D (2014)	RW-14-010D (2017)	RW-14-011S (2014)	RW-14-011D (2017)
General Parameters																			
pH	pH units		7.52	7.78	7.87	7.59	7.46	7.57	7.63	7.65	7.58	7.67	7.63	7.65	7.44	7.47	7.36	7.78	7.57
Alkalinity	mg/L as CaCO ₃	500	354	293	490	571	357	311	364	309	332	351	268	391	374	374	372	563	360
Electrical Conductivity	µS/cm		12500	1380	1450	1980	2030	786	1570	1390	1570	1490	2410	1220	2440	4480	4920	1400	1390
Total Dissolved Solids (TDS)	mg/L	500	15200	940	961	1420	1580	463	1010	877	1110	1030	1920	767	1800	4270	4650	877	952
Hardness	mg/L as CaCO ₃		10700	747	742	1030	1220	425	789	825	816	820	1380	625	1290	2770	3030	682	800
Major Ions																			
Chloride (Cl)	mg/L	250	3.7	9.9	11.9	8.1	9.4	7.5	122	96.0	16.6	14.1	53.6	12.1	18.6	62.0	46.5	10.2	14.7
Sulphate (SO ₄)	mg/L	500	11300	484	259	723	912	110	371	324	588	475	1160	273	1040	2790	2950	179	424
Bicarbonate (HCO ₃)	mg/L		432	357	598	571	436	379	445	375	405	428	327	477	456	456	454	687	440
Carbonate (CO ₃)	mg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide (OH)	mg/L		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrate (NO ₃ -N)	mg/L as N	10	50.6	<0.50	22.4	0.86	<0.50	0.64	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16.9	<0.50
Nitrite (NO ₂ -N)	mg/L as N	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen (NO ₃ + NO ₂)	mg/L		50.7	<0.50	22.4	0.87	<0.50	0.66	0.76	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16.9	<0.50
Calcium (Ca)	mg/L		431	111	129	149	174	109	123	131	195	194	287	123	257	476	534	85.2	163
Potassium (K)	mg/L		34	7.2	7.3	5.1	7.5	3.4	2.2	1.4	7.9	8.4	7.9	6.5	9.7	16	16.6	8.8	7.3
Magnesium (Mg)	mg/L		2340	114	102	160	191	37.1	117	121	79.9	81.6	161	77.1	158	384	411	114	95.4
Sodium (Na)	mg/L	200	645	38.3	59.0	86.5	74.3	6.6	52.8	15.4	57.3	49.8	90.2	40.3	96.3	314	367	66.7	31.8
Cation - Anion Balance	%		-0.6	1.7	1.3	-0.4	2.7	0.6	-1.1	4.6	0.7	4.1	1.1	2.9	1.0	1.5	4.6	0.8	3.2
Bacteriological																			
Total Coliforms	MPN/100 mL	0	>200.5	>200.5	>200.5	>200.5	0	>200.5	>200.5	0	>200.5	0	>200.5	0	0	43	10	36	3
Escherichia Coli	MPN/100 mL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous																			
Heterotrophic Plate Count	CFU/mL		>3000	>3000	>3000	>3000	>2420	>3000	>3000	>2420	>2420	>3000	>2420	>3000	>3000	>3000	>2420	>3000	>2420
Iron Reducing Bacteria			present																

Table 2: Groundwater Geochemical and Bacteriological Results

Parameter	Units	Guidelines	RW-14-0015 (2014)	RW-14-001D (2014)	RW-14-002S (2014)	RW-14-003S (2014)	RW-14-003D (2014)	RW-14-004S (2014)	RW-14-005S (2014)	RW-14-006D (2014)	RW-14-006D (2017)	RW-14-007D (2014)	RW-14-007D (2017)	RW-14-008D (2014)	RW-14-008D (2017)	RW-14-009D (2014)	RW-14-010D (2014)	RW-14-010D (2017)	RW-14-011D (2014)	RW-14-011D (2017)
Aluminum	mg/L	0.1	<0.10	<0.10	<0.010	<0.010	<0.0050	<0.010	<0.162	<0.010	<0.0020	<0.0020	<0.0020	<0.010	<0.0082	<0.010	<0.010	<0.00040	<0.00020	<0.00020
Antimony	mg/L	0.06	<0.020	<0.0020	0.0064	0.0024	0.00019	0.00036	0.00026	<0.0020	0.00029	<0.0020	<0.0020	<0.0020	<0.0020	0.00054	0.00029	<0.00050	0.00029	<0.00010
Arsenic	mg/L	0.010	<0.020	0.00083	0.00138	0.00085	0.00053	0.00107	0.00102	0.00302	0.00332	0.00058	0.00151	0.00212	0.00068	0.00109	0.00119	0.00227	0.00119	0.0156
Barium	mg/L	1.0	0.046	0.0249	0.258	0.0454	0.00776	0.0572	0.109	0.0467	0.0335	0.0196	0.0113	0.0472	0.0338	0.0310	0.0238	0.0238	0.0881	0.0159
Beryllium	mg/L		<0.020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	<0.00010	<0.00020	<0.00010	<0.00020	<0.00010	<0.00020	<0.00020	<0.00040	<0.00020	<0.00050	<0.00010	<0.00010
Bismuth	mg/L		<0.040	<0.00040	<0.00040	<0.00040	<0.00050	<0.00040	<0.00050	<0.00040	<0.00050	<0.00040	<0.00050	<0.00040	<0.00040	<0.00040	<0.00020	<0.00050	<0.00020	<0.00050
Boron	mg/L	5.0	0.31	0.056	0.086	0.051	0.105	0.024	0.016	0.099	0.135	0.036	0.038	0.098	0.098	0.192	0.252	0.048	0.048	0.067
Cadmium	mg/L	0.005	<0.00020	0.000055	<0.000020	0.000047	0.000042	0.000031	0.0000371	0.000079	0.000068	0.00057	0.000055	<0.000020	0.000084	0.000176	0.00046	0.0000758	0.00017	0.000758
Chromium	mg/L	0.05	<0.040	<0.00040	0.00173	0.00151	<0.00020	0.00043	0.00095	<0.00040	<0.00010	<0.00040	<0.00020	<0.00020	<0.00040	<0.00040	<0.00050	<0.00010	0.00025	<0.00010
Cobalt	mg/L		<0.0020	0.00202	0.00028	0.00028	0.00197	0.00012	0.00038	0.00131	0.0012	0.00181	0.00181	<0.00020	0.00310	0.00366	0.00651	0.000359	0.00025	0.000359
Copper	mg/L	1	0.014	0.0023	0.0083	0.0044	0.00041	0.00125	0.00313	0.0016	0.00055	0.0018	<0.00040	0.0012	0.0068	0.0036	<0.0010	0.00490	0.00068	0.00068
Iron	mg/L	0.3	<0.40	<0.040	<0.040	<0.040	0.487	<0.020	0.169	<0.040	0.012	<0.040	0.58	<0.040	<0.040	<0.040	0.532	<0.020	1.37	<0.020
Lead	mg/L	0.01	<0.020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	0.000137	<0.00020	<0.000050	<0.00020	<0.000050	<0.00020	<0.00020	<0.00020	<0.00025	<0.00010	0.000053	0.000053
Lithium	mg/L		0.388	0.0415	0.0706	0.0461	0.0544	0.0079	0.0262	0.0309	0.0487	0.0323	0.0332	0.0355	0.0633	0.115	0.15	0.0499	0.0487	0.0487
Manganese	mg/L	0.05	<0.010	0.863	<0.0010	0.0083	0.536	0.0329	0.0091	0.469	0.732	1.33	1.52	0.0437	1.01	0.607	2.61	0.00072	0.247	0.247
Molybdenum	mg/L		0.0083	0.00889	0.0108	0.00203	0.00373	0.00142	0.00125	0.00636	0.00661	0.00510	0.00393	0.00412	0.00492	0.00756	0.00358	0.00528	0.00448	0.00448
Nickel	mg/L		0.013	0.0055	0.0060	0.0064	0.0029	0.00281	0.0057	0.00385	0.00385	0.0058	0.0091	0.0052	0.0117	0.0144	0.014	0.00475	0.0017	0.0017
Phosphorus	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.050	<2.0	<0.050	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0.066
Selenium	mg/L	0.05	0.164	0.00113	0.0205	0.0148	0.00010	0.00058	0.00941	0.00040	0.000284	0.00491	0.00018	0.00067	0.00689	0.0375	0.00377	0.0176	0.00064	0.00064
Silicon	mg/L		10.3	7.90	11.7	9.84	8.21	9.92	10.4	7.43	8	7.26	7.26	7.38	7.45	7.86	6.71	10.3	9.64	9.64
Silver	mg/L		<0.00040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000010	<0.000040	<0.00010	<0.000040	<0.000020	<0.000040	<0.000040	<0.000040	<0.000050	<0.000020	<0.00010	<0.00010
Strontium	mg/L		2.70	0.364	0.740	0.364	0.663	0.226	0.343	0.695	0.556	0.434	0.431	0.475	0.835	2.01	2.34	0.398	0.618	0.618
Thallium	mg/L		<0.0010	<0.00010	<0.00010	<0.00010	<0.000020	<0.000050	0.000014	<0.00010	0.000059	<0.00010	<0.000020	<0.00010	<0.00010	<0.00010	0.000217	<0.000050	<0.00010	<0.00010
Tin	mg/L		<0.020	<0.00020	<0.00020	0.00039	<0.00020	0.00030	0.00018	0.00025	0.00023	<0.00020	0.00025	<0.00020	0.00021	<0.00020	<0.00020	<0.00050	0.00018	0.0002
Titanium	mg/L		<0.010	<0.010	<0.010	<0.010	<0.0015	<0.00050	0.00057	<0.0010	<0.00030	<0.0010	<0.0015	<0.0010	<0.0010	<0.0010	<0.0015	<0.00050	<0.00030	<0.00030
Uranium	mg/L	0.02	0.120	0.00782	0.0634	0.0372	0.00152	0.00406	0.00356	0.00539	0.00448	0.0145	0.00444	0.00506	0.0289	0.0329	0.0306	0.0197	0.00036	0.00036
Vanadium	mg/L		<0.0020	0.00046	0.00045	0.00034	<0.00010	0.00028	0.000387	0.00033	0.00171	0.00029	<0.0010	0.00027	0.00030	0.00037	<0.0025	0.00061	<0.00050	<0.00050
Zinc	mg/L	5	<0.10	<0.010	<0.010	<0.010	0.0055	<0.0050	0.0052	<0.010	0.0051	<0.010	0.0055	<0.010	0.030	<0.010	0.007	0.0057	0.0042	0.0042

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; % = percent; mL = millilitre.



Observations from the sampling events and geochemical analyses with respect to drinking water quality guidelines listed in the Saskatchewan Environmental Quality Guidelines (Government of Saskatchewan) were as follows:

- A total coliform count greater than zero was detected in all monitoring wells sampled in 2014, this was suspected to be a result of contamination during sampling in the field. A total coliform count greater than zero was detected in monitoring wells RW-14-007D, RW-14-010D and RW-14-011D during the 2017 groundwater sampling program.
- Nitrate concentrations exceeded the guideline of 10 milligrams per litre (mg/L) in monitoring wells RW-14-001S, RW14-002S and RW-14-011S during the 2014 groundwater sampling program. High nitrate concentrations are suspected to be due to the presence of cattle in the area. Monitoring wells RW-14-001S and RW14-002S were not sampled in 2017. Nitrate concentrations in monitoring well RW-14-011S were below the detectable limits.
- Guidelines for total dissolved solids, alkalinity, sodium and sulphate are aesthetic objectives only.
- Uranium concentrations slightly exceeded drinking water guidelines in several of the monitoring wells sampled in 2014 and one of the monitoring wells sampled in 2017 (RW-14-010D), which is presumed to be a natural, background condition at the site.
- Selenium concentrations slightly exceeded drinking water guidelines in one of the monitoring wells sampled in 2014 (RW-14-001S), this is presumed to be a natural, background condition at the site. Monitoring well RW-14-001S was not sampled in 2017; none of the monitoring wells sampled in 2017 indicated selenium concentrations exceeding the guidelines.

Summary

Discussions and recommendations from Golder's 2015 report, and additional information collected in 2017, is summarised below.

Foundation Considerations

The foundation considerations and recommendations in Golder's 2015 report are considered to be applicable to the currently proposed development, and are summarised below:

- a typical single family dwelling constructed at the site could be founded on conventional strip or spread footings on undisturbed sand or clay using a design allowable bearing capacity of 100 kiloPascals (kPa);
- exterior footings should be provided with 2.5 metres (m) of soil cover after final grading and the basement should not be left unheated for extended periods of time, to reduce potential damage due to frost action;
- footings should have a minimum width of 600 millimetres (mm), and perimeter drainage should be provided at the base of the footings;
- excavations for basement construction should be in accordance with Saskatchewan Occupational Health and Safety Regulations to protect workers in the excavation; and
- basement walls and other underground structures, such as septic tanks, should be designed using a rectangular earth pressure distribution, a lateral earth pressure coefficient of 1.0 and a total weight unit of soil of 2,000 kilograms per cubic metre (kg/m³).

Groundwater

The measured groundwater levels in 2017 were lower than the previous measurements by an average of about 0.6 m, however, the direction of groundwater flow and the gradients are similar to those outlined in Golder's 2015 report. Groundwater chemistry is also similar between the current results and Golder's 2015 report. High nitrate levels indicated in Golder's 2015 report appear to be the result of cattle being pastured in the area.

On-Site Wastewater Treatment Systems

On-site wastewater treatment system (OWTS) design must address the protection of groundwater from on-site sewage disposal; pathogen exposure and cumulative nitrate assessment are considered when assessing OWTS. The pathogen exposure evaluation and cumulative nitrate assessment conducted for this site are summarised below and described in more detail in Golder's 2015 report.

Pathogen Exposure

Soil conditions and vadose zone depth were evaluated to determine whether there was sufficient retention time for pathogen removal. Government of Saskatchewan (2012) suggests that the retention time in the vadose zone should be 60 days to achieve at 99.9% removal of pathogens. The most porous material type encountered in the vadose zone during the 2014 geotechnical investigation was sandy loam. The design infiltration rate for sandy loam soil type is 0.60 gal/day/ft² which is equivalent to a Darcy velocity of 2.82×10^{-7} m/s, which corresponds to 1.5 m of separation from the bottom of the mound to the underlying aquifer for a 60 day retention time. Groundwater depths shallower than 1.5 mBGS were measured at monitoring wells RW-14-001D, RW-14-004S and RW-14-005S, on September 11, 2014 and/or April 19, 2017; however, these three wells are located in Phase 2 of the development.

Within Phase 1 of the development, groundwater depths greater than 1.5 mBGS were measured; therefore, the measured soil profiles are capable of providing a 60 day retention time in the vadose zone for pathogen removal. However, the measured soil profiles at select monitoring well locations (RW-14-001D, RW-14-004S and RW-14-005S) within Phase 2 of the development are not capable of providing a 60 day retention time in the vadose zone for pathogen removal (i.e., groundwater depths shallower than 1.5 mBGS were measured). It should be noted that this evaluation was conducted based on limited groundwater level data (from September 11, 2014 and April 19, 2017 monitoring well readings) and that groundwater levels may be subject to seasonal and/or annual fluctuations.

Cumulative Nitrate Assessment

A nitrate impact assessment was conducted by Golder to assess the fate of OWTS effluent using nitrate-nitrogen as an indicator. The results of the assessment are described in Golder's 2015 report, and summarised below:

- solute migration trends south and radially from the site in the direction of groundwater flow;
- maximum nitrate concentrations in groundwater were noted adjacent to the source areas;
- simulated nitrate concentration results for a Type II mound effluent nitrate concentration of 40 mg/L (i.e., untreated effluent), applied over a 100-year simulation, exceed 10 mg/L at the site boundary; and
- simulated nitrate concentration results for a Type II mound effluent nitrate concentration of 5 mg/L (i.e., treated effluent), applied over a 100-year simulation, are less than 5 mg/L at the site boundary.

The assessment also considered nitrate concentrations results when including the observed background nitrate concentration at monitoring wells RW-14-001, RW-14-002 and RW-14-011. However, as noted, high nitrate concentrations measured in these monitoring wells during the 2014 groundwater sampling program are suspected to be due to the presence of cattle in the area and are therefore not relevant to this assessment.

It should be noted that the models constructed for the assessment were based on limited site specific testing and/or historical borehole information (i.e., there is insufficient information with which to perform a rigorous calibration of the numerical model). Additional field information would be required to further refine the estimates provided herein. While there is uncertainty with the input parameters and model construction details, the nitrate assessment showed that without further treatment, effluent discharged from a Type II sewage mound would result in nitrate concentrations greater than 10 mg/L leaving the site boundary.

Classification of Subdivision's Suitability for OWTS and Recommendations

Based on the soil conditions encountered at the site, calculated vadose zone depth, measured groundwater levels, and simulated nitrate concentration results, the proposed Meadow Ridge Estates subdivision's suitability for Type II sewage mounds is classified as having moderate limitations. These limitations include:

- 1) Measured soil profiles/groundwater depths at select locations within Phase 2 of the development are insufficient to provide a 60 day retention time in the vadose zone for pathogen removal; and
- 2) Simulated nitrate concentration results indicate that a reduction in the nitrate concentration of the sewage effluent is required to keep nitrate concentrations less than 10 mg/L at the boundary of the proposed development.

Therefore, a performance-based on-site wastewater treatment system (OWTS) capable of discharging Type II mound effluent with a nitrate concentration of 9 mg/L or less is recommended.

Closure

The findings of this memorandum are based on the results of groundwater monitoring conducted by Golder. The memorandum was prepared for Dan Beaulac for the proposed works described in the text. The information provided should not be used for any other purpose, or by any other parties, without written consent from Golder. The findings of this memorandum were prepared in accordance with generally accepted professional engineering principles and practice. No other warranty, expressed or implied, is given.

GOLDER ASSOCIATES LTD.



Laurie Stang, P.Eng.
Geotechnical Engineer

LNS/PGB/crm



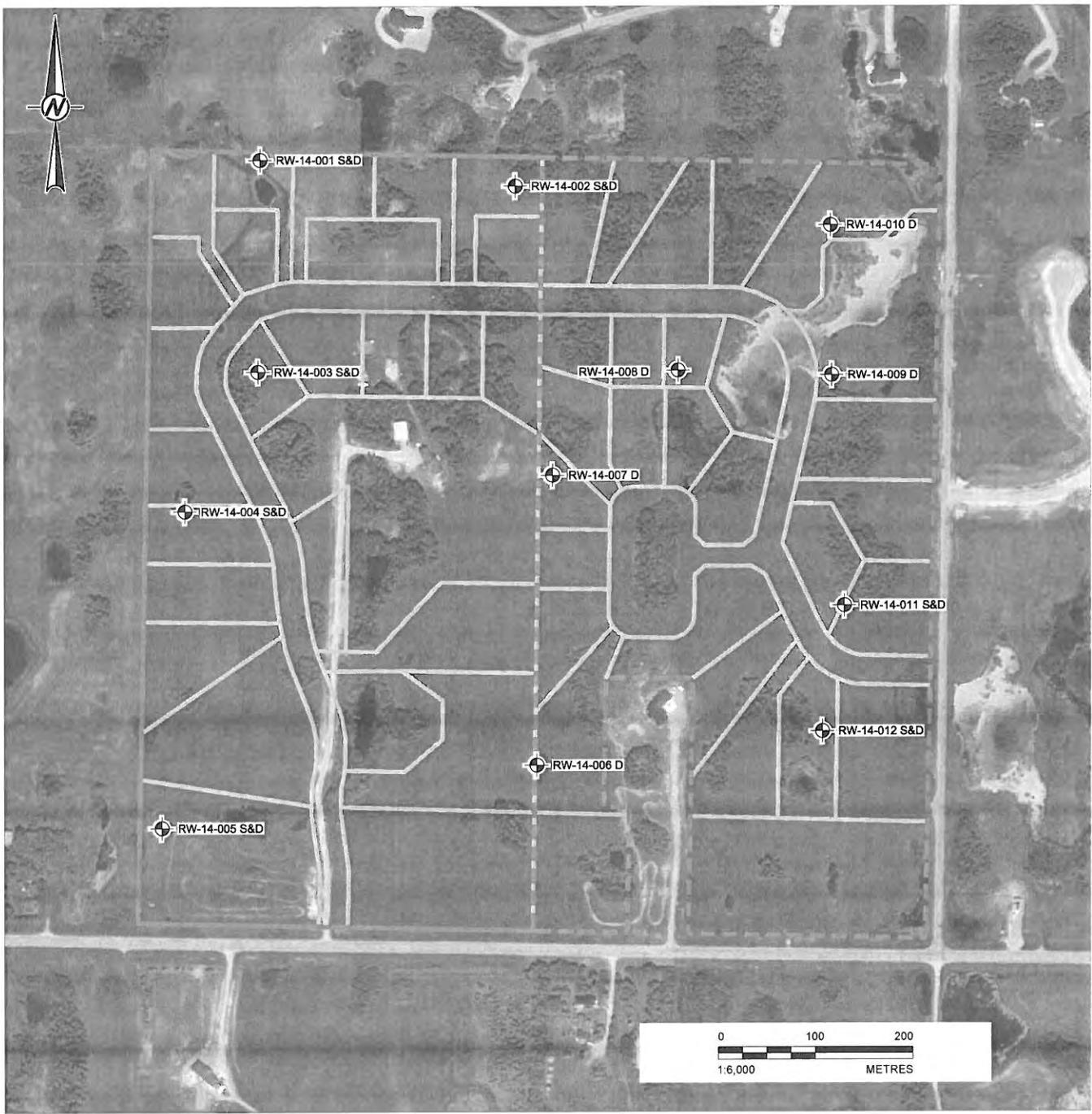
Phil Bruch, M.Sc., P.Eng., FCSCE
Principal, Senior Geotechnical Engineer

Association of Professional Engineers & Geoscientists of Saskatchewan		
CERTIFICATE OF AUTHORIZATION		
Golder Associates Ltd.		
Number C0230		
Permission to Consult held by:		
Discipline	Sk. Reg. No.	Signature
<u>GEOTECHNICAL</u>	<u>6039</u>	<u>Phil Bruch</u>

References

- Golder Associates Ltd. 2015. Ridgewood Estates, Hydro-Geotechnical Investigation, Report Number 1406388, August 2015.
- Government of Saskatchewan. 2012. Guidance Document for Developments and Subdivisions Where Onsite Wastewater Treatment Systems are Proposed.
- Health Canada. 2012. Guidelines for Canadian Drinking Water Quality, August 2012.
- Saskatchewan Ministry of Health. 2009. Saskatchewan Onsite Wastewater Disposal Guide. 2nd Edition.
- Government of Saskatchewan. Saskatchewan Environmental Quality Guidelines.
<https://envrbrportal.crm.saskatchewan.ca/seqg-search/>

FIGURES



Path: \\p:\hler\p15\gis\ek\blomggat\2014\1406388_Ridgeview Estates\Phase 6000\2017 Update\1 File Name: 1406388_6000 - Borehole Location Plan.dwg

LEGEND

- BOREHOLE LOCATION
- STUDY AREA (PHASE 1)
- STUDY AREA (PHASE 2)
- LOT BOUNDARIES (APPROXIMATE)

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE.
 IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE.
 NAD83 UTM ZONE 13

CLIENT
MEADOW RIDGE ESTATES

PROJECT
**MEADOW RIDGE ESTATES SUBDIVISION, SE-14-36-4-W4M
 HYDROGEOLOGY INVESTIGATION
 SASKATCHEWAN, CANADA - 2017 UPDATE**

TITLE
BOREHOLE LOCATION PLAN

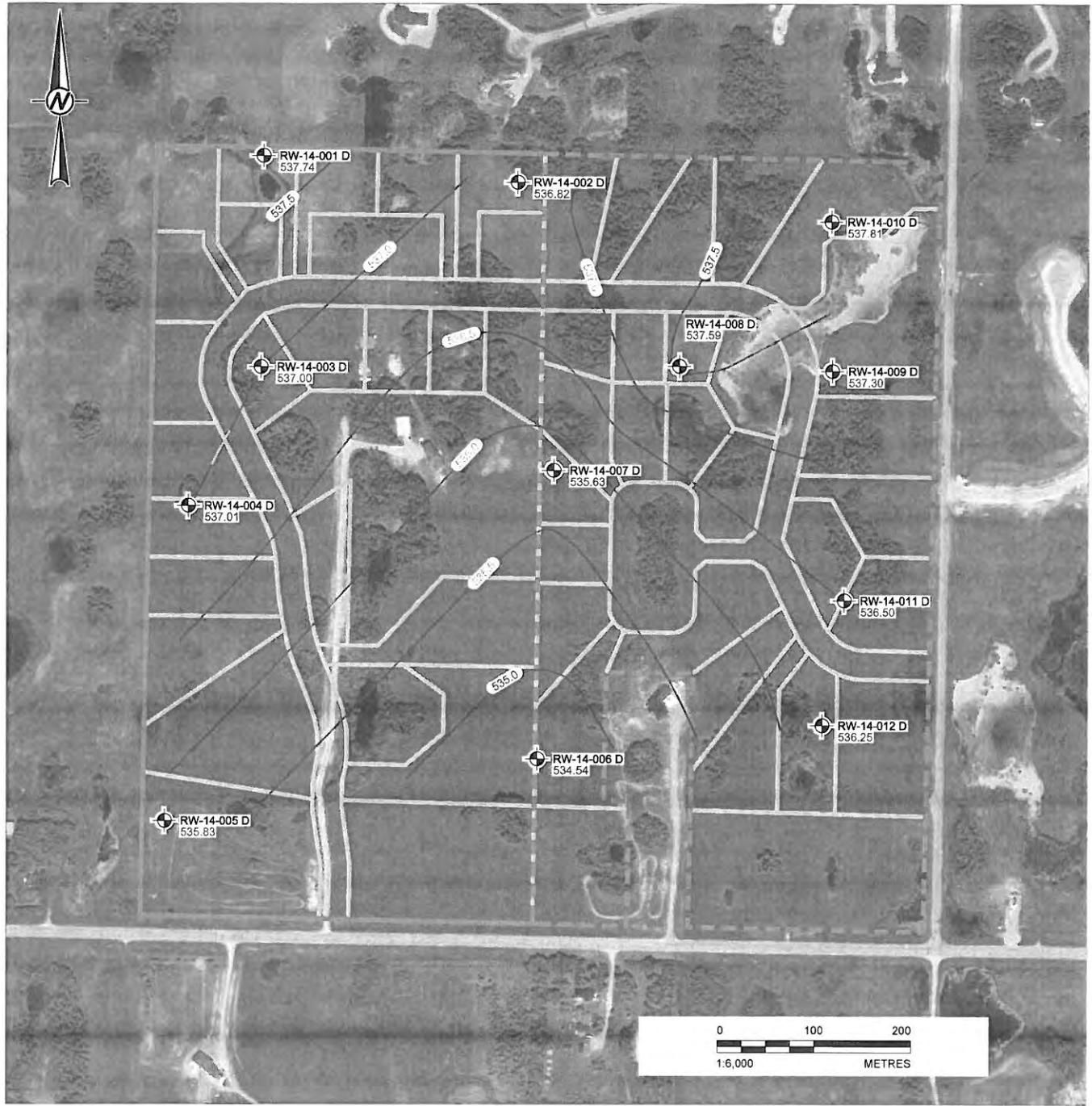
CONSULTANT



YYYY-MM-DD	2017-05-04
PREPARED	MKH
DESIGN	LNS
REVIEW	PGB
APPROVED	PGB

PROJECT No.	PHASE	Rev.	FIGURE
1406388	6000	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A 25 mm



LEGEND

-  BOREHOLE LOCATION
-  STUDY AREA (PHASE 1)
-  STUDY AREA (PHASE 2)
-  LOT BOUNDARIES (APPROXIMATE)
-  GROUNDWATER CONTOURS (0.5m INTERVAL)

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE.
 IMAGERY DATE: JULY 13TH, 2014. GOOGLE EARTH IMAGE IS NOT TO SCALE.
 NAD83 UTM ZONE 13

CLIENT
MEADOW RIDGE ESTATES

PROJECT
**MEADOW RIDGE ESTATES SUBDIVISION, SE-14-36-4-W3M
 HYDROGEOLOGY INVESTIGATION
 SASKATCHEWAN, CANADA - 2017 UPDATE**

TITLE
GROUNDWATER CONTOUR PLAN

CONSULTANT



YYYY-MM-DD 2017-05-04

PREPARED MKH

DESIGN LNS

REVIEW PGB

APPROVED PGB

PROJECT No.
1406388

PHASE
6000

Rev.
0

FIGURE
3

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3 (297 mm x 420 mm) TO A4 (210 mm x 297 mm)

APPENDIX A

Important Information and Limitations of this Report



IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface



IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Certificates of Analysis



Golder Associates Ltd.
ATTN: Colin Higgins
1721 8th Street East
Saskatoon SK S7H 0T4

Date Received: 20-APR-17
Report Date: 25-APR-17 17:03 (MT)
Version: FINAL

Client Phone: 306-665-7989

Certificate of Analysis

Lab Work Order #: L1915455
Project P.O. #: NOT SUBMITTED
Job Reference: 1406388
C of C Numbers: 14-489437
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-1 RW-14-003D							
Sampled By: CLIENT on 20-APR-17 @ 12:35							
Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		22-APR-17	R3704474
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	0.0045	DLDS	0.0040	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.00110	DLDS	0.00020	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.00776	DLDS	0.00010	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.00010	DLDS	0.00010	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.105	DLDS	0.020	mg/L		24-APR-17	R3707840
Cadmium (Cd)-Dissolved	0.000042	DLDS	0.000010	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00197	DLDS	0.00020	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	0.00041	DLDS	0.00040	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	0.487	DLDS	0.020	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	<0.00010	DLDS	0.00010	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.0544	DLDS	0.0020	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	0.536	DLDS	0.00020	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00373	DLDS	0.00010	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.0029	DLDS	0.0010	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	<0.10	DLDS	0.10	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.00070	DLDS	0.00040	mg/L		24-APR-17	R3707840
Selenium (Se)-Dissolved	0.00010	DLDS	0.00010	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	8.21	DLDS	0.10	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	0.663	DLDS	0.00040	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.00040	DLDS	0.00040	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Uranium (U)-Dissolved	0.00152	DLDS	0.000020	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	<0.0010	DLDS	0.0010	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0055	DLDS	0.0020	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	<0.00030	DLDS	0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	436		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10.		10	mg/L		21-APR-17	R3703925
Carbonate (CO3)	<10.		10	mg/L		21-APR-17	R3703925
Alkalinity, Total (as CaCO3)	357		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	9.4		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-1 RW-14-003D Sampled By: CLIENT on 20-APR-17 @ 12:35 Matrix: WATER							
Conductivity (Automated)							
Conductivity	2030		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	174	DLDS	2.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	7.5	DLDS	2.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	191	DLDS	2.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	74.8	DLDS	4.0	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO4)	912	DLDS	6.0	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	2.7			%		25-APR-17	
TDS (Calculated)	1580			mg/L		25-APR-17	
Hardness (as CaCO3)	1220			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.46		0.10	pH		21-APR-17	R3703925
L1915455-2 RW-14-00GS Sampled By: CLIENT on 20-APR-17 @ 12:00 Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	0.0000090		0.0000050	mg/L		22-APR-17	R3704474
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	0.162		0.0020	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	0.00026		0.00010	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.00102		0.00010	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.109		0.000050	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.016		0.010	mg/L		24-APR-17	R3707840
Cadmium (Cd)-Dissolved	0.0000371		0.0000050	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	0.000017		0.000010	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	0.00095		0.00010	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00038		0.00010	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	0.00313		0.00020	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	0.169		0.010	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	0.000137		0.000050	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.0262		0.0010	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	0.00888		0.00010	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00125		0.000050	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.00132		0.00050	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.00121		0.00020	mg/L		24-APR-17	R3707840

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-2 RW-14-00GS Sampled By: CLIENT on 20-APR-17 @ 12:00 Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Selenium (Se)-Dissolved	0.0164		0.000050	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	10.4		0.050	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	0.343		0.00020	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	0.000014		0.000010	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	0.00018		0.00010	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	0.0067	DLM	0.0030	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Uranium (U)-Dissolved	0.00356		0.000010	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	0.00074		0.00050	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0032		0.0010	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	0.00033		0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	376		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10.		10	mg/L		21-APR-17	R3703925
Carbonate (CO ₃)	<10.		10	mg/L		21-APR-17	R3703925
Alkalinity, Total (as CaCO ₃)	309		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	99.0		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							
Conductivity	1390		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	131		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	1.4		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	121		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	15.4		2.0	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO ₄)	324		3.0	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	4.6			%		25-APR-17	
TDS (Calculated)	877			mg/L		25-APR-17	
Hardness (as CaCO ₃)	825			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.65		0.10	pH		21-APR-17	R3703925
L1915455-3 RW-14-006D Sampled By: CLIENT on 20-APR-17 @ 11:05 Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	0.0000071		0.0000050	mg/L		22-APR-17	R3704474

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-3 RW-14-006D							
Sampled By: CLIENT on 20-APR-17 @ 11:05							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	<0.0020		0.0020	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	0.00029		0.00010	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.00332		0.00010	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.0335		0.000050	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.135		0.010	mg/L		24-APR-17	R3707840
Cadmium (Cd)-Dissolved	0.0000680		0.0000050	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00120		0.00010	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	0.00055		0.00020	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	0.012		0.010	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.0487		0.0010	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	0.732		0.00010	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00661		0.000050	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.00396		0.00050	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.00129		0.00020	mg/L		24-APR-17	R3707840
Selenium (Se)-Dissolved	0.000284		0.000050	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	8.00		0.050	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	0.656		0.00020	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	0.000099		0.000010	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	0.00023		0.00010	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Uranium (U)-Dissolved	0.00448		0.000010	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	0.00171		0.00050	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0051		0.0010	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	428.		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10.		10	mg/L		21-APR-17	R3703925
Carbonate (CO ₃)	<10.		10	mg/L		21-APR-17	R3703925
Alkalinity, Total (as CaCO ₃)	351		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	14.1		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							
Conductivity	1490		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	194		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	8.4		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	81.6		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	49.8		2.0	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO ₄)	475		3.0	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	4.1			%		25-APR-17	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-3 RW-14-006D Sampled By: CLIENT on 20-APR-17 @ 11:05 Matrix: WATER							
Ion Balance Calculation							
TDS (Calculated)	1030			mg/L		25-APR-17	
Hardness (as CaCO3)	820			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.67		0.10	pH		21-APR-17	R3703925
L1915455-4 RW-14-007D Sampled By: CLIENT on 20-APR-17 @ 10:15 Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	3		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		22-APR-17	R3704474
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	0.0082	DLDS	0.0040	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.00151	DLDS	0.00020	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.0113	DLDS	0.00010	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.00010	DLDS	0.00010	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.038	DLDS	0.020	mg/L		24-APR-17	R3707840
Cadmium (Cd)-Dissolved	0.000055	DLDS	0.000010	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00181	DLDS	0.00020	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	<0.00040	DLDS	0.00040	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	0.580	DLDS	0.020	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	<0.00010	DLDS	0.00010	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.0332	DLDS	0.0020	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	1.52	DLDS	0.00020	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00393	DLDS	0.00010	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.0091	DLDS	0.0010	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	<0.10	DLDS	0.10	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.00045	DLDS	0.00040	mg/L		24-APR-17	R3707840
Selenium (Se)-Dissolved	0.00018	DLDS	0.00010	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	7.26	DLDS	0.10	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	0.431	DLDS	0.00040	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.00040	DLDS	0.00040	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	<0.000020	DLDS	0.000020	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	0.00025	DLDS	0.00020	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00020	DLDS	0.00020	mg/L		24-APR-17	R3707840

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-4 RW-14-007D Sampled By: CLIENT on 20-APR-17 @ 10:15 Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Uranium (U)-Dissolved	0.00444	DLDS	0.000020	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	<0.0010	DLDS	0.0010	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0055	DLDS	0.0020	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	<0.00030	DLDS	0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	319.		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10.		10	mg/L		21-APR-17	R3703925
Carbonate (CO3)	<10.		10	mg/L		21-APR-17	R3703925
Alkalinity, Total (as CaCO3)	261		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	48.8		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							
Conductivity	1780		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	241		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	7.0		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	107		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	49.7		2.0	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO4)	733		3.0	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	2.9			%		25-APR-17	
TDS (Calculated)	1340			mg/L		25-APR-17	
Hardness (as CaCO3)	1040			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.44		0.10	pH		21-APR-17	R3703925
L1915455-5 RW-14-010D Sampled By: CLIENT on 20-APR-17 @ 09:40 Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	10		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		22-APR-17	R3704474
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	<0.010	DLDS	0.010	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.00227	DLDS	0.00050	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.0238	DLDS	0.00025	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.252	DLDS	0.050	mg/L		24-APR-17	R3707840

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-5 RW-14-010D							
Sampled By: CLIENT on 20-APR-17 @ 09:40							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Cadmium (Cd)-Dissolved	0.000460	DLDS	0.000025	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00581	DLDS	0.00050	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	<0.0010	DLDS	0.0010	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	0.532	DLDS	0.050	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.150	DLDS	0.0050	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	2.61	DLDS	0.00050	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00358	DLDS	0.00025	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.0140	DLDS	0.0025	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.0025	DLDS	0.0010	mg/L		24-APR-17	R3707840
Selenium (Se)-Dissolved	0.00377	DLDS	0.00025	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	6.71	DLDS	0.25	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	2.34	DLDS	0.0010	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	0.000217	DLDS	0.000050	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00050	DLDS	0.00050	mg/L		24-APR-17	R3707840
Uranium (U)-Dissolved	0.0306	DLDS	0.000050	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0070	DLDS	0.0050	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	0.00034	DLDS	0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO ₃)	454		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10		10	mg/L		21-APR-17	R3703925
Carbonate (CO ₃)	<10		10	mg/L		21-APR-17	R3703925
Alkalinity, Total (as CaCO ₃)	372		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	46.5		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							
Conductivity	4920		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	534	DLDS	5.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	16.6	DLDS	5.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	411	DLDS	5.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	367	DLDS	10	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO ₄)	2950	DLDS	15	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	4.6			%		25-APR-17	
TDS (Calculated)	4550			mg/L		25-APR-17	
Hardness (as CaCO ₃)	3030			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.36		0.10	pH		21-APR-17	R3703925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-5 RW-14-010D Sampled By: CLIENT on 20-APR-17 @ 09:40 Matrix: WATER							
L1915455-6 RW-14-011D Sampled By: CLIENT on 20-APR-17 @ 09:00 Matrix: WATER							
Miscellaneous Parameters							
Heterotrophic Bacteria Count	>2420		1	MPN/100mL	20-APR-17	22-APR-17	R3705284
Iron Bacteria	PRESENT					21-APR-17	R3707981
Total Coliform, E. Coli - Quanti-Tray							
Total Coliforms	3		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Escherichia Coli	0		0	MPN/100mL	20-APR-17	21-APR-17	R3704273
Dissolved Mercury in Water by CVAAS							
Dissolved Mercury Filtration Location	FIELD					22-APR-17	R3704394
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		22-APR-17	R3704474
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-APR-17	R3704107
Aluminum (Al)-Dissolved	<0.0020		0.0020	mg/L		24-APR-17	R3707840
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Arsenic (As)-Dissolved	0.0156		0.00010	mg/L		24-APR-17	R3707840
Barium (Ba)-Dissolved	0.0159		0.000050	mg/L		24-APR-17	R3707840
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		24-APR-17	R3707840
Boron (B)-Dissolved	0.067		0.010	mg/L		24-APR-17	R3707840
Cadmium (Cd)-Dissolved	0.0000758		0.0000050	mg/L		24-APR-17	R3707840
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Cobalt (Co)-Dissolved	0.00059		0.00010	mg/L		24-APR-17	R3707840
Copper (Cu)-Dissolved	0.00068		0.00020	mg/L		24-APR-17	R3707840
Iron (Fe)-Dissolved	1.37		0.010	mg/L		24-APR-17	R3707840
Lead (Pb)-Dissolved	0.000053		0.000050	mg/L		24-APR-17	R3707840
Lithium (Li)-Dissolved	0.0487		0.0010	mg/L		24-APR-17	R3707840
Manganese (Mn)-Dissolved	0.247		0.00010	mg/L		24-APR-17	R3707840
Molybdenum (Mo)-Dissolved	0.00448		0.000050	mg/L		24-APR-17	R3707840
Nickel (Ni)-Dissolved	0.00170		0.00050	mg/L		24-APR-17	R3707840
Phosphorus (P)-Dissolved	0.066		0.050	mg/L		24-APR-17	R3707840
Rubidium (Rb)-Dissolved	0.00058		0.00020	mg/L		24-APR-17	R3707840
Selenium (Se)-Dissolved	0.000064		0.000050	mg/L		24-APR-17	R3707840
Silicon (Si)-Dissolved	9.64		0.050	mg/L		24-APR-17	R3707840
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Strontium (Sr)-Dissolved	0.618		0.00020	mg/L		24-APR-17	R3707840
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L		24-APR-17	R3707840
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L		24-APR-17	R3707840
Tin (Sn)-Dissolved	0.00020		0.00010	mg/L		24-APR-17	R3707840
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		24-APR-17	R3707840
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L		24-APR-17	R3707840
Uranium (U)-Dissolved	0.000360		0.000010	mg/L		24-APR-17	R3707840
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L		24-APR-17	R3707840
Zinc (Zn)-Dissolved	0.0042		0.0010	mg/L		24-APR-17	R3707840
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		24-APR-17	R3707840
Routine Water Analysis (no Fluoride)							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	440.		20	mg/L		21-APR-17	R3703925
Hydroxide (OH)	<10.		10	mg/L		21-APR-17	R3703925
Carbonate (CO3)	<10.		10	mg/L		21-APR-17	R3703925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1915455-6 RW-14-011D							
Sampled By: CLIENT on 20-APR-17 @ 09:00							
Matrix: WATER							
Alkalinity by Auto. Titration							
Alkalinity, Total (as CaCO ₃)	360		20	mg/L		21-APR-17	R3703925
Chloride (Cl)							
Chloride (Cl)	14.7		1.0	mg/L	21-APR-17	21-APR-17	R3704296
Conductivity (Automated)							
Conductivity	1390		10	uS/cm		21-APR-17	R3703925
ICP Cations							
Calcium (Ca)	163		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Potassium (K)	7.3		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Magnesium (Mg)	95.4		1.0	mg/L	21-APR-17	21-APR-17	R3704267
Sodium (Na)	31.8		2.0	mg/L	21-APR-17	21-APR-17	R3704267
Sulfur (as SO ₄)	424		3.0	mg/L	21-APR-17	21-APR-17	R3704267
Ion Balance Calculation							
Cation - Anion Balance	3.2			%		25-APR-17	
TDS (Calculated)	952			mg/L		25-APR-17	
Hardness (as CaCO ₃)	800			mg/L		25-APR-17	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
Nitrite-N	<0.050		0.050	mg/L	21-APR-17	21-APR-17	R3704264
Nitrate+Nitrite-N	<0.50		0.50	mg/L	21-APR-17	21-APR-17	R3704264
pH by Meter (Automated)							
pH	7.57		0.10	pH		21-APR-17	R3703925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PCT-SK	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
CL-COL-SK	Water	Chloride (Cl)	APHA 4500-CL E
Thiocyanate ion (SCN) is liberated from mercuric thiocyanate by chloride ion to form un-ionized mercuric chloride. In the presence of ferric ion, the liberated SCN forms a colored ferric thiocyanate complex proportional to the original chloride concentration. Absorbance of the colored complex is measured using a Gallery discrete analyzer.			
EC-PCT-SK	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
ETL-ROUTINE-ICP-SK	Water	ICP Cations	APHA 3120 B-ICP-OES-ROU
These ions are determined directly y ICP-OES.			
Reference Greenberg, Arnold E., Cleseri, Lenore S., Eaton, Andrew D., Standard Methods For The Examination of Water and Wastewater, 18th Edition, 1992, Method 3120B.			
HG-D-CVAA-ED	Water	Dissolved Mercury in Water by CVAAS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
HPC-QT97-SK	Water	Heterotrophic Bacteria Count-Quanti Tray	APHA 9215E, 2004
Analysis is carried out using procedures adapted from APHA 9215E "Heterotrophic Plate Count, Enzyme Substrate Method". Heterotrophic bacteria are determined by mixing sample with a mixture of hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 44-72 hours and the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table			
IB-BART-CL	Water	Iron Bacteria, Presence/Absence	BART TEST KIT
Iron Related Bacteria- IRB BART Method (Presence/Absence): A small amount of sample is transferred to a vial (anaerobic chamber). Presence/Absence of aggressive strains of IRB is reported by observing the chamber over 5 days and observing the reaction within the chamber. This method is applicable to both iron-oxidizing and iron-reducing bacteria. Determination of non-aggressive strains require 6-9 days, and determination of semi-quantitative results require up to 9 days.			
IONBALANCE-OP03-SK	Water	Ion Balance Calculation	APHA 1030-E
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
N2/N3-SK	Water	Nitrate, Nitrite and Nitrate+Nitrite-N	APHA 4500 NO3F
Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water-soluble dye has a magenta color, which is measured at 520nm. Original nitrite can also be determined by removing the cadmium column and following the same procedure. Nitrate-N, Nitrite-N and NO3+NO2-N are reported.			
PH-PCT-SK	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field.			
TC,EC-QT51-SK	Water	Total Coliform, E. Coli - Quanti-Tray	APHA 9223B 2B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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The analysis of Total Coliform (TC) & Escherichia coli (EC) is processed by Quanti-tray (QT): Two substrates, ONPG for TC detection and MUG for EC detection are used. The substrates are added to the 100 ml sample dispensed into the 51 well tray. The tray is incubated at 35 Celcius for 24 hours. A colour reaction develops to indicate a positive reaction (presence of TC, EC). The number of positive wells are counted and converted to Most Probable Number Units (MPNU) per 100 ml.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

14-489437

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1915455

Report Date: 25-APR-17

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Client: Golder Associates Ltd.
 1721 8th Street East
 Saskatoon SK S7H 0T4

Contact: Colin Higgins

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-PCT-SK Water								
Batch R3703925								
WG2514340-2	LCS	PCT	95.5		%		85-115	21-APR-17
Alkalinity, Total (as CaCO ₃)								
WG2514340-3	MB		<20		mg/L		20	21-APR-17
Alkalinity, Total (as CaCO ₃)								
CL-COL-SK Water								
Batch R3704296								
WG2514825-2	DUP	L1915455-6	14.6		mg/L	0.4	20	21-APR-17
Chloride (Cl)								
WG2514825-4	LCS	50PPM-CL	100.7		%		90-110	21-APR-17
Chloride (Cl)								
WG2514825-1	MB		<1.0		mg/L		1	21-APR-17
Chloride (Cl)								
EC-PCT-SK Water								
Batch R3703925								
WG2514340-2	LCS	PCT	100.9		%		90-110	21-APR-17
Conductivity								
WG2514340-3	MB		<10		uS/cm		10	21-APR-17
Conductivity								
ETL-ROUTINE-ICP-SK Water								
Batch R3704267								
WG2514372-3	LCS		102.8		%		80-120	21-APR-17
Calcium (Ca)								
			100.7		%		80-120	21-APR-17
Potassium (K)								
			102.9		%		80-120	21-APR-17
Magnesium (Mg)								
			101.3		%		80-120	21-APR-17
Sodium (Na)								
			100.3		%		90-110	21-APR-17
Sulfur (as SO ₄)								
WG2514372-1	MB		<1.0		mg/L		1	21-APR-17
Calcium (Ca)								
			<1.0		mg/L		1	21-APR-17
Potassium (K)								
			<1.0		mg/L		1	21-APR-17
Magnesium (Mg)								
			<2.0		mg/L		2	21-APR-17
Sodium (Na)								
			<3.0		mg/L		3	21-APR-17
Sulfur (as SO ₄)								
HG-D-CVAA-ED Water								
Batch R3704474								
WG2515237-3	DUP	L1915455-1	<0.0000050	RPD-NA	mg/L	N/A	20	22-APR-17
Mercury (Hg)-Dissolved								
WG2515237-2	LCS							



Quality Control Report

Workorder: L1915455

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-ED	Water							
Batch R3704474								
WG2515237-2 LCS								
Mercury (Hg)-Dissolved			100.0		%		80-120	22-APR-17
WG2515237-1 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	22-APR-17
WG2515237-4 MS		L1915455-2						
Mercury (Hg)-Dissolved			100.0		%		70-130	22-APR-17
HPC-QT97-SK	Water							
Batch R3705284								
WG2514428-1 DUP		L1915455-2						
Heterotrophic Bacteria Count		>2420	2420		MPN/100mL	0.0	65	22-APR-17
WG2514428-2 MB								
Heterotrophic Bacteria Count			<1		MPN/100mL		1	22-APR-17
MET-D-CCMS-SK	Water							
Batch R3707840								
WG2514378-3 CRM		TMRM 20						
Aluminum (Al)-Dissolved			109.9		%		80-120	24-APR-17
Antimony (Sb)-Dissolved			101.4		%		80-120	24-APR-17
Arsenic (As)-Dissolved			100.1		%		80-120	24-APR-17
Barium (Ba)-Dissolved			101.4		%		80-120	24-APR-17
Beryllium (Be)-Dissolved			98.6		%		80-120	24-APR-17
Bismuth (Bi)-Dissolved			99.9		%		80-120	24-APR-17
Boron (B)-Dissolved			98.4		%		80-120	24-APR-17
Cadmium (Cd)-Dissolved			100.5		%		80-120	24-APR-17
Cesium (Cs)-Dissolved			99.9		%		80-120	24-APR-17
Chromium (Cr)-Dissolved			100.1		%		80-120	24-APR-17
Cobalt (Co)-Dissolved			100.1		%		80-120	24-APR-17
Copper (Cu)-Dissolved			99.0		%		80-120	24-APR-17
Iron (Fe)-Dissolved			100.5		%		80-120	24-APR-17
Lead (Pb)-Dissolved			101.5		%		80-120	24-APR-17
Lithium (Li)-Dissolved			104.3		%		80-120	24-APR-17
Manganese (Mn)-Dissolved			99.9		%		80-120	24-APR-17
Molybdenum (Mo)-Dissolved			100.8		%		80-120	24-APR-17
Nickel (Ni)-Dissolved			100.7		%		80-120	24-APR-17
Phosphorus (P)-Dissolved			91.9		%		70-130	24-APR-17
Rubidium (Rb)-Dissolved			96.6		%		80-120	24-APR-17
Selenium (Se)-Dissolved			105.5		%		80-120	24-APR-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK		Water						
Batch	R3707840							
WG2514378-3	CRM	TMRM_20						
Silicon (Si)-Dissolved			96.1		%		60-140	24-APR-17
Silver (Ag)-Dissolved			99.4		%		80-120	24-APR-17
Strontium (Sr)-Dissolved			106.5		%		80-120	24-APR-17
Tellurium (Te)-Dissolved			107.4		%		80-120	24-APR-17
Thallium (Tl)-Dissolved			100.8		%		80-120	24-APR-17
Tin (Sn)-Dissolved			100.1		%		80-120	24-APR-17
Titanium (Ti)-Dissolved			94.0		%		80-120	24-APR-17
Tungsten (W)-Dissolved			103.1		%		80-120	24-APR-17
Uranium (U)-Dissolved			103.6		%		80-120	24-APR-17
Vanadium (V)-Dissolved			99.5		%		80-120	24-APR-17
Zinc (Zn)-Dissolved			94.5		%		80-120	24-APR-17
Zirconium (Zr)-Dissolved			93.0		%		80-120	24-APR-17
WG2514378-2	DUP	L1915455-4						
Aluminum (Al)-Dissolved		0.0082	0.0097		mg/L	17	20	24-APR-17
Antimony (Sb)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	24-APR-17
Arsenic (As)-Dissolved		0.00151	0.00161		mg/L	6.4	20	24-APR-17
Barium (Ba)-Dissolved		0.0113	0.0111		mg/L	1.8	20	24-APR-17
Beryllium (Be)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	24-APR-17
Bismuth (Bi)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	24-APR-17
Boron (B)-Dissolved		0.038	0.037		mg/L	5.0	20	24-APR-17
Cadmium (Cd)-Dissolved		0.000055	0.000060		mg/L	9.1	20	24-APR-17
Cesium (Cs)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	24-APR-17
Chromium (Cr)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	24-APR-17
Cobalt (Co)-Dissolved		0.00181	0.00188		mg/L	3.8	20	24-APR-17
Copper (Cu)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	24-APR-17
Iron (Fe)-Dissolved		0.580	0.607		mg/L	4.6	20	24-APR-17
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	24-APR-17
Lithium (Li)-Dissolved		0.0332	0.0327		mg/L	1.4	20	24-APR-17
Manganese (Mn)-Dissolved		1.52	1.53		mg/L	1.0	20	24-APR-17
Molybdenum (Mo)-Dissolved		0.00393	0.00385		mg/L	2.0	20	24-APR-17
Nickel (Ni)-Dissolved		0.0091	0.0092		mg/L	1.5	20	24-APR-17
Phosphorus (P)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	24-APR-17
Rubidium (Rb)-Dissolved		0.00045	0.00054		mg/L	18	20	24-APR-17
Selenium (Se)-Dissolved		0.00018	0.00014	J	mg/L	0.00004	0.0002	24-APR-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch	R3707840							
WG2514378-2 DUP		L1915455-4						
Silicon (Si)-Dissolved		7.26	7.15		mg/L	1.5	20	24-APR-17
Silver (Ag)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	24-APR-17
Strontium (Sr)-Dissolved		0.431	0.449		mg/L	4.2	20	24-APR-17
Tellurium (Te)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	24-APR-17
Thallium (Tl)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	24-APR-17
Tin (Sn)-Dissolved		0.00025	0.00025		mg/L	3.8	20	24-APR-17
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	24-APR-17
Tungsten (W)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	24-APR-17
Uranium (U)-Dissolved		0.00444	0.00453		mg/L	2.1	20	24-APR-17
Vanadium (V)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	24-APR-17
Zinc (Zn)-Dissolved		0.0055	0.0055		mg/L	0.0	20	24-APR-17
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	24-APR-17
WG2514378-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	24-APR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-APR-17
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	24-APR-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-APR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-APR-17
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch	R3707840							
WG2514378-1 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-APR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-APR-17
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	24-APR-17
WG2514378-4 MS		L1915455-6						
Aluminum (Al)-Dissolved			90.4		%		70-130	24-APR-17
Antimony (Sb)-Dissolved			105.9		%		70-130	24-APR-17
Arsenic (As)-Dissolved			92.6		%		70-130	24-APR-17
Barium (Ba)-Dissolved			85.8		%		70-130	24-APR-17
Beryllium (Be)-Dissolved			92.5		%		70-130	24-APR-17
Bismuth (Bi)-Dissolved			88.7		%		70-130	24-APR-17
Boron (B)-Dissolved			92.3		%		70-130	24-APR-17
Cadmium (Cd)-Dissolved			95.1		%		70-130	24-APR-17
Cesium (Cs)-Dissolved			100.5		%		70-130	24-APR-17
Chromium (Cr)-Dissolved			90.8		%		70-130	24-APR-17
Cobalt (Co)-Dissolved			89.1		%		70-130	24-APR-17
Copper (Cu)-Dissolved			86.8		%		70-130	24-APR-17
Iron (Fe)-Dissolved			84.4		%		70-130	24-APR-17
Lead (Pb)-Dissolved			94.7		%		70-130	24-APR-17
Lithium (Li)-Dissolved			95.4		%		70-130	24-APR-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	24-APR-17
Molybdenum (Mo)-Dissolved			98.8		%		70-130	24-APR-17
Nickel (Ni)-Dissolved			86.2		%		70-130	24-APR-17
Phosphorus (P)-Dissolved			100.1		%		70-130	24-APR-17
Rubidium (Rb)-Dissolved			92.7		%		70-130	24-APR-17
Selenium (Se)-Dissolved			116.8		%		70-130	24-APR-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch	R3707840							
WG2514378-4	MS	L1915455-6						
Silicon (Si)-Dissolved			79.7		%		70-130	24-APR-17
Silver (Ag)-Dissolved			94.6		%		70-130	24-APR-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	24-APR-17
Tellurium (Te)-Dissolved			110.5		%		70-130	24-APR-17
Thallium (Tl)-Dissolved			93.4		%		70-130	24-APR-17
Tin (Sn)-Dissolved			98.9		%		70-130	24-APR-17
Titanium (Ti)-Dissolved			92.2		%		70-130	24-APR-17
Tungsten (W)-Dissolved			99.9		%		70-130	24-APR-17
Uranium (U)-Dissolved			100.9		%		70-130	24-APR-17
Vanadium (V)-Dissolved			93.0		%		70-130	24-APR-17
Zinc (Zn)-Dissolved			84.3		%		70-130	24-APR-17
Zirconium (Zr)-Dissolved			101.4		%		70-130	24-APR-17
N2/N3-SK	Water							
Batch	R3704264							
WG2514452-3	LCS							
Nitrate-N			99.0		%		90-110	21-APR-17
Nitrite-N			93.6		%		90-110	21-APR-17
Nitrate+Nitrite-N			98.2		%		90-110	21-APR-17
WG2514452-2	MB							
Nitrate-N			<0.50		mg/L		0.5	21-APR-17
Nitrite-N			<0.050		mg/L		0.05	21-APR-17
Nitrate+Nitrite-N			<0.50		mg/L		0.5	21-APR-17
WG2514452-4	MS	L1915455-4						
Nitrate-N			121.5		%		70-130	21-APR-17
Nitrite-N			105.4		%		70-130	21-APR-17
Nitrate+Nitrite-N			120.1		%		70-130	21-APR-17
PH-PCT-SK	Water							
Batch	R3703925							
WG2514340-2	LCS	PCT						
pH			6.87		pH		6.76-6.96	21-APR-17
TC,EC-QT51-SK	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TC,EC-QT51-SK	Water							
Batch	R3704273							
WG2514271-2	MB							
Total Coliforms			0		MPN/100mL		1	21-APR-17
Escherichia Coli			0		MPN/100mL		1	21-APR-17

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	20-APR-17 12:35	21-APR-17 10:00	0.25	21	hours	EHTR-FM
	2	20-APR-17 12:00	21-APR-17 10:00	0.25	22	hours	EHTR-FM
	3	20-APR-17 11:05	21-APR-17 10:00	0.25	23	hours	EHTR-FM
	4	20-APR-17 10:15	21-APR-17 10:00	0.25	24	hours	EHTR-FM
	5	20-APR-17 09:40	21-APR-17 10:00	0.25	24	hours	EHTR-FM
	6	20-APR-17 09:00	21-APR-17 10:00	0.25	25	hours	EHTR-FM
Bacteriological Tests							
Iron Bacteria, Presence/Absence							
	6	20-APR-17 09:00	21-APR-17 10:15	24	25	hours	EHTL

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1915455 were received on 20-APR-17 14:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com



L1915455-COFC

COC Number 14 - 489437

Page 1 of 1

Report To
 Company: GOLDER ASSOCIATES
 Contact: COLIN HIGGINS
 Address: 1721 8th St. E
 Phone: (306) 665-7989

Report Format / Distribution
 Select Report Format: PDF EXCEL ED3 (DIGITAL)
 Quality Control (QC) Report with Report Yes No
 Criteria on Report - provide details below if box checked
 Select Distribution: EMAIL MAIL FAX
 Email 1 or Fax: Colin Higgins @ golder.com
 Email 2: phil-bruch @ golder.com

Invoice To Same as Report To Yes No
 Copy of Invoice with Report Yes No

Company:
 Select Invoice Distribution: EMAIL MAIL FAX
 Email 1 or Fax:
 Email 2:

Project Information
 ALS Quote #: 1406388
 Job #: 1406388
 PO / AFE:
 LSD:

ALS Lab Work Order # (lab use only)
 Sample Identification and/or Coordinates (This description will appear on the report)
 ALS Sample # (lab use only):
 RW-14-003 D
 RW-14-005 S
 RW-14-006 D
 RW-14-007 D
 RW-14-010 D
 RW-14-011 D

ALS Contact:
 Date: 20/APR/17 Time: 12:35 Sample Type: H2O
20/APR/17 12:00 H2O
20/APR/17 11:05 H2O
20/APR/17 10:15 H2O
20/APR/17 09:40 H2O
20/APR/17 09:00 H2O

Analysis Request
 Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below
 F P P P P
 ROUTINE
 DISS METALS + H
 IRB
 HPC
 TR, EC

Number of Containers
 6
 6
 6
 6
 6
 6

Special Instructions / Specify Criteria to add on report (client use)
 Drinking Water (DW) Samples (client use)
 Are samples taken from a Regulated DW System? Yes No
 Are samples for human drinking water use? Yes No

SHIPMENT RELEASE (client use)
 Released by: [Signature] Date: 20/APR/17 Time: 14:05

INITIAL SHIPMENT RECEIPTION (lab use only)
 Received by: [Signature] Date: 20/4 Time: 1501

FINAL SHIPMENT RECEIPTION (lab use only)
 Received by: _____ Date: _____ Time: _____

Temperature Observations
 Frozen Yes No
 Ice packs Yes No
 Custody seal intact Yes No
 Cooling initiated Yes No
 Cooler temperatures Yes No
 Cooler temperatures Yes No

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

