COMPREHENSIVE DEVELOPMENT REVIEW

TUSCAN RIDGE ESTATES

Prepared for:

THE RURAL MUNICIPALITY OF CORMAN PARK NO. 344

Prepared by:

Whitewater Holdings Ltd.

In Association With:

Catterall & Wright Consulting Engineers

Webb Surveys

P. Machibroda Engineering Ltd.

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and

Stantec

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EXECUTIVE SUMMARY

Whitewater Holdings Ltd. (the Developer) is applying to rezone 58.27 ha (144 acres) of Ptn. SE 24-36-04 W3M to Country Residential 1 District (CR1) for the purpose of developing a 43 lot country residential development. The proposed development is known as Tuscan Ridge Estates residential subdivision and is situated on land located within the R.M. of Corman Park and a portion of the access road within the R.M. of Blucher. It is the intention of the Developer to compliment the existing natural beauty of the region by carefully integrating housing into the development. The Developer intends to minimize the environmental footprint of the development and create an exceptional family-focused development with an innovative solar project. Country residential development is the proposed land use. The developer will determine a series of architectural controls and conditions for site development, homes and accessory buildings that will be required conditions of lot sales.

The development conforms to the policies contained within the R.M. of Corman Park Official Community Plan and will conform to development standards and regulations contained within the R.M. Zoning Bylaws.

A total of 43 lots are planned for this residential development. The Developer has decided to develop this community in two Phases. Phase I will consists of 23 lots (lots #1-16 Block 1, lots 7-13 Block 2), dedication of MR1, MR3 (Park), ER1, ER2, as well as road construction and culverts for the entire Development. Also, the park which is located on MR3 will be completed as well as the full Solar Project located on MR1. Also, the water pump house will be constructed and located on MR1 and will be functional to service the Development. Phase II will consist of 20 lots (lots 17-30 Block 1, lots 1-6 Block 2), as well as dedication of MR2. The Developer is requesting Council to rezone the entire development to CR1, and designate Phase II with a holding provision.

The Developer is proposing to undertake a number of special initiatives with the development of the Tuscan Ridge Estates subdivision. A very innovative solar project for the development is planned which will be the first of its kind in Saskatchewan. A 32,000 kw/yr solar system will be installed that will be a grid tied system and qualify under the Small Power Producers program with SaskPower. The energy produced is contracted at 10 cents/kwhour and will increase by 2%/year. The money generated by this project will be credited back to an established "Tuscan Ridge Community Association" which will determine where the funds will be allocated. These funds could be used to offset resident's power bills or a portion of the funds may be allocated for additional park structures/maintenance. Also, a central park/playground will be built by the Developer for families of the Development along with neighbors to enjoy

together. Continued maintenance and care of this park will be maintained by the established "Tuscan Ridge Community Association" so no burden is put on the R.M. in the future. The park is located on Municipal Reserve so the Developer is proposing a 50 year lease back option from the R.M. and the Developer is committing to maintain the park up until 50% of lot sales. There will also be plenty of recreational activities available to residents of the Development. Jogging, cycling, walking, bird watching, and enjoying the sunsets from the gorgeous vistas throughout the development could be daily activities. There will be in excess of 13% Municipal Reserve set aside to provide natural habitat for the resident animals and plants to continue to thrive.

The Developer has contacted various public utilities with regard to placement of shallow utilities to the site including power, natural gas, and telephone. Shallow Utilities will be provided by SaskPower, SaskEnergy, and SaskTel along with underground cable following construction of deep utilities. Shallow utilities will be located within the road right-of-way to provide service to the front of each lot.

A geotechnical investigation and a hydrogeological investigation were performed by P. Machibroda Engineering Ltd. to determine the ideal wastewater treatment for the development. As such, sewage treatment and dispersal will be achieved by installing a septic tank with a pressurized Type II mound and a chamber absorption field at each residence. Mr. Brent Latimer, Safe Communities, Saskatoon Public Health was contacted and was very helpful but preferred to review the file when it comes from Community Planning.

Lost River Water Corporation has confirmed their ability to provide potable water to the proposed development. They will manage the on-site distribution lines and associated infrastructure. It will be sourced from the main trunk of their 4" water line. There is 20 imperial gallons per minute extra capacity now and more in the future if needed. There is approximately .33-.40 ipgm per house so there will be plenty of supply available for the future 43 houses of the development. Through extensive consultation with Robert Risling of Lost River Water Co. Ltd., the Developer has decided to offer a pressurized water supply to the residents of Tuscan Ridge Estates. A pump house will be constructed and will contain 15,000 gallons of potable water storage and 2 high-pressure water pumps which will distribute the water supply to the residents.

Residents will have a choice concerning solid waste and recycling. Owners may use an independent company such as Loraas Disposal for the removal of their solid waste and recycling, or they can choose to remove it on their own and use the landfill located at the South Corman Park landfill.

A geotechnical report was prepared by P. Machibroda Engineering Ltd.. 16 test holes were drilled on site to investigate sub-surface geology and piezometers were installed and water levels measured. The sub-surface soil conditions consisted of topsoil overlying variable deposits of silt, clay and/or glacial till

(sand). Results showed the water table is situated approximately 1 to 4 meters below existing ground surface. A shallow foundation system consisting of standard strip or spread footings bearing on undisturbed, naturally occurring soils could be considered as a foundation system. With the same recommendations applying for basement levels and/or crawlspace floors.

To minimize the potential for groundwater infiltration into basements, it is recommended that basement floor slabs be constructed at least 500 mm above the groundwater table and a sub-surface drainage system be installed below the floor slab and around the perimeter of the foundation walls. Due to the presence of a shallow groundwater table at some sites, some lots may have to be built up to allow for the construction of the basement. Alternately, a deep foundation system consisting of drilled, cast-in-place concrete piles should perform satisfactorily as well. Recommendations have also been prepared for site preparation; standard strip and/or spread footings; drilled, cast-in-place concrete piles; factor safety/resistance factors; excavations and dewatering; floor slabs; foundation walls; grade beams; foundation concrete; exterior slabs/resistance factor; seismic site classification and access roads. Prior to building development and as a condition of sale, the Developer will be requiring all lot owners to undertake a lot specific geotechnical investigation (by a qualified professional geotechnical engineer) to determine soil conditions, whether basement development could occur on the site without additional fill and define a minimum building elevation. A further condition of sale will be that a copy of each of these reports be provided to the R.M. with a development permit application.

The Developer contacted the Deputy Chief of Saskatoon Fire and Protective Services to confirm the Fire Service Agreement held between the R.M. of Corman Park and Saskatoon Fire and Protective Services. The Deputy Chief confirmed the arrangement and raised no concerns with the development. The Corman Park Police Service currently works in conjunction with the RCMP to provide protective services to the area.

Based on the 2011 average household size for the R.M. of Corman Park (2.9), the total projected population of the community may reach 124 people. The Development falls within the Clavet School Region of the Prairie Spirit School Division. Correspondence was made with Kerry Donst, Facilities Planner at Prairie Spirit School Division regarding future enrollment of school-aged children. She stated that they had reviewed the projected enrolment for Clavet Composite School and the school should be able to accommodate students from the Development.

In terms of ecological concerns regarding wildlife and vegetation habitat assessment, an Environmental assessment was performed by Golder Associates. Dan Coffen (biologist, Golder) and Catherine Fairburn (ecologist, Golder) completed a field evaluation of the proposed land in July 2013. They found the

land to be made up of weedy cover, scattered wetlands and patches of woody vegetation. Many plant species were observed including wolf willow, trembling aspen, chokecherry, and slough grass. However, no federal or provincial plant species were observed. The landscape surrounding the project has been heavily modified by agriculture, infrastructure development, and acreage development, which reduces the quality of natural wildlife habitat in the proposed area. However, the wetlands and patches of woody vegetation present have the potential to provide suitable nesting and foraging habitat for several species such as the red-winged blackbird, baltimore oriole, american coot, eastern kingbird, as well as the whitetail deer. Once again, no federal or provincial listed wildlife species were observed.

In terms of any Heritage concerns in the SE 24-36-04 W3M, consultation was done with Nathan P. Friesen, Senior Archaeologist at the Heritage Conservations Branch, Saskatchewan Parks, Culture, and Sport. Nathan indicated there are no recorded sites within the proposed area for development and they do not have any further concerns with the development proceeding as planned.

The proposed Development land, just like a huge amount of land in Saskatchewan, is adjacent to a Potash lease area. As part of the CDR submission it was recommended that information be obtained regarding surface development adjacent to known PotashCorp lease areas. Potash lease land covers approximately 150 km wide by 350 km long area from a few miles South of North Battleford, down to Regina, and all the way to the Southeastern part of the Province around Rocanville. This is an extensive area with tens of thousands of homes being built on, or adjacent to Potash lease land – with no issues. Extensive consultation was also undertaken with Trevor Berg, General Manager, PotashCorp, Patience Lake. It was confirmed that there are no underground workings in the area below the proposed Tuscan Ridge Estates land. In fact, the nearest tunneling is located quite a distance away – approximately 1.6 km's. Because PCS Patience Lake is a solution based mine it is very unlikely this will change.

A Traffic Impact Study was performed by Stantec in June of 2014. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements, if any, to the transportation system in order to meet those demands. The scope of this study also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule. The number of new trips generated by the development were determined and added to the projected background traffic volumes at full build out conditions (Year 2020). Finally, they set to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersections control to provide acceptable levels of service and safety. Based on the analysis conducted, the roadway network as proposed is capable of handling the traffic volumes

generated by Tuscan Ridge Estates at full build out, taking into consideration the expected background growth and traffic generated by the nearby Development of Ridgewood Estates. Sheliza Keltz with the Department of Highways was contacted for comment but preferred to review the file when it comes from Community Planning.

Concerning Drainage, Catteral and Wright Consulting Engineers were contracted to perform the drainage engineering for the proposed land. The report indicates that the site is currently divided into 2 separate localized catchment areas. Catchment #1 covers approximately 60% of the development area and has several small slough storage areas and a larger slough storage area. This Catchment contains approximately 50% developed roads for the proposed subdivision as well as twenty four lots. The remainder of the development (Catchment #2) drains in an easterly direction and contains 50% of the developed roadways and nineteen lots. They determined through natural drainage routes and collection areas they do not anticipate a significant increase in runoff rates from the development. Considering a 1:100 year event no artificial storm water ponding will be required for the development and existing depression storage should be sufficient to accommodate additional runoff rates and volumes. Therefore, it was recommended that the development utilize existing low areas and vegetation to enhance and manage natural ponding. It was also recommended a minimum finished ground elevation at all buildings in the subdivision be above the estimated peak water levels as indicated on a lot specific map included in the report. Al Keller at the Water Security Agency was contacted for comment regarding the Drainage Report but preferred to review the file when it is sent from Community Planning.

As part of the R.M's initial call for development proposals, an initial public consultation was undertaken with all residents within a one-mile radius of the proposed land in Nov, 2013. This was done by a mail out through the R.M. office to all residents. Information about the development as well as a comment form was included in the mail out. In all, there were 60 landowners contacted; 50 in the R.M. of Corman Park and 10 in the adjacent R.M. of Blucher. The mailing was done very early on to give residents time to respond and to allow time for further discussions/meetings with the Developer and many in person meetings took place to discuss the Development. It is important to note that the Developer invested significant time researching the ideal development design and layout and many of these concepts were incorporated such as buffer zones around adjacent pre-existing residences and designing a beautiful park/playground area for neighbors to use.

Many close neighbors commented how ideally the land was suited for development due to the rolling hills and plentiful trees. Most people were quite pleased with the arrangement of the proposed development. They appreciated that it was a family-orientated development with a central park/playground for residents and neighbors to enjoy and interact. The common concerns that were

raised were the increase in traffic on local roads, effects on water supply at Hidden Ridge, effects on wildlife, and light pollution. To address traffic concerns a Traffic Impact Study was done by Stantec to ensure the existing infrastructure was sufficient. Extensive consultation was done with Rob Risling of Lost River Water and he made assurances that the water supply at Hidden Ridge will not be affected. To address wildlife concerns, the proposed land will have restrictions in place to minimize impact on wildlife. Lot placement and conditions for site development will be minimally invasive as well as plenty of land being put aside as Municipal Reserve. This will allow many plant and animal species that currently reside on the land to continue to thrive. Lastly, light pollution will be kept to a minimum as there will be no street lighting in the development. Methods will be encouraged to help reduce light pollution and ensure responsible lighting within the development. It will be recommended for residents to utilize motion detection lighting and shielding of lights. Also, lower wattage bulbs will be encouraged as well as potting lights into full cut-off fixtures

In summary, the majority of the surrounding residents were very pleased with the proposed development. Any concerns that were raised were able to be adequately addressed. Many issues did not come up as the Developer was proactive in the design of the development placing buffers around any existing homes that were adjacent to the property and creating a beautiful park/playground for everyone in the community to enjoy!

In July of 2014 residents within a one-mile radius of the proposed Development were once again contacted and asked for comments/concerns and notified of a public open house. A come and go open house was scheduled for July 14th, 2014 at the Floral Community Center from 5:00-8:00 pm and details were provided about the proposed development. Several informational display boards were erected showing the exact location of the proposed development, overall layout of the development, and concept image of the public park/playground. The open house was well attended by 8 of the surrounding residents and Rebecca Row from the R.M. of Corman Park. Discussions ranged from the layout of the development, servicing of the development, traffic concerns, and onsite wastewater management methods. There were discussions regarding the numerous studies that were performed and results of these studies were emailed to residents in attendance that requested them following the open house.

Feedback on the proposed development was quite positive and many favorable comments were received regarding the layout of the development with the centrally located playground/park and the thoughtful design incorporating a lot of the existing trees into the layout. The concerns expressed by residents included traffic concerns along Patience Lake Highway and this being the sole access to the development, drainage concerns, the park attracting "bush partiers" and young teenagers, type of onsite wastewater management systems

proposed, school attendance, potable water supply, servicing, density of the development and smaller lot size, and the slow movement of lots of nearby Applewood Estates.

Residents with traffic concerns were informed that with the Developer's past presentation to R.M. of Corman Park Council in Dec./2013, the Council was not in favor of further build up of Range Road 3040 to access 8th Street as there were concerns regarding the poor shape of this road. Therefore, to address traffic concerns an official Traffic Impact Study was performed by Stantec. The study determined that "the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates taking into account background growth and traffic generated by the nearby development of Ridgewood Estates. No additional intersection or roadway improvements are required." Some residents did want to see pavement on Range Road 3040 sooner than 90% build out because of dust concerns. However, due to the extremely high cost of pavement it is not economically viable to do this sooner than 90% build out. However, the developer will be looking into the possibility of spraying RR 3040 during the summer months with Calcium Chloride to help control the dust in the interim until RR 3040 is paved.

For drainage concerns residents were informed that Catterall & Wright Engineering Consultants were contracted to perform a drainage study for the proposed development. Because of the rolling topography of the land it was found that there is enough depression storage on the land to handle drainage and adjacent properties will not be affected. Residents concerned about the park/playground were assured that the Developer is not trying to create a new "party spot" or hangout for teenagers. There is no common community centre building or area where teenagers can hang out undetected. It is designed as a playground area/park for families to enjoy and interact with their neighbours. The park is also centrally located in the development and is in the direct line of sight of 13 of the lots.

Regarding onsite wastewater treatment residents were told that a Hydrogeological study was performed by P. Machibroda engineering to determine the recommended methods of wastewater treatment so that adjacent property owners were not affected. This study determined that holding tanks with Type 2 pressurized mounds would be a favorable method of choice.

Residents were also informed that the development is located in the Prairie Spirit School Division and confirmation was received for future attendance for residents at Clavet School. Also, potable water supply will come from Lost River Water Co. that currently supplies Hidden Ridge. There has been significant communication between the Developer and Rob Risling from Lost River Water and he confirms that there will be no affect on current water supply to Hidden Ridge when Tuscan Ridge is supplied. Residents were counseled that all services are already available on the proposed land.

In regards to demand/density, residents were informed that Applewood currently sits at 33% sold. However, if nearby Developments of Saddleridge and Greenbryre are considered, they are moving at a much faster pace both currently sitting around 60% sold. Tuscan Ridge Estates is designed to cater to a different market with the primary goal of the development to attract young families to live in Corman Park. Also it will cater to people that are environmentally conscious with the very large solar project that is planned. There are a few larger lots in the 4-5 acre range but most are smaller as the overall design of the development is again to cater to young families. This gives young families the ability to spend extra time with their kids instead of having to look after and maintain a very large piece of property.

DEVELOPMENT CONTEXT

Tuscan Ridge Estates will be a high-quality, environmentally friendly, family-centered country residential community. For a rural community, it is in very close proximity to Saskatoon and the many amenities, services, and commercial development in the broader Saskatoon-Corman Park region. Nearby Developments include Hidden Ridge and Applewood Estates located to the Southwest, and the City neighborhoods of Rosewood and Briarwood to the West. Overall, the Developer is of the opinion that conflict with existing surrounding land uses will be minimal, especially since there is no abutment of pre-existing country residential developments which allows each Development their own autonomy. The Developer will incorporate a gorgeous park/playground as the focal point of the family-focused development as well as an innovative solar project which will be the first of its kind in a development in Saskatchewan.

INTRODUCTION

1.1 Purpose

The Purpose of this document is to provide the Rural Municipality of Corman Park No. 344 with a Comprehensive Development Review (CDR) as required in Section 5.2.3 of the R.M. of Corman Park Official Community Plan.

This review provides a framework for a proposed community consisting of 43 residential lots at the Ptn. SE 24-36-04 W3M (see plan of proposed subdivision attached as Appendix A). The name of the proposed subdivision is Tuscan Ridge Estates and the Developer of the project is Whitewater Holdings Ltd. (Landowner and Developer).

Questions about the proposal or the material contained within this document should be directed to Greg Murdoch (306-290-4937).

1.2 Overview

It is the intention of the Developer to compliment the existing natural beauty of the region by carefully integrating housing into the development. The Developer intends to minimize the environmental footprint of the development and create an exceptional family-focused development with an innovative solar project.

Designed to be an environmentally friendly community, the Developer incorporates planning, engineering, and architectural principles with the goal of creating a family-focused community unlike any other in the region.

- Development boasts minimal travel distance from the City of Saskatoon

- The Developer will be incorporating a 32,000 kw/yr solar project – the first of its kind in a Saskatchewan Development.

- The natural green space on each lot and large amount of Municipal Reserve that is set aside will result in minimal impact to existing ecosystems and wildlife

- The Development will feature a centrally located family park/playground to encourage interaction with neighbors to develop a strong sense of community.

1.3 Land Use Context

The proposed Development will be situated on lands located within the R.M. of Corman Park in the Ptn. SE 24-36-04 W3M. The site is located North of Patience Lake Highway and West of Range Road 3040. According to the 2013 Golder Environmental Screening Report (see Appendix B), the surrounding land uses in the project area have been heavily modified by agriculture, infrastructure development, and acreage development (other Country Residential Developments).

Present land use of the Ptn. SE 24-36-04 W3M is scrubland. Additionally, two existing yard sites (8 acres each) are present within the quarter section in the Southeast Corner or the property. These existing landowners have been consulted regarding the development and have no concerns. The existing land use of the proposed development is detailed as follows:

North

- Quarter section of farmland/sloughs:	Adjacent to North boundary
- Continuation of 8th Street:	Half mile North of land boundary

East

- Range Road 3040:	Adjacent to East Boundary
- Quarter section of farmland/sloughs:	Across R.R. 3040

South

- 80 acres of slough/bushland:	Adjacent to South boundary
- Single residence on 80 acres	Adjacent to South boundary

West

- City of Saskatoon:	5.7 km's from West boundary
- 80 acres pastureland:	Adjacent to West boundary
- Single residence on 80 acres:	Adjacent to West Boundary

Nearby Neighborhoods/Developments include:

- Hidden Ridge Estates:	Approx. ½ km to the southwest
- Applewood Estates:	Approx. 1 km to the Southwest
- Rosewood:	Approx. 5.7 km's to the West

A regional context map (Figure 1) and a local context map (Figure 2) show the location of the parcel within the Rural Municipality of Corman Park, and in context to other development in the area.

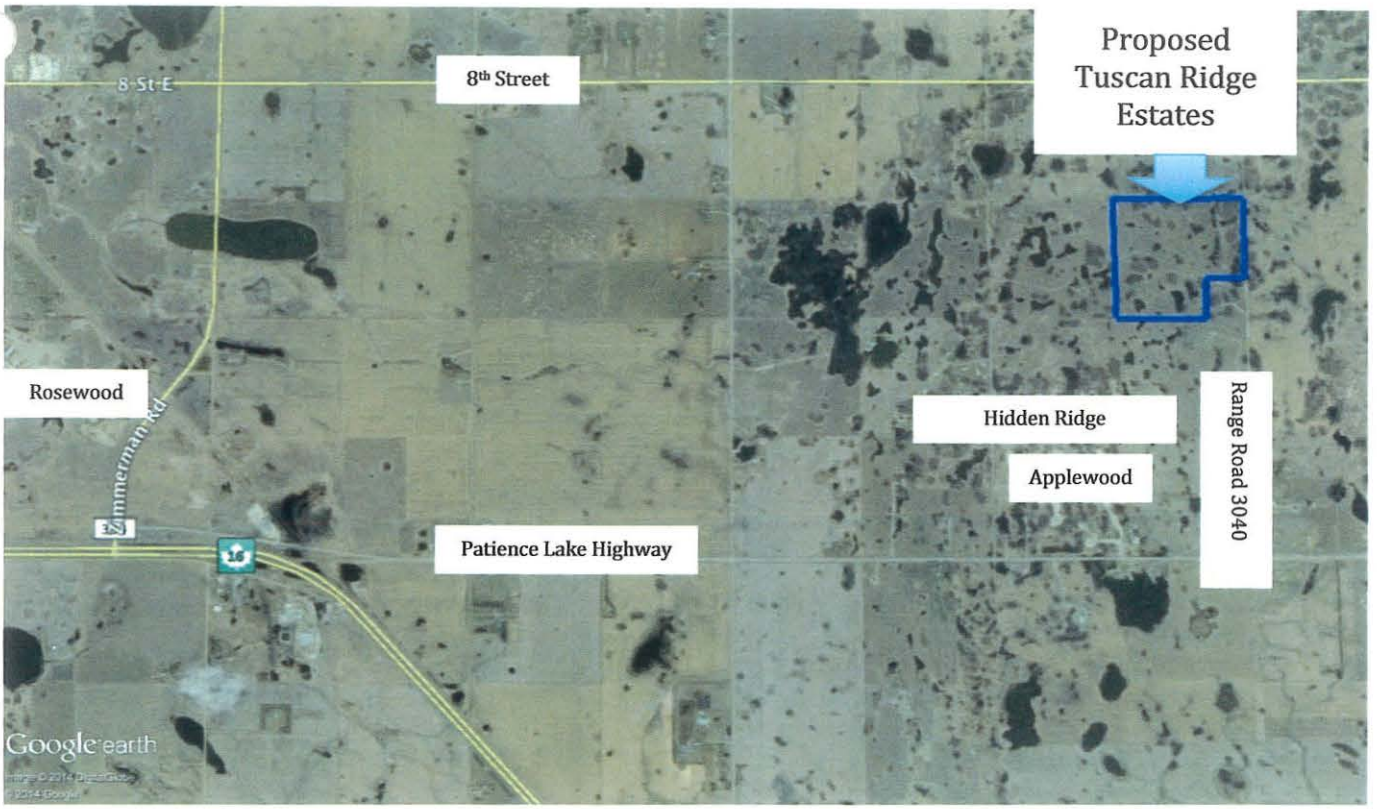


FIGURE 1: REGIONAL CONTEXT MAP

FIGURE 2: LOCAL CONTEXT MAP

1.4 POLICY CONTEXT

Tuscan Ridge Estates has been designed to meet the requirements of the Official Community Plan and Zoning Bylaw for the R.M. of Corman Park.

CORMAN PARK OFFICIAL COMMUNITY PLAN

General Development Policies (Section 5.2)

5.2.1 – General Country Residential Policies:

5.2.1.6 – The proposed development is located on land with "marginal" soil capacity, as defined by the Canada Land Inventory (CLI) Soil Class Rating System. The proposed development land is currently scrub land and carries the soil class rating of 3(7S)5(3W) according to the Canada Land Inventory (C.L.I.) Soil Class Rating System. Class 3 soils have moderately severe limitations and Class 5 soils have severe limitations that restrict capability to produce forage crops.

5.2.1.6 – The proposed development will be located along existing municipally maintained roadways.

5.2.3 – Multi Parcel Country Residential Subdivision Policies:

5.2.3.1 – The intent of this Comprehensive Development Review is to serve as a part of the application to rezone and subdivide the land for multi-parcel country residential use. This CDR addresses all matters of land use integration, environmental sustainability, public involvement and potential conflict mitigation, and the provision of services to the development as set out in the Zoning Bylaw.

5.2.3.2 – In considering the current demand for and existing inventory of undeveloped multi-parcel country residential lots, it is noted that there is currently a very large demand for lots in the Saskatoon area. At a recent Saskatoon Regional Growth Summit hosted by SREDA in the fall of 2013, population growth rates of 2.7% are expected for the Saskatoon area and it is expected to be one of the leading communities in Canada for population growth. Housing starts are expected to be 3000 in 2014, and it is expected that 15,000 new housing units will be required in the next 5 years. Tuscan Ridge Estates is a very innovative development with a large solar project planned (1st of its kind in Saskatchewan) and a family orientated layout with central park/playground. This will appeal to young families and environmentally conscious residents that would have otherwise not resided in the R.M. of Corman Park because there is no

other development of its kind in the R.M.. Tuscan Ridge Estates was recently shortlisted by the R.M. to proceed to the CDR stage.

5.2.3.3 – Tuscan Ridge Estates is located on a very choice piece of property with a naturally well-treed rolling landscape. Residents will be able to enjoy the natural surroundings and also take advantage of the family park that will be constructed. This park will provide enjoyable social interactions between parents and kids alike. In this picturesque setting there will be plenty of opportunity to enjoy the natural wildflowers and wildlife found in this area (please see attached Environmental Assessment by Golder and Associates Appendix B). Because of the picturesque setting, innovative solar project, and family centered development this will greatly increase the housing options available for people wishing to live in Corman Park.

5.2.3.5. – The density proposed is in line with current requirements and the minimum lot size is above that which is required by the R.M.. A geotechnical study (Appendix C), a hydrogeological study (Appendix D), and an environmental study (Appendix B) have all been performed to ensure all factors are considered in the design of the proposal. All necessary infrastructure is located within a half mile of the development land. There is no abutment of multi-parcel subdivision which will allow each development their own autonomy. However, the subdivision design has been carefully considered to be sure it fits into the surrounding area and buffer zones have been put in place to appease nearby neighbors.

5.2.3.6 – The Environmental/Terrestrial Assessment (Appendix B) describes the landscape surrounding the development land as being 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. However, the wetlands and patches of woody vegetation present have the potential to provide suitable nesting and foraging habitat for several species. The project area is considered to have moderate wildlife potential. No federal or provincially listed wildlife species or plant species were observed, and the habitat suitability for these species is low to moderate.

- in order to minimize the impact on the natural setting, the internal road network has been designed to avoid tree stands, shrubs, and low areas where possible. The length of road within the development has been minimized while still allowing a separate entrance and exit to the development. Also, minimal landscape

alterations will be encouraged to residents and housing sites will be arranged relative to natural features.

5.2.3.7 – The total size of the proposed development is 58.27 ha (144 acres)

5.2.3.9 – The Developer has decided to develop this community consisting of 43 lots in two Phases. The public park/playground which is located on MR3 will be developed concurrently with Phase I, as well as the full solar project.

5.2.3.10 – This CDR contains a clear record of substantial public consultation. (please see Appendix E) As part of the R.M's initial call for development proposals, an initial public consultation was undertaken with all residents within a one-mile radius of the proposed land in Nov, 2013. This was done by a mail out through the R.M. office to all residents. Information about the development as well as a comment form was included in the mail out. In all, there were 60 landowners contacted; 50 in the R.M. of Corman Park and 10 in the adjacent R.M. of Blucher. The mailing was done very early on to give residents time to respond and to allow time for further discussions/meetings with the Developer. Gathering of the opinions was quite involved. A total of 16 comment letters were received, 7 in person meetings were conducted, 6 phone conversations/meetings, 3 response letters, and 2 emails were sent out. Many close neighbors commented how ideally the land was suited for development due to the rolling hills and plentiful trees. Most people were quite pleased with the arrangement of the proposed development. They appreciated that it was a family-orientated development with a central park/playground for residents and neighbors to enjoy and interact. 4 common concerns were raised 1)Increased traffic on local roads – With adding more residences there will obviously be an increase in traffic on the roads. The primary access to the development will be Patience Lake Highway then north 1 ¼ miles along Range Road 3040. There will still be approximately half a mile of RR 3040 that was not going to be built up past the access of the development that connects it with the continuation of 8th street. However, after consulting with neighbors, the Developer agreed that he would build up the remainder of RR 3040 to connect with 8th Street (at a significant expense) to help spread the traffic load. However, after presentation to the R.M. of Corman Park Council it seemed as though this would not be a great option due to the poor condition of 8th street. 2) Effect on water supply at Hidden Ridge – A few of the residents at Hidden Ridge were concerned that their water supply would be less if another development was added nearby. However, further consultation was done with Rob Risling of Lost River Water

who currently supplies Hidden Ridge and plans to supply the Development. Mr. Risling said that the main supply line is along highway 16 and carries approximately 300 gal/min. To supply the whole proposed Tuscan Ridge Development an additional 20 gal/min will be needed. When the Development goes ahead an additional 20 gal/min will be available through the current lines to Hidden Ridge residents. Then as Tuscan Ridge is gradually filled in they will draw on the excess supply. So for the time before the development fills in there will actually be an excess of water available to Hidden Ridge residents, ultimately ending with the same supply they currently have. 3) Effects on Wildlife – The proposed land will have restrictions in place to minimize impact on wildlife. Lot placement and conditions for site development will be minimally invasive as well as plenty of land being put aside as Municipal Reserve. This will allow many plant and animal species that currently reside on the land to continue to thrive. 4) Light Pollution from Yard/Street lighting - There will be no street lights at the proposed Development and lighting will be restricted to yard lighting only. Methods will be encouraged to help reduce light pollution and ensure responsible lighting within the development. It will be recommended for residents to utilize motion detection lighting and shielding of lights. Also, lower wattage bulbs will be encouraged as well as potting lights into full cut-off fixtures for more efficient lighting. Solar lighting will also be encouraged.

In summary, the majority of the surrounding residents were very pleased with the proposed development. Any concerns that were raised were able to be adequately addressed. Many issues did not come up as the Developer was proactive in the design of the development placing buffers around any existing homes that were adjacent to the property and creating a beautiful park/playground area for residents and neighbors to enjoy.

Subsequently, in July of 2014 residents within a one-mile radius of the proposed Development were once again contacted and asked for comments/concerns and notified of a public open house. A come and go open house was scheduled for July 14th, 2014 at the Floral Community Center from 5:00-8:00 pm and details were provided about the proposed development. Several informational display boards were erected showing the exact location of the proposed development, overall layout of the development, and concept image of the public park/playground. The open house was well attended by 8 of the surrounding residents and Rebecca Row from the R.M. of Corman Park. Discussions ranged from the layout of the development, servicing of the development, traffic concerns, and onsite wastewater management methods. There were discussions regarding the numerous studies that were performed and results of these studies

were emailed to residents in attendance that requested them following the open house.

Feedback on the proposed development was quite positive and many favorable comments were received regarding the layout of the development with the centrally located playground/park and the thoughtful design incorporating a lot of the existing trees into the layout. The concerns expressed by residents included traffic concerns along Patience Lake Highway and this being the sole access to the development, drainage concerns, the park attracting "bush partiers" and young teenagers, type of onsite wastewater management systems proposed, school attendance, potable water supply, servicing, density of the development and smaller lot size, and the slow movement of lots of nearby Applewood Estates.

Residents with traffic concerns were informed that with the Developers past presentation to RM of Corman Park Council in Dec./2013, the Council was not in favor of building up the remainder of Range Road 3040 to access 8th Street as there were concerns regarding the poor shape of this road. Therefore, to address traffic concerns an official Traffic Impact Study was performed by Stantec. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands. The traffic analysis also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule. Projections were also made to consider the traffic at full build-out of the development. Further, Stantec specifically looked to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety. The study determined that "the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates taking into account background growth and traffic generated by the nearby development of Ridgewood Estates. No additional intersection or roadway improvements are required." Some residents did want to see pavement on Range Road 3040 sooner than 90% build out because of dust concerns. However, they were educated that due to the extremely high cost of pavement it is not economically viable to do this sooner than 90% build out. With dust being the major concern to nearby neighbors the developer will be looking into the possibility of spraying RR 3040 during the summer months with Calcium Chloride to help control the dust in the interim until RR 3040 is paved.

For drainage concerns residents were informed that Catterall & Wright Engineering Consultants were contracted to perform a drainage study for the proposed development. Because of the rolling topography of the land it was found that there is enough depression storage on the land to handle drainage and adjacent properties will not be affected.

Residents concerned about the park/playground were assured that the Developer is not trying to create a new "party spot" or hangout for teenagers. There is no common community center building or area where teenagers can hang out undetected. It is designed as a playground area/park for families to enjoy and interact with their neighbors. The park is also centrally located in the development and is in the direct line of sight of 13 of the lots. The park will be public space as it is located on Municipal Reserve so in reality it will be available for use to all of the public. It is assumed that nearby neighbors would be the primary users but it would be great if neighbors from all around would come and use the park with their kids. As mentioned previously, an innovative solar project is planned for the development which will qualify under the small power producers program with SaskPower. The money generated from this fairly large solar project will be credited back to the Tuscan Ridge Community Association and they will be able to allocate the funds as they see fit. They can direct some of this money toward park maintenance as well as some of the money being credited back to the residents to offset their power bills.

Regarding onsite wastewater treatment residents were told that a Hydrogeological study was performed by P. Machibroda engineering to determine the recommended methods of wastewater treatment and holding tanks with Type 2 pressurized mounds were going to be the method of choice.

Residents were also informed that the development is located in the Prairie Spirit School Division and confirmation was received for future attendance for residents at Clavet School. Also, potable water supply will come from Lost River Water Co. that currently supplies Hidden Ridge. There has been significant communication between the Developer and Rob Risling from Lost River Water and he confirms that there will be no affect on current water supply to Hidden Ridge when Tuscan Ridge is supplied. Residents were also informed that all services that will be required are already located on the proposed development land.

In regards to demand/density, residents were informed that Applewood currently sits at 33% sold. However, if we consider

nearby Developments of Saddleridge and Greenbryre they are moving at a much faster pace. Of the 143 lots in Greenbryre 60% of these lots are sold and Saddleridge currently sits at 61% sold. Tuscan Ridge Estates is designed to cater to a different market with the primary goal of the development to attract young families to live in Corman Park. Also it will cater to people that are environmentally conscious with the very large solar project that is planned. There are a few larger lots in the 4-5 acre range but most are smaller as the overall design of the development is again to cater to young families. This gives young families the ability to spend extra time with their kids instead of having to look after and maintain a very large piece of property.

5.2.3.12 – A servicing agreement has not yet been created, but as subdivision ensues it will be negotiated at a future time prior to development.

5.2.3.13 – Lost River Water has confirmed its ability to provide potable water to the development, as noted in the written correspondence attached to this report (please see Appendix F)

5.2.3.14 – Septic utility and wastewater treatment systems acceptable to the R.M. and Saskatoon District Health Region will be constructed. The Developer will be setting up a septic utility for the development as per the bylaw requirements.

5.2.3.15 – There is no existing multi-parcel residential developments abutting the proposed development.

5.2.3.17 – The location of the proposed development conforms to all requirements of this section.

5.2.3.18 - The Environmental/Terrestrial Assessment describes the landscape surrounding the development land as being 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. However, the wetlands and patches of woody vegetation present have the potential to provide suitable nesting and foraging habitat for several species. The project area is considered to have moderate wildlife potential. No federal or provincially listed wildlife species or plant species were observed, and the habitat suitability for these species is low to moderate.

- There were no cultural/heritage concerns with the proposed development land as per attached correspondence with Nathan P.

Friesen, Senior Archaeologist with the Heritage Conservation Branch, Saskatchewan Parks, Culture and Sport (Appendix G)

5.2.3.19 – The proposed development land is currently scrub land and carries the soil class rating of 3(7S)5(3W) according to the Canada Land Inventory (C.L.I.) Soil Class Rating System. Class 3 soils have moderately severe limitations and Class 5 soils have severe limitations that restrict capability to produce forage crops.

5.2.3.20 – A Traffic Impact Study was performed by Stantec in June of 2014 (Appendix H). The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements, if any, to the transportation system in order to meet those demands. The scope of this study also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule. Study area intersections looked at were; Range Road 3040 and North Development access, Range Road 3040 and South Development access, Range Road 3040 and Highway 394 (Patience Lake Highway), and Highway 394/Zimmerman Road/Highway 16 intersection. The number of new trips generated by the development were determined and added to the projected background traffic volumes at full build out conditions (Year 2020). Also, traffic operating conditions at key intersections were evaluated for the combined traffic volumes at full build out of the development for the weekday morning and afternoon peak hour time periods. Finally, they set to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersections control to provide acceptable levels of service and safety. Based on the analysis conducted, the roadway network as proposed is capable of handling the traffic volumes generated by Tuscan Ridge Estates at full build out, taking into consideration the expected background growth and traffic generated by the nearby Development of Ridgewood Estates. Recommendations for the roadway network are to construct each local access road into the Development with a single all directional lane in the eastbound direction. Stop-control in the eastbound direction. No auxiliary lanes are required on Range Road 3040 or on Highway 394 (Patience Lake Highway). The intersection at Zimmerman Road and Highway 16 will soon see significant upgrades at the full build out of the Rosewood subdivision and as the commercial area adjacent to Zimmerman Road is developed (expected to begin early 2015). This build out will address any concerns at this intersection.

5.2.3.21 – School aged children whom wish to attend public school would typically attend Clavet Composite School (grades K-12). This school falls within the jurisdiction of the Prairie Spirit School Division and bussing of students to and from Clavet is provided.(please see attached consultation with Prairie Spirit School Division–Appendix I) Alternatively parents could drive their kids in to Saskatoon to attend school. This would also be the option for kids wanting to attend Catholic School.

5.2.3.22 – The Developer has decided to develop this community consisting of 43 lots in two Phases. Phase I will consists of 23 lots (lots #1-16 Block 1, lots 7-13 Block 2), dedication of MR1, MR3 (Park), ER1, ER2, as well as road construction and culverts for the entire Development. The park which is located on MR3 will be completed as well as the full Solar Project located on MR1. Also, the water pump house will be constructed and located on MR1 and will be functional to service the Development. Phase II will consist of 20 lots (lots 17-30 Block 1, lots 1-6 Block 2), as well as dedication of MR2. Phasing the development will ensure that roadway development and the provision of other services will not unnecessarily precede lot development.

Servicing Policies (Section 11)

11.2 – Servicing Policies:

11.2.1 – All roads in the proposed subdivision will be completed to R.M. standards.

11.2.2 – The proposed development will have legal and year round, all weather physical access to a municipal maintained roadway. Internal roads will be constructed at the expense of the Developer.

11.2.3 – The Developer has provided correspondence with the Prairie Spirit School Division regarding future capacity within the present school system for new school-age children (See Appendix I)

Implementation Policies (Section 12)

12.2 – General Policies:

12.2.1 – A servicing agreement between the Developer and the R.M. of Corman Park is expected to address the following (but not limited to):

- Outline the requirements for site-specific geotechnical reports.

- Identify roadway and approach specifications, including roads that will not be public roadways.

- Identify pre-site investigation requirements for the installation of septic systems. This may include information pertaining to regular maintenance reports for individual systems.

- Identify the proposed form of water distribution and sewage collection and treatment including how it will be administered.

- Identify off-site servicing fees, payable to the R.M.

- Identify the value of the required performance bond or letter of credit.

- The proposed Municipal Reserve comprises approximately 7.88 ha of land (19.48 acres). As the subdivision is approximately 58.27 ha (144 acres) of land in total, this exceeds the minimum Municipal Reserve requirement of 10%.

ZONING BYLAW

The Developer is applying to rezone the Ptn. SE 24-36-4 W3M to Country Residential 1 District (CR1). Development standards and regulations within the District Zoning Bylaw will be met.

1.5 SPECIAL INITIATIVES

- The Developer is committed to providing a very innovative solar project for the development which will be the first of its kind in Saskatchewan. A 32,000 kw/yr solar system will be installed for the development. It will be a grid tied system and qualify under the Small Power Producers program with SaskPower. The energy produced is contracted at 10 cents/kwhour and will increase by 2%/year. The money generated by this project will be credited back to an established "Tuscan Ridge Community Association" which will determine where the funds will be allocated. These funds could be used to offset resident's power bills or some money may be allocated for additional

park structures/maintenance. The solar project will be located in MR1 behind (West) of lot 11 Blk 1. It will consist of two 100ft long runs of 4 ft x 3 ft solar panels immediately adjacent to one another. These two 100 ft strings of panels will be separated by approximately 20 feet and will be placed on racks that are approximately 4 ft high in the front (southernmost) and approximately 9 feet high at the back. Both solar arrays will be completely surrounded by chain line fencing. Please see attached photo for an example of the fenced solar array. (Appendix J)

- A central park/playground will be built by the Developer for families – adults and kids alike – to enjoy together and with neighbors in the development. Continued maintenance and care of this park will be maintained by the established "Tuscan Ridge Community Association" so no burden is put on the R.M.. The park will be located on a section of Municipal Reserve and the Developer proposes a 50 year lease back option from the R.M. so no additional burden is put on the R.M. of Corman Park for future maintenance. The Developer also commits to maintain the park until 50% lot sales are reached. At this time it will then be turned over to the Tuscan Ridge Community Association.

- There will be plenty of recreational activities available to residents of the Development. Jogging, cycling, walking, bird watching, and enjoying the sunsets from the gorgeous vistas throughout the development could be daily activities. There will be in excess of 13% Municipal Reserve set aside to provide natural habitat for the resident animals and plants to continue to thrive.

FIGURE 3: PARK/PLAYGROUND

2.1 Existing Land Use

The proposed development site consists of 58.27 Hectares (144 Acres) in the Ptn SE 24-36-04 W3M. The quarter section is currently occupied by pot and kettle topography with numerous patches of woody vegetation and some pothole wetlands in a few low lying areas. The land is undeveloped and not currently used for agriculture purposes. There are two 8 acre parcels (A and B) in the south east corner of the property which have previously been subdivided from the parcel. Only one of the lots currently has a residence on it (southernmost) and the other lot is currently not developed. Both owners of these lots have no objections to the proposed development.

2.2 Proposed Land use

The proposed land use is a family-centered residential development with an innovative solar project (first of its kind in Saskatchewan) that will offer the opportunity for families to grow and interact in a picturesque setting.

The subdivision will be provided with transportation access via Patience Lake Highway then North on Range Road 3040 to access the development. There will be 2 access points to the development off of Range Road 3040. All roadways will be finished according to R.M. standards.

Range Road 3040 is in the R.M. of Blucher and the developer obtained permission from them to build up Range Road 3040 to access the development. This road was recently built up and inspected by the R.M. of Blucher to ensure it met the R.M. standards. It is the developer's intention that at 90% lot sales Range Road 3040 will be paved with hot asphalt from Patience Lake Highway to the northern most access of the development. Internal roads within the development will either be paved or seal coated depending on the R.M. of Corman Park's preference at 90% lot sales as well.

Following formal subdivision approval, an agreement regarding the cost-sharing structure between the R.M. of Corman Park and the R.M. of Blucher for future maintenance of the road will be established.

2.3 Servicing

Shallow utilities will be provided by SaskPower, SaskEnergy, and SaskTel following construction of deep utilities. Shallow utilities will be located within the road right-of-way to provide service at the front of each lot.

Surface drainage will be directed to one of two on-site catchment areas. (Please see Appendix K)

Sewage treatment and dispersal will be achieved by installing a septic tank with a pressurized Type II mound and a chamber absorption field at each residence. These systems treat water via mechanical and/or natural processes to the point where the treated wastewater can be safely released into the environment without causing harm to the surrounding environment or to human health. The Developer will be setting up a septic utility for the development as per the bylaw requirements.

Potable water will be supplied by Lost River Water Corporation and they will manage the on-site distribution lines and associated infrastructure. It will be sourced from the main trunk of their 4" water line located one half mile to the west of the proposed development land. There is 20 imperial gallons per minute extra capacity now and more in the future if needed. There is approximately .33-.40 ipgm per house so there will be plenty of supply available for the future 43 houses of the development. Through extensive consultation with Robert Risling of Lost River Water Co. Ltd. the Developer decided to offer a pressurized water supply to the residents of Tuscan Ridge Estates. A 10 foot by 10 foot pump house with a storage tank will be constructed on the Municipal Reserve 1 behind Lot 12 and 13, Block 1. This pump house will contain 15,000 gallons of potable water storage and 2 high-pressure water pumps which will distribute the water supply to the residents. This will be a huge advantage as residents will not have to have any storage tanks in their dwellings and will just hook directly up to the pressurized water line. The area where the pump house is located has a very small foot print on MR1, however, if the RM wishes this could be established as Municipal Utility land – MU1? Confirmation of water supply and a template agreement between the water supplier and end user can be found in Appendix L.

3. DESIGN ELEMENTS

3.1 Concept

The Development is a culmination of architectural, marketing and community research and planning. This development is designed to integrate and promote the privacy of acreage living while incorporating the sense of community with a centralized family park.

3.2 Land Use

Tuscan Ridge Estates is proposing a Country Residential Development in the Ptn. SE 24-36-04 W3M with the intent of completing a unique and highly desirable multi-parcel residential development just minutes East of Saskatoon.

The construction of this development will maintain and complement the surrounding land use of the area. Other land uses in proximity to the subject property include a country residential subdivision development to the Southwest (Hidden Ridge Estates) and another a half mile further south (Applewood Estates). However, these developments are not immediately adjacent to the proposed property which will allow each development their own autonomy. A single parcel country residence exists immediately to the South and another immediately to the West of the property. Otherwise, to the North and East is non-occupied farmland.

The proposed lots will range in size from 1.10 acres to 5.04 acres with an average lot size of 2.50 Acres.

4. TRANSPORTATION AND MUNICIPAL SERVICES

4.1 Community Access and Projected Vehicular Traffic

The primary access to the community will be via Patience Lake Highway and then North on Range Road 3040. The developer has agreed to provide pavement access on Range Road 3040 to the Northern most entrance to the development at 90 % lot sales and has been in correspondence with the R.M. of Blucher in this regard. Following subdivision approval, the R.M. of Corman Park and the R.M. of Blucher will determine an appropriate cost sharing agreement regarding road maintenance.

A Traffic Impact Study was performed by Stantec in June of 2014 (Appendix H). The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements, if any, to the transportation system in order to meet those demands. The scope of this study also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule.

Study area intersections looked at were; Range Road 3040 and North Development access, Range Road 3040 and South Development access, Range Road 3040 and Highway 394 (Patience Lake Highway), and Highway 394/Zimmerman Road/Highway 16 intersection.

The number of new trips generated by the development were determined and added to the projected background traffic volumes at full build out conditions (Year 2020). Also, traffic operating conditions at key intersections were evaluated for the combined traffic volumes at full build out of the development for the weekday morning and afternoon peak hour time periods. Finally, they set to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersections control to provide acceptable levels of service and safety.

Based on the analysis conducted, the roadway network as proposed is capable of handling the traffic volumes generated by Tuscan Ridge Estates at full build out, taking into consideration the expected background growth and

traffic generated by the nearby Development of Ridgewood Estates. Recommendations for the roadway network are to construct each local access road into the Development with a single all directional lane in the eastbound direction. Stop-control in the eastbound direction. No auxiliary lanes are required on Range Road 3040 or on Highway 394 (Patience Lake Highway). The intersection at Zimmerman Road and Highway 16 will soon see significant upgrades at the full build out of the Rosewood subdivision and as the commercial area adjacent to Zimmerman Road is developed (expected to begin early 2015). This build out will address any concerns at this intersection.

4.2 Internal Roads

Proposed roadways within the development will be constructed to R.M. of Corman Park specifications with the surface of the internal roads either seal-coated or paved – depending on the R.M.'s preference.

4.3 Pedestrian and Bicycle Traffic

Pedestrian and bicycle traffic will have access to internal roads as well as natural trails along the boundaries of the existing wetlands.

4.4 Potable Water Supply and Distribution

Potable water will be supplied by Lost River Water Corporation and they will manage the on-site distribution lines and associated infrastructure. It will be sourced from the main trunk of their 4" water line located one half mile to the west of the proposed development land. There is 20 imperial gallons per minute extra capacity now and more in the future if needed. There is approximately .33-.40 ipgm per house so there will be plenty of supply available for the future 43 houses of the development. Through extensive consultation with Robert Risling of Lost River Water Co. Ltd. the Developer decided to offer a pressurized water supply to the residents of Tuscan Ridge Estates. A 10 foot by 10 foot pump house with a 15,000 gallon storage tank will be constructed on the Municipal Reserve 1 behind Lot 12 and 13, Block 1. This pump house will contain 15,000 gallons of potable water storage and 2 high-pressure water pumps which will distribute the water supply to the residents. This will be a huge advantage as residents will not have to have any storage tanks in their dwellings and will just hook directly up to the pressurized water line. The area where the pump house is located has a very small foot print on MR1, however, if the RM wishes this could be established as Municipal Utility land – MU1? Confirmation of water supply and a

template agreement between the water supplier and end user can be found in Appendix L.

4.5 Wastewater Treatment

A geotechnical investigation and a hydrogeological investigation was performed by P. Machibroda Engineering Ltd. which determined that the ideal wastewater treatment would be a holding tank with type II pressure mounds. Please see Appendix C and Appendix D.

4.6 Drainage and Stormwater Management

Catteral and Wright Consulting Engineers was contracted to perform the drainage engineering for the proposed land (Appendix K). The report indicates that the site is currently divided into 2 separate localized catchment areas. Catchment #1 covers approximately 60% of the development area and has several small slough storage areas and a larger slough storage area. This Catchment contains approximately 50% developed roads for the proposed subdivision as well as twenty four lots. The remainder of the development (Catchment #2) drains in an easterly direction and contains 50% of the developed roadways and nineteen lots. The study showed approximately 5 acres of impervious area added to the watershed area as a result of the development. However, since the impervious areas will be flowing onto pervious surfaces and through natural drainage routes and collection areas they do not anticipate a significant increase in runoff rates from the development. Considering a 1:100 year event no artificial storm water ponding will be required for the development and existing depression storage should be sufficient to accommodate additional runoff rates and volumes.

It was recommended that the development utilize existing low areas and vegetation to enhance and manage natural ponding. It was also recommended a minimum finished ground elevation at all buildings in the subdivision be above the estimated peak water levels as indicated on a lot specific map included in the report. All lots contain land above this elevation except lots 2 and 3 of Block 1. A portion of these 2 lots will be filled to bring them up to the minimum building elevation. Also, a shallow swale will be constructed along the western property line of Lot 3 to accommodate and maintain proper drainage conveyance from areas to the North. It also shows areas that development be restricted along localized drainage paths and natural drainage pathways throughout the development. Lastly, all culverts within the development shall be 450mm or larger and locations of culverts on Range Road 3040 were determined to accommodate the natural flow of water and allow for equalization on both sides of the road.

4.7 Shallow Utilities

Shallow Utilities will be provided by SaskPower, SaskEnergy, and SaskTel along with underground cable following construction of deep utilities. Shallow utilities will be located within the road right-of-way to provide service to the front of each lot.

4.8 Solid Waste Disposal

Residents will have a choice concerning solid waste. Owners may use an independent company such as Loraas Disposal for the removal of their solid waste, or they can choose to remove it on their own and use the landfill located at the South Corman Park landfill. Recycling can also be arranged to be picked up by Lorass Disposal. (Appendix M)

5 OTHER

5.1 Geotechnical

A geotechnical report was prepared by P. Machibroda Engineering Ltd. and is attached in Appendix C. 16 test holes were drilled on site to investigate sub-surface geology and piezometers were installed and water levels measured. The sub-surface soil conditions consisted of topsoil overlying variable deposits of silt, clay and/or glacial till (sand).

Results showed the water table is situated approximately 1 to 4 metres below existing ground surface. A shallow foundation system consisting of standard strip or spread footings bearing on undisturbed, naturally occurring soils could be considered as a foundation system. With the same recommendations applying for basement levels and/or crawlspace floors.

To minimize the potential for groundwater infiltration into basements, it is recommended that basement floor slabs be constructed at least 500 mm above the groundwater table and a sub-surface drainage system be installed below the floor slab and around the perimeter of the foundation walls. Due to the presence of a shallow groundwater table at some sites, some lots may have to be built up to allow for the construction of the basement. Alternately,

a deep foundation system consisting of drilled, cast-in-place concrete piles should perform satisfactorily as well.

Recommendations have been prepared for site preparation; standard strip and/or spread footings; drilled, cast-in-place concrete piles; factor safety/resistance factors; excavations and dewatering; floor slabs; foundation walls; grade beams; foundation concrete; exterior slabs/resistance factor; seismic site classification and access roads.

Prior to building development and as a condition of sale, the Developer will be requiring all lot owners to undertake a lot specific geotechnical investigation (by a qualified professional geotechnical engineer) to determine soil conditions, whether basement development could occur on the site without additional fill and define a minimum building elevation. A further condition of sale will be that a copy of each of these reports be provided to the R.M. with a development permit application.

5.2 Fire and Protective Services

The Developer contacted Deputy Chief Dave Rumpel of Saskatoon Fire and Protective Services to confirm the Fire Service Agreement held between the R.M. of Corman Park and Saskatoon Fire and Protective Services. Deputy Chief Rumpel confirmed the arrangement and raised no concerns. Please find correspondence with Fire and Protective Services attached in Appendix N.

5.3 Population and Schools

Based on the 2011 average household size for the R.M. of Corman Park (2.9), the total projected population of the community may reach 124 people. The Development falls within the Clavet School Region of the Prairie Spirit School Division. Consultation with Kerry Donst, Facilities Planner at Prairie Spirit School Division, determined that a review of the projected enrolments for Clavet Composite School should be able to accommodate students for the proposed Development. (Please see Appendix I)

5.4 Recreation

There will be plenty of recreation activities for residents to enjoy. Walking, biking or jogging will be possible along the internal roads of the development. The gorgeous setting of the property with plenty of municipal and environmental reserve will provide many opportunities for bird watching and observing the many plant and animal species that thrive in the well treed areas as well as the scattered wetland areas. Many hours of family

enjoyment will be had at the centrally located park that is ideally situated to bring families together. Wintertime activities such as snowshoeing and cross-country skiing will also be possible for residents of the development.

5.5 Ecological and Heritage Concerns

In terms of wildlife and vegetation habitat assessment, an Environmental assessment was performed by Golder Associates.(please see Appendix B) Dan Coffen (biologist, Golder) and Catherine Fairburn (ecologist, Golder) completed a field evaluation of the proposed land in July 2013. They found the land to be made up of weedy cover, scattered wetlands and patches of woody vegetation. Many plant species were observed including wolf willow, trembling aspen, chokecherry, and slough grass. However, no federal or provincial plant species were observed.

The landscape surrounding the project has been heavily modified by agriculture, infrastructure development, and acreage development, which reduces the quality of natural wildlife habitat in the proposed area. However, the wetlands and patches of woody vegetation present have the potential to provide suitable nesting and foraging habitat for several species such as the red-winged blackbird, baltimore oriole, american coot, eastern kingbird, as well as the whitetail deer. Once again, no federal or provincial listed wildlife species were observed.

In terms of any Heritage concerns in the SE 24-36-04 W3M, consultation was done with Nathan P. Friesen, Senior Archaeologist at the Heritage Conservations Branch, Saskatchewan Parks, Culture, and Sport. Nathan indicated there are no recorded sites within the proposed area for development and they do not have any further concerns with the development proceeding as planned. Please see Appendix G.

5.6 Adjacent PotashCorp Lease Land

The proposed Development land, just like a huge amount of land in Saskatchewan, is adjacent to a Potash lease area. As part of the CDR submission it was recommended that information be obtained regarding surface development adjacent to known PotashCorp. lease areas.

Enclosed please find a copy of the Potash Lease areas in the Province of Saskatchewan (Appendix O). As can be seen on the attached map, Potash lease land covers approx. 150 km wide by 350 km long area from a few miles South of North Battleford, down to Regina, and all the way to the Southeastern part of the Province around Rocanville. This is an extensive

area with tens of thousands of homes being built on, or adjacent to Potash lease land – with no issues.

Extensive consultation was also undertaken with Trevor Berg, General Manager, PotashCorp, Patience Lake (Appendix P). It was confirmed that there are no underground workings in the area below the proposed Tuscan Ridge Estates land. In fact, the nearest tunneling is located quite a distance away – approximately 1.6 km's. (please see Appendix Q). Many years ago due to extensive flooding, PCS Patience Lake became a solution based mine where they circulate brine through the old workings of the mine. There are no plans to change this so any new tunneling is unlikely. Areas on this map show that there are about 31 injection wells installed that are drilled to the old mine workings but all within the same area. Some are vertical wells and others are directional drilled from one location. The main pipelines to these areas are shown on the map. None are located close to the property.

Also, the mine workings are in the range of 1Km below ground and in areas where there is tunneling there is a small risk of subsidence. However, this is not a concern with Tuscan Ridge Estates as the closest tunneling is 1.6 Km's away. Even considering this, there are currently tens of thousands of homes built on top of Potash Lease land in the Province of Saskatchewan.

6.0 STAGING AND IMPLEMENTATION

The Developer has decided to develop this community consisting of 43 lots in two Phases. Phase I will consists of 23 lots (lots #1-16 Block 1, lots 7-13 Block 2), dedication of MR1, MR3 (Park), ER1, ER2, as well as road construction and culverts for the entire Development. The park which is located on MR3 will be completed as well as the full Solar Project located on MR1. Also, the water pump house will be constructed and located on MR1 and will be functional to service the Development. Phase II will consist of 20 lots (lots 17-30 Block 1, lots 1-6 Block 2), as well as dedication of MR2. The Developer is requesting Council to rezone the entire development to CR1, and designate Phase II with a holding provision.

7.0 PUBLIC OPINION

The requirements of a Comprehensive Development Review include ensuring there is substantial public consultation from surrounding residents during the development process. This section outlines the community

consultation initiatives undertaken with this development proposal. It is important to note that the Developer researched many of the possible issues that occur with new developments and took these into consideration in the original plan right from the start. For example, buffer zones were placed around any pre-existing residences so there was no direct abutment of lots. A beautiful community park/playground was created for all neighbors to utilize and enjoy. The Developer also took the time initially to go out and meet many of the surrounding neighbors in person and explain and discuss the proposed Development.

7.1 Preliminary Consultation

As part of the R.M's initial call for development proposals, an initial public consultation was undertaken with all residents within a one-mile radius of the proposed land in Nov, 2013. (Please see Appendix E) This was done by a mail out through the R.M. office to all residents. Information about the development as well as a comment form was included in the mail out. In all, there were 60 landowners contacted; 50 in the R.M. of Corman Park and 10 in the adjacent R.M. of Blucher. The mailing was done very early on to give residents time to respond and to allow time for further discussions/meetings with the Developer. Gathering of the opinions was quite involved. A total of 16 comment letters were received, 7 in person meetings were conducted, 6 phone conversations/meetings, 3 response letters, and 2 emails were sent out.

Many close neighbors commented how ideally the land was suited for development due to the rolling hills and plentiful trees. Most people were quite pleased with the arrangement of the proposed development. They appreciated that it was a family-orientated development with a central park/playground for residents and neighbors to enjoy and interact. 4 common concerns were raised ;

1) Increased traffic on local roads – With adding more residences there will obviously be an increase in traffic on the roads. The primary access to the development will be Patience Lake Highway then north 1 ¼ miles along Range Road 3040. There will still be approximately half a mile of RR 3040 that was not going to be built up past the access of the development that connects it with the continuation of 8th street. However, after consulting with neighbors the Developer agreed that he would build up the remainder of RR 3040 to connect with 8th Street (at a significant expense) to help spread the traffic load. However, after presentation to the R.M. of Corman Park Council it seemed as though this would not be a great option due to the poor condition of 8th street.

2) Effect on water supply at Hidden Ridge – A few of the residents at Hidden Ridge were concerned that their water supply would be less if another development was added nearby. However, further consultation was done with Rob Risling of Lost River Water who currently supplies Hidden Ridge and plans to supply the Development. Rob said that the main supply line is along highway 16 and carries approximately 300 gal/min. To supply the whole proposed Tuscan Ridge Development an additional 20 gal/min will be needed. When the Development goes ahead an additional 20 gal/min will be available through the current lines to Hidden Ridge residents. Then as Tuscan Ridge is gradually filled in they will draw on the excess supply. So for the time before the development fills in there will actually be an excess of water available to Hidden Ridge residents, ultimately ending with the same supply they currently have.
3) Effects on Wildlife – The proposed land will have restrictions in place to minimize impact on wildlife. Lot placement and conditions for site development will be minimally invasive as well as plenty of land being put aside as Municipal Reserve. This will allow many plant and animal species that currently reside on the land to continue to thrive.
4) Light Pollution from Yard/Street lighting - There will be no street lights at the proposed Development and lighting will be restricted to yard lighting only. Methods will be encouraged to help reduce light pollution and ensure responsible lighting within the development. It will be recommended for residence to utilize motion detection lighting and shielding of lights. Also, lower wattage bulbs will be encouraged as well as potting lights into full cut-off fixtures for more efficient lighting. Solar lighting will also be encouraged.

In summary, the majority of the surrounding residents were very pleased with the proposed development. Any concerns that were raised were able to be adequately addressed. Many issues did not come up as the Developer was proactive in the design of the development placing buffers around any existing homes that were adjacent to the property and incorporating a beautiful park/playground into the development for all surrounding neighbors to use.

7.2 Public Open House and Mail Out to Residents Within 1 Mile

In July of 2014 residents within a one-mile radius of the proposed Development were once again contacted and asked for comments/concerns and notified of a public open house. A come and go open house was scheduled for July 14th, 2014 at the Floral Community Center from 5:00-8:00 pm and details were provided about the proposed development. Several informational display boards were erected showing the exact location of the proposed development, overall layout of the development, and concept image of the public park/playground. The

open house was well attended by 8 of the surrounding residents and Rebecca Row from the R.M. of Corman Park. Discussions ranged from the layout of the development, servicing of the development, traffic concerns, and onsite wastewater management methods. There were discussions regarding the numerous studies that were performed and results of these studies were emailed to residents in attendance that requested them following the open house.

Feedback on the proposed development was quite positive and many favorable comments were received regarding the layout of the development with the centrally located playground/park and the thoughtful design incorporating a lot of the existing trees into the layout. The concerns expressed by residents included traffic concerns along Patience Lake Highway and this being the sole access to the development, drainage concerns, the park attracting "bush partiers" and young teenagers, type of onsite wastewater management systems proposed, school attendance, potable water supply, density of the development and smaller lot size, and the slow movement of lots of nearby Applewood Estates.

Residents with traffic concerns were informed that with the Developers past presentation to RM of Corman Park Council in Dec./2013, the Council was not in favor of building up the remainder of Range Road 3040 to access 8th Street as there were concerns regarding the poor shape of this road. Therefore, to address traffic concerns an official Traffic Impact Study was performed by Stantec. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands. The traffic analysis also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule. Projections were also made to consider the traffic at full build-out of the development. Further, Stantec specifically looked to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety. The study determined that "the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates taking into account background growth and traffic generated by the nearby development of Ridgewood Estates. No additional intersection or roadway improvements are required." Some residents did want to see pavement on Range Road 3040 sooner than 90% build out because of dust concerns. However, they were educated that due to the extremely high cost of pavement it is not economically viable to do this sooner than 90% build out. With dust being the major concern to nearby neighbors the developer will be looking into the possibility of spraying RR 3040

during the summer months with Calcium Chloride to help control the dust in the interim until RR 3040 is paved.

For drainage concerns residents were informed that Catterall & Wright Engineering Consultants were contracted to perform a drainage study for the proposed development. Because of the rolling topography of the land it was found that there is enough depression storage on the land to handle drainage and adjacent properties will not be affected.

Residents concerned about the park/playground were assured that the Developer is not trying to create a new "party spot" or hangout for teenagers. There is no common community centre building or area where teenagers can hang out undetected. It is designed as a playground area/park for families to enjoy and interact with their neighbours. The park is also centrally located in the development and is in the direct line of sight of 13 of the lots. The park will be public space as it is located on Municipal Reserve so in reality it will be available for use to all of the public. It is assumed that nearby neighbours would be the primary users but it would be great if neighbors from all around would come and use the park with their kids. As mentioned previously, an innovative solar project is planned for the development which will qualify under the small power producers program with SaskPower. The money generated from this fairly large solar project will be credited back to the Tuscan Ridge Community Association and they will be able to allocate the funds as they see fit. They can direct some of this money toward park maintenance as well as some of the money being credited back to the residents to offset their power bills.

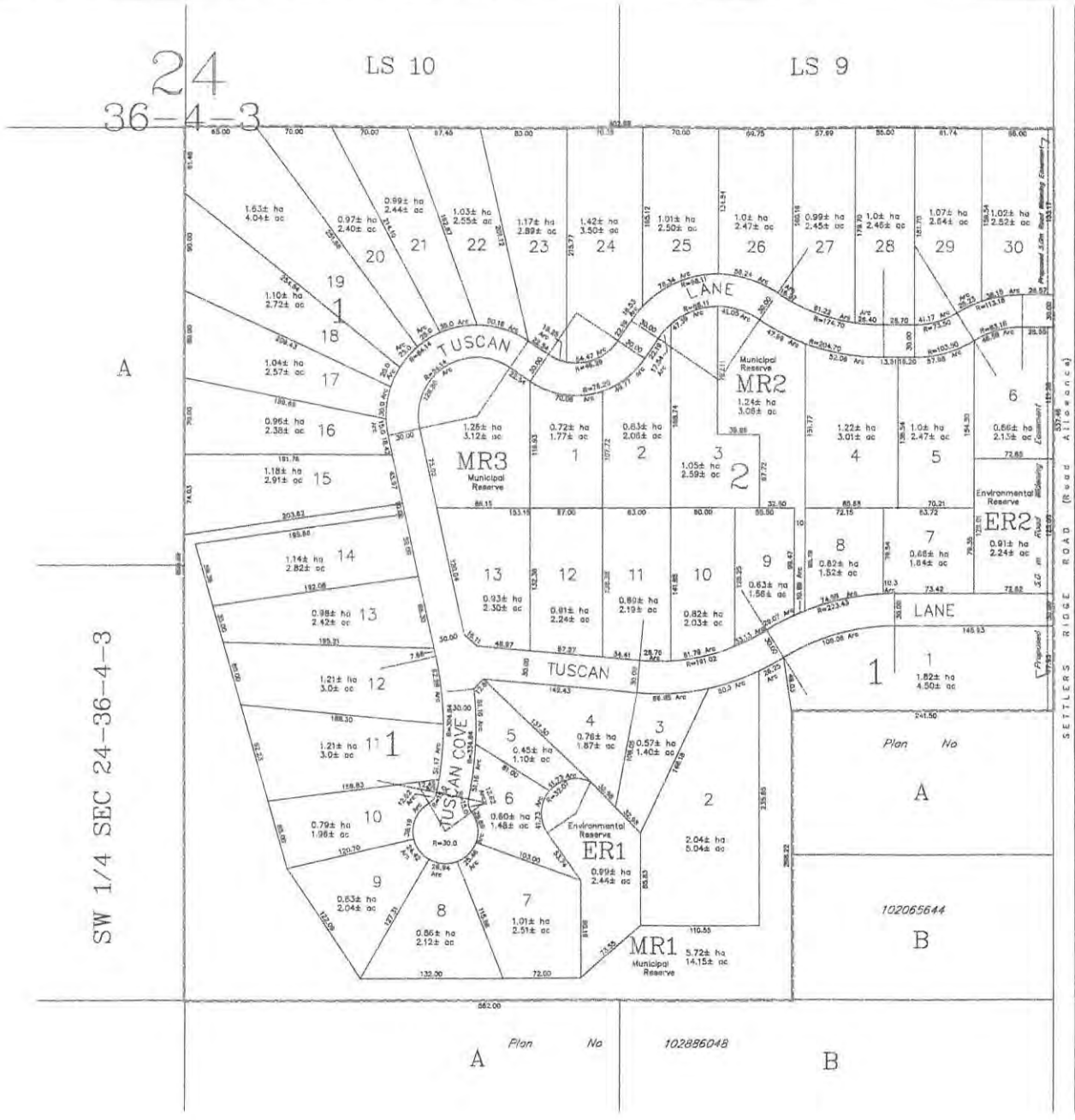
Regarding onsite wastewater treatment residents were told that a Hydrogeological study was performed by P. Machibroda engineering to determine the recommended methods of wastewater treatment and holding tanks with Type 2 pressurized mounds were going to be the method of choice.

Residents were also informed that the development is located in the Prairie Spirit School Division and confirmation was received for future attendance for residents at Clavet School. Also, potable water supply will come from Lost River Water Co. that currently supplies Hidden Ridge. There has been significant communication between the Developer and Rob Risling from Lost River Water and he confirms that there will be no affect on current water supply to Hidden Ridge when Tuscan Ridge is supplied.

In regards to demand/density, residents were informed that Applewood currently sits at 33% sold. However, if we consider nearby Developments of Saddleridge and Greenbryre they are moving at a much faster pace. Of

the 143 lots in Greenbryre 60% of these lots are sold and Saddleridge currently sits at 61% sold. Tuscan Ridge Estates is designed to cater to a different market with the primary goal of the development to attract young families to live in Corman Park. Also it will cater to people that are environmentally conscious with the very large solar project that is planned. There are a few larger lots in the 4-5 acre range but most are smaller as the overall design of the development is again to cater to young families. This gives young families the ability to spend extra time with their kids instead of having to look after and maintain a very large piece of property.

Appendix A
Plan of Proposed Subdivision



PLAN OF PROPOSED SUBDIVISION
PART OF SE 1/4 SEC 24-TWP 36-RGE 4-W 3RD MER
RM OF CORMAN PARK NO 344
SASKATCHEWAN
BY T.R. WEBB, S.L.S.
SCALE 1:2500

Dimensions shown are in metres and decimals thereof.
Portion of this plan to be subdivided is outlined in red with a bold, dashed line and contains 58.25± ha (143.93± ac.) which includes 5.18± (12.8± ac) for roadways.
Distances are approximate and may vary by 5± metres.

Seal

T.R. Webb, September 2[illegible], 2014
Saskatchewan Land Surveyor

Registered Owner dd/mm/yy
The signature above indicates that I (we) approve the Plan of Proposed Subdivision as presented.

Prepared by
Webb Surveys
13-2607cw CAS

Appendix B
Environmental/Terrestrial Assessment

Golder Associates

TECHNICAL MEMORANDUM

DATE July 31, 2013 **PROJECT No.** 13-1361-0027

TO Greg Murdoch

CC Chris Downie

FROM Catherine Fairbairn **EMAIL** Cfairbairn@golder.com

GREG MURDOCH SUBDIVISION TECHNICAL MEMORANDUM

1.0 INTRODUCTION

Mr. Greg Murdoch is planning to construct a multi-parcel country residential subdivision in SE 24-36-4 W3M approximately 7 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 subdivision area and prepare this memorandum. Dan Coffen (biologist, Golder) and Catherine Fairbairn (ecologist, Golder) completed a field evaluation of the quarter section on July 5, 2013. 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.

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, with 30% of the cropland generally left as summer fallow (Acton et al. 1998). Within this area, the Project is located on a quarter section of land that historically has been farmed. The majority of land in the quarter has been broken, although there are numerous patches of woody vegetation, primarily around or in association with pothole wetlands that support the establishment of native vegetation. The quarter section has been left fallow for the past several years and open areas are currently dominated by a cover of weedy species. The quarter sections surrounding the Project are also cultivated fields or hayland with wetlands and stands of woody vegetation in low areas.

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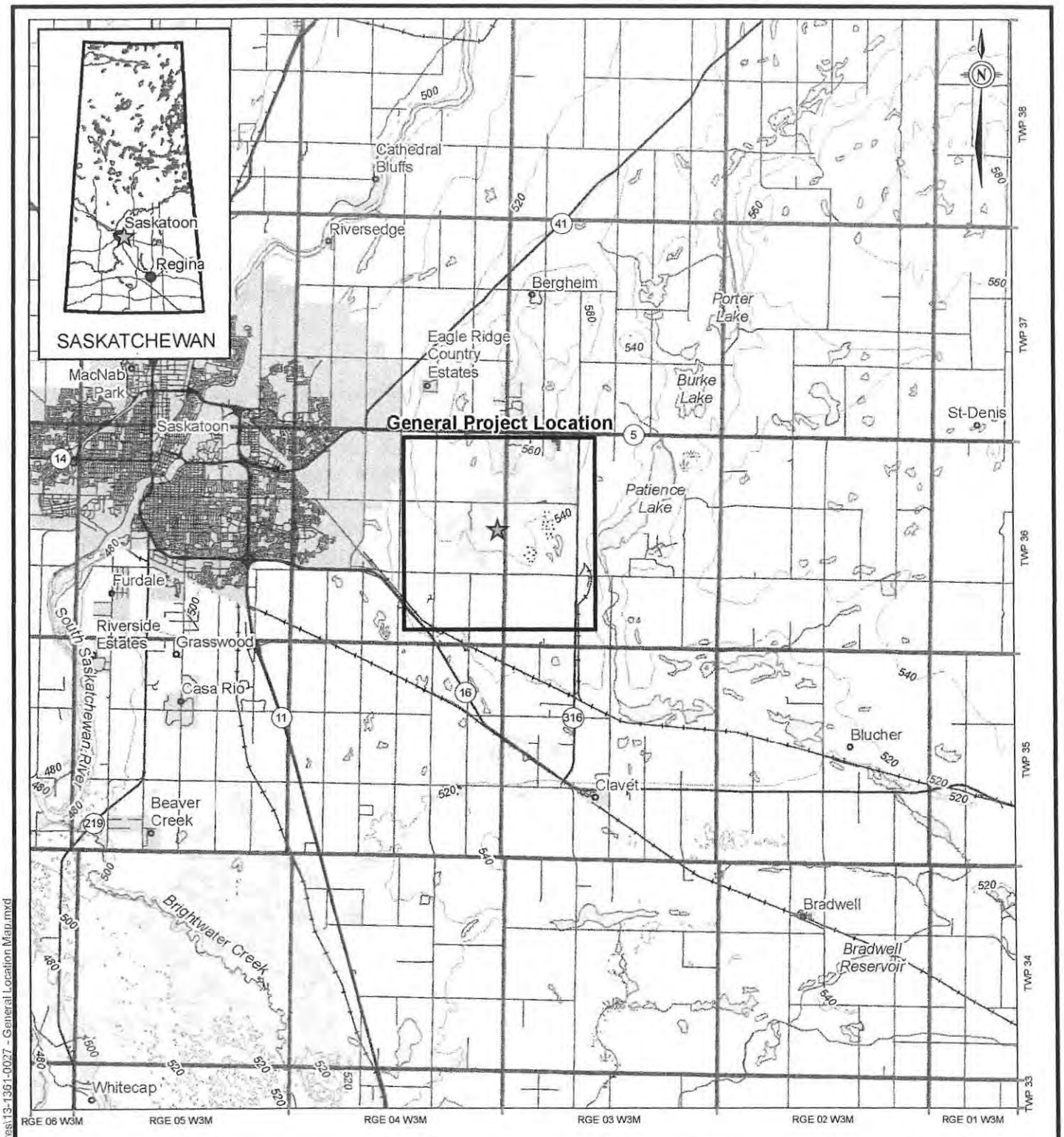
Tel: +1 (306) 665 7989 Fax: +1 (306) 665 3342 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America



PROJECT

GREG MURDOCH SUBDIVISION

TITLE

GENERAL LOCATION MAP

REFERENCE

INFORMATION SERVICES CORPORATION, 2013
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
NTS MAPSHEET: 72O, 73B
NAD 83 UTM ZONE 13

Golder Associates
Saskatoon, Saskatchewan

PROJECT		13-1361-0027	FILE No.
DESIGN			SCALE AS SHOWN REV: 0
GIS	LMR	31/07/13	FIGURE: 1
CHECK	CF	31/07/13	
REVIEW	CD	31/07/13	

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2.3 Surface Water

The Minichinas Upland Landscape Area is generally poorly drained, with local drainage into Patience Lake (Acton et al. 1998) or the local potholes distributed throughout the area. The quarter section the Project is located on does not have any drainages or creeks. 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 IV wetlands (i.e., semi-permanent to permanent wetlands with an open water area surrounded by a ring of vegetation that often includes cattail [*Typha* latifolia]) based on the Stewart and Kantrud (1979) classification system.

2.4 Vegetation

The Project site is characterized by weedy, formerly cultivated land, scattered wetlands, and patches of woody vegetation (Table 1). The formerly cultivated areas supported a vegetation cover dominated by smooth brome (*Bromus inermis*), sweet clover (*Melilotus* spp.), and noxious and nuisance weeds such as foxtail barley (*Hordeum jubatum*), sow thistle (*Sonchus* spp.), nodding thistle (*Carduus nutans*), dandelion (*Taraxacum officinale*), Canada thistle (*Cirsium arvense*), and blue lettuce (*Lactuca tatarica* var. *pulchella*). Some native plants have started to recolonize these areas, including occasional patches of snowberry (*Symphoricarpos occidentalis*), everlasting/pussytoes (*Antennaria* sp.), 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 veiny meadow rue (*Thalictrum venulosum*). Wetland areas were dominated by cattail (*Typha latifolia*) and duckweed (*Lemna minor*), with occasional rings of woody vegetation that included willow (*Salix* sp.) and trembling aspen. No federal or provincial listed plant species were observed.

Table 1: Plant Species Observed in SE 24-36-3 W3M

Common Name	Scientific Name	Common Name	Scientific Name
Trees and Shrubs			
Wolf Willow	*Elaeagnus commutata*	Prickly Rose	*Rosa acicularis*
Trembling Aspen	*Populus tremuloides*	Wild Raspberry	*Rubus idaeus* ssp. *strigosus*
Chokecherry	*Prunus virginiana*	Willow	*Salix sp.*
Current	*Ribes* sp.	Western Snowberry	*Symphoricarpos occidentalis*
Grasses and Grass-like Species			
Slough Grass	*Beckmannia syzigachne*	Foxtail Barley**	*Hordeum jubatum***
Smooth Brome	*Bromus inermis*	Kentucky Bluegrass	*Poa pratensis*
Tufted Hair Grass	*Deschampsia caespitosa*	Cattail	*Typha latifolia*
Northern Wheatgrass	*Elymus lanceolatus* ssp. *lanceolatus*		
Forbs			
Common Yarrow	*Achillea millefolium*	Blue Lettuce**	*Lactuca tatarica* var. *pulchella***
Canada Anemone	*Anemone canadensis*	Bluebur	*Lappula* sp.
Small-leaf Everlasting	*Antennaria microphylla*	Cream-coloured Vetchling	*Lathyrus ochroleucus*
Low Pussytoes	*Antennaria parvifolia*	Alfalfa	*Medicago sativa*
Silverweed	*Argentina anserina*	White Sweet Clover	*Melilotus alba*
Prairie Sage	*Artemisia ludoviciana*	Yellow Sweet Clover	*Melilotus officinalis*
Aster	*Aster* sp.	Lilac-flowered Beardtongue	*Penstemon gracilis*
Blue Bell	*Campanula rotundifolia*	Canada Goldenrod	*Solidago canadensis*

Table 1: Plant Species Observed in SE 24-36-3 W3M (continued)

Common Name	Scientific Name	Common Name	Scientific Name
Trees and Shrubs			
Nodding Thistle*	*Carduus nutans**	Prickly Sow Thistle*	*Sonchus asper**
Narrow-leaved Goosefoot	*Chenopodium leptophyllum*	Dandelion*	*Taraxacum officinale**
Canada Thistle*	*Cirsium arvense**	Veiny Meadow Rue	*Thalictrum venulosum*
Hawk's Beard	*Crepis occidentalis* ssp. *occidentalis*	Goldenbean	*Thermopsis rhombifolia*
Field Horsetail	*Equisetum arvense*	Goat's Beard	*Tragopogon dubius*
Philadelphia Fleabane	*Erigeron philadelphicus*	Red Clover	*Trifolium pratense*
Wild Strawberry	*Fragaria virginiana*	Stinging Nettle	*Urtica dioica*
Northern Bedstraw	*Galium boreale*	American Vetch	*Vicea americana*
Gumweed	*Grindelia squarrosa*	Canada Violet	*Viola canadensis*

* Noxious Weed under the *Weed Control Act* (2010)

** Nuisance Weed under the *Weed Control Act* (2010)

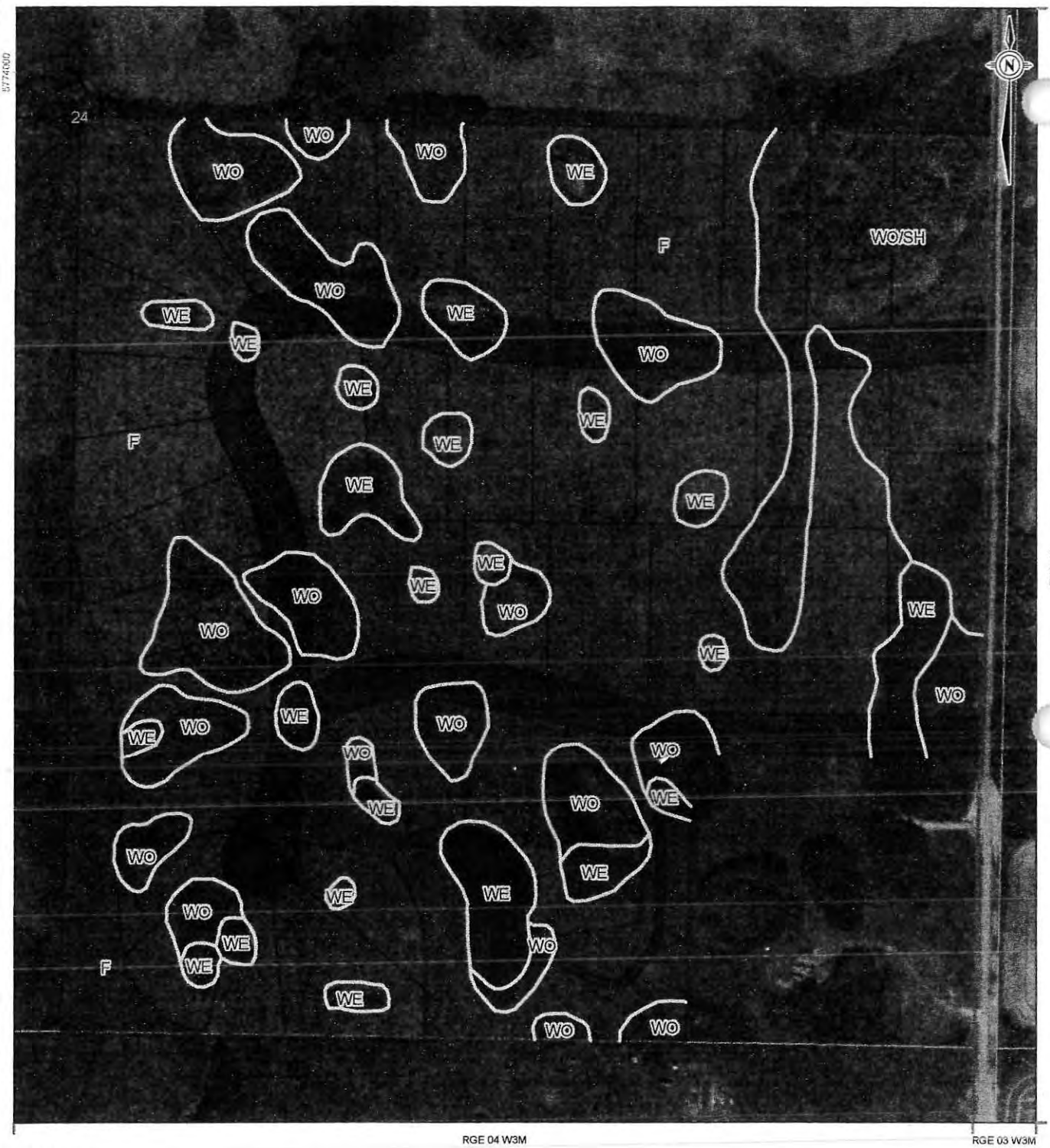
2.5 Wildlife and Wildlife Habitat

The landscape surrounding the Project has been heavily modified by agriculture, infrastructure development, and acreage development. The presence of developed roads and nearby acreages, coupled with the previous disturbance to the Project area from cultivation, collectively reduces the quality of natural wildlife habitat in the Project area. Nonetheless, the wetlands and patches of woody vegetation present have the potential to provide suitable nesting and foraging habitat for several species (Figure 2). The Project area is considered to have moderate wildlife habitat potential.

During the field assessment on July 5, 2013, eleven bird species were observed by sight or identified by song (Table 2). The majority of these species were identified in woodland or shrubland areas, while the remainder were identified in wetland or modified grassland areas. Signs of white-tailed deer (*Odocoileus virginianus*) were also observed. No federal or provincial listed wildlife species were observed and the habitat suitability for these species is low to moderate.

Table 2: Bird Species Observed in SE 24-36-3 W3M

Common Name	Scientific Name	Habitat
Red-winged blackbird	*Agelaius phoeniceus*	Wetland
Baltimore oriole	*Icterus galbula*	Woodland
Warbling vireo	*Vireo gilvus*	Woodland
Brown-headed cowbird	*Molothrus ater*	Woodland
Clay-coloured sparrow	*Spizella pallida*	Shrubland
American coot	*Fulica americana*	Wetland
Yellow warbler	*Setophaga petechia*	Woodland
Eastern kingbird	*Tyrannus tyrannus*	Shrubland
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Shrubland
Vesper sparrow	*Pooecetes gramineus*	Modified grassland
American goldfinch	*Carduelis tristis*	Modified grassland & Woodland



LEGEND

- TOWNSHIP AND RANGE BOUNDARY
- SECTION BOUNDARY

PROPOSED SUBDIVISION

- PHASE 1 & 2 LOTS
- MUNICIPAL RESERVE
- PARK
- PATHWAY
- ROADWAY

HABITAT DELINEATION

- F - FALLOW FIELD
- SH - SHRUBLAND
- WE - WETLAND
- WO - WOODLAND

100 0 100

SCALE 1:5,000 METRES

PROJECT

GREG MURDOCH SUBDIVISION

TITLE

HABITAT MAP

REFERENCE

INFORMATION SERVICES CORPORATION, 2013
IMAGERY SOURCE: ESRI, I-CUBED, USDA, USGS, AEX, GEOEYE, GETMAPPING, AEROGRID, IGN, IGP, AND THE GIS USER COMMUNITY
NAD 83 UTM ZONE 13

Golder Associates
Saskatoon, Saskatchewan

PROJECT	13-1361-0027		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	LMR	19/07/13	FIGURE: 2	
CHECK	CF	31/07/13		
REVIEW	CD	31/07/13		

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3.0 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.

Catherine Fairbairn, M.Phil., B.Sc.
Ecologist

Mark Ealey, B.Sc.
Associate, Senior Reclamation Specialist

CNF/ME/ldmg

4.0 REFERENCES

Acton, D.F., G.A. Padbury, and C.T. Stushnoff. 1998. The Ecoregions of Saskatchewan. Canadian Plains Research Centre, University of Regina.

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. 57 pp.

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Photoplates

Photo 1: Characteristic view of formerly cultivated land, dominated by sweet clover and Canada goldenrod with patches of woody vegetation in the background.

Photo 2: Characteristic view of formerly cultivated land, dominated by weedy species including nodding thistle, with a nearby wetland.

Photo 3: Class IV wetland dominated by cattail with willow in the foreground.

Photo 4: Class IV wetland dominated by cattail and surrounded by weedy vegetation such as sweet clover.

Appendix C
Geotechnical Report

P. MACHIBRODA ENGINEERING LTD.

CONSULTING
GEOTECHNICAL
GEOENVIRONMENTAL
ENGINEERS AND
GEOSCIENTISTS

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- Soils Testing
- Concrete Testing
- Asphalt Testing

GEOTECHNICAL INVESTIGATION
PROPOSED RURAL SUBDIVISION
SE1/4-24-36-4-W3M
NEAR SASKATOON, SASKATCHEWAN
PMEL FILE NO. S13-8644
JANUARY 13, 2014

PREPARED FOR:

WHITEWATER HOLDINGS LTD
423 BLACKBURN TERRACE
SASKATOON, SASKATCHEWAN
S7L 1E8

ATTENTION: MR. GREG MURDOCK

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S13-8644-24	Grain Size Distribution Analysis
S13-8644-25	Grain Size Distribution Analysis
S13-8644-26	Grain Size Distribution Analysis
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Appendix A	Explanation of Terms on Test Hole Logs
Appendix B	Topsoil, Organic Matter and Organics

1.0 INTRODUCTION

The following report has been prepared on the subsurface soil conditions existing at the site of the proposed Rural Subdivision to be constructed on SE1/4-24-36-4-W3M near Saskatoon, Saskatchewan.

Authorization to proceed with this investigation was provided on November 6, 2013. The Terms of Reference were presented in P. Machibroda Engineering Ltd. (PMEL) Proposal No. 1025-8306, dated October 28, 2013.

The field test drilling and soil sampling were conducted on November 26 and 27, 2013.

2.0 FIELD INVESTIGATION

Sixteen test holes, located as shown on the Site Plan, Drawing No. S13-8644-1 were dry drilled using our truck-mounted, continuous flight, solid stem auger drill rig. The test holes were 150 mm in diameter and extended to depths of 3 to 18 metres below the existing ground surface.

Test hole drill logs were compiled during test drilling to record the soil stratification, the groundwater conditions, the position of unstable sloughing soils and the depths at which cobblestones and/or boulders were encountered.

Disturbed samples of auger cuttings were collected during test drilling and sealed in plastic bags to minimize moisture loss. The soil samples were taken to our laboratory for analysis.

Standard penetration tests (N-index), utilizing a safety hammer with automatic trip, were performed during test drilling.

Standpipe piezometers (50 mm diameter slotted PVC pipe) were installed in all test holes to monitor the existing groundwater conditions.

3.0 FIELD DRILL LOGS

The field drill logs recorded during test drilling have been shown plotted on Drawing Nos. S13-8644-2 to 17, inclusive.

The ground surface elevation and plan location of the Test Holes was provided by Altus Geomatics.

3.1 Soil Profile

The general soil profile consisted of 100 to 200 mm of topsoil overlying variable deposits of silt, clay and sand that extended to depths of 100 mm to 1.8 metres. These deposits were underlain by glacial till (clay), which extended to a depth of at least 18 metres, the maximum depth explored with our Test Holes at this site.

3.2 Groundwater Conditions, Sloughing

Groundwater seepage and sloughing conditions were encountered in saturated sand layers/lenses during test drilling. The depths at which groundwater seepage and sloughing conditions were encountered have been shown on Drawing Nos. S13-8644-2 to 17, inclusive. A summary of the groundwater levels recorded in the piezometers has been presented in Table I.

TABLE I. RECORDED GROUNDWATER LEVELS

Test Hole No.	Piezometer Rim Elevation (metres)	Ground Surface Elevation (metres)	Recorded Groundwater Elevation (metres)	
			November 27, 2013	December 12, 2013
13-1	541.5	540.5	Dry	537.7
13-2	544.8	543.8	Dry	Dry
13-3	547.6	546.4	Dry	535.0
13-4	547.4	546.4	Dry	Dry
13-5	547.3	546.3	Dry	541.6
13-6	543.7	542.6	Dry	540.3
13-7	542.9	541.6	533.4	539.5
13-8	544.0	543.0	Dry	Dry
13-9	542.3	541.4	532.8	540.3
13-10	545.1	544.0	Dry	539.8
13-11	545.5	544.5	Dry	Dry
13-12	545.5	544.5	Dry	526.8
13-13	545.5	544.5	Dry	Dry
13-14	543.2	542.3	Dry	539.6
13-15	543.5	542.5	Dry	538.6
13-16	540.9	539.8	Dry	538.4

Examination of Table I revealed that the groundwater table was situated approximately 1 to 4 metres below the existing ground surface elevation on December 12, 2013. Higher static water levels should be expected during or following spring snowmelt and periods of precipitation.

3.3 Cobblestones and Boulders

Cobblestones and/or boulders were encountered in saturated sand layers during test drilling as shown on Drawing Nos. S13-8644-2 to 17, inclusive.

The glacial till consisted of a mixture of gravel, sand, silt and clay-sized particles. In addition to the above particle sizes, a random distribution of larger particle sizes in the cobblestone (60 to 200 mm) and boulder-sized range (larger than 200 mm) were encountered at the subject site.

It should be recognized that the statistical probability of encountering cobblestones and/or boulders in the sixteen small diameter Test Holes drilled at this site was low. Intertill deposits of cobblestones, boulders, boulder pavements and isolated deposits of saturated sand or gravel should be anticipated. The frequency of encountering such deposits will increase proportionately with the number of piles installed or volume of soil excavated.

4.0 LABORATORY ANALYSIS

The soil classification and index tests performed during this investigation consisted of a visual classification of the soil, water contents, Atterberg limits, unit weights, grain size distribution analysis and water soluble sulphate contents.

The results of the soil classification and index tests conducted on representative samples of soil have been plotted on the drill logs alongside the corresponding depths at which the samples were recovered, as shown on Drawing Nos. S13-8644-2 to 17, inclusive.

The results of the grain size distribution analyses have been shown plotted on Drawing Nos. S13-8644-18 to 32, inclusive.

5.0 DESIGN RECOMMENDATIONS

Based on the foregoing outline of soil test results, the following foundation considerations and design recommendations have been presented.

5.1 Design Considerations

It is understood that the proposed Rural Subdivision will consist of 38 lots, a roadway, a park and municipal reserve areas.

The subsurface soil conditions at the site of the proposed Rural Subdivision consisted of topsoil overlying variable deposits of silt, clay and/or glacial till (sand). These deposits were underlain by glacial till (clay). The subgrade soils are considered frost susceptible and the average depth of frost penetration for a heated building in the Saskatoon, Saskatchewan area is in the order of 1.8 metres.

Groundwater seepage and sloughing conditions were encountered in intertill sand layers/lenses during test drilling. Based on the water level measured on December 12, 2013 within the piezometers installed during the field investigation, the water table is situated approximately 1 to 4 metres below existing ground surface. Higher static water levels should be expected during or following spring snowmelt and periods of precipitation.

A shallow foundation system consisting of standard strip or spread footings bearing on undisturbed, naturally occurring soils could be considered as a foundation system at this site. The same recommendations apply for basement levels and/or crawlspace floors.

To minimize the potential for groundwater infiltration into a basement, it is recommended that basement floor slabs be constructed at least 500 mm above the groundwater table and a sub-surface drainage system be installed below the floor slab and around the perimeter of the foundation walls. Due to the presence of a shallow groundwater table at the site, some of the lots will need to be built up to allow for the construction of a basement.

Alternately, a deep foundation system consisting of drilled, cast-in-place concrete piles should perform satisfactorily at this site. Construction difficulties associated with cobblestones, boulders, groundwater seepage and sloughing conditions should be anticipated during the construction of drilled, cast-in-place concrete piles at this site. Temporary casing will be required to provide an open hole for placement of reinforcing steel and concrete for some of the piles.

Recommendations have been prepared for site preparation; standard strip and/or spread footings; drilled, cast-in-place concrete piles; factor safety/resistance factors; excavations and dewatering; floor slabs; foundation walls; grade beams; foundation concrete; exterior slabs/resistance factor; seismic site classification and access roads.

5.2 Site Preparation

All organic topsoil, loose fill and deleterious materials should be removed from the building, access roads and parking/walkway areas. Staining and root intrusion from the overlying organic material and roots may be encountered during excavation within the subsurface mineral soils. If these conditions are suspected, a representative of the Geotechnical Consultant should inspect the site during excavation to verify the depth of unsuitable soil which should be removed in preparation of the site for construction. See Appendix B for further information with respect to topsoil composition and soil structure.

The surface of the subgrade should be levelled and compacted to the following minimum density requirements.

Building Areas	-	96 percent of standard Proctor density at optimum moisture content;
Roadway Areas	-	96 percent of standard Proctor density at optimum moisture content;
Landscape Areas	-	90 percent of standard Proctor density at optimum moisture content.

Fill, required to bring the subgrade soil to the design elevation in the construction area, should preferably consist of granular material or non-expansive (i.e. low plastic) fine-grained soil. The on-site glacial till soils are considered suitable for use as general subgrade fill across the site. The fill should be placed in thin lifts (maximum 150 mm loose) and compacted to 96 percent of standard Proctor density at optimum moisture content.

The site should be graded to ensure positive site drainage away from all structures.

5.3 Standard Strip and/or Spread Footings

The near surface subgrade soil conditions at the subject site consisted of topsoil overlying variable deposits of clay, silt and/or sand. These deposits were underlain by glacial till. Footings bearing on naturally occurring glacial till should perform satisfactorily.

The following minimum recommendations should be incorporated into the design of a footing foundation.

1. For a continually heated dwelling with a basement, the footings should be founded on naturally deposited, undisturbed soil at a minimum depth of 1.2 metres below finished ground surface. Footings for a heated building without a basement should be based at a minimum depth of 1.8 metres below finished grade to provide protection against frost action. Alternately, rigid polystyrene insulation can be utilized to minimize the depth of frost and footing elevation. In this case, a continuous layer of rigid polystyrene insulation should be placed over the exterior face of the foundation wall/grade beam, extending vertically a minimum of 300 mm above grade and laterally a minimum distance of 1.2 metres away from the foundation. The insulation should be a minimum of 50 mm in thickness and should be positively sloped away from the foundation to promote drainage. The lateral section of insulation should be buried a minimum of 300 mm below finished grade.

2. Footings in unheated areas should be based at a deeper elevation (i.e., 2.3 metres) to avoid the detrimental impacts of frost.

3. Footings based on naturally deposited, undisturbed soil may be designed to exert an ultimate bearing pressure of 300 kPa (Ultimate Limit States, ULS). The Serviceability Limit States (SLS) bearing pressure equivalent to 25 mm of footing settlement would be equal to 100 kPa.

4. A minimum strip footing width of 500 mm is recommended. A minimum dimension of 1,000 mm is recommended for square and rectangular footings.

5. If the subgrade soil is disturbed during excavation below the design depth, then the disturbed soil should be removed to an undisturbed, level surface. Fill, required to raise the subgrade elevation to the underside of the footings, should be concrete.

6. Footings should not be constructed on desiccated, frozen or wet subgrade soil. Frost should not be allowed to penetrate beneath the footings prior to, during or after construction.

7. The finished grade should be landscaped to provide for positive site drainage away from the proposed buildings.

5.4 Drilled, Cast-In-Place Concrete Piles

A deep foundation consisting of drilled, cast-in-place concrete piles could be utilized as a foundation system at this site. Construction difficulties associated with groundwater seepage and sloughing conditions, cobblestones/boulders, and sand/gravel layers/lenses should be anticipated during the construction of drilled piles at this site.

Drilled, cast-in-place, straight shaft concrete piles should be designed on the basis of skin friction only.

The ultimate skin friction bearing pressures of the undisturbed soil are as follows:

TABLE II. SKIN FRICTION BEARING PRESSURES (DRILLED PILES)

Zone* (metres)	Ultimate Skin Friction Bearing Pressure (kPa)
0 to 2	0
2 to 5	75
Below 5	90

*Note: Potential for encountering wet sand/gravel layers and boulders increases with greater depth penetrated into the glacial till stratum.

Notes:

1. To minimize frost heave potential, skin friction piles should be extended to a minimum depth of 6 metres below finished ground surface. The use of a sono-tube form for the uppermost 2 metres of the pile shaft is recommended for external piles, as it would significantly reduce the potential for frost-heaving of the straight shaft concrete piles. The sono-tube should be at least 50 mm in diameter smaller than the drilled hole.

2. Piles should be reinforced.

3. A minimum pile diameter of 400 mm is recommended for the primary structural loads. Larger pile diameters may be required to allow for the removal of cobbles and boulders in some pile holes.

4. The pile holes should be filled with concrete as soon as practical after drilling.

5. Groundwater seepage and sloughing conditions were encountered during test drilling. Casing will be required where groundwater seepage and sloughing conditions are encountered to maintain the pile holes open for placing of the reinforcing steel and concrete. The annular space between the casing and drilled hole must be filled with concrete. As casing is extracted, concrete in casing must have adequate head to displace all water in the annular space.

6. A minimum centre-to-centre pile spacing of not less than three pile diameters is recommended.

7. A representative of the Geotechnical Consultant should inspect and document the installation of the drilled, cast-in-place concrete piles.

5.5 Factor of Safety/Resistance Factors

When using traditional Working (allowable) Stress Design (WSD) to design the foundations, an appropriate Factor of Safety must be applied to the ultimate bearing pressures presented in this report. PMEL typically recommends a Factor of Safety of 2.5 for compressive loading and 3.5 to 4 for tensile loading. The actual Factor of Safety should be based on the governing design requirements/codes.

As with WSD, an appropriate reduction must be applied to the ultimate bearing pressures (otherwise known as Ultimate Limit State, ULS) when designing the foundations on the basis of Limit States Design (LSD). This is accomplished in the form of using resistance factors (Φ). As per the National Building Code of Canada - NBCC (2010), the following resistance factors are considered appropriate for the design of:

- Shallow foundations:
  - Compressive Resistance, $\Phi = 0.5$

- Deep foundations:
  - Compressive Resistance, $\Phi = 0.4$

For both WSD and LSD, a settlement analysis of the foundation must also be evaluated to ensure the structure is not negatively impacted by excessive settlement at the design load. This is also known as Serviceability Limit States (SLS) when designing on the basis of LSD.

With respect to a footing foundation at this site, the provided SLS bearing capacity is based on a settlement of 25 mm. If a lesser settlement is required for the footing foundation, PMEL should re-evaluate the recommended SLS bearing capacity.

For piles, provided the foundation is designed using the appropriate factors of safety or resistance factors presented above, the amount of settlement at the design load will be small and within tolerable limits (typically less than 10 mm). Hence, settlement typically does not govern in the majority of cases of deep foundation design.

5.6 Excavations and Dewatering

Excavations at this site should be made in accordance with current Saskatchewan Labour Occupational Health and Safety (OH&S) Guidelines. The subsurface conditions at this site may be classified as "Type 3" soils (i.e., the excavation sideslopes should be at an angle not steeper than one horizontal to one vertical). The side slopes may need to be flattened where the excavation extends below the groundwater table, particularly where saturated sand layers are encountered.

Depending on lateral constraints, excavations at this site may be completed with unbraced, sloped side walls. The stability of the excavation walls will be affected by wetting and drying of the exposed excavation walls, the length of time that the excavation remains open and the consistency and structure (degree of fracturing, slickensiding, etc.) of the subgrade soils. The excavated soil should be removed from the excavation banks (and stockpiled) to minimize potential sloughing of the trench sidewalls due to the soil surcharge loading.

Groundwater seepage and sloughing conditions were encountered in intertill sand layers/lenses during test drilling. The water level in the piezometers installed during the field investigation suggests that the water table was 1 to 4 metres below existing ground surface. Higher static water levels should be expected during or following spring snowmelt and periods of precipitation. De-watering should be conducted on an "as required" basis over the time period for which the excavations are left open. A sump (or multiple sumps, if required) should be set up at the deepest excavation points and the floor of the excavation sloped to the sump(s) to handle groundwater seepage and precipitation runoff. A self-actuated sump pump(s) should be operated on a continuous basis and should be discharged well away from the excavations.

The magnitude of dewatering required to provide dry working conditions will depend on the frequency of saturated sand layers encountered.

5.7 Floor Slabs

5.7.1 At-Grade Slabs

The near surface subgrade soil conditions consisted of topsoil overlying variable deposits of silt, clay, sand and/or glacial till. Grade supported slabs bearing on these soils should perform satisfactorily. Grade-supported floor slabs based on medium plastic clay soils could potentially undergo some differential movements associated with moisture fluctuations in the soil profile. An increase in the moisture content would result in swelling and heaving, whereas a decrease in the moisture content would result in shrinkage and settlement.

Providing positive drainage alongside the foundation, extending downspouts well away from the building and eliminating irrigation alongside the foundation would serve to minimize the potential for increased soil moisture content adjacent the foundation and potential swelling. The subgrade clay soils should also not be allowed to dry out during construction to minimize shrinkage and subsequent swelling upon wetting.

Since the amount of slab movement depends on many factors (i.e. swelling potential of the clay, existing overburden pressure, existing soil moisture regime, availability of free water, etc.) and is difficult to quantify, measures should be taken to accommodate potential swelling by constructing structural elements such as partition walls, staircases, grade beams, columns, etc. independent of the slab.

If some differential movements/floor cracking cannot be tolerated, then a structural floor should be constructed. Alternately, overexcavation of the medium plastic clay and replacement with non-expansive soil (i.e., glacial till or sand) could be considered as an option to minimize potential floor movements.

The following minimum provisions should be incorporated into the design of a conventional, heated, grade-supported, cast-in-place, reinforced concrete slab subject to light loading.

1. Prepare the site in accordance with Section 5.2, Site Preparation. Provide a minimum of 150 mm of granular base fill (i.e., leveling course) beneath the underside of the slab.

2. Level and compact the upper 150 mm of subgrade soil to 96 percent of standard Proctor density at optimum moisture content. Do not allow the subgrade soil to dry out. Cover the prepared subgrade soil with non-expansive fill as soon as practical after preparation.

3. Excavate soft subgrade areas and replace with suitable, non-expansive fill, placed and compacted to 96 percent of standard Proctor density at optimum moisture content.

4. All structural fill placed above the natural soils should be placed and compacted in thin lifts (150 mm maximum) to 98 percent of standard Proctor density at optimum moisture content.

5. Isolate the slab from foundation walls, columns, etc., by means of separation joints.

6. Reinforce the concrete slab and articulate the slab at regular intervals to provide for controlled cracking.

7. Provide positive site drainage away from the proposed Building. Extend downspouts at least 3 metres away from the foundation.

8. Floor slabs should not be constructed on desiccated, wet, or frozen subgrade soil or base.

9. Frost should not be allowed to penetrate beneath the floor slab just prior to, during or after construction.

5.7.2 Basement Slabs

Based on the groundwater monitoring conducted at the site, the groundwater table is situated between 1 to 4 metres below existing ground surface. If the main floor level is constructed at or near existing ground level, it would put the elevation of the basement below or just above the existing groundwater table in some areas of the site. The groundwater table would also likely be higher in wetter periods of the year. For this reason, and to avoid the detrimental impacts of water infiltration into the basement level of the buildings, it is recommended to situate the basement floor a minimum of 0.5 metres above the elevation of the groundwater table and provide a sump pit to collect any free water which may accumulate beneath the floor. A minimum of 300 mm of clean, free-draining granular fill (see gradation requirements below) should be provided beneath the underside of the floor slab to allow any water that accumulates beneath the slab to drain freely into the sump pit.

TABLE III. CLEAN, GRANULAR DRAINAGE AGGREGATE

Sieve Designation (mm)	Percent Passing
25.0	100
9.5	60 – 100
5.0	44 – 90
2.0	20 – 80
0.850	0 – 53
0.425	0 – 32
0.150	0 – 10
0.071	0 – 3

The surface of the subgrade should be positively graded towards the sump pit(s). The sump pit(s) should be perforated (and wrapped with filter cloth) to allow water to drain in from the sub-slab drainage layer.

5.8 Foundation Walls

Subsurface foundation walls should be designed to resist lateral earth pressure exerted by the backfill as well as the horizontal pressure induced by any surcharge loading. The lateral earth pressure may be calculated on the basis of an equivalent fluid pressure distribution of 10 kN/m^3 for walls backfilled with clean, free-draining backfill and a perforated drainage pipe drainage system.

A perforated drainage pipe should be installed alongside the foundation walls with the invert elevation at or below the base of the foundation. The perforated drainage pipe should be at least 100 mm in diameter and installed on non-woven geotextile capable of transmitting a flow of not less than 50 litres per second per square metre (ASTM D-4491). The geotextile should be placed on naturally deposited, undisturbed soil or free-draining sand as may be required for leveling.

The geotextile should be used to encapsulate at least 300 mm of clean, granular drainage aggregate above the invert of the drainage pipe. The clean drainage aggregate should meet the aggregate gradation requirements specified in Table III.

The drainage pipe should be directed to a sump pit and accumulated water discharged in accordance with local regulations.

In the zone 350 mm above the invert of the drainage pipe and extending to within 500 mm of ground surface, clean, free-draining granular material with less than 5 percent material finer than the 0.071 mm sieve size should be used. The uppermost 500 mm should consist of clay or other low permeability material.

5.9 Grade Beams

The grade beams should be reinforced at both top and bottom throughout their entire length. Grade beams should be constructed to allow for a minimum of 100 mm of net void space between the underside of the grade beam and the subgrade soil.

5.10 Foundation Concrete

The results of water soluble sulphate testing on soil samples recovered from the subject site have been summarized in Table IV.

TABLE IV. WATER SOLUBLE SULPHATE TEST RESULTS

Test Hole No.	Depth (m)	Soil Type	Water Soluble Sulphate (%)	Class of Exposure	Degree of Sulphate Exposure
13-1	9-9.4	Glacial Till	0.047	--	Negligible
13-3	6-6.4	Glacial Till	0.072	--	Negligible
13-4	3.0	Glacial Till	0.067	--	Negligible
13-10	9-9.4	Glacial Till	0.067	--	Negligible
13-15	7.5	Glacial Till	0.210	S-3	Moderate

An examination of Table IV revealed that the measured sulphate concentrations of the tested soils were between 0.047 and 0.210 percent, which is considered negligible to moderate in terms of potential degree of sulphate attack. Based on the test results, sulphate resistant cement is recommended for foundation concrete in contact with the soil.

It should be recognized that water soluble sulphate salts combined with moist soil conditions or low pH soils, could render the soil highly corrosive to some types of metal water lines, elbows, connectors, etc., in contact with the soil.

5.11 Exterior Slabs/Sidewalks

Grade-supported concrete slabs exposed to freezing conditions (i.e., exterior slabs/sidewalks, etc.) will be subject to differential movements associated with frost action. The development of differential slab movements may be less tolerable at locations such as front entrances as compared to general sidewalk areas. Placement of rigid polystyrene insulation beneath concrete slabs exposed to freezing temperatures could be considered to minimize frost penetration. The insulation should have a minimum thickness of 75 mm and should extend below the concrete and sub-horizontally away from the outer edges of the slab/sidewalk a minimum distance of 1.2 metres. The insulation should butt up against the exterior grade beam to direct any heat loss from the building envelope to the underside of the exterior slab. If differential movements cannot be tolerated, the slabs/sidewalks could be constructed as structural slabs (i.e., pile supported).

5.12 Site Classification for Seismic Site Response

Based on the subgrade soils encountered at this site, the site classification for seismic response, in accordance with Table 4.1.8.4.A of the NBCC (2010), is Site Class D.

5.13 Access Roads

Suitable borrow soils (i.e., sand, clay or glacial till) exist at the subject site for construction of subdivision roads and parking areas. Silt soils should not be used for access road/parking area construction.

It is anticipated that the subdivision roads and parking areas will be subject to light passenger vehicle to medium truck traffic wheel loading for the most part with some occasional heavy truck traffic wheel loading.

The following minimum recommendations should be incorporated into the design of the asphalt concrete and/or gravel surface structure.

1. Prepare the site in accordance with Section 5.2, Site Preparation.

2. Where soft subgrade conditions are encountered during site preparation, the need for special measures (i.e., overexcavation, geotextile, geogrid, cement stabilization and/or gravel fill) in soft areas must be subject to review by the Geotechnical Consultant during field construction. Based on the actual conditions encountered at the time of construction, the road structure may need to be modified to accommodate the construction equipment and the intended use.

3. As a subgrade support, the CBR (California Bearing Ratio) rating of the compacted subgrade soil should be in the order of 3 (silt) to 8 (sand). Based on the CBR rating, the following pavement structures have been presented.

TABLE V. THICKNESS DESIGN FOR ACCESS ROADS

Pavement/Granular Structure	Heavy Truck Traffic Wheel Loading (5,400 kg) (mm)		Light Truck/Passenger Vehicle Traffic Wheel Loading (1,830 kg) (mm)	
Surfacing Gravel	-	50	-	50
Asphalt Concrete	100	-	65	-
Granular Base (Min CBR = 65)	200	200	150	150
Granular Sub-Base (Min. CBR = 20)	250	400	150	225
Prepared Subgrade	(150)	(150)	(150)	(150)
Geogrid/Geotextile	*	*	*	*
Total Thickness	**550**	**650**	**365**	**425**

*High strength Geogrid/Geotextile will be required where soft subgrade soils are encountered. Prior to placement the Geotechnical Consultant should review the field conditions. Based on the field conditions, the roadway structure may need to be modified.

4. Subgrade fill, if required, should preferably consist of imported granular soil or the local clay, sand or glacial till soils. Subgrade fill should be placed in thin lifts (150 mm loose, maximum) and compacted to 96 percent of standard Proctor density at optimum moisture content.

5. All granular fill placed above the subgrade elevation should be placed in thin lifts (150 mm loose) and compacted to 98 percent of standard Proctor density at optimum moisture content. The granular base and sub-base course material should meet the following aggregate gradation requirements.

TABLE VI. AGGREGATE GRADATION REQUIREMENTS

Grain Size (mm)	Percent Passing		
	Base Course	Sub-Base Course	Surface Gravel
50.0	–	100	–
25.0	100	85 – 100	100
18.0	87 – 100	80 – 100	–
12.5	72 – 93	70 – 100	–
5.0	45 – 77	50 – 85	45 – 80
2.0	26 – 56	35 – 75	25 – 60
0.900	18 – 39	25 – 50	–
0.400	13 – 26	15 – 35	0 – 30
0.160	7 – 16	8 – 22	–
0.071	6 – 11	0 – 13	–
Plasticity Index (%)	0 – 6	0 – 6	0 – 6
CBR (min.)	65	20	–
% Fracture (min.)	50	--	40

6. Positive surface drainage (2% minimum) is recommended to reduce the potential for moisture infiltration through the pavement structure.

7. Surface water should be prevented from seeping back under the outer edges of the pavement structure.

8. For glacial till and/or sand borrow materials, roadway embankment slopes should be no steeper than 3.0 Horizontal to 1.0 Vertical (3H:1V). Similarly, ditch sideslopes should be no steeper than 3H:1V. Flatter sloped may be required where clay fill is used for borrow.

9. The roads should be constructed at least 300 mm above adjacent surrounding ground to minimize the accumulation of snow during the winter months.

10. Erosion protection is recommended for all embankment sideslopes. The slopes should be covered with topsoil and seeded to encourage vegetation growth. Alternately, erosion control blankets or hydromulch could be installed. Ditch blocks should be installed within the ditches to minimize soil erosion.

11. The surfacing gravel should be graded to provide a smooth riding surface. Periodic grading will be required to maintain the desired riding surface. Where asphalt pavement is constructed, periodic maintenance (such as crack sealing) will be required.

6.0 LIMITATIONS

The presentation of the summary of the field drill logs and foundation design recommendations has been completed as authorized. Sixteen, 150 mm diameter test holes were dry drilled using our truck-mounted, continuous flight auger drill rig. Field drill logs were compiled for the Test Holes during test drilling which, we believe, were representative of the subsurface conditions at the Test Hole locations at the time of test drilling.

Variations in the subsurface conditions from that shown on the drill logs at locations other than the exact Test Hole locations should be anticipated. If conditions should differ from those reported here, then we should be notified immediately in order that we may examine the conditions in the field and reassess our recommendations in the light of any new findings.

The subsurface investigation necessitated the drilling of deep test holes. The test holes were backfilled at the completion of test drilling. Please be advised that some settlement of the backfill materials will occur which may leave a depression or an open hole. It is the responsibility of the client to inspect the site and backfill, as required, to ensure that the ground surface at each Test Hole location is maintained level with the existing grade.

No detectable evidence (odour or staining) of environmentally sensitive materials was detected during the actual time of the field test drilling program. If, on the basis of any knowledge, other than that formally communicated to us, there is reason to suspect that environmentally sensitive materials may exist, then additional test holes should be drilled and samples recovered for chemical analysis.

This report has been prepared for the exclusive use of Whitewater Holdings Ltd. and their agents for specific application to the proposed Rural Subdivision to be constructed on SE1/4-24-36-4-W3M near Saskatoon, Saskatchewan. It has been prepared in accordance with generally accepted geotechnical engineering practices and no other warranty, express or implied, is made.

Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Party. Governing Agencies such as municipal, provincial, or federal agencies having jurisdictions with respect to this development and/or construction of the facilities described herein have full jurisdiction with respect to the described development. Any other unspecified subsequent development would be considered Third Party and would, therefore, require prior review by PMEL. PMEL accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

The acceptance of responsibility for the design/construction recommendations presented in this report is contingent on adequate and/or full time inspection (as required, based on site conditions at the time of construction) by a representative of the Geotechnical Consultant. PMEL will not accept any responsibility on this project for any unsatisfactory performance if adequate and/or full time inspection is not performed by a representative of PMEL.

If this report has been transmitted electronically, it has been digitally signed and secured with personal passwords to lock the document. Due to the possibility of digital modification, only originally signed reports and those reports sent directly by PMEL can be relied upon without fault.

We trust that this report fulfils your requirements for this project. Should you require additional information, please contact us.

P. MACHIBRODA ENGINEERING LTD.

Kai Runtz, Engineer-In-Training

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
P. MACHIBRODA ENGINEERING LTD.
Number 172
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
Geotechnical	04955	T. Werbovetski 14-01-13

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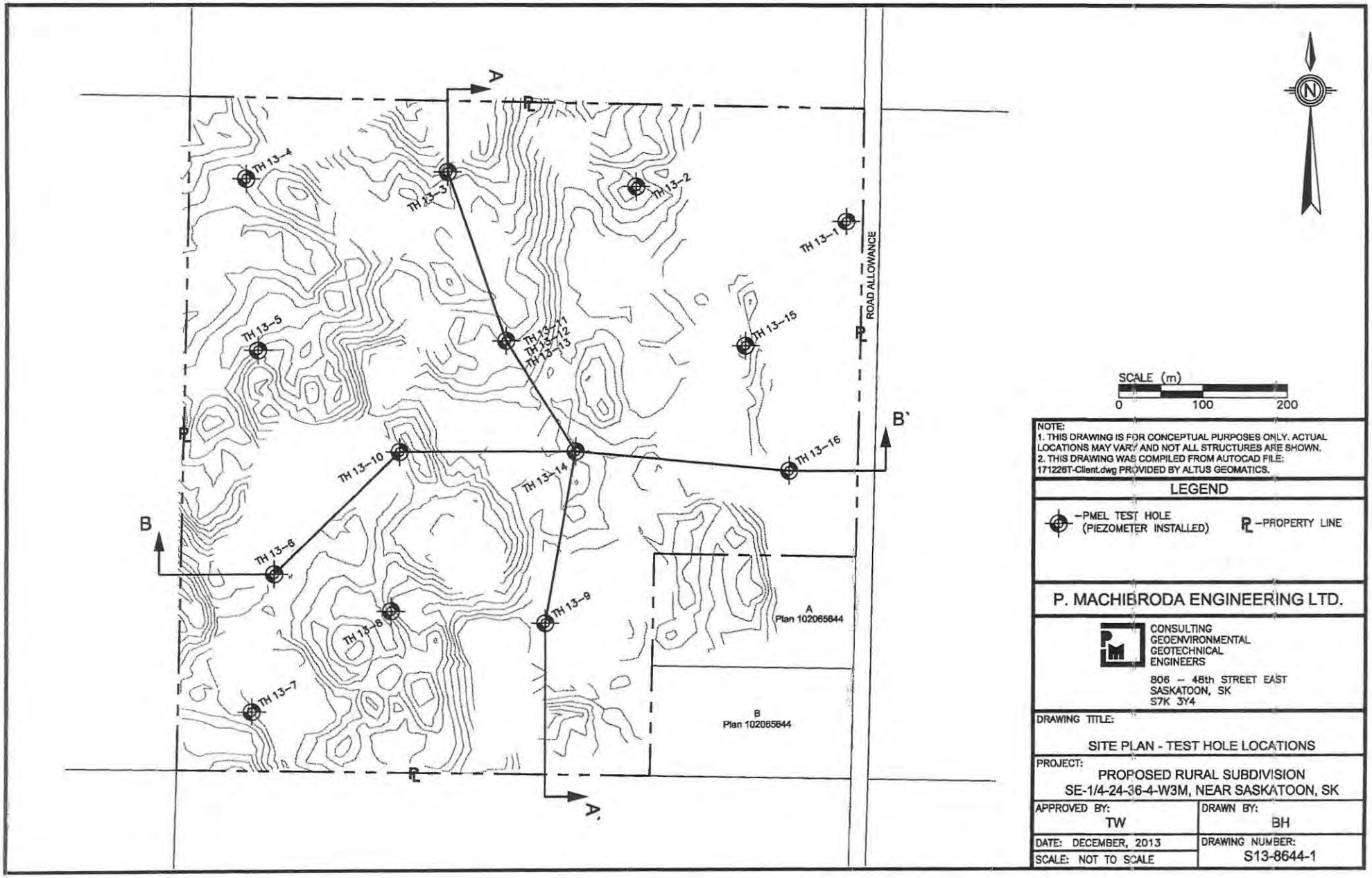
DRAWINGS



NOTE:
1. THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.
2. THIS DRAWING WAS COMPILED FROM AUTOCAD FILE: 171226T-Client.dwg PROVIDED BY ALTUS GEOMATICS.

LEGEND

⊕ –PMEL TEST HOLE (PIEZOMETER INSTALLED)

PL –PROPERTY LINE

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806 – 48th STREET EAST
SASKATOON, SK
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DRAWING TITLE:

SITE PLAN - TEST HOLE LOCATIONS

PROJECT:

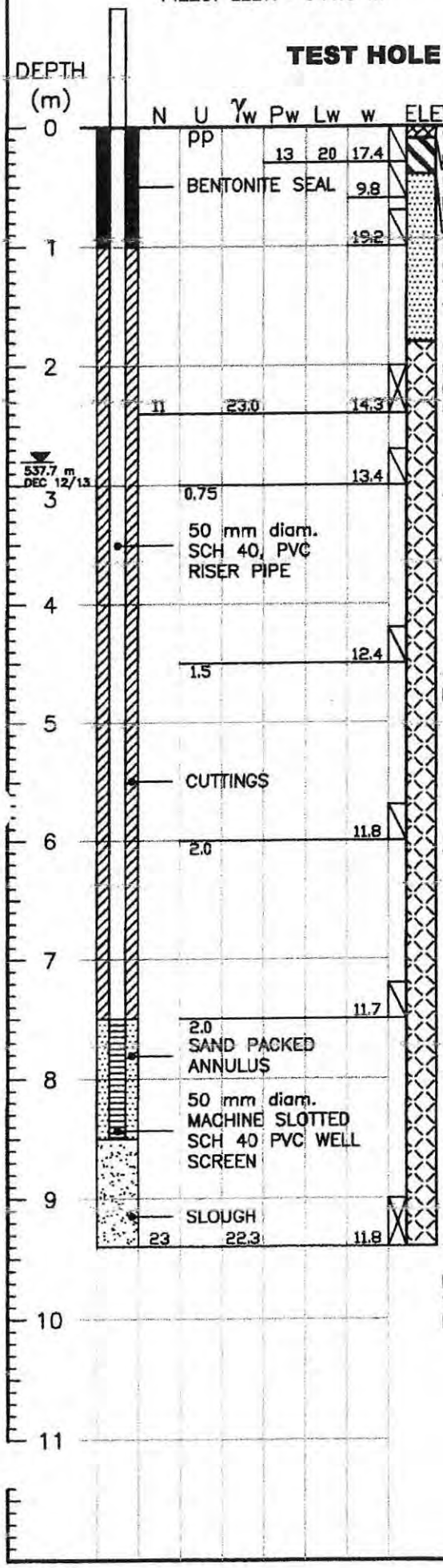
PROPOSED RURAL SUBDIVISION
SE-1/4-24-36-4-W3M, NEAR SASKATOON, SK

APPROVED BY:	DRAWN BY:
TW	BH
DATE: DECEMBER, 2013	DRAWING NUMBER:
SCALE: NOT TO SCALE	S13-8644-1

PIEZO. ELEV.= 541.5 m

TEST HOLE 13-1

ELEV: 540.5 m



TOPSOIL, organic, moist, black, rootlets, frozen.

CLAY, silty, trace sand, firm, low plastic, moist, brown.
–P200 = 70.7% at 300 mm.

SAND, silty, trace clay, some gravel, compact, well graded, fine to coarse grained, moist, brown.
–wet, seepage, sloughing at 1.0 m.

GLACIAL TILL, clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, oxide stained, gypsum crystals.

–stiff below 3.1 m.

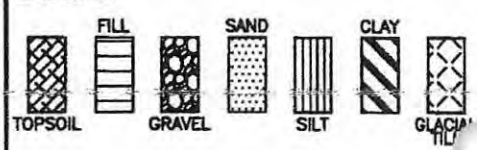
–stiff to very stiff, mottled brown/grey below 4.6 m.

–grey below 6.1 m.

–SO_4 = 0.047% at 9.4 m.

NOTE:
1. Test Hole sloughed to 8.5 m I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773813 **EASTING:** 401881

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-2

PIEZO. ELEV.= 544.8 m

TEST HOLE 13-2

ELEV: 543.8 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0		PP				11.4
		BENTONITE SEAL		13	21	9.1
		50 mm diam. SCH 40 PVC RISER PIPE				10.6
1						
		SAND PACKED ANNULUS				16.2
2						
		50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN				11.9
3		DRY DEC 12/13				
4						
5						
6						
7						
8						
9						
10						
11						

TOPSOIL, organic, moist, black, rootlets, frozen.

SILT AND SAND, some sand, some clay, firm, low plastic, moist, brown.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY

TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

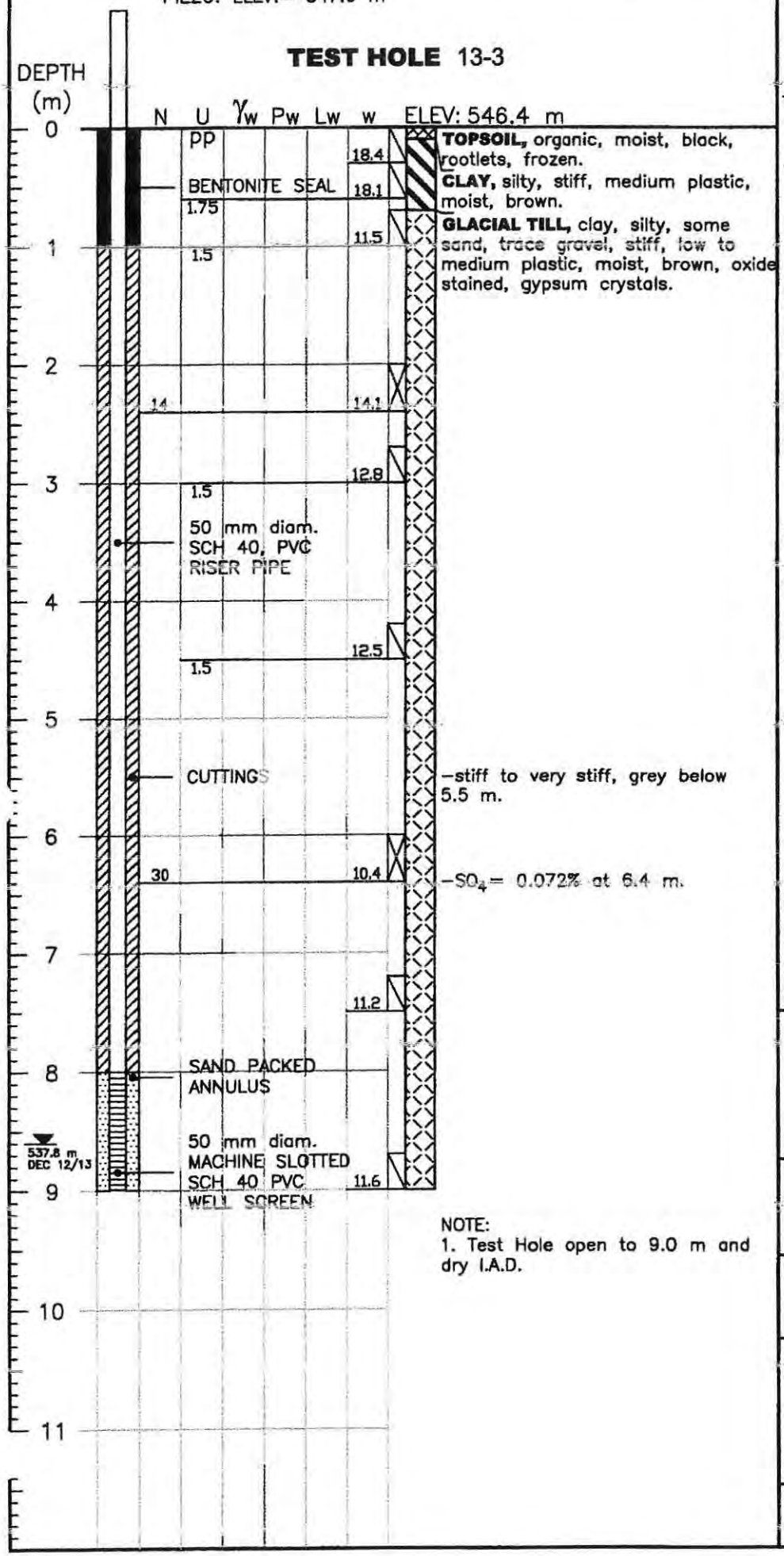
SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773854 **EASTING:** 401630

DATE DRILLED:	**DRAWING NUMBER:**
NOV 26/13	S13-8644-3

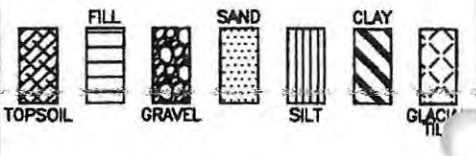
PIEZO. ELEV.= 547.6 m

TEST HOLE 13-3



NOTE:
1. Test Hole open to 9.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE | SPLIT SPOON | CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

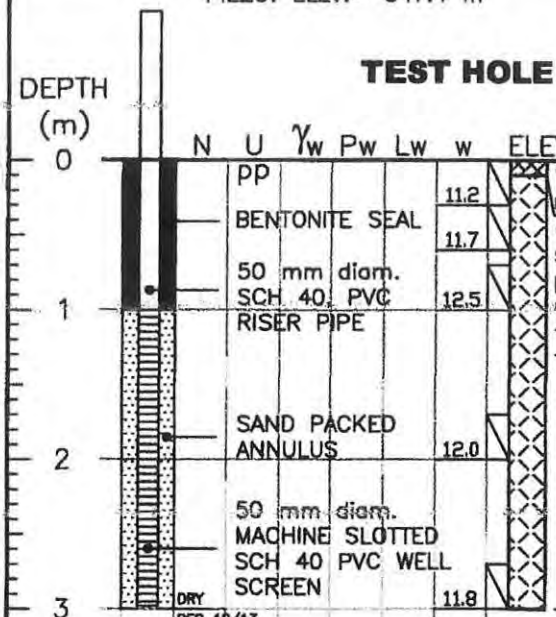
SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773871 **EASTING:** 401405

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-4

PIEZO. ELEV.= 547.4 m

TEST HOLE 13-4



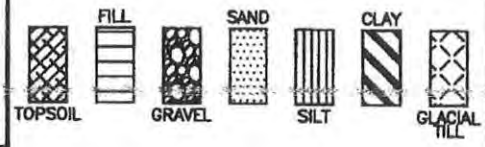
TOPSOIL, organic, moist, black, rootlets, frozen.

GLACIAL TILL, clay, silty, some sand, trace gravel, low to medium plastic, moist, brown, oxide stained, gypsum crystals.
–frozen to 300 mm.
–stiff below 300 mm.

$-SO_4$ = 0.067% at 3.0 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

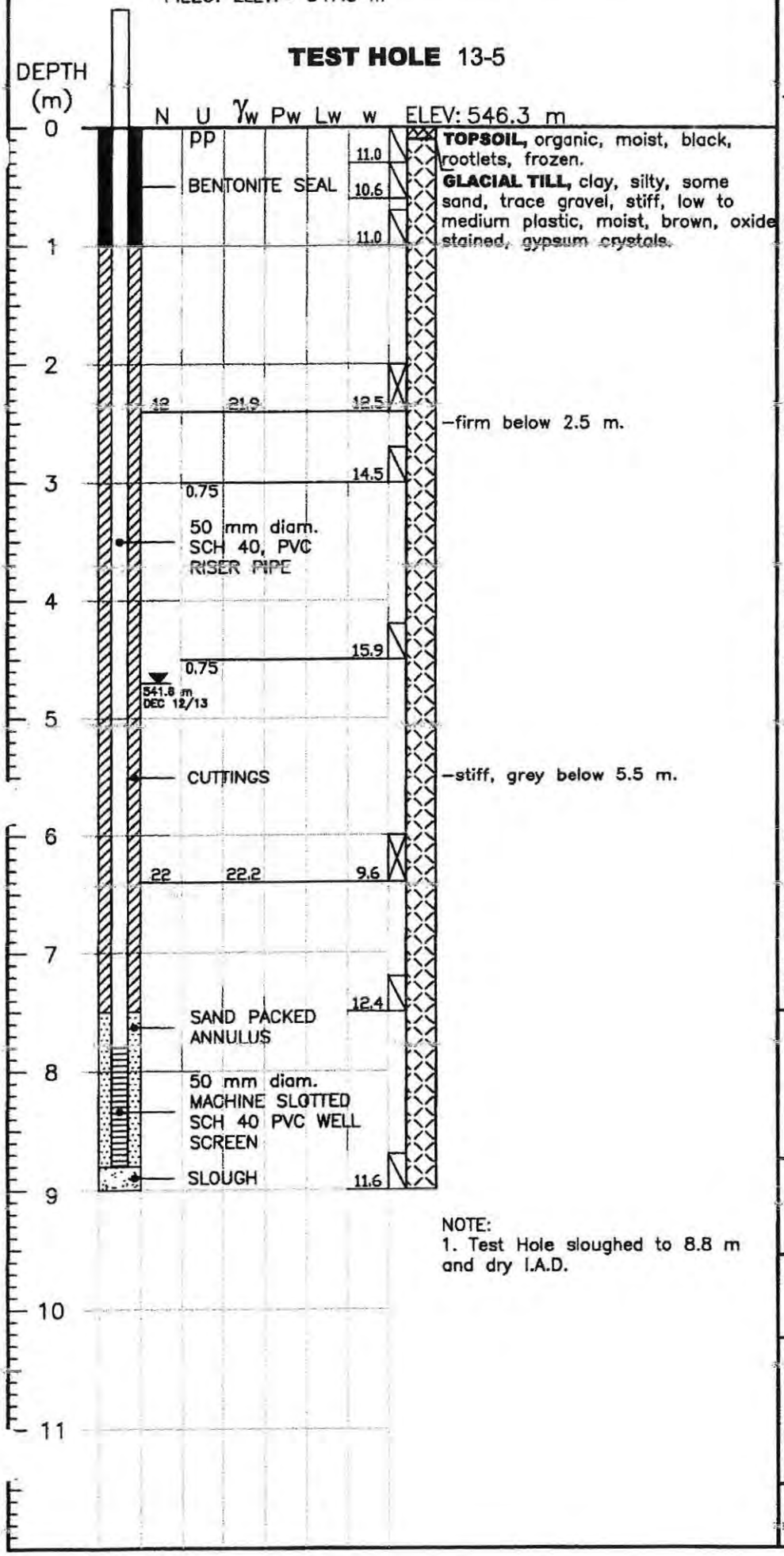
NORTHING: 5773863 **EASTING:** 401166

DATE DRILLED:	**DRAWING NUMBER:**
NOV 26/13	S13-8644-5

PIEZO. ELEV.= 547.3 m

TEST HOLE 13-5

ELEV: 546.3 m



TOPSOIL, organic, moist, black, rootlets, frozen.

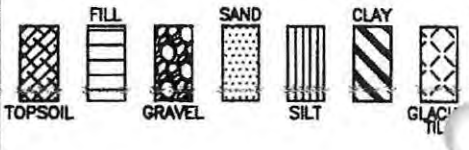
GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown, oxide stained, gypsum crystals.

–firm below 2.5 m.

–stiff, grey below 5.5 m.

NOTE:
1. Test Hole sloughed to 8.8 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773659 **EASTING:** 401180

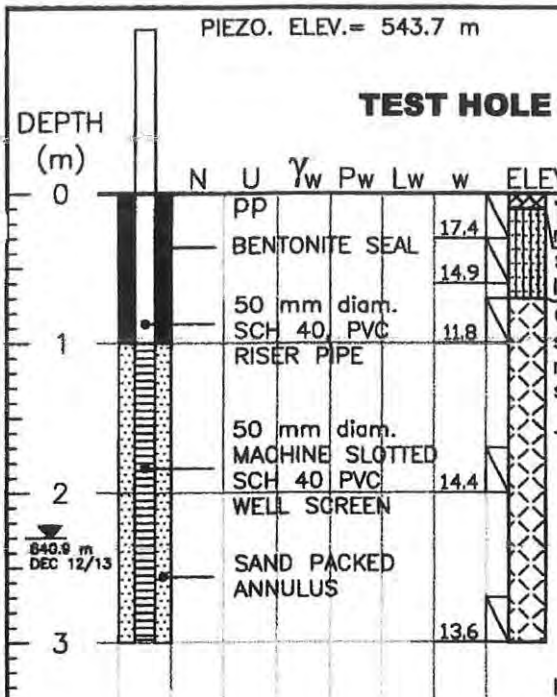
DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-6

PIEZO. ELEV.= 543.7 m

TEST HOLE 13-6

ELEV: 542.6 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0	PP					17.4
						14.9
1						11.8
2						14.4
3						13.6



TOPSOIL, organic, moist, black, rootlets, frozen.

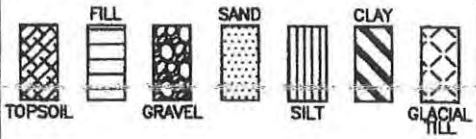
SILT AND SAND, some clay, firm, low plastic, moist, brown.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown, oxide stained, gypsum crystals.

–soft below 1.6 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

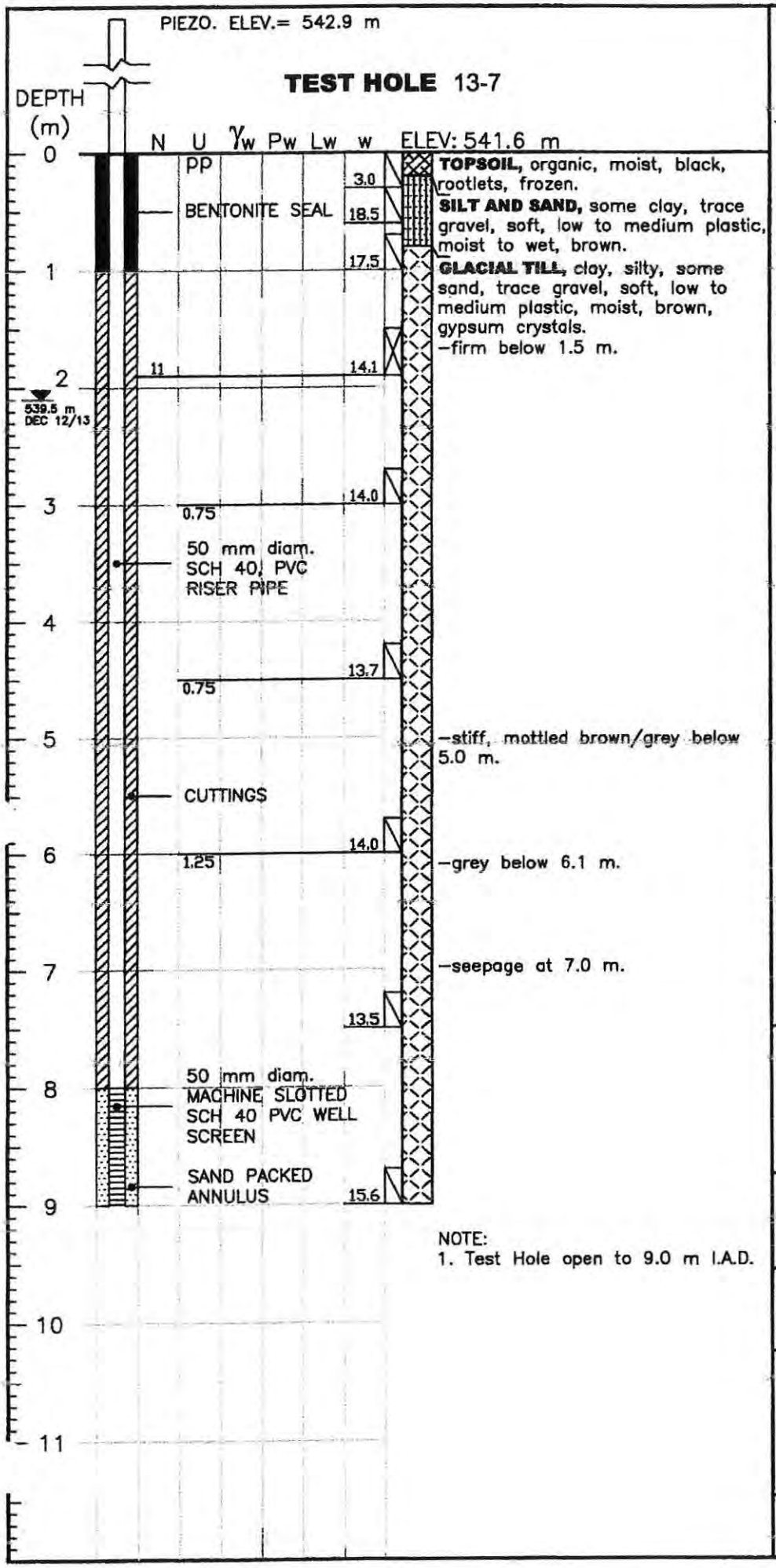
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773392 **EASTING:** 401200

DATE DRILLED:	**DRAWING NUMBER:**
NOV 26/13	S13-8644-7



NOTE:
1. Test Hole open to 9.0 m I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

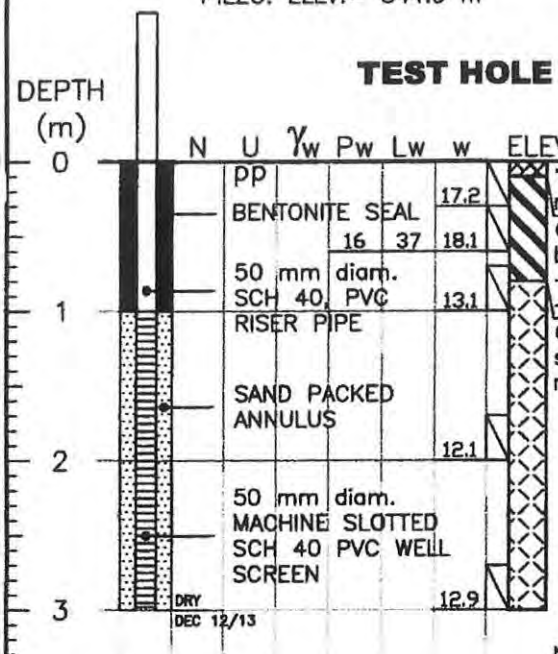
SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773227 **EASTING:** 401174

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-8

PIEZO. ELEV.= 544.0 m

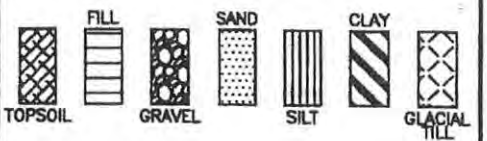
TEST HOLE 13-8



TOPSOIL, organic, moist, black, rootlets, frozen.
CLAY, silty, medium plastic, moist, brown.
–frozen to 300 mm.
–stiff below 300 mm.
GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown.

NOTE:
1. Test Hole open to 3.0 m I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

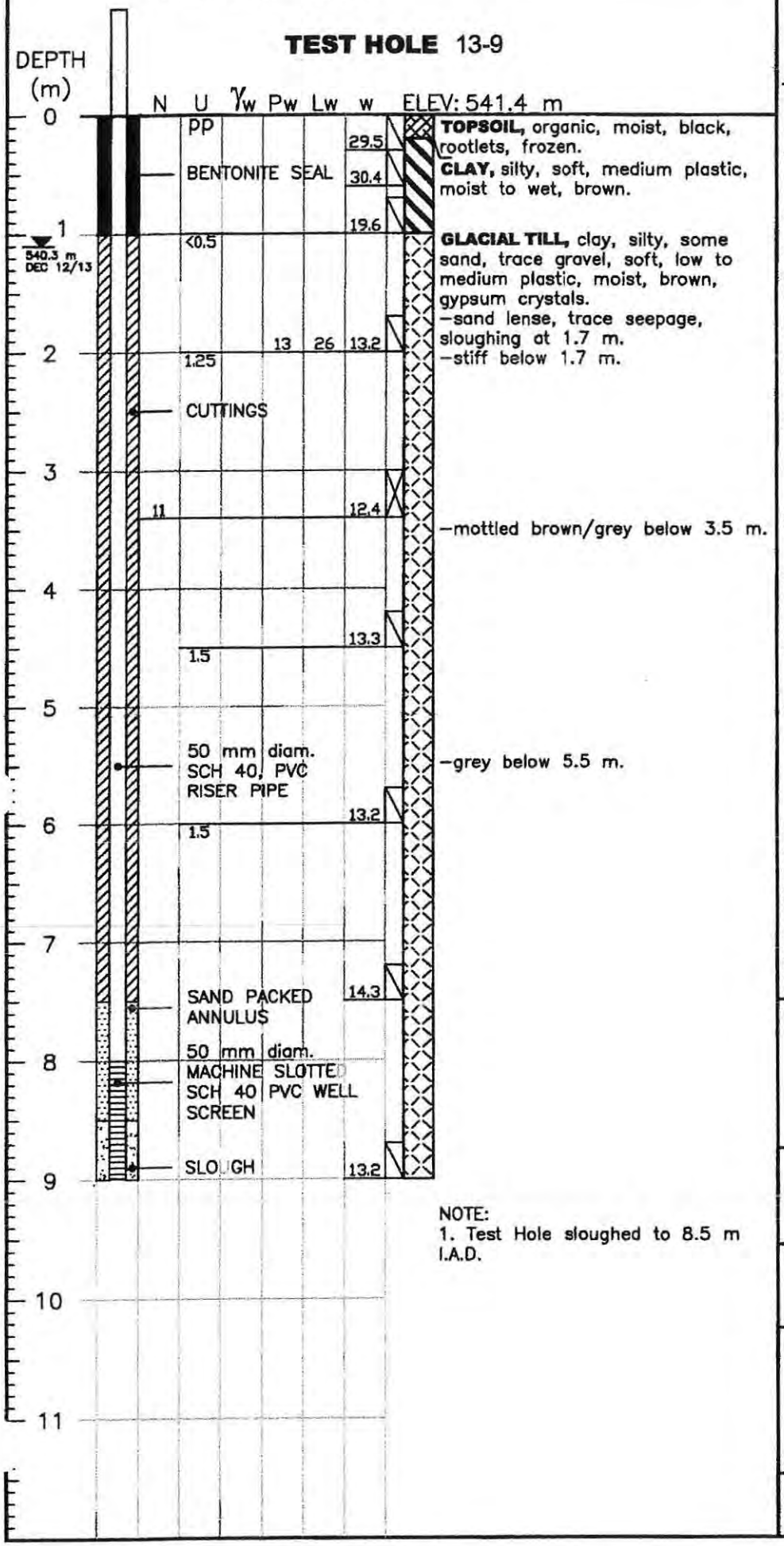
NORTHING: 5773348 **EASTING:** 401338

DATE DRILLED:	**DRAWING NUMBER:**
NOV 26/13	S13-8644-9

PIEZO. ELEV.= 542.3 m

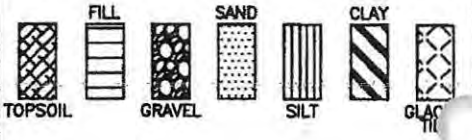
TEST HOLE 13-9

ELEV: 541.4 m



NOTE:
1. Test Hole sloughed to 8.5 m I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

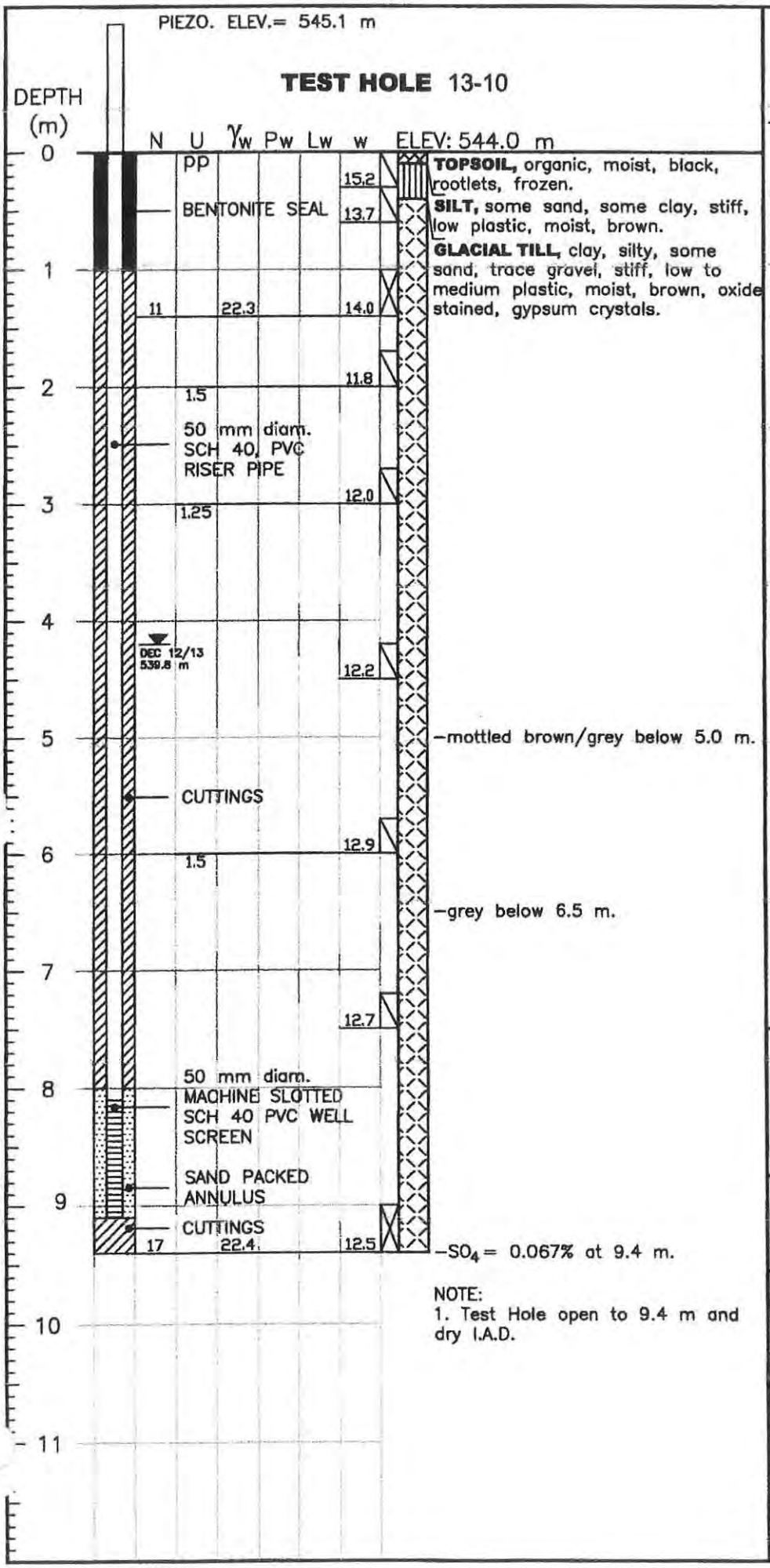
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773333 **EASTING:** 401522

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-10



LEGEND:

FILL, SAND, CLAY

TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

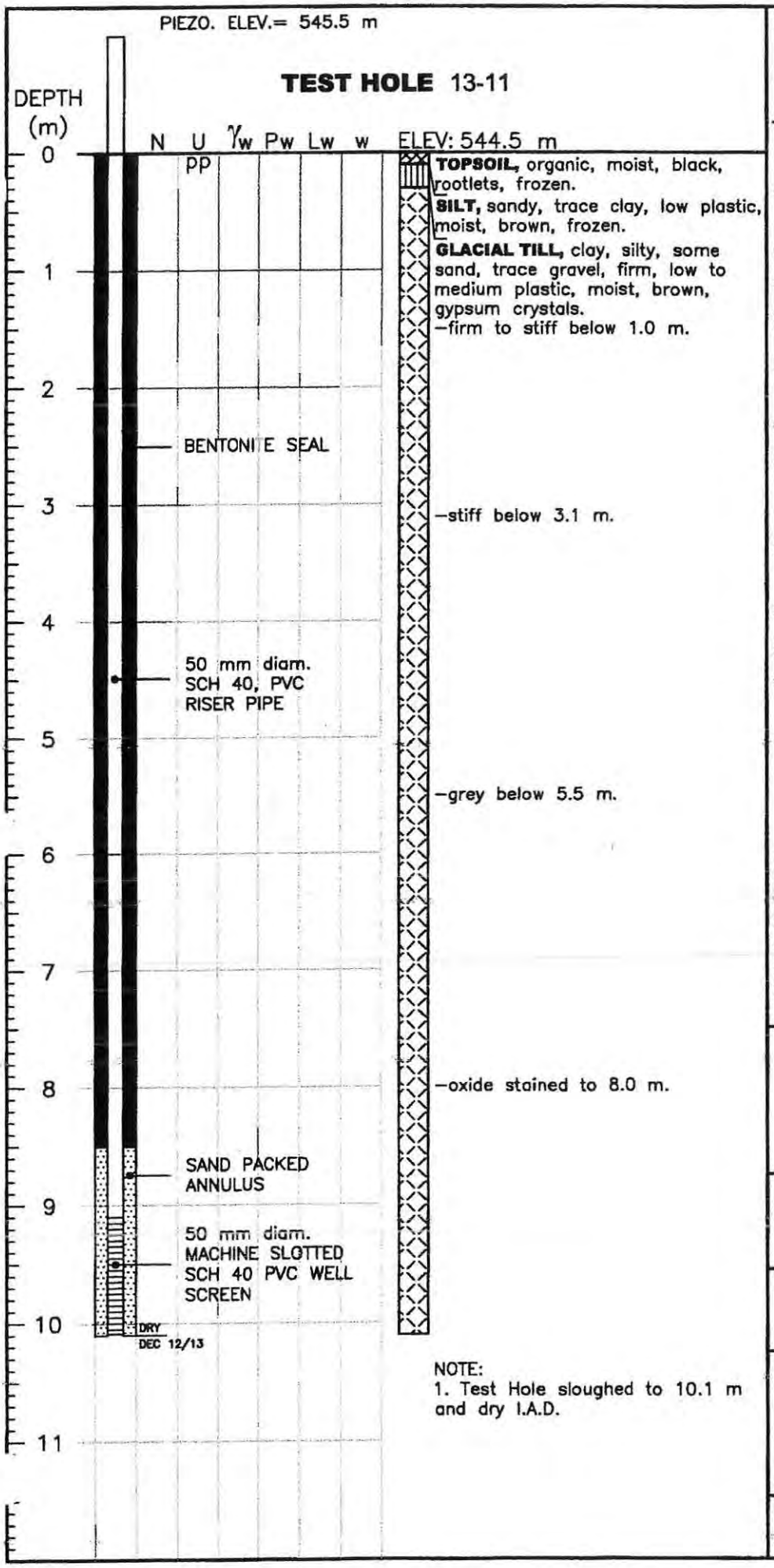
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773537 **EASTING:** 401348

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-11



NOTE:
1. Test Hole sloughed to 10.1 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-12

PIEZO. ELEV.= 545.5 m

TEST HOLE 13-12

ELEV: 544.5 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w	
0	PP				14	22	10.1
	BENTONITE SEAL						15.9
0.75							14.5
1.0							11.5
1.0							12.1
1.0							
							11.9
1.5							
	50 mm diam. SCH 40, PVC RISER PIPE						
							12.7
1.75							
	CUTTINGS						
							12.2
1.75							
							12.3
1.5							
							11.5
1.5							
	BENTONITE SEAL						
					12	28	12.4
2.0							

TOPSOIL, organic, moist, black, rootlets, frozen.

SILT, sandy, trace clay, low plastic, moist, brown, frozen.

GLACIAL TILL, clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, gypsum crystals.

–firm to stiff below 1.0 m.

–stiff below 3.1 m.

–grey below 5.5 m.

–oxide stained to 8.0 m.

CONTINUED ON NEXT PAGE

LEGEND:

FILL, SAND, CLAY

TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

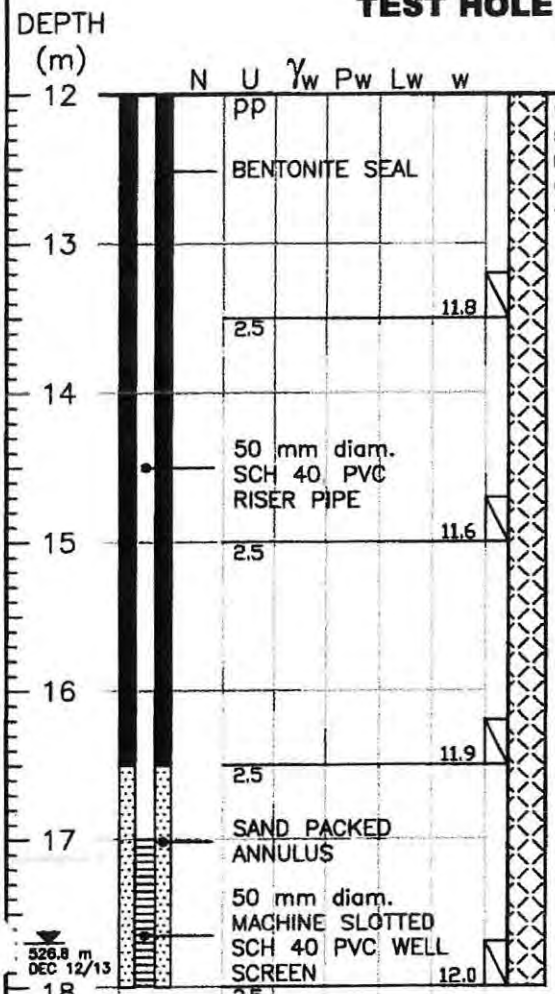
LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644-13

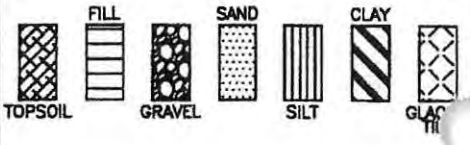
TEST HOLE 13-12



GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, grey, gypsum crystals.
–very stiff below 12.1 m.

NOTE:
1. Test Hole open to 18.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

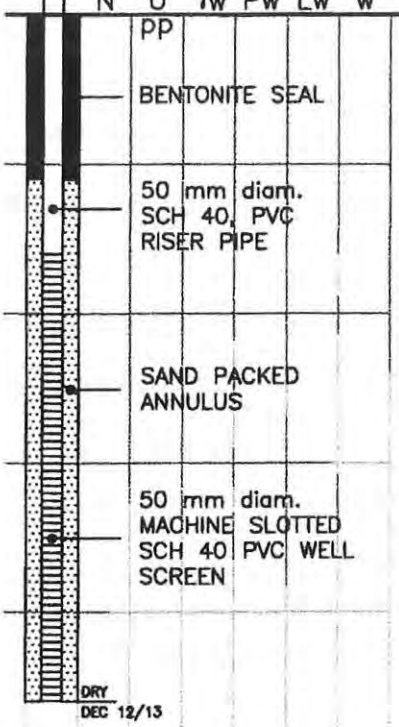
DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-13A

PIEZO. ELEV.= 545.5 m

TEST HOLE 13-13

DEPTH (m)

N U γ_w Pw Lw w ELEV: 544.5 m



TOPSOIL, organic, moist, black, rootlets, frozen.

SILT, sandy, trace clay, low plastic, moist, brown, frozen.

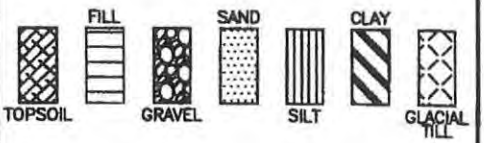
GLACIAL TILL, clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, gypsum crystals.

–firm to stiff below 1.0 m.

–stiff below 3.1 m.

NOTE:
1. Test Hole open to 4.6 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

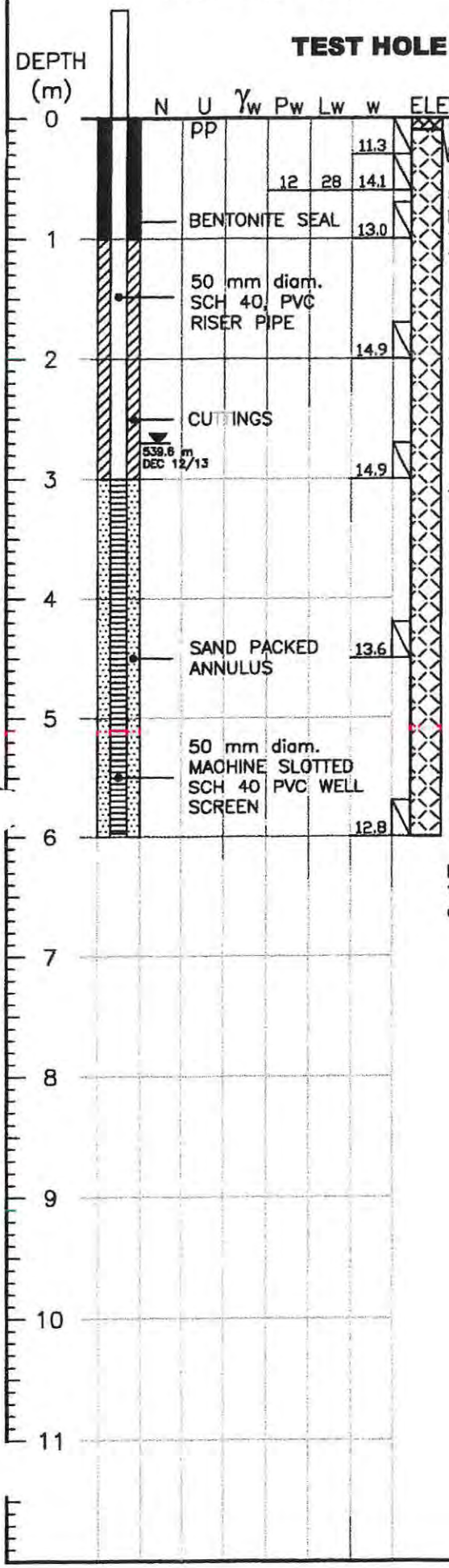
SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-14

PIEZO. ELEV.= 543.2 m

TEST HOLE 13-14



TOPSOIL, organic, moist, black, rootlets, frozen.

GLACIAL TILL, clay, silty, some sand, trace gravel, low to medium plastic, moist, brown, oxide stained.
–frozen to 300 mm.
–stiff below 300 mm.

–soft below 2.0 m.

–firm below 3.1 m.

NOTE:
1. Test Hole open to 6.0 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

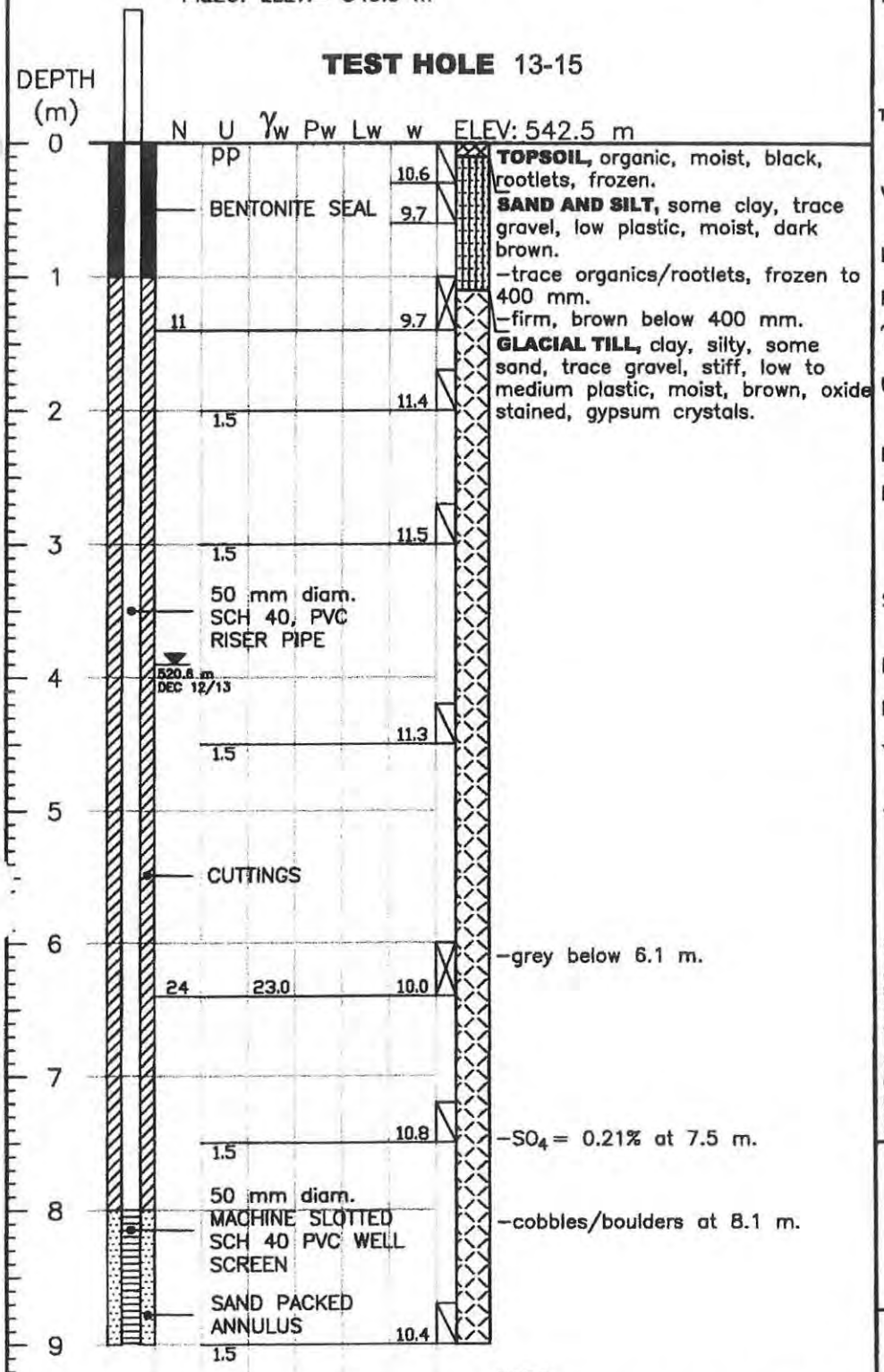
NORTHING: 5773537 **EASTING:** 401558

DATE DRILLED:	**DRAWING NUMBER:**
NOV 26/13	S13-8644-15

PIEZO. ELEV.= 543.5 m

TEST HOLE 13-15

ELEV: 542.5 m



TOPSOIL, organic, moist, black, rootlets, frozen.

SAND AND SILT, some clay, trace gravel, low plastic, moist, dark brown.

–trace organics/rootlets, frozen to 400 mm.

–firm, brown below 400 mm.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown, oxide stained, gypsum crystals.

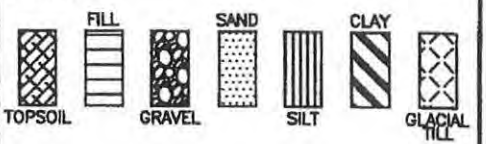
–grey below 6.1 m.

–SO_4 = 0.21% at 7.5 m.

–cobbles/boulders at 8.1 m.

NOTE:
1. Test Hole open to 9.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

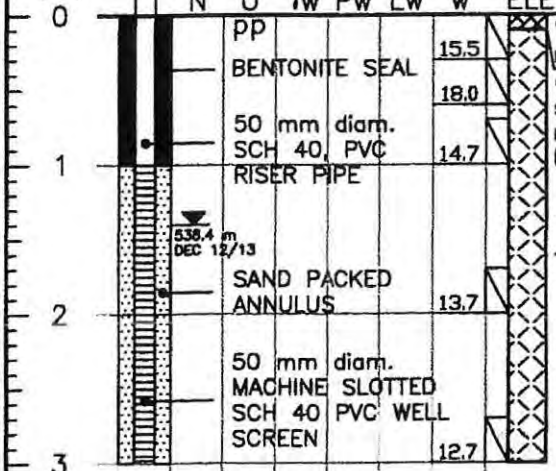
NORTHING: 5773664 **EASTING:** 401761

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644-16

PIEZO. ELEV.= 540.9 m

TEST HOLE 13-16

ELEV: 539.8 m



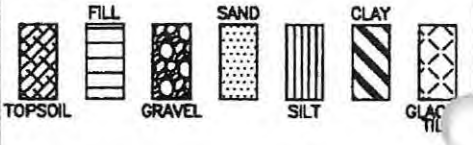
TOPSOIL, organic, moist, black, rootlets, frozen.

GLACIAL TILL, clay, silty, some sand, some gravel, soft, low to medium plastic, moist to wet, brown, gypsum crystals.

–firm to stiff, moist below 1.6 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773514 **EASTING:** 401813

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644-17

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-1

Sample No.: 43

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	96
3/4"	19.1	91
3/8"	9.5	89
# 4	4.75	85
# 10	2.00	79
# 20	0.850	71
# 40	0.425	62.4
# 60	0.250	50.8
# 100	0.150	34.0
# 200	0.075	22.5

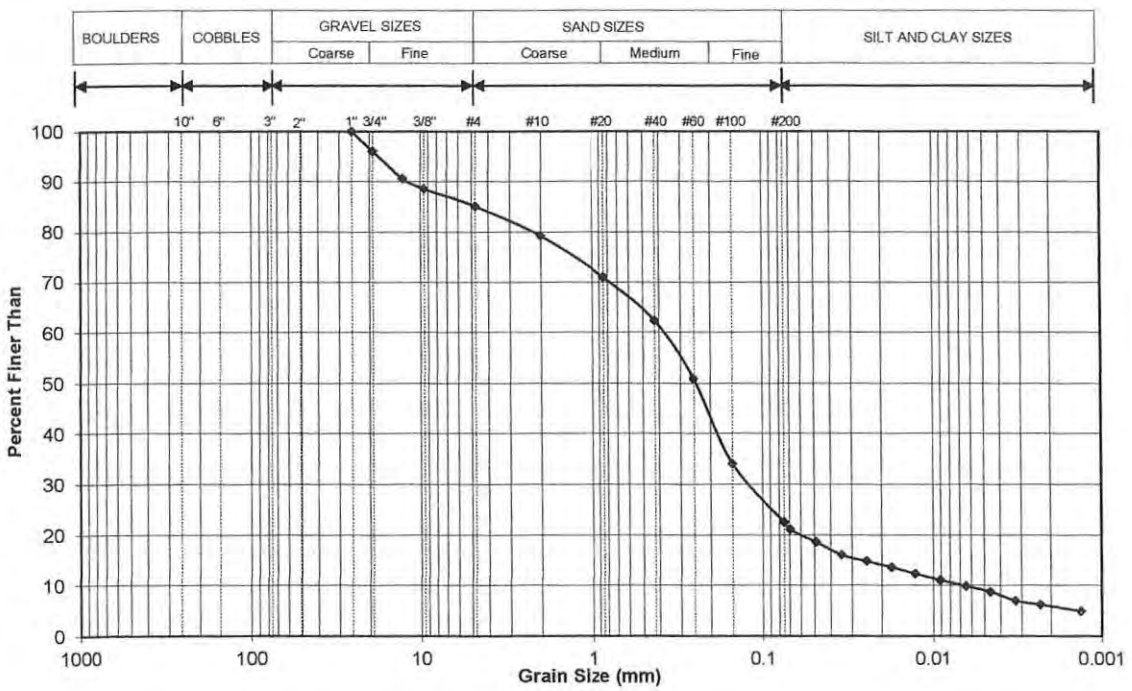
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0691	21.0
Sodium Hexametaphosphate	0.0488	18.6
	0.0345	16.1
	0.0245	14.8
	0.0174	13.6
	0.0128	12.4
	0.0091	11.1
	0.0064	9.9
	0.0046	8.8
	0.0032	7.0
	0.0023	6.3
	0.0013	4.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
15	63	16	6

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-18

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-2

Sample No.: 13

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	94
# 40	0.425	89.2
# 60	0.250	81.3
# 100	0.150	70.1
# 200	0.075	56.3

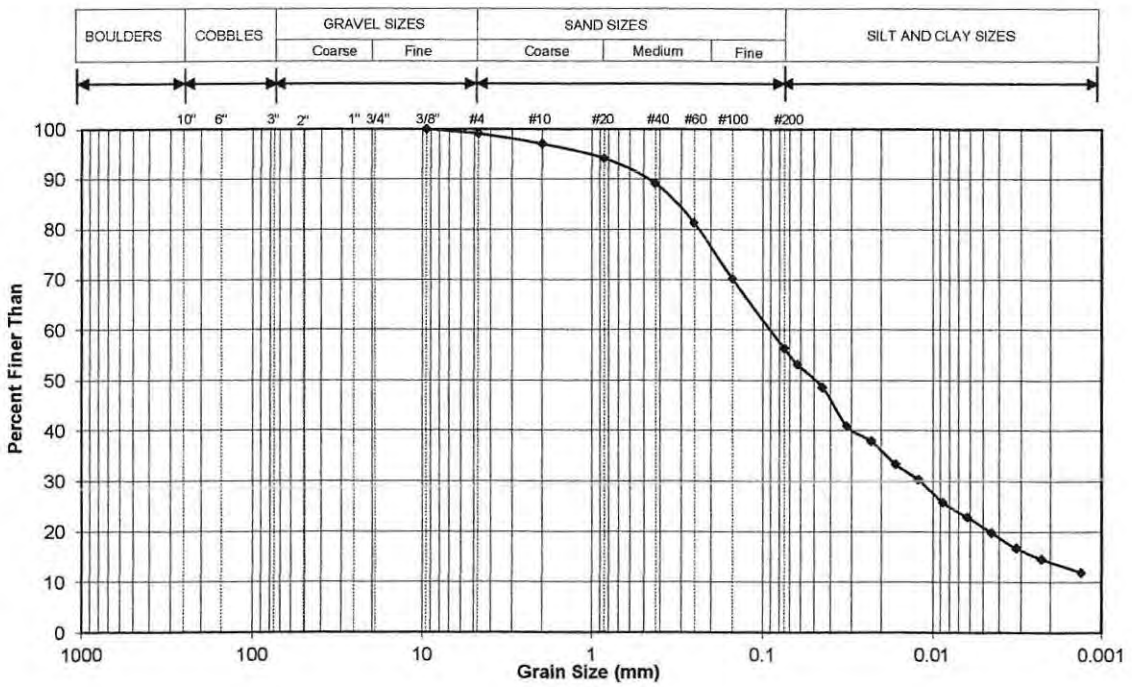
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0625	53.1
Sodium Hexametaphosphate	0.0445	48.6
	0.0320	40.9
	0.0229	37.9
	0.0165	33.3
	0.0121	30.3
	0.0087	25.8
	0.0062	22.9
	0.0044	19.8
	0.0032	16.7
	0.0023	14.6
	0.0013	11.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	42	42	15

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-19

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-3

Sample No.: 66

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	100
# 10	2.00	100
# 20	0.850	100
# 40	0.425	99.4
# 60	0.250	97.8
# 100	0.150	96.8
# 200	0.075	94.8

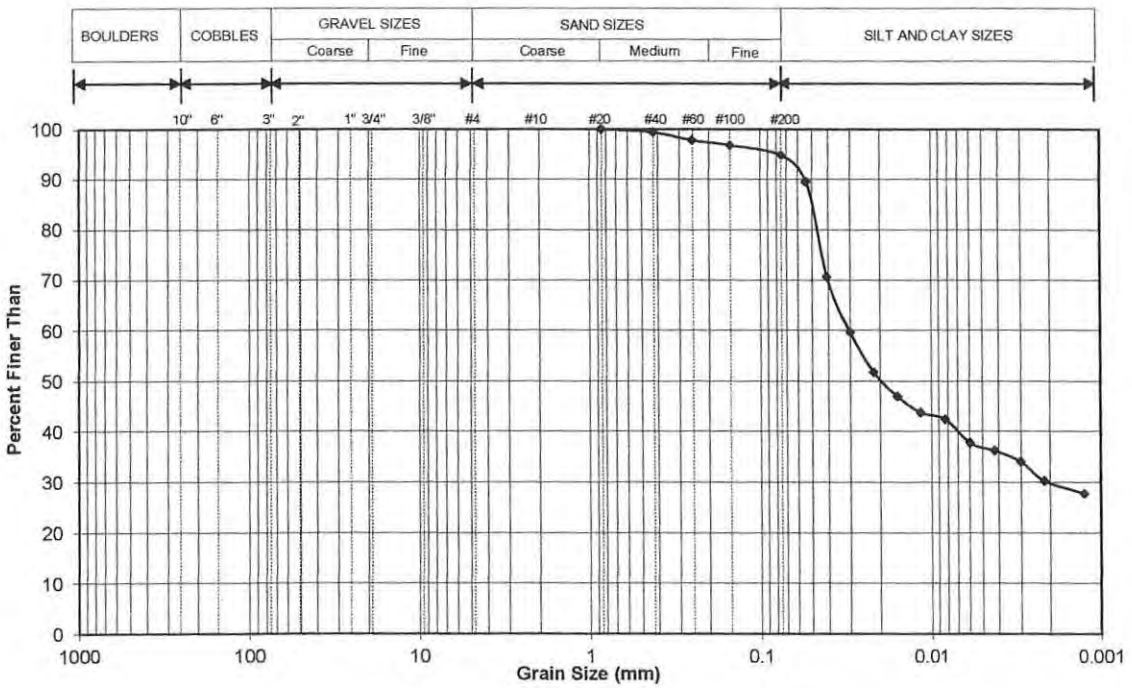
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0535	89.5
Sodium Hexametaphosphate	0.0409	70.6
	0.0299	59.6
	0.0218	51.7
	0.0157	46.9
	0.0116	43.8
	0.0082	42.4
	0.0059	37.7
	0.0042	36.2
	0.0030	34.0
	0.0021	30.2
	0.0013	27.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
0	5	65	30

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-20

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-4

Sample No.: 9

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	99
# 4	4.75	95
# 10	2.00	83
# 20	0.850	79
# 40	0.425	72.8
# 60	0.250	65.7
# 100	0.150	58.1
# 200	0.075	49.0

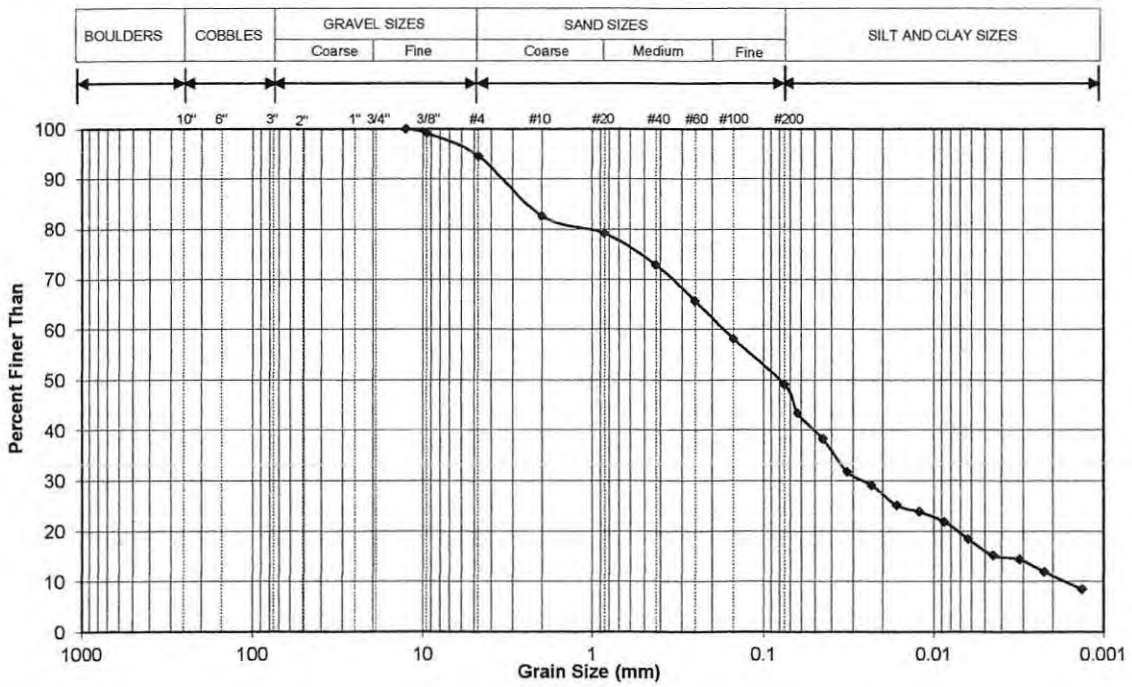
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0629	43.4
Sodium Hexametaphosphate	0.0449	38.2
	0.0323	31.7
	0.0231	29.0
	0.0166	25.1
	0.0122	23.8
	0.0087	21.8
	0.0062	18.4
	0.0045	15.2
	0.0031	14.4
	0.0023	12.0
	0.0013	8.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
5	46	37	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-21

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-4

Sample No.: 9

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	99
# 4	4.75	95
# 10	2.00	83
# 20	0.850	79
# 40	0.425	72.8
# 60	0.250	65.7
# 100	0.150	58.1
# 200	0.075	49.0

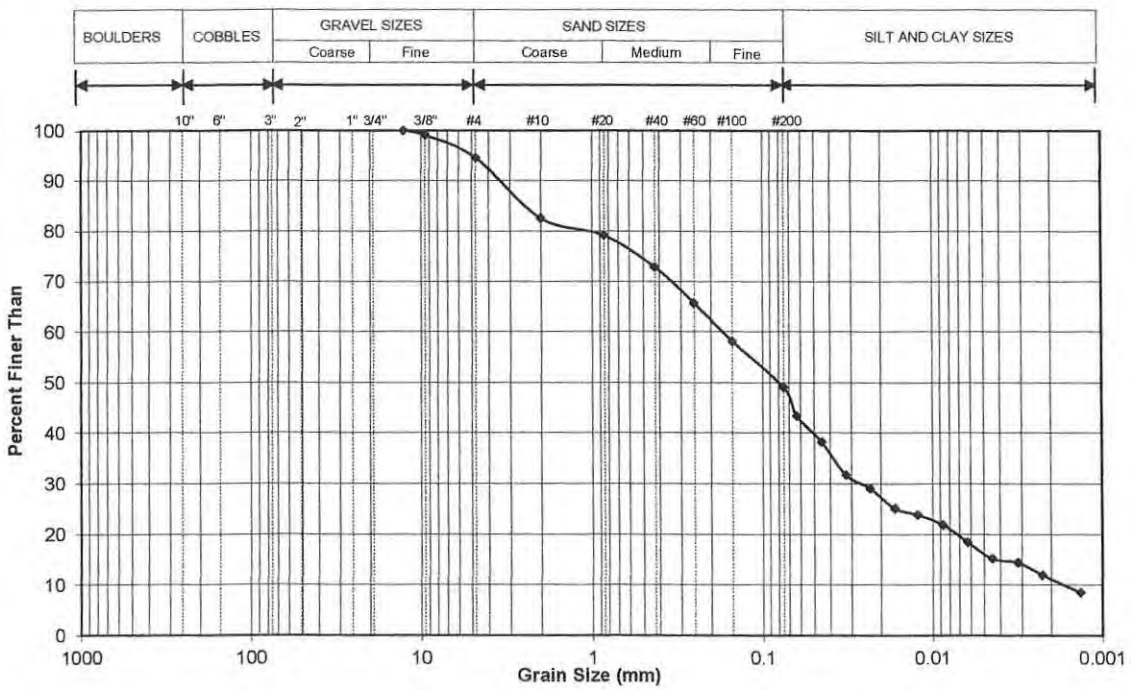
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0629	43.4
Sodium Hexametaphosphate	0.0449	38.2
	0.0323	31.7
	0.0231	29.0
	0.0166	25.1
	0.0122	23.8
	0.0087	21.8
	0.0062	18.4
	0.0045	15.2
	0.0031	14.4
	0.0023	12.0
	0.0013	8.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
5	46	37	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-21

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-5

Sample No.: 86

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	97
# 10	2.00	94
# 20	0.850	87
# 40	0.425	80.4
# 60	0.250	74.1
# 100	0.150	65.4
# 200	0.075	54.1

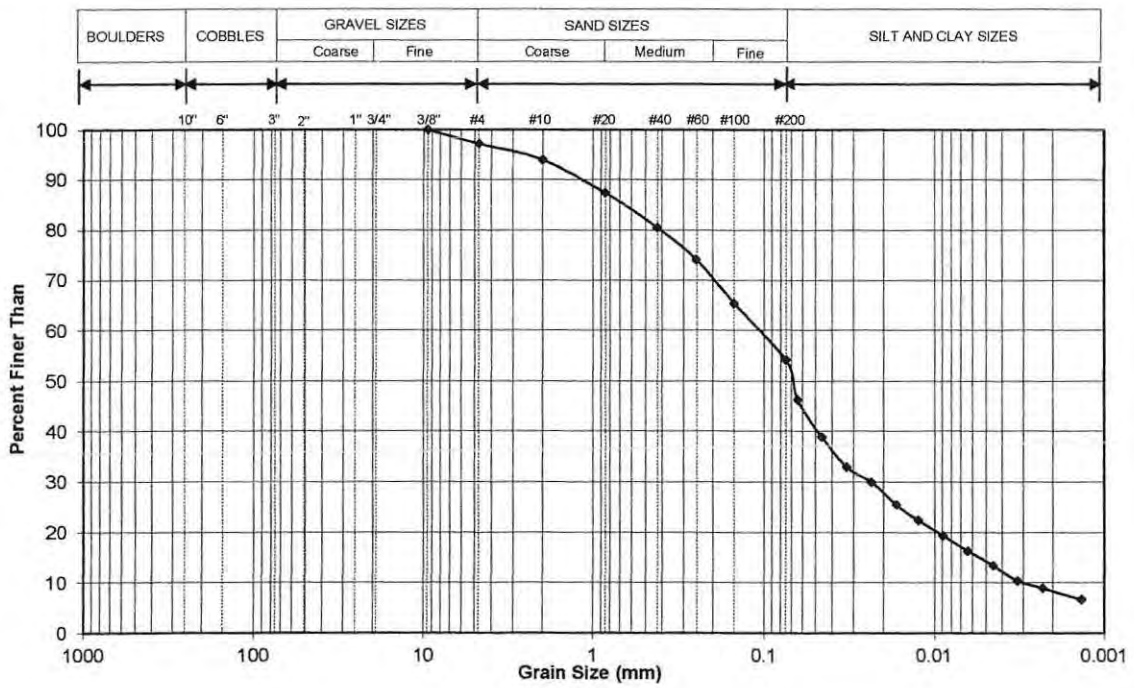
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0638	46.2
Sodium Hexametaphosphate	0.0458	38.8
	0.0327	32.9
	0.0234	29.9
	0.0168	25.4
	0.0124	22.4
	0.0089	19.3
	0.0063	16.3
	0.0045	13.4
	0.0032	10.4
	0.0023	8.9
	0.0014	6.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
3	43	45	9

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-22

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-5

Sample No.: 86

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	97
# 10	2.00	94
# 20	0.850	87
# 40	0.425	80.4
# 60	0.250	74.1
# 100	0.150	65.4
# 200	0.075	54.1

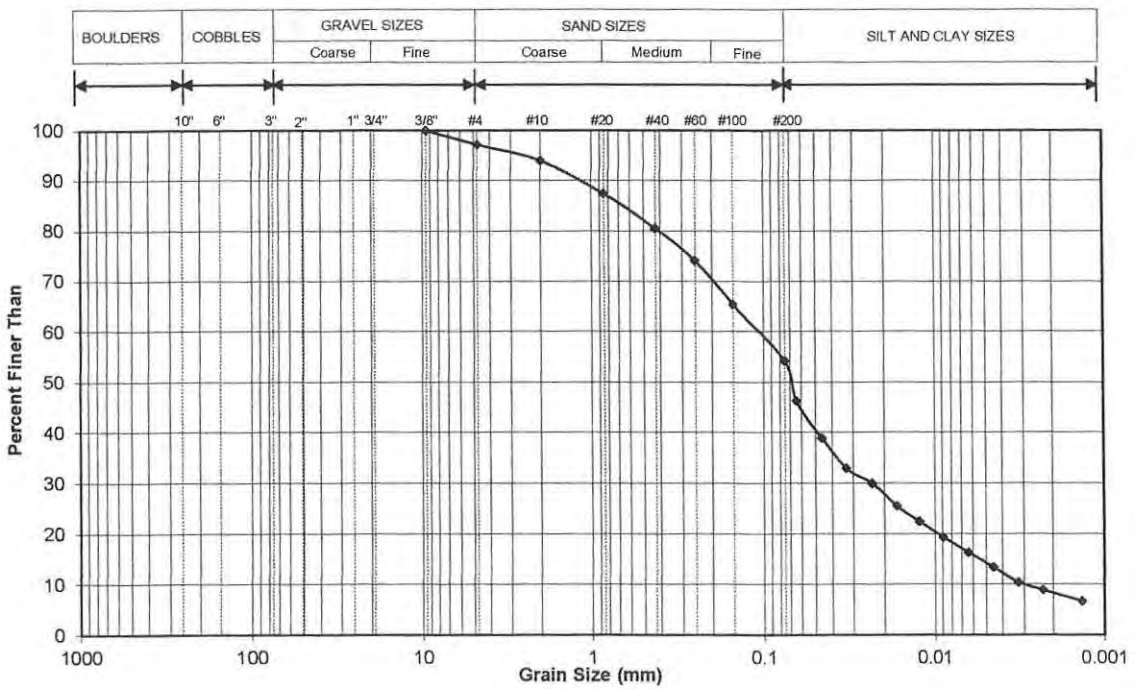
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0638	46.2
Sodium Hexametaphosphate	0.0458	38.8
	0.0327	32.9
	0.0234	29.9
	0.0168	25.4
	0.0124	22.4
	0.0089	19.3
	0.0063	16.3
	0.0045	13.4
	0.0032	10.4
	0.0023	8.9
	0.0014	6.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
3	43	45	9

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-22

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-6

Sample No.: 23

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	94
# 40	0.425	90.4
# 60	0.250	81.1
# 100	0.150	75.1
# 200	0.075	66.1

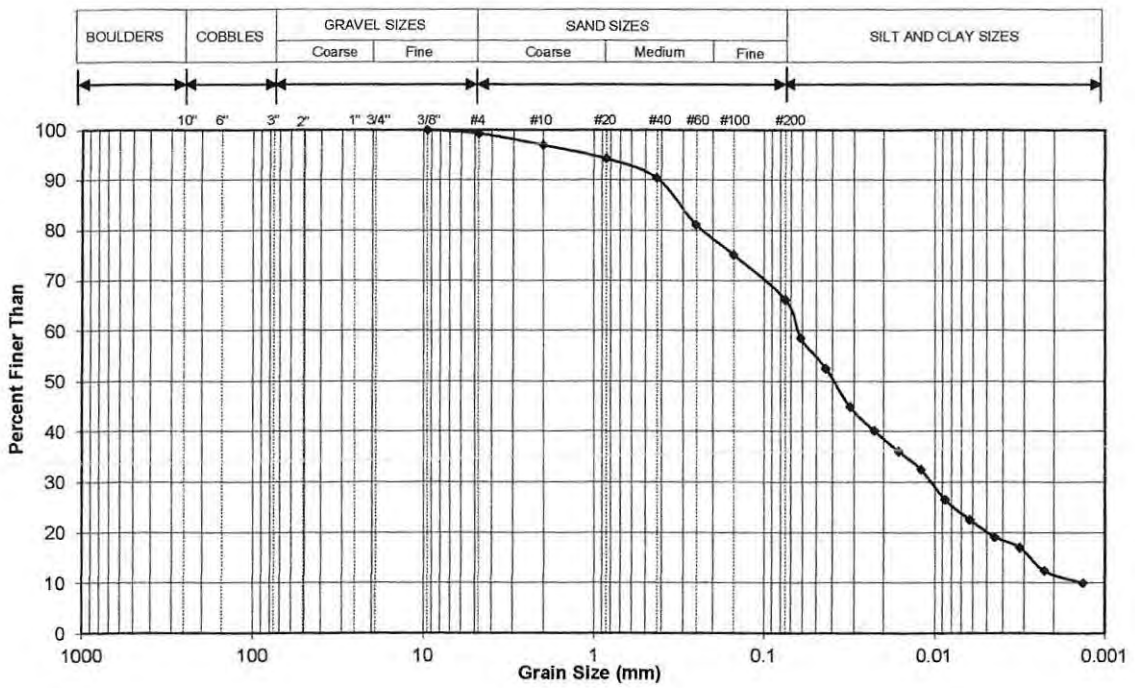
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0611	58.5
Sodium Hexametaphosphate	0.0437	52.5
	0.0314	44.8
	0.0226	40.1
	0.0163	36.0
	0.0120	32.4
	0.0087	26.5
	0.0062	22.4
	0.0044	19.1
	0.0032	17.0
	0.0023	12.4
	0.0013	10.0

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	33	54	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-23

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-7

Sample No.: 94

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	94
# 10	2.00	92
# 20	0.850	88
# 40	0.425	82.5
# 60	0.250	76.1
# 100	0.150	69.8
# 200	0.075	62.2

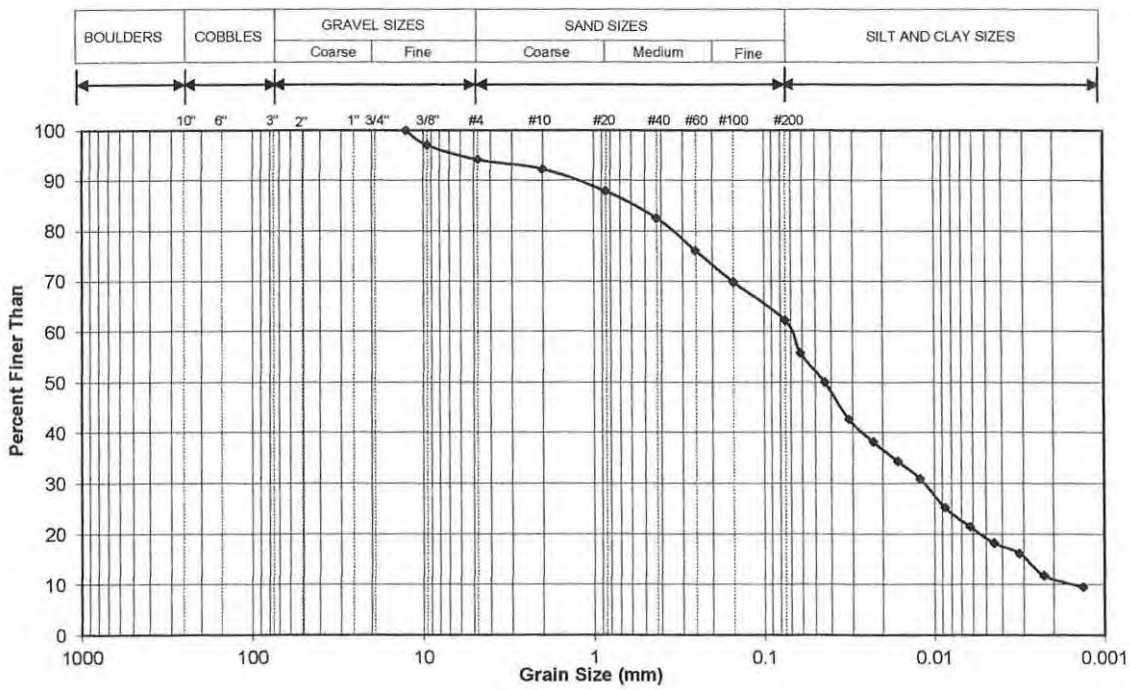
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0611	55.7
Sodium Hexametaphosphate	0.0437	50.0
	0.0314	42.6
	0.0226	38.2
	0.0163	34.3
	0.0120	30.8
	0.0087	25.2
	0.0062	21.4
	0.0044	18.1
	0.0032	16.2
	0.0023	11.8
	0.0013	9.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
6	32	50	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-24

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-8

Sample No.: 20

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	95
# 10	2.00	93
# 20	0.850	89
# 40	0.425	83.4
# 60	0.250	75.0
# 100	0.150	65.7
# 200	0.075	54.6

Hydrometer Analysis:

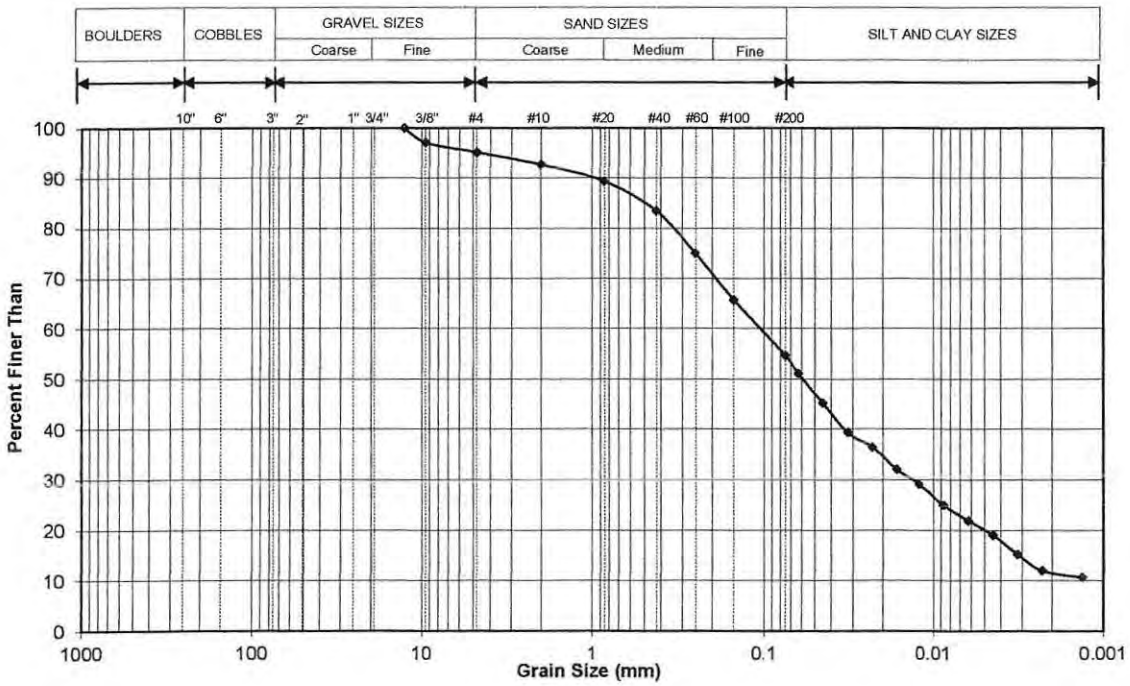
Dispersing Agent:
Sodium Hexametaphosphate

Diameter mm	% Finer
0.0625	51.1
0.0447	45.2
0.0320	39.3
0.0229	36.4
0.0165	32.0
0.0121	29.1
0.0087	24.9
0.0062	21.9
0.0044	19.0
0.0032	15.2
0.0023	12.0
0.0013	10.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
5	40	43	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-25

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-9

Sample No.: 102

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	100
# 10	2.00	99
# 20	0.850	98
# 40	0.425	97.0
# 60	0.250	93.4
# 100	0.150	89.7
# 200	0.075	86.9

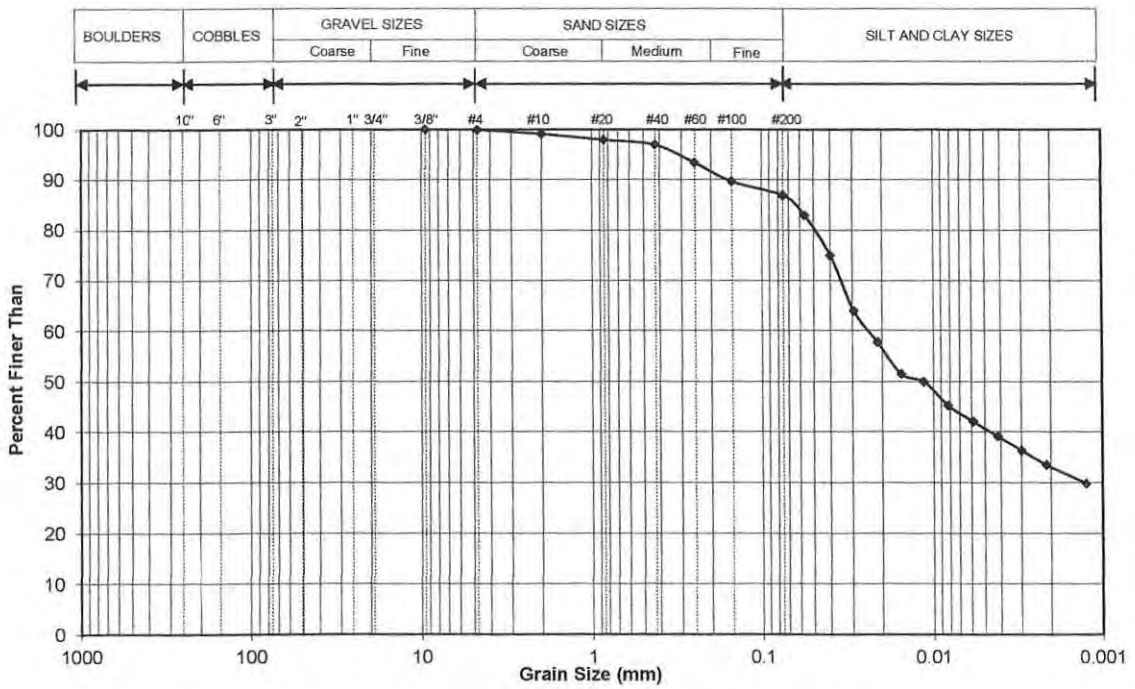
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0559	82.9
Sodium Hexametaphosphate	0.0399	74.9
	0.0293	64.0
	0.0213	57.7
	0.0154	51.4
	0.0113	49.9
	0.0082	45.2
	0.0058	42.1
	0.0042	39.1
	0.0030	36.3
	0.0021	33.5
	0.0012	29.8

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
0	13	54	33

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-26

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-10

Sample No.: 76

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	93
# 40	0.425	89.7
# 60	0.250	85.1
# 100	0.150	79.9
# 200	0.075	73.2

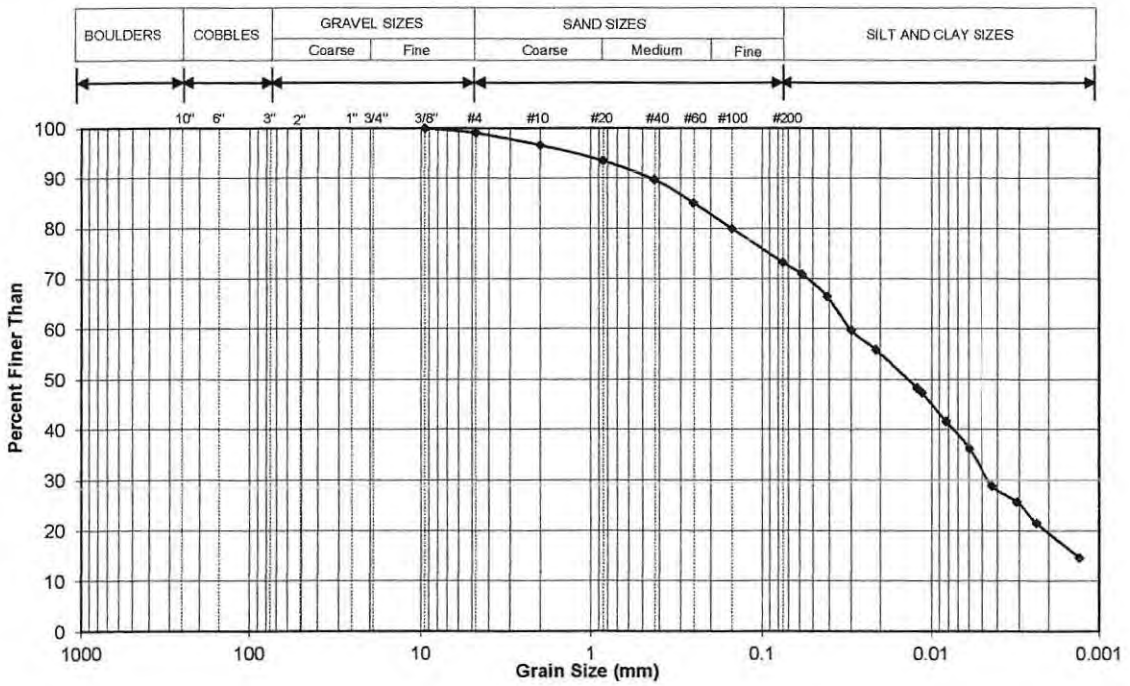
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0577	70.8
Sodium Hexametaphosphate	0.0411	66.4
	0.0297	59.6
	0.0212	55.8
	0.0122	48.2
	0.0114	47.3
	0.0082	41.6
	0.0059	36.2
	0.0043	28.8
	0.0031	25.6
	0.0023	21.4
	0.0013	14.6

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	26	52	21

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-27

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-12

Sample No.: 51

Depth (m): 0.2

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	97
3/8"	9.5	96
# 4	4.75	92
# 10	2.00	88
# 20	0.850	83
# 40	0.425	77.4
# 60	0.250	69.7
# 100	0.150	61.4
# 200	0.075	51.6

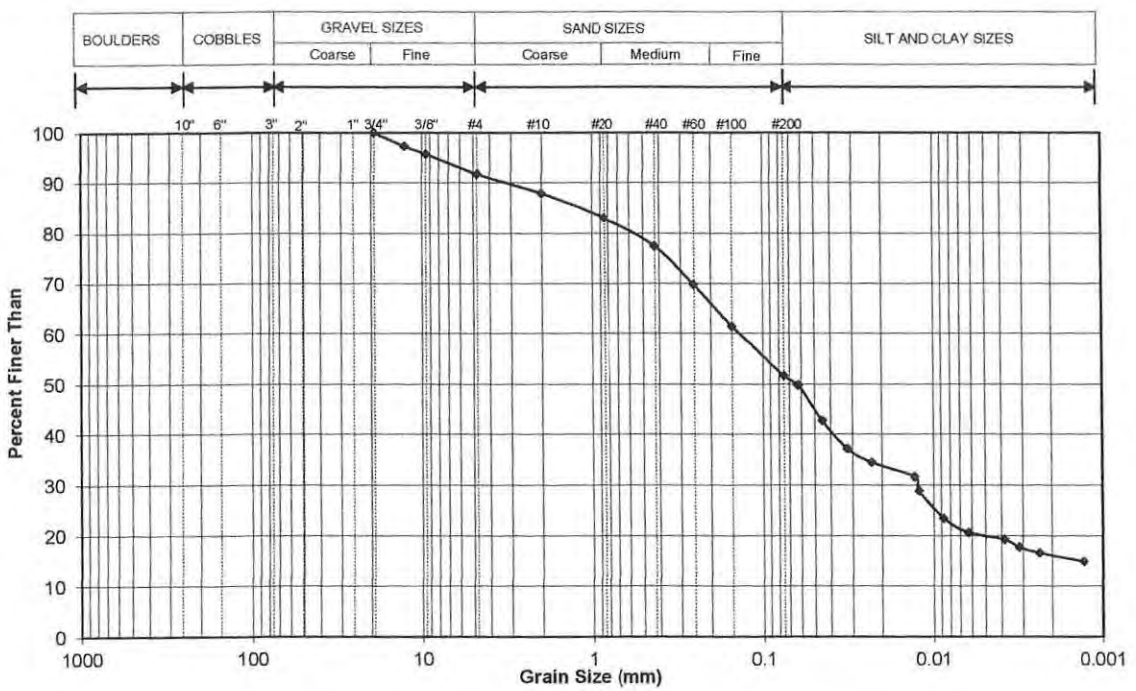
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0622	49.7
Sodium Hexametaphosphate	0.0448	42.7
	0.0321	37.2
	0.0229	34.4
	0.0129	31.6
	0.0121	28.8
	0.0087	23.4
	0.0062	20.6
	0.0038	19.2
	0.0031	17.7
	0.0024	16.6
	0.0013	14.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
8	40	35	17

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-28

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-12

Sample No.: 60

Depth (m): 10.5

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	99
# 4	4.75	97
# 10	2.00	94
# 20	0.850	89
# 40	0.425	83.3
# 60	0.250	75.8
# 100	0.150	67.5
# 200	0.075	57.2

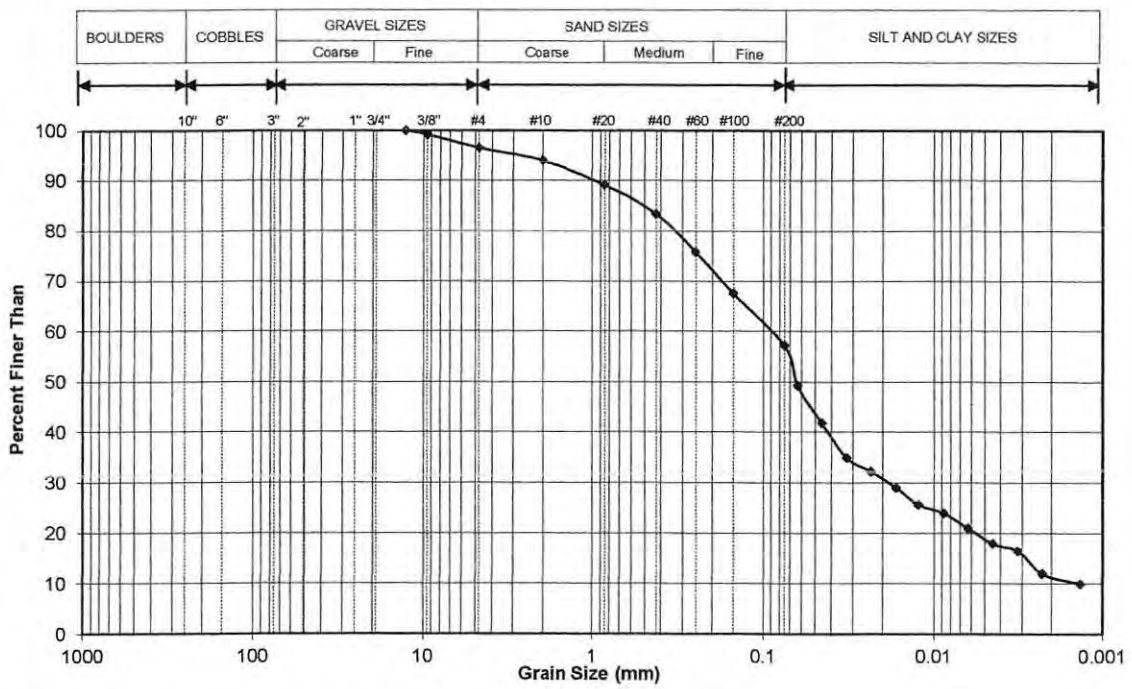
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0630	49.2
Sodium Hexametaphosphate	0.0453	41.8
	0.0325	34.9
	0.0233	32.1
	0.0166	28.9
	0.0123	25.6
	0.0087	23.9
	0.0062	20.9
	0.0045	17.9
	0.0032	16.5
	0.0023	12.0
	0.0013	10.0

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
3	39	46	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-29

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-14

Sample No.: 1

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	94
3/8"	9.5	94
# 4	4.75	89
# 10	2.00	86
# 20	0.850	81
# 40	0.425	75.1
# 60	0.250	67.0
# 100	0.150	58.6
# 200	0.075	48.4

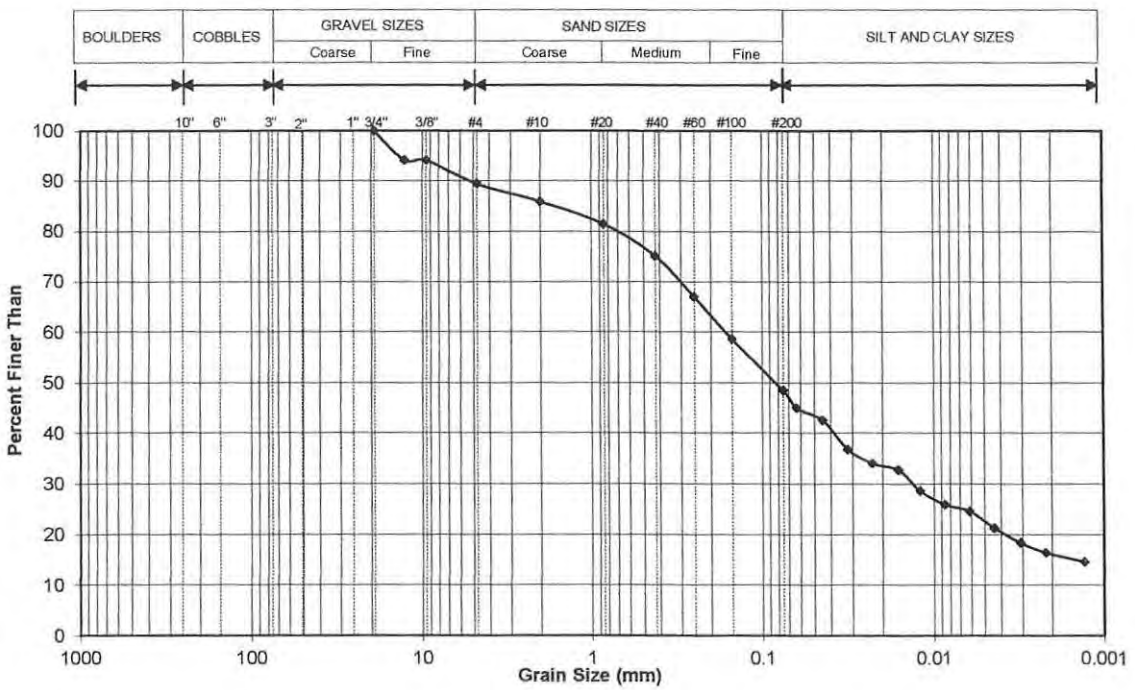
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0630	45.0
Sodium Hexametaphosphate	0.0445	42.5
	0.0319	36.8
	0.0228	34.0
	0.0162	32.7
	0.0121	28.5
	0.0086	25.9
	0.0061	24.5
	0.0044	21.2
	0.0031	18.3
	0.0022	16.4
	0.0013	14.6

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
11	41	32	16

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-30

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-15

Sample No.: 34

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	96
# 10	2.00	94
# 20	0.850	92
# 40	0.425	89.3
# 60	0.250	81.6
# 100	0.150	63.6
# 200	0.075	50.0

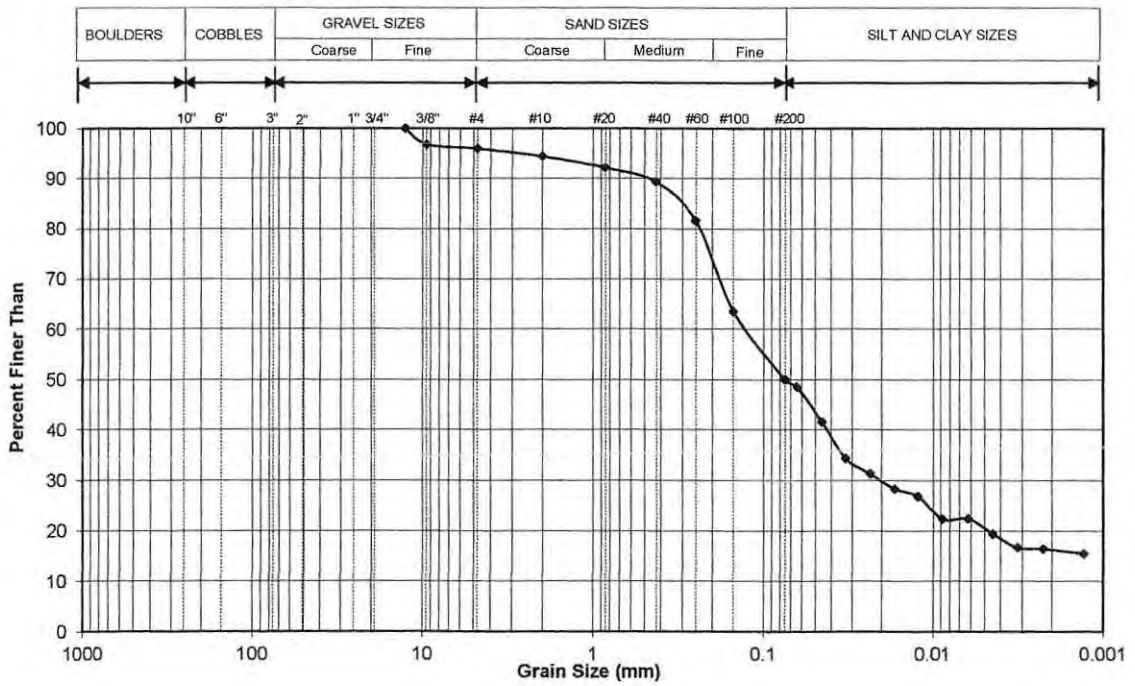
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0638	48.5
Sodium Hexametaphosphate	0.0455	41.5
	0.0326	34.3
	0.0233	31.2
	0.0167	28.3
	0.0122	26.8
	0.0088	22.3
	0.0062	22.4
	0.0044	19.4
	0.0032	16.7
	0.0022	16.4
	0.0013	15.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
4	46	34	16

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-31

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-16

Sample No.: 30

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	91
1"	25.4	91
3/4"	19.1	86
3/8"	9.5	85
# 4	4.75	83
# 10	2.00	81
# 20	0.850	77
# 40	0.425	71.1
# 60	0.250	63.5
# 100	0.150	55.2
# 200	0.075	44.7

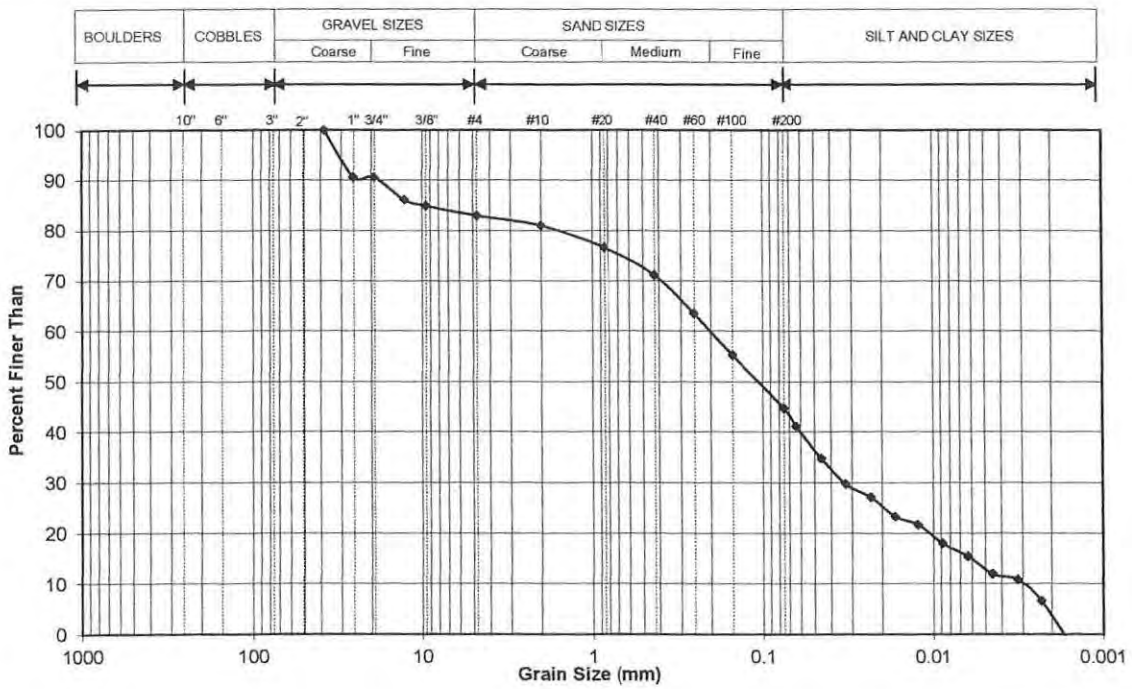
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0634	41.1
Sodium Hexametaphosphate	0.0456	34.7
	0.0325	29.7
	0.0233	27.0
	0.0167	23.2
	0.0123	21.6
	0.0088	18.0
	0.0063	15.4
	0.0045	11.9
	0.0032	10.8
	0.0023	6.6
	0.0014	-4.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
17	38	38	7

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644-32

APPENDIX A

EXPLANATIONS OF TERMS ON TEST HOLE LOGS

P. MACHIBRODA ENGINEERING LTD.

CLASSIFICATION OF SOILS

Coarse-Grained Soils: Soils containing particles that are visible to the naked eye. They include gravels and sands and are generally referred to as cohesionless or non-cohesive soils. Coarse-grained soils are soils having more than 50 percent of the dry weight larger than particle size 0.080 mm.

Fine-Grained Soils: Soils containing particles that are not visible to the naked eye. They include silts and clays. Fine-grained soils are soils having more than 50 percent of the dry weight smaller than particle size 0.080 mm.

Organic Soils: Soils containing a high natural organic content.

Soil Classification By Particle Size

Clay – particles of size	< 0.002 mm
Silt – particles of size	0.002 – 0.060 mm
Sand – particles of size	0.06 – 2.0 mm
Gravel – particles of size	2.0 – 60 mm
Cobbles – particles of size	60 – 200 mm
Boulders – particles of size	>200 mm

TERMS DESCRIBING CONSISTENCY OR CONDITION

Coarse-grained soils: Described in terms of compactness condition and are often interpreted from the results of a Standard Penetration Test (SPT). The standard penetration test is described as the number of blows, N, required to drive a 51 mm outside diameter (O.D.) split barrel sampler into the soil a distance of 0.3 m (from 0.15 m to 0.45 m) with a 63.5 kg weight having a free fall of 0.76 m.

Compactness Condition	SPT N-Index (blows per 0.3 m)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	Over 50

Fine-Grained Soils: Classified in relation to undrained shear strength.

Consistency	Undrained Shear Strength (kPa)	N Value (Approximate)	Field Identification
Very Soft	<12	0-2	Easily penetrated several centimetres by the fist.
Soft	12-25	2-4	Easily penetrated several centimetres by the thumb.
Firm	25-50	4-8	Can be penetrated several centimetres by the thumb with moderate effort.
Stiff	50-100	8-15	Readily indented by the thumb, but penetrated only with great effort.
Very Stiff	100-200	15-30	Readily indented by the thumb nail.
Hard	>200	>30	Indented with difficulty by the thumbnail.

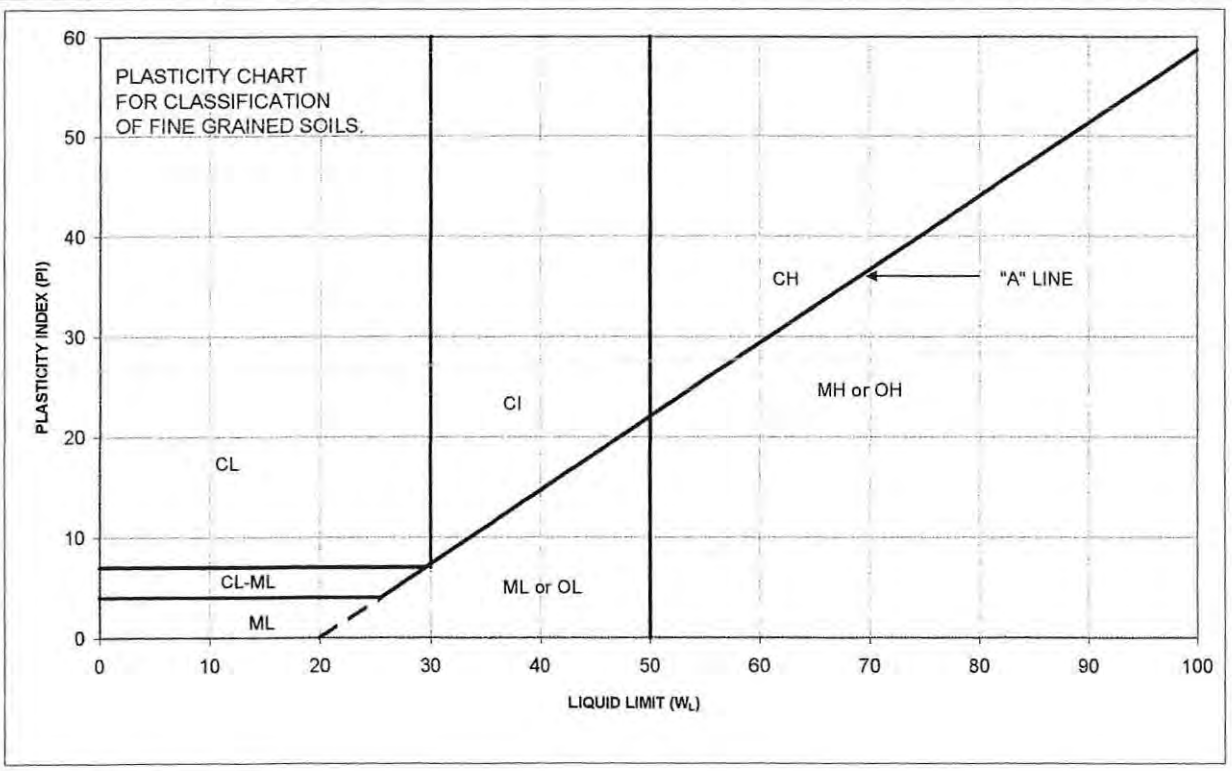
Organic Soils: Readily identified by colour, odour, spongy feel and frequently by fibrous texture.

DESCRIPTIVE TERMS COMMONLY USED TO CHARACTERIZE SOILS

Poorly Graded	- predominance of particles of one grain size.
Well Graded	- having no excess of particles in any size range with no intermediate sizes lacking.
Mottled	- marked with different coloured spots.
Nuggety	- structure consisting of small prismatic cubes.
Laminated	- structure consisting of thin layers of varying colour and texture.
Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks.
Fractured	- broken by randomly oriented interconnecting cracks in all 3 dimensions.

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR AND OFTEN FIBROUS TEXTUR
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS More than half coarse fraction larger than No. 4 sieve size	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4 \quad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			GP	POORLY-GRADED GRAVELS AND GRAVEL-SAND MIXTURES <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS FOR GW
		DIRTY GRAVELS	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR PI < 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH PI > 7
	SANDS More than half coarse fraction smaller than No. 4 sieve size	CLEAN SANDS	SW	WELL-GRADED SANDS, GRAVELLY SANDS MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6 \quad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			SP	POORLY-GRADED SANDS OR GRAVELLY SANDS <5% FINES	NOT MEETING ALL GRADATION REQUIREMENTS FOR SW
		DIRTY SANDS	SM	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR PI < 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH PI >7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSING NO. 200 SIEVE SIZE)	SILTS Below "A" line on plasticity chart; negligible organic content		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$
	CLAYS Above 'A" line on plasticity chart; negligible organic content		CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$
			CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	$W_L > 30 < 50$
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$
	ORGANIC SILTS & ORGANIC CLAYS Below "A" line on plasticity chart		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
			OH	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$



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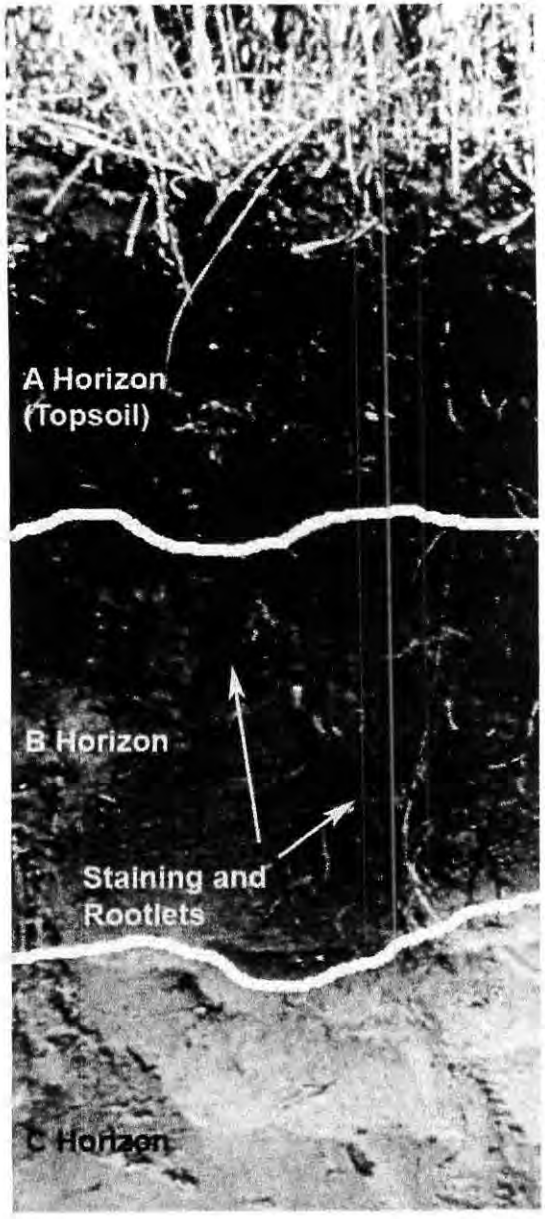
APPENDIX B

TOPSOIL, ORGANIC MATTER AND ORGANICS



A Horizon

The A horizon is the topsoil layer of the soil strata. It is characterized by a build up of organic matter, and a lower unit weight than subsequent layers. The organic matter content of this layer is typically 4-10% by mass.

The colour of this horizon varies from dark black to brown, depending on surface vegetation and climatic conditions.

B Horizon

Typically reddish brown in colour and contains accumulations of matter that have been washed down from the A Horizon. The B horizon is generally composed of clay that has been washed out of the A Horizon, but can also contain iron, calcium and sodium deposits as well.

C Horizon

Unweathered parent soil.

Topsoil is a mixture of mineral soil and organic matter. The organic matter is developed from decaying biological material (leaves, grass, trees, animals, etc.) and contributes to the brown to black colour of the soil. Following the topsoil is the B horizon which is a transition layer, where staining from the overlying topsoil is common. This results in a darker colour of the soil immediately below the organic topsoil layer. Depending on the surface vegetation, rootlets may be present below the depth of topsoil. However it should be recognized that these rootlets are not the same as organic matter in topsoil.

Physically speaking in comparison to mineral soil, topsoil has a significantly lower bulk density and a lower unit weight as compared to the underlying parent soil. This is due to larger pore spaces and non mineral materials in the soil matrix. Along with lower density, topsoil is often spongy and colloidal/fibrous. The following figure is of a typical prairie soil. Each horizon is labelled accordingly to demonstrate a typical soil profile.

Reference

Henry L. 2003. Henry's Handbook of Soil and Water, Henry Perspectives, Saskatoon, SK.

Appendix D
Hydrogeological Report

P. MACHIBRODA ENGINEERING LTD.

CONSULTING
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- Asphalt Testing

June 16, 2014

Whitewater Holdings Ltd
423 Blackbum Terrace
Saskatoon, SK S7L 1E8
E: wmurdoc@hotmail.com

ATTENTION: Mr. Greg Murdoch

Dear Sir:

RE: ADDITIONAL RECOMMENDATIONS
PROPOSED RURAL SUBDIVISION
SE1/4-24-36-4-W3M
NEAR SASKATOON, SASKATCHEWAN
PMEL FILE NO. S14-8644.2

The following letter has been prepared to address proposed changes to the Rural Subdivision to be located at SE 24-36-04-W3M, near Saskatoon, Saskatchewan. It is understood that it is being proposed to increase the number of residential lots, within the proposed Rural Subdivision, from 38 to 43. Doing this would change the proposed Rural Subdivision from a "Medium Density Area" to a "High Density Area" as defined by the Saskatchewan Onsite Wastewater Disposal Guide (Saskatchewan Ministry of Health, 2009).

As a result of the above-mentioned changes, Type I mounds would no longer be considered an acceptable onsite wastewater treatment system (OWTS). In addition, chamber and adsorption field systems would be limited to pressure systems only. In other words gravity systems would no longer be considered acceptable OWTS for the site.

In summary the following are considered acceptable OWTS for a "High Density Subdivision":

- Holding Tanks
- Pressure Absorption/Pressure Chamber Systems
- Type II Mounds

We trust the above is the information you require at this time. If you have any questions or require additional information, please contact our office.

P. MACHIBRODA ENGINEERING LTD.

Kai Runtz, Engineer-In-Training

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
P. MACHIBRODA ENGINEERING LTD.
Number 172
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
Geotechnical	6687	

Ray Machibroda, P. Eng., M. Sc.

KR/RM/ldw.

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HYDROGEOLOGICAL INVESTIGATION
PROPOSED RURAL SUBDIVISION
SE1/4-24-36-4-W3M
NEAR SASKATOON, SASKATCHEWAN
PMEL FILE NO. S13-8644.1
JANUARY 31, 2014

PREPARED FOR:

WHITEWATER HOLDINGS LTD
423 BLACKBURN TERRACE
SASKATOON, SASKATCHEWAN
S7L 1E8

ATTENTION: MR. GREG MURDOCK

EXECUTIVE SUMMARY

Based on the information reviewed and the results of the drilling investigation, PMEL is of the opinion that Onsite Wastewater Treatment Systems (OWTS), specifically septic tanks, Type I/II mounds and/or chamber systems, are suitable to treat wastewater at the proposed development. The recommended minimum separation distance required between infiltrative surface of the OWTS (i.e., bottom of dispersal trench, etc.) to the water table is 1.5 meters. Since the depth to the groundwater table ranges from 1.1 to 4.7 metres below grade, some of the proposed OWTS may not be suitable to some lots.

The results of the information reviewed indicated that the site overlies glacial till soils that form a low capacity surficial, unconfined aquifer. It is expected that nitrate released from OWTS at the site will flow horizontally through this shallow unconfined aquifer towards the east-southeast. However, the nitrate concentrations released in this direction are expected to have dissipated prior to reaching any potable groundwater receptors (i.e., wells). In other words, use of OWTS at the proposed development is not likely to present a significant risk to wells located downgradient (i.e., to the east-southeast) of the study site.

The information presented in this Report has been provided to give a general indication of the suitability of the existing soils and groundwater conditions for satisfactorily treating sanitary effluent. It is recommended that further assessments be undertaken for each lot once the lot plan and location of the OWTS have been finalized. Site specific soil samples should be gathered at the proposed septic field locations and design and construction of the septic treatment system should be undertaken by qualified personnel in accordance with Saskatchewan Health specifications and recommendations.

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1.0 INTRODUCTION

The following report presents the results of a hydrogeological study conducted by P. Machibroda Engineering Ltd. (PMEL) for the proposed residential subdivision (study site) to be constructed on the property legally described as:

- The southeast quarter of Section 24, Township 36, Range 4, West of the 3rd Meridian (SE1/4-24-36-4-W3M) located within the Rural Municipality (RM) of Corman Park No. 344, Saskatchewan.

Authorization to proceed with this investigation was provided on November 6, 2013. The terms of reference for this investigation were presented in PMEL Proposal No. 1025-8306, dated October 28, 2013. Field work, including field test drilling and soil sampling, was conducted on November 26 and 27, 2013. A survey of the Test Hole locations was conducted by Altus Geomatics on November 12 and 13, 2013. Groundwater monitoring and sampling were performed at the site on December 12, 2013.

The objective of this investigation was to determine if the study site is suitable for use of Onsite Wastewater Treatment Systems (OWTS).

2.0 SITE CHARACTERIZATION

2.1 Site Description

The layout of the proposed subdivision is shown on the Site Plan, Drawing No. S13-8644.1-1. The subject site, which is comprised of agricultural land, is bordered on all sides by farm/pasture-land with sections of sparse residential development. The City of Saskatoon is located approximately 9 km west of the site. Patience Lake is located approximately 4 km east of the site. A gravel road (Settler's Ridge Road), which is located along the east property line, connects the study site to 8th Street East, which is located approximately 800 metres to the north of the study site.

2.2 Topography

The elevation of the land surface at the subject property ranges from approximately 550 metres geodetic, proximate the northwest corner of the site, to approximately 540 metres geodetic proximate to the southeast corner of the site. Regionally, the ground surface in the area slopes east towards the Patience Lake which is located at 512 metres geodetic.

2.3 Subdivision Density

It is understood that the proposed residential subdivision will consist of 38 residential lots ranging in size from 0.5 and 1.9 ha (1.3 and 4.8 acres) with an average lot size of 2.7 ha (1.1 acres). The proposed development will also include community open spaces (i.e., playground, picnic tables, etc), municipal reserve areas, roadways and walking trails. Since the average parcel size of the proposed subdivision is less than 4 ha (10 acres) the subdivision is considered a "Medium Density Area" as defined by the *Guidance Documents for Developments and Subdivisions Where Onsite Wastewater Treatment Systems are Proposed* (Government of Saskatchewan, 2012).

2.4 Physiography/Geology

A review of Acton et. al., 1960 revealed that The subject property lies in the physiographic region known as the Saskatchewan Rivers Plain which is characterized as gently undulating to rolling glacial lacustrine-alluvial (glacial lake) plains, aeolian plains (dunes) and till plains. The subject property overlies approximately 90 metres of glacial till and stratified drift (gravel, sand, silt and clay) followed by silt and clay "shale" of the Bearpaw Formation - Montana Group (MDH, 2011).

2.5 Regional Hydrogeology

An examination of hydrogeological data (Christiansen, 1967 and MDH, 2011) for this region revealed the following observations:

1. The primary source of water in this region is drift aquifers above or between glacial till strata and the Sutherland Group (Forestry Farm Aquifer), between the base of the glacial till and the surface of the bedrock.

2. The base of groundwater exploration, or the depth which it is considered to be uneconomic to explore for groundwater because the cost of wells is too high or the water is too mineralized, is considered to be the bedrock surface at the base of the drift.

3. The study site overlies the western limits of a large surficial aquifer. The aquifer extends from grade to depths of up to approximately 6.0 metres below grade in the vicinity of the study site.

4. The Forestry Farm Aquifer, which is located in the Upper Floral Formation, is present at a depth of approximately 9.8 metres below grade and is approximately 13 metres thick in the vicinity of the subject property.

5. No Empress Group, Battleford, Upper Dundurn and/or Warman formation aquifers are known to exist proximate the subject property.

6. The subject property overlies a portion of a Lower Dundurn Formation Aquifer. The aquifer, which is up to 9 metres thick, is located at a depth of approximately 75 metres below grade.

7. A Mennon formation aquifer, that is reportedly up to 10 metres thick, is located at depths of approximately 75 to 90 metres below grade in the vicinity of the subject property.

8. The surface of the Bearpaw Formation is located approximately 80 to 90 metres below grade.

9. The surface of the Judith River formation aquifer is located at a depth of approximately 130 to 170 metres below grade. This aquifer is reportedly 1 to 5 metres thick in the vicinity of the subject property.

10. The closest surface water body to the site is the Patience Lake, which is located approximately 5 km east of the subject property.

11. Patience Lake is a discharge region for surrounding higher elevation areas.

2.6 Groundwater Wells

A search of the Saskatchewan Watershed Authority (SWA) Groundwater Well Database (https://gis.swa.ca/, cited November 14, 2013) was conducted for the study site and surrounding area. The distribution of the registered water wells proximate the study site has been shown on Drawing No. S13-8644.1-1A – Surrounding Land Use and Registered Water Wells. Detailed Saskatchewan Water Corporation (SaskWater) Water Well records have been included in Appendix B while a summary of the well records is presented in Table I. Review of the water well search revealed the following:

1. No registered groundwater wells are located on the subject property.

2. Twenty-five registered groundwater water wells are located within a 1.6 km radius of the subject property.

3. Eighteen of these wells are registered for domestic use and seven are registered for research.

TABLE I. SUMMARY OF REGISTERED GROUNDWATER WELLS

Well	Location					Depth		Diameter		Pumping Rate		Water
Record	Quarter	Section	Township	Range	Meridian	(m)	(feet)	(mm)	(inches)	Litres/Minute	Gallons/Minute	Use
014475	NW	24	36	4	3	8	27	76	3	9	2	Domestic
048641	SW	24	36	4	3	24	80	114	4.5	173	38	Domestic
031784	SW	13	36	4	3	34	113	Not Recorded				Research
031783	SW	13	36	4	3	34	112	Not Recorded				Research
031782	SW	16	36	4	3	34	112	Not Recorded				Research
031781	SW	16	36	4	3	34	112	Not Recorded				Research
119562	SW	13	36	4	3	14	45	914	36	18	4	Domestic
086518	SE	13	36	4	3	101	330	127	5	295	65	Domestic
031779	SW	13	36	4	3	34	112	Not Recorded				Research
217618	NW	24	36	4	3	22	73	762	30	16	3.5	Domestic
031569	SE	30	36	3	3	55	182	102	4	36	8	Domestic
119562	SW	13	36	4	3	14	45	914	36	18	4	Domestic
116889	SW	13	36	4	3	109	358	Not Recorded				Research
012381	SW	13	36	4	3	9	28	Not Recorded				Domestic
112621	SW	24	36	4	3	110	360	127	5	68	15	Domestic
031567	--	18	36	3	3	50	163	Not Recorded				Domestic
110409	NW	13	36	4	3	79	260	127	5	45	10	Domestic
031568	SW	18	36	3	3	30	100	Not Recorded				Domestic
087325	SE	30	36	3	3	13	43	762	30	9	2	Domestic
080788	SE	23	36	4	3	30	100	127	5	91	20	Domestic
071260	SE	30	36	3	3	23	75	Not Recorded				Domestic
031793	NE	23	36	4	3	15	50	914	36	45	10	Domestic
031786	SW	13	36	4	3	89	293	Not Recorded				Research
031792	NE	23	36	4	3	20	64	914	36	Not Recorded		Domestic
031785	SW	13	36	4	3	34	112	Not Recorded				Domestic

2.7 Surface Water

Patience Lake is located approximately 4 km east of the subject site. In addition, numerous small sloughs exist on and adjacent to the study site.

2.8 Water Supply

It is understood that the potable water supply for each lot will be via a piped distribution system with its source located in the South Saskatchewan River.

2.9 Waste Water

It is proposed that each lot be equipped with an Onsite Waste Treatment System (OWTS).

3.0 FIELD INVESTIGATION

3.1 Test Hole Drilling

Sixteen test holes, located as shown on the Site Plan, Drawing No. S13-8644.1-1 were dry drilled using our truck-mounted, continuous flight, solid stem auger drill rig. The test holes were 150 mm in diameter and extended to depths of 3 to 18 metres below the existing ground surface.

Test hole drill logs were compiled during test drilling to record the soil stratification, the groundwater conditions, the position of unstable sloughing soils and the depths at which cobblestones and/or boulders were encountered.

Disturbed samples of auger cuttings were collected during test drilling and sealed in plastic bags to minimize moisture loss. The soil samples were taken to our laboratory for analysis.

Standard penetration tests (N-index), utilizing a safety hammer with automatic trip, were performed during test drilling.

3.2 Monitoring Well Installation

Monitoring wells (i.e., piezometers), were installed in each test hole drilled at the site to allow for monitoring of subsurface conditions, and collection of groundwater samples.

Each monitoring well consisted of a 50 mm diameter, Schedule 40, PVC machine slotted screen with a solid riser pipe. The annular spaces around the slotted screens were filled with silica sand and bentonite seals were placed around the solid riser pipe.

3.3 Hydraulic Conductivity Testing

Bail response tests were performed on December 12, 2013 in the monitoring wells installed in Test Hole Nos. 13-1, 13-5, and 13-10 to determine the bulk saturated hydraulic conductivity of the in-situ soil. Each test consisted of removing a known volume of water to produce a decrease in the hydraulic head within the monitoring wells. The water levels within the monitoring wells were then allowed to recover and the response was measured with respect to time. The recorded data was used to estimate the saturated, bulk hydraulic conductivity of the adjacent soil unit.

3.4 Groundwater Sampling

On December 16, 2013, following hydraulic conductivity testing, groundwater samples were collected from 8 of the monitoring wells installed at the site. The collected samples were placed in laboratory supplied jars with appropriate preservatives and submitted to ALS for analysis of routine parameters including: pH; conductivity; reduced iron; Total Dissolved Solids (TDS); major ions; Hardness; Nitrate-Nitrogen; Nitrite-Nitrogen; alkalinity; total coliforms; and E.Coli. In-situ groundwater testing was also conducted to test for pH (in-situ), oxidation/reduction potential (REDOX) and Dissolved Oxygen (DO).

4.0 RESULTS OF INVESTIGATION

4.1 Ground Surface Elevations

The ground surface elevation at each Test Hole location was surveyed by Altus Geomatics.

4.2 Soil Profile

Detailed descriptions of the site stratigraphy are presented on the Test Hole Logs, Drawing Nos. S13-8466.1-2 to 17, inclusive while stratigraphic sections are presented on Drawing Nos. S13-8466.1-18 and 19. The general soil profile consisted of 100 to 200 mm of topsoil overlying variable deposits of silt, clay and sand that extended to depths of 100 mm to 1.8 metres below grade. These deposits were underlain by glacial till (clay), which extended to a depth of at least 18 metres, the maximum depth explored with our Test Holes at this site.

4.3 Groundwater Conditions, Sloughing

Groundwater seepage and sloughing conditions were encountered during test drilling. The depths at which groundwater seepage and sloughing conditions were encountered have been shown plotted on Drawing Nos. S13-8644.1-2 to 17, inclusive. A summary of the groundwater levels recorded in the piezometers located on the subject site has been presented in Table II.

TABLE II. RECORDED GROUNDWATER ELEVATIONS

Test Hole Number	Elevation (meters)		Recorded Groundwater Elevation (metres)	
	Piezometer Rim	Ground Surface	27-Nov-13	12-Dec-13
13-1	541.5	540.5	Dry	537.7
13-2	544.8	543.8	Dry	Dry
13-3	547.6	546.4	Dry	535
13-4	547.4	546.4	Dry	Dry
13-5	547.3	546.3	Dry	541.6
13-6	543.7	542.6	Dry	540.3
13-7	542.9	541.6	533.4	539.5
13-8	544.0	543.0	Dry	Dry
13-9	542.3	541.4	532.8	540.3
13-10	545.1	544.0	Dry	539.8
13-11	545.5	544.5	Dry	Dry
13-12	545.5	544.5	Dry	526.8
13-13	545.5	544.5	Dry	Dry
13-14	543.2	542.3	Dry	539.6
13-15	543.5	542.5	Dry	538.6
13-16	540.9	539.8	Dry	538.4

Review of the results presented in Table II revealed that the depth to groundwater on December 12, 2013 ranged from approximately 1.1 to 4.7 metres below existing grade while the apparent direction of groundwater flow was towards the southeast at an average gradient of 0.008. Review of the monitoring well nest comprised of Test Hole Nos. 13-11, 13-12 and 13-13 suggested a downward vertical gradient exists at the site. In other words the site is located in an area of groundwater recharge. The recorded groundwater levels may not have achieved static equilibrium. Higher static water levels should be expected following piezometer equilibration and/or during following spring snowmelt or periods of precipitation.

4.4 Cobblestones and Boulders

Cobblestones and/or boulders were encountered during test drilling. The depths at which cobblestones and/or boulders were encountered during drilling have been shown on Drawing Nos. S13-8644.1-2 to 17, inclusive.

The glacial till consisted of a heterogeneous mixture of gravel, sand, silt and clay-sized particles. The glacial till strata also contained sorted deposits of the above particle sizes. In addition to the sorted deposits, a random distribution of larger particle sizes in the cobblestone range (60 to 200 mm) and boulder-sized range (larger than 200 mm) were encountered during test drilling.

It should be recognized that the statistical probability of encountering cobblestones and/or boulders in the sixteen small diameter test holes drilled at this site was low. Intertill deposits of cobblestones, boulders, boulder pavements and isolated deposits of saturated sand or gravel should be anticipated. The frequency of encountering such deposits will increase proportionately with the volume of soil excavated and/or the number of piles installed.

4.5 Soil Classification and Index Tests

The soil classification and index tests consisted of a visual classification of the soil, water contents, unit weights, Atterberg limits and grain size distribution analysis. The results of the soil classification and index tests conducted on representative samples of soil recovered from this site have been plotted on the drill logs alongside the corresponding depths at which the samples were recovered as shown on Drawing Nos. S13-8644.1-2 to 17, inclusive.

4.6 CSC Soil Classification

The results of the grain size distribution analyses have been shown on Drawing Nos. S13-8644.1-2 to 17, inclusive and summarized in Table III. Review of the results presented in Table III revealed that the surficial (i.e., upper 1.0 metres) glacial till soils at the site are classified as "loam," "silt loam," "sandy loam" and/or "silty clay loam." In accordance with SaskHealth (2009) all of these soil types are considered suitable for development of an OWTS with the exception of the "silty clay loam" encountered in Test Hole No. 13-3. Further testing would be required to determine suitability of the "silty clay loam" soil in to assess its suitability for development of OWTS.

TABLE III. CSC SOIL CLASSIFICATION

Test Hole No.	Depth (metres)	Grain Size Distribution Analysis (percent)			Saskatchewan Health Soil Texture Classification
		Sand	Silt	Clay	
13-1	0.6	63	16	6	Sandy Loam
13-2	0.3	43	42	15	Loam
13-3	0.3	5	65	30	Silty Clay Loam
13-4	0.6	46	37	12	Loam
13-5	1.0	43	45	9	Silt Loam
13-6	0.3	33	54	12	Silt Loam
13-7	0.6	32	50	12	Silt Loam
13-8	1.0	40	43	12	Loam
13-9	0.3	13	53	33	Silt Loam
13-10	0.6	26	52	21	Silt Loam
13-12	0.2	40	35	17	Loam
13-12	10.5	39	45	12	Loam
13-14	0.3	41	32	16	Loam
13-15	0.6	46	34	16	Loam
13-16	1.0	38	38	7	Silt Loam

4.7 Hydraulic Conductivity Testing

The results of Hydraulic Conductivity Tests, calculated using the methodology proposed by Hyder et al. (1994), also known as the KGS (Kansas Geological Survey) Model, are summarized in Table IV, while detailed reports are presented in Appendix C.

TABLE IV. SUMMARY OF HYDRAULIC CONDUCTIVITY TEST RESULTS

Test Hole No.	Depth (m)	Hydraulic Conductivity (m/s)	Soil Type
13-1	7.5 to 8.5	2×10^{-9}	Glacial Till
13-5	7.8 to 8.8	5×10^{-9}	Glacial Till
13-10	8.1 to 9.1	9×10^{-9}	Glacial Till
Average:		5×10^{-9} m/s	

4.8 Hydraulic Retention Time

The hydraulic conductivity of the subsurface soils ranged from 0.0002 to 0.0009 m/day. As such, the minimum required separation distance from the bottom of the infiltrative surfaces (i.e., bottom of dispersal trench, etc.) to the surface of the water table, required to achieve a 3-log (i.e., 99.9 %) removal of pathogens, would be less than 0.1 metres. However, it is recommended that a separation of 1.5 metres be maintained.

4.9 Laboratory Chemical Analysis - Groundwater

The results of the laboratory chemical analysis for major ions and routine parameters are summarized in Table V along with the Health Canada (2012) Guidelines for Canadian Drinking Water Quality. Detailed laboratory reports, including a listing of the laboratory methods, are presented in Appendix D.

Review of the results presented in Table V revealed the following:

1. The Total Alkalinity of the groundwater samples recovered from the monitoring wells in Test Hole Nos. 13-1 and 13-9 exceeded the referenced criterion.

2. Hardness and TDS at concentrations exceeding the referenced criterion were present in all the groundwater samples analyzed.

3. Nitrate-N at a concentration exceeding the referenced criterion was present in the groundwater sample recovered from the monitoring well in Test Hole No. 13-14.

4. Magnesium, at a concentration exceeding the referenced criterion, was present in each of the groundwater samples analyzed, except the samples recovered from Test Hole Nos. 13-1 and 13-5.

5. Sodium, at concentrations exceeding the referenced criterion, was present in the groundwater samples recovered from the monitoring wells installed in Test Hole Nos. 13-10, 13-14 and 13-16.

6. Sulfur, at concentrations exceeding the referenced criterion, was present in each of the groundwater samples analyzed, except the samples recovered from Test Hole Nos. 13-5 and 13-9.

7. E. Coli, at a concentration exceeding the referenced criterion, was present in the groundwater sample recovered from the monitoring well installed in Test Hole No. 13-10.

8. Total Coliforms, at concentrations exceeding the referenced criterion, were present in all of the groundwater samples analyzed, except the sample recovered from Test Hole No 13-5.

9. The groundwater from 13-1, 13-5 and 13-9 appears to be of the same origin.

10. The groundwater from 13-3 and 13-15 appears to be of the same origin.

11. The groundwater from 13-14 and 13-16 appears to be of the same origin and is highly mineralized, typical of relatively stagnant water associated with low flow (glacial till) formations.

TABLE V. RESULTS OF LABORATORY CHEMICAL ANALYSIS

Monitoring Well No.	13-1	13-3	13-5	13-9	Health Canada
Sample No.	2	5	7	9	(2012) Guidelines
Date Sampled	December 12, 2013	December 12, 2013	December 12, 2013	December 12, 2013	for Canadian
PARAMETER					Drinking Water
Conductivity (EC) [uS/cm]	1850	2920	1170	2040	No Criterion
pH	7.43	7.2	7.28	7.64	6.5-8.5
Alkalinity, Total (as CaCO3)	554	217	419	722	500**
Bicarbonate (HCO3)	676	264	511	881	No Criterion
Carbonate (CO3)	<10.	<10.	<10.	<10.	No Criterion
Chloride (Cl)	23.5	25.5	4.6	16.4	250
Hardness (as CaCO3)	1090	2020	659	1180	500
Hydroxide (OH)	<10.	<10.	<10.	<10.	No Criterion
Nitrate+Nitrite-N	<0.50	<0.50	<0.50	0.62	No Criterion
Nitrate-N	<0.50	<0.50	<0.50	0.58	10
Nitrite-N	<0.050	<0.050	<0.050	<0.050	3.2
Total Kjeldahl Nitrogen	0.78	1.02	0.41	0.89	No Criterion
TDS (Calculated)	1280	2790	753	1370	500
Cation - Anion Balance	4	1.0 *	2.8	4.6	No Criterion
Calcium (Ca) Dissolved	206	461 *	144	143	No Criterion
Magnesium (Mg) Dissolved	139	210 *	72.8	201	200**
Potassium (K) Dissolved	11	16.3 *	9.1	16.2	No Criterion
Sodium (Na) Dissolved	53.2	90 *	23.8	76.7	200
Sulfur (as SO4) Dissolved	515	1860 *	247	483	500
Chemical Oxygen Demand	50	40	30	40	
Dissolved Oxygen [mg/L]	12	17	16	18	No Criterion
Redox Potential (RP) [mV]	220	274	261	256	No Criterion
Iron (Fe)	Non-detect	Non-detect	Non-detect	Non-detect	0.3
Bacterological Parameters					
E. Coli [CFU/100mL)	<1	<1	<1	<1	0.0
Total Coliforms [CFU/10	>200.5	>200.5	<1	5	0.0

*Units expressed in mg/L except EC which is in uS/cm, pH which is unitless and E. Coli, Heterophic Plate Count and Total Coliforms which is CFU/100mL

**Total Alkalinity and Dissolved Magnesium guidlines from Saskatchewan Environment (2002) Drinking Water Quality Standards and Objectives

Health Canada (2012) Guidelines for Canadian Drinking Water

< - Result below laboratory detection limit

> - Result above laboratory detection limit

- Concentration Exceeds Referenced Criterion

- Detection Limits Exceeds Referenced Criterion

TABLE V. RESULTS OF LABORATORY CHEMICAL ANALYSIS

Monitoring Well No.	13-10	13-14	13-15	13-16	Health Canada
Sample No.	6	8	4	3	(2012) Guidelines
Date Sampled	December 12, 2013	December 12, 2013	December 12, 2013	December 12, 2013	for Canadian
PARAMETER					Drinking Water
Conductivity (EC) [uS/cm]	6590	11000	3890	9710	No Criterion
pH	7.28	7.36	7.36	7.31	6.5-8.5
Alkalinity, Total (as CaCO3)	301	290	284	307	500**
Bicarbonate (HCO3)	367	354	346	374	No Criterion
Carbonate (CO3)	<10.	<10.	<10.	<10.	No Criterion
Chloride (Cl)	99.5	92.1	41.5	138	250
Hardness (as CaCO3)	4300	8260	2720	7610	500
Hydroxide (OH)	<10.	<10.	<10.	<10.	No Criterion
Nitrate+Nitrite-N	3.23	12	<0.50	3.46	No Criterion
Nitrate-N	3.15	11.8	<0.50	3.44	10
Nitrite-N	0.08	0.217	<0.050	<0.050	3.2
Total Kjeldahl Nitrogen	2.5	2.66	0.93	2.73	No Criterion
TDS (Calculated)	6680	12400	3740	11000	500
Cation - Anion Balance	2.9 *	1.8 *	1.4 *	1.7 *	No Criterion
Calcium (Ca) Dissolved	518 *	420 *	512 *	457 *	No Criterion
Magnesium (Mg) Dissolved	731 *	1750 *	350 *	1570 *	200**
Potassium (K) Dissolved	24.5 *	21 *	27.2 *	28 *	No Criterion
Sodium (Na) Dissolved	546 *	898 *	131 *	677 *	200
Sulfur (as SO4) Dissolved	4570 *	9030 *	2510 *	7960 *	500
Chemical Oxygen Demand	110	120	40	120	
Dissolved Oxygen [mg/L]	16	17	13	17	No Criterion
Redox Potential (RP) [mV]	280	285	210	290	No Criterion
Iron (Fe)	Non-detect	Non-detect	Non-detect	Non-detect	0.3
Bacterological Parameters					
E. Coli [CFU/100mL)	7	<1	<1	<1	0.0
Total Coliforms [CFU/10	7	>200.5	>200.5	>200.5	0.0

*Units expressed in mg/L except EC which is in uS/cm, pH which is unitless and E. Coli, Heterophic Plate Count and Total Coliforms which is CFU/100mL

**Total Alkalinity and Dissolved Magnesium guidlines from Saskatchewan Environment (2002) Drinking Water Quality Standards and Objectives

Health Canada (2012) Guidelines for Canadian Drinking Water

< - Result below laboratory detection limit

> - Result above laboratory detection limit

- Concentration Exceeds Referenced Criterion

- Detection Limits Exceeds Referenced Criterion

5.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

As shown on Drawing Nos. S13-8644.1-18 and 19, the general soil profile consisted of 100 to 200 mm of topsoil overlying variable deposits of silt, clay and sand that extended to depths of 100 mm to 1.8 metres below grade. These deposits were underlain by glacial till (clay), which extended to a depth of at least 18 metres, the maximum depth explored with our Test Holes at this site. The upper portion of the glacial till, which has likely been damaged by numerous freeze-thaw cycles and wetting-drying cycles is likely fractured and thus also considered to represent a low capacity unconfined aquifer. The lower (unfractured) portion of the glacial till is considered an aquitard.

All groundwater at the site originates as groundwater infiltrating downward from the ground surface eventually forming unconfined aquifers in the damaged glacial till formations. Horizontal groundwater flow in the unconfined aquifers is expected to be predominantly towards the southeast. The saturated thickness of the unconfined glacial till aquifer at the site is not expected to exceed 6 metres.

The water quality of the near surface groundwater at the site is highly mineralized and would require treatment prior to consumption. Nitrate-N at a concentration (11.8 mg/L) exceeding the Health Canada (2013) Drinking Water Quality Guideline was present in a water sample recovered from Test Hole No. 13-14.

Although wells are located within a 1.6 km (1 mile) radius of the site, most of the wells are relatively deep. As such, these wells are considered unlikely to be impacted by Nitrate-N, which tends to stay near the surface of the near surface groundwater.

The subject property is located proximate the reported north-western fringe of a large surficial aquifer. However, no evidence of this aquifer was apparent in the Test Holes drilled to a depth of at least 18 metres below grade. The average hydraulic conductivity of the upper portion of the glacial till is approximately 5×10^{-9} m/s. It is expected that the fracture spacing and density would decrease with depth, eventually causing the glacial till to form an aquitard that acts as a barrier to vertical flow. Maathuis (1992) reported that the vertical hydraulic conductivity of the glacial till soils is in the realm of 3×10^{-10} to 5×10^{-11} m/s. In consideration of the above, lower aquifers present below the site would be considered to be hydraulically isolated from proposed OWTS to be installed at this site.

The surficial soils at the Test Hole locations are classified as Loam, Silty Loam, Sand Loam and/or Silty Clay Loam. In accordance with SaskHealth (2009), Silty Clay Loam soils would require additional testing to determine their suitability the development of OWTS. The minimum depth to groundwater at the site ranged from approximately 1.1 to 4.7 metres below existing grade on December 12, 2013.

6.0 ONSITE WASTE WATER TREATMENT SYSTEMS

6.1 Sewage Volumes

Assuming a single family dwelling with three bedrooms is constructed on each lot in the proposed subdivision the expected volume of sewage per day is calculated as follows:

$V = (V_p) \times (P_B) \times (B)$

Where:

V = expected sewage volume (L/day)
V_p = volume of sewage generated per person per day = 340 L/person/day
P_B = Persons per bedroom = 1.5 persons/bedroom
B = No. of Bedrooms = 3

V = (340 L/person/day) x (1.5 persons/bedroom) x (3 bedrooms) = 1,530 L/Day

6.2 Holding Tanks

The subject property is considered suitable for use of holding tanks to store sewage and wastewater until it can be transported to a final point of disposal.

6.3 Lagoons

The proposed lot sizes at the subject property range from 0.5 to 1.9 ha (1.3 to 4.8 acres). Since lagoons require a minimum lot size of 4 ha, they are not considered an acceptable OWTS for the proposed development (SKMoE, 2009).

6.4 Septic Tanks

6.4.1 Jet Type Disposal Systems

Jet type disposal systems require a minimum parcel/Lot size of 4 ha. As such, Jet disposal systems are not considered an acceptable system for the proposed development (SKMoE, 2009).

6.4.2 Type I/II Mounds

Sanitary effluent collected in adequately constructed septic tanks can be transmitted into the soil using Type I/II Mounds. The Mounds and associated works should be designed and constructed in accordance with Saskatchewan Ministry of Health (2009). The base of each mound will require a separation distance of at least 1.5 metres from the high groundwater table. As such site selection of the specific location of proposed mounds will be contingent on groundwater conditions and soil

6.4.3 Chamber Systems and Adsorption Field Systems

Sanitary effluent collected in an adequately constructed septic tank can be transmitted into the soil using a Chamber System. Construction of Chamber Systems and associated works should be performed in accordance with Saskatchewan Ministry of Health (2009). The base of each Chamber System will require a separation distance of at least 1.5 metres from the high groundwater table. As such site selection of the specific location of proposed Chamber System will be contingent on groundwater conditions and soil stratigraphy. Further investigation (i.e., Test Pits, Test Borings, etc.) should be performed at the specific site of the proposed Chamber System prior to installation to optimize the site selection.

7.0 NITRATE ASSESSMENT

7.1 Existing Nitrate Concentrations

As shown on Drawing No. S13-8644.1-35, nitrate-nitrogen at a concentration (11.8 mg/L) exceeding the Health Canada (2013) Drinking Water Quality Guidelines (10 mg/L) was measured in a groundwater sample recovered from the monitoring well installed in Test Hole No. 13-14 on December 16, 2013. Nitrate-nitrogen concentrations measured in the remaining groundwater samples analyzed ranged from less than 0.50 to 3.44 mg/L.

7.2 Fate of Subsurface Nitrate-Nitrogen

For a typical OWTS, almost no nitrate-nitrogen (NO_3-N) is removed during the treatment process. As such, a vertical nitrate plume develops beneath the OWTS until it encounters the groundwater table where very little attenuation occurs. In addition, the dilution mechanism is slow lateral dispersion within the groundwater table as the plume moves forward under mostly laminar flow conditions. Also, it has been determined that the nitrate plume generally stays near the surface of the groundwater table (Froese, et al., 2009).

The upper part of the glacial till layer has been damaged by freeze-thaw cycles and wetting-drying cycles. As a result, this upper part of the glacial till has a secondary porosity due to the presence of micro cracks and bio-channels. This increases the saturated hydraulic conductivity of the soil, forming an unconfined aquifer in the upper portion of the glacial till. Based on the results of the groundwater monitoring on December 12, 2013, the bulk saturated hydraulic conductivity of the upper (9.0 metres) of damaged glacial till was 5×10^{-9} m/s. It is expected that the fracture spacing and density would decrease with depth, eventually causing the glacial till to form an aquitard which acts as a barrier to vertical flow. Based on published information (Maathuis, 1992), the vertical hydraulic conductivity of the lower, undamaged glacial till would be in the order of 10^{-10} to 10^{-11} m/s in the Saskatoon area.

In consideration of the above, NO_3-N released from OWTS is expected to travel vertically until it reaches the groundwater table. From there, the NO_3-N is expected to flow horizontally towards the northeast along the surface of the water table.

7.3 Horizontal Nitrate Migration

Based on the results of the groundwater monitoring on December 12, 2013, the near surface groundwater at the site flows towards the northeast at an average gradient of 0.008, while the measured hydraulic conductivity (K) at the site was 5×10^{-9} m/s. Assuming a porosity of 0.3, the average linear velocity of horizontal flow can be calculated using plug flow modeling as follows:

$$V = \frac{(K)(i)}{n}$$

Where:

- V = groundwater velocity
- K = hydraulic conductivity = 5×10^{-9} m/s (measured on December 12, 2013)
- i = horizontal gradient = 0.008 (measured on December 12, 2013)
- N = soil porosity = 0.3 (Maathius, 1992)

Therefore:

$$V = \frac{(5 \times 10^{-9}\ m/s)(0.008)}{(0.3)}$$

$$= 1.3 \times 10^{-10}\ m/s$$

$$= 4\ mm/year$$

7.4 Nitrate Dilution – Single OWTS

The nitrate dilution model, also known as the Bauman Schafer Model (Bauman and Schafer, 1984), was used to calculate the dilution of nitrate as it moved away from a theoretical OWTS located on the lot in the vicinity of TH13-14 (Lot # 18). TH 13-14 was chosen since the existing nitrate concentration on this lot was the highest value (11.8 mg/L) measured on the subdivision. A detailed description of the model is presented by the Montana Department of Environmental Quality Public Water and Subdivisions Bureau (http://www.deq.mt.gov/wqinfo/nondeg/HowToNonDeReg.mcpx) while the results of the model are presented below.

Review of the results of the nitrate dilution model revealed that, assuming an initial effluent nitrate concentration of 50 mg/L and a background nitrate concentration of 11.8 mg/L, a distance of 1,266 metres would be required to dilute the nitrate concentration emanating from the OWTS to below 10 mg/L. Based on a review of aerial photographs, no residential developments or other potential receptors of nitrate impacted groundwater appears to be located within 1,200 metres to the east-southeast of the subject property. As such, nitrate emanating from the site is expected to dissipate to below 10 mg/L prior to reaching any drinking water receptors.

VARIABLES	DESCRIPTION	VALUE	UNITS	Source
K	Hydraulic Conductivity	5.0E-09	m/s	Measured (refer to Table IV)
I	Hydraulic Gradient	0.008	m/m	Measured (December 12, 2013)
D	Mixing Zone Thickness (usually constant)	4.6	m	Assumed
L	Mixing Zone Length	1266	m	Assumed
Y	Width of Drainfield Perpendicular to Ground Water Flow	61	m	Width of Facility
Ng	Background Nitrate (as Nitrogen) Concentration	11.8	mg/L	Measured (refer to Table V)
Nr	Nitrate (as Nitrogen) Concentration in Precipitation (usually constant)	1.00	mg/L	Assumed
Ne	Nitrate (as Nitrogen) Concentration in Effluent	50.0	mg/L	Assumed
Ql	Daily Effluent Quantity	1.530	m^3/day	Assumed
P	Precipitation	347.2	mm/year	Environment Canada
V	Percent of Precipitation Recharging Ground Water (usually constant)	0.02		Assumed for Glacial Till Soils

EQUATIONS

W	Width of Mixing Zone Perpendicular to Ground Water Flow = (0.175)(L)+(Y)	282.55	m
Am	Cross Sectional Area of Aquifer Mixing Zone = (D)(W)	1292	m^2
As	Surface Area of Mixing Zone = (L)(W)	357708	m^2
Qg	Ground Water Flow Rate = (K)(I)(Am)	0.00	m^3/day
Qr	Recharge Flow Rate = (As)(P/12/365)(V)	6.81	m^3/day
Qe	Effluent Flow Rate = (#I)(Ql)	2	m^3/day

SOLUTION

Nt	**Nitrate (as Nitrogen) Concentration at End of Mixing Zone =((Ng)(Qg)+(Nr)(Qr)+(Ne)(Qe)) / ((Qg)+(Qr)+(Qe))**	**9.99**	**mg/L**

8.0 DISCUSSION OF RESULTS

Based on the information reviewed and the results of the drilling investigation, PMEL is of the opinion that Onsite Wastewater Treatment Systems (OWTS), specifically septic tanks, Type I/II mounds and/or chamber systems, are suitable to treat wastewater at the proposed development. The recommended minimum separation distance required between infiltrative surface of the OWTS (i.e., bottom of dispersal trench, etc.) to the water table is 1.5 meters. Since the depth to the groundwater table ranges from 1.1 to 4.7 metres below grade, some of the proposed OWTS may not be suitable to some lots.

The results of the information reviewed indicated that the site overlies glacial till soils that form a low capacity surficial, unconfined aquifer. It is expected that nitrate released from OWTS at the site will flow horizontally through this shallow unconfined aquifer towards the east-southeast. However, the nitrate concentrations released in this direction are expected to have dissipated prior to reaching any potable groundwater receptors (i.e., wells). In other words, use of OWTS at the proposed development is not likely to present a significant risk to wells located downgradient (i.e., to the east-southeast) of the study site.

The information presented in this Report has been provided to give a general indication of the suitability of the existing soils and groundwater conditions for satisfactorily treating sanitary effluent. It is recommended that further assessments be undertaken for each lot once the lot plan and location of the OWTS have been finalized. Site specific soil samples should be gathered at the proposed septic field locations and design and construction of the septic treatment system should be undertaken by qualified personnel in accordance with Saskatchewan Health specifications and recommendations.

9.0 LIMITATIONS

The presentation of the summary of the field drill logs and design recommendations has been completed as authorized. Sixteen, 150 mm diameter test holes were dry drilled using our continuous flight auger drill rig. Field drill logs were compiled for the Test Holes during test drilling which, we believe, were representative of the subsurface conditions at the Test Hole locations at the time of test drilling.

Variations in the subsurface conditions from that shown on the drill logs at locations other than the exact Test Hole locations should be anticipated. If conditions should differ from those reported here, then we should be notified immediately in order that we may examine the conditions in the field and reassess our recommendations in the light of any new findings.

No identifiable evidence (i.e. odour or visual) of environmentally sensitive materials was detected during the actual time of the field test drilling program. If, on the basis of any knowledge, other than that formally communicated to us, there is reason to suspect that environmentally sensitive materials may exist, then additional test holes should be drilled and samples recovered for chemical analysis.

The subsurface investigation necessitated the drilling of deep test holes. The test holes were backfilled at the completion of test drilling. Please be advised that some settlement of the backfill materials will occur which may leave a depression or an open hole. It is the responsibility of the client to inspect the site and backfill, as required, to ensure that the ground surface at each Test Hole location is maintained level with the existing grade.

This report has been prepared for the exclusive use of Whitewater Holdings Ltd. and their agents for specific application to the proposed Rural Subdivision to be constructed within SE-1/4-24-36-4-W3M near Saskatoon, Saskatchewan. It has been prepared in accordance with generally accepted geotechnical engineering practices and no other warranty, express or implied, is made.

Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Party. Governing Agencies such as municipal, provincial or federal agencies having jurisdiction with respect to this development and/or construction of the facilities described herein have full jurisdiction with respect to the described development. Any other unspecified subsequent development would be considered Third Party and would, therefore, require prior review by PMEL. PMEL accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

The acceptance of responsibility for the design/construction recommendations presented in this report is contingent on adequate and/or full time inspection (as required, based on site conditions at the time of construction) by a representative of the Geotechnical Consultant. PMEL will not accept any responsibility on this project for any unsatisfactory performance if adequate and/or full time inspection is not performed by a representative of PMEL.

If this report has been transmitted electronically, it has been digitally signed and secured with personal passwords to lock the document. Due to the possibility of digital modification, only originally signed reports and those reports sent directly by PMEL can be relied upon without fault.

We trust that this report fulfils your requirements for this project. Should you require additional information, please contact us.

P. MACHIBRODA ENGINEERING LTD.

Kai Runtz, Engineer-In-Training

Ray Machibroda, P. Eng., M. Sc.

KR/RM/ldw

Association of Professional Engineers & Geoscientists of Saskatchewan
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Geotechnical	6687	

14-02-04

10.0 REFERENCES

Acton, D. F., Clayton, J. S., Ellis, J. G., Christiansen, E. A., and Kupsch, W. O. 1960. Physiographic divisions of Saskatchewan. Saskatchewan Research Council, Map No. 1.

Froese, et. al., 2009 On-Site Wastewater Treatment Systems in Subdivisions. Project No. SH/SWA H01-2009 Final Report, September 29, 2009.

Health Canada, 2012. Guidelines for Canadian Drinking Water Quality Summary Table. Http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/2012-sum_guide-res_recom/2012-sum_guide-res_recom-eng.pdf. Cited, October 28, 2013

Hyder, Z., J.J. Butler, Jr., C.D. McElwee and W. Liu, 1994. Slug tests in partially penetrating wells, Water Resources Research, vol. 30, no. 11, pp. 2945-2957.

Maathius, H., 1992. Quaternary Aquifers and Aquitards, 2009 in Notes for One Day Seminar, Engineering Geology of Glacial Deposits, December 10, 1992, University of Saskatchewan, Saskatoon Saskatchewan, Sponsored by Saskatoon Geotechnical Group, Saskatchewan Research Council and Department of Civil Engineering, University of Saskatchewan.

MDH (MDH Engineered Solutions), 2011. Hydrogeology Mapping of NTS Mapsheet Saskatoon 73B. Prepared for Saskatchewan Watershed Authority. M1890-1030109, April, 2011.

MDEQ (Montana Department of Environmental Quality). 2005. How to perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems (SWTS), 2005.

Saskatchewan Ministry of Health. 2009. Saskatchewan Onsite Wastewater Disposal Guide, 169 pp

Simpson, M. A., 1998. Geology and Hydrostratigraphy of the Rosetown Area (72O), Saskatchewan, Saskatchewan Research Council Report No. 10416-2C98.

Taylor, J. 2003., Evaluating Groundwater Nitrates from On-Lot Septic Systems, a Guidance Model for Land Planning in Pennsylvania. http://www.taylorgeoservices.com/papers/nitratereport.PDF. Cited January 7, 2014.

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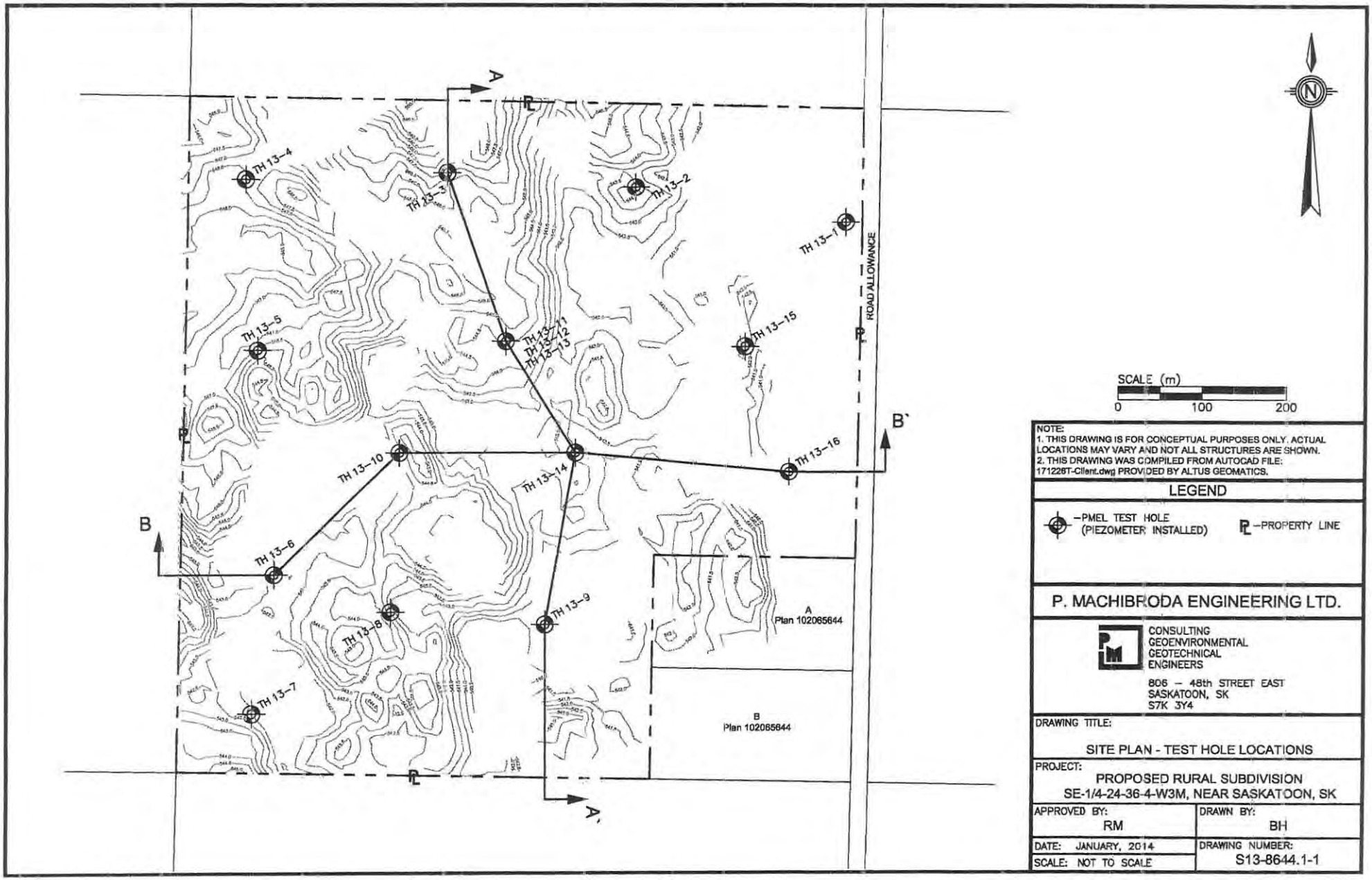
DRAWINGS



NOTE:
1. THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.
2. THIS DRAWING WAS COMPILED FROM AUTOCAD FILE: 171226T-Client.dwg PROVIDED BY ALTUS GEOMATICS.

LEGEND

⊕ –PMEL TEST HOLE (PIEZOMETER INSTALLED)

PL –PROPERTY LINE

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DRAWING TITLE:
SITE PLAN - TEST HOLE LOCATIONS

PROJECT:
PROPOSED RURAL SUBDIVISION
SE-1/4-24-36-4-W3M, NEAR SASKATOON, SK

APPROVED BY:	DRAWN BY:
RM	BH
DATE: JANUARY, 2014	DRAWING NUMBER: S13-8644.1-1
SCALE: NOT TO SCALE	

PIEZO. ELEV.= 541.5 m

TEST HOLE 13-1

ELEV: 540.5 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w	
0		pp					**TOPSOIL,** organic, moist, black, rootlets, frozen.
				13	20	17.4	
		BENTONITE SEAL				9.8	**CLAY,** silty, trace sand, firm, low plastic, moist, brown.
							–P200 = 70.7% at 300 mm.
1						19.2	**SAND,** silty, trace clay, some gravel, compact, well graded, fine to coarse grained, moist, brown.
							–wet, seepage, sloughing at 1.0 m.
2							**GLACIAL TILL,** clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, oxide stained, gypsum crystals.
	11			23.0		14.3	
						13.4	
3		0.75					–stiff below 3.1 m.
		50 mm diam. SCH 40, PVC RISER PIPE					
4							
						12.4	
		1.5					–stiff to very stiff, mottled brown/grey below 4.6 m.
5		CUTTINGS					
						11.8	
6		2.0					–grey below 6.1 m.
7							
						11.7	
		2.0 SAND PACKED ANNULUS					
8		50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN					
9		SLOUGH					
	23			22.3		11.8	–SO_4 = 0.047% at 9.4 m.
10							
11							

537.7 m DEC 12/13

NOTE:
1. Test Hole sloughed to 8.5 m I.A.D.

LEGEND:

TOPSOIL, FILL, GRAVEL, SAND, SILT, CLAY, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773813 **EASTING:** 401881

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-2

PIEZO. ELEV.= 544.8 m

TEST HOLE 13-2

ELEV: 543.8 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0		PP				11.4
		BENTONITE SEAL			13	21	9.1
		50 mm diam. SCH 40 PVC RISER PIPE					10.6
1						
2		SAND PACKED ANNULUS					16.2
		50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN					11.9
3	DRY DEC 12/13					

TOPSOIL, organic, moist, black, rootlets, frozen.

SILT AND SAND, some sand, some clay, firm, low plastic, moist, brown.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

4
5
6
7
8
9
10
11

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

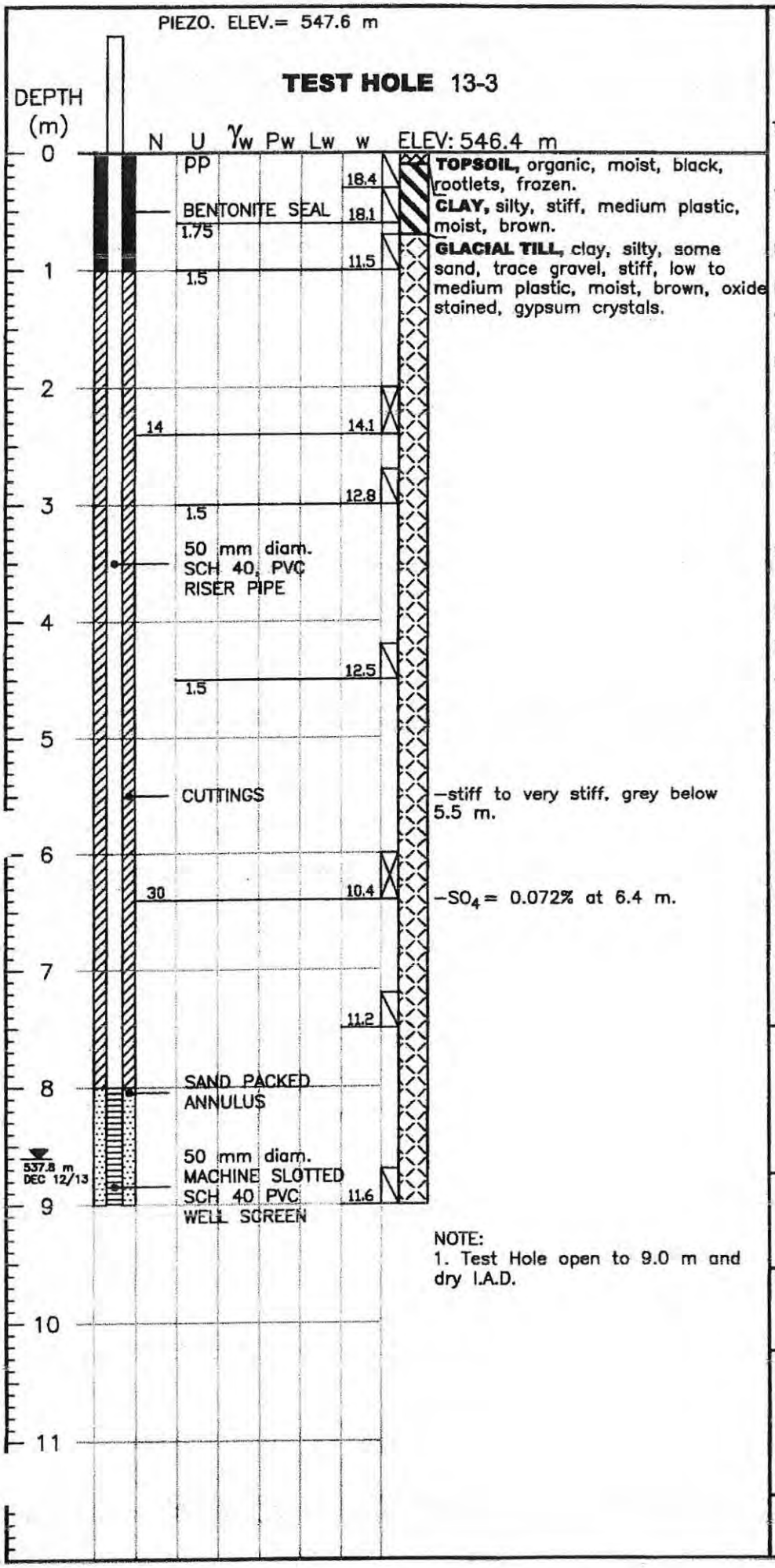
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773854 **EASTING:** 401630

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-3



LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773871 **EASTING:** 401405

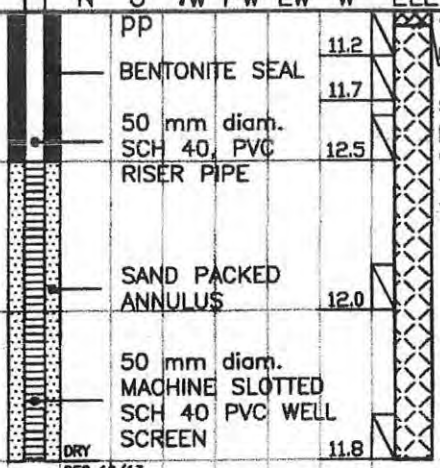
DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-4

PIEZO. ELEV.= 547.4 m

TEST HOLE 13-4

ELEV: 546.4 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0	PP					11.2
						11.7
1						12.5
2						12.0
3						11.8



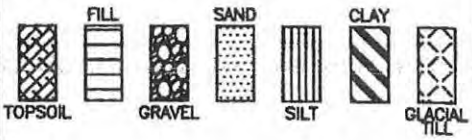
TOPSOIL, organic, moist, black, rootlets, frozen.

GLACIAL TILL, clay, silty, some sand, trace gravel, low to medium plastic, moist, brown, oxide stained, gypsum crystals.
–frozen to 300 mm.
–stiff below 300 mm.

$-SO_4$ = 0.067% at 3.0 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE | SPLIT SPOON | CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773863 **EASTING:** 401166

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-5

PIEZO. ELEV.= 547.3 m

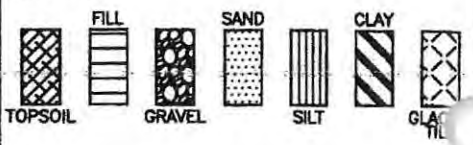
TEST HOLE 13-5

ELEV: 546.3 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w	
0		pp				11.0	**TOPSOIL,** organic, moist, black, rootlets, frozen.
		BENTONITE SEAL				10.6	**GLACIAL TILL,** clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown, oxide stained, gypsum crystals.
1						11.0	
2	12		21.9			12.5	–firm below 2.5 m.
3		0.75				14.5	
		50 mm diam. SCH 40 PVC RISER PIPE					
4						15.9	
		0.75					
		541.8 m DEC 12/13					
5		CUTTINGS					–stiff, grey below 5.5 m.
6	22		22.2			9.6	
7						12.4	
		SAND PACKED ANNULUS					
8		50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN					
		SLOUGH				11.6	
9							
10							
11							

NOTE:
1. Test Hole sloughed to 8.8 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE | SPLIT SPOON | CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773659 **EASTING:** 401180

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-6

PIEZO. ELEV.= 543.7 m

TEST HOLE 13-6

ELEV: 542.6 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0		PP				17.4
						14.9
1						11.8
2						14.4
3						13.6

BENTONITE SEAL

50 mm diam. SCH 40 PVC RISER PIPE

50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN

SAND PACKED ANNULUS

640.9 m DEC 12/13

TOPSOIL, organic, moist, black, rootlets, frozen.

SILT AND SAND, some clay, firm, low plastic, moist, brown.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown, oxide stained, gypsum crystals.

–soft below 1.6 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:

TOPSOIL, FILL, GRAVEL, SAND, SILT, CLAY, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

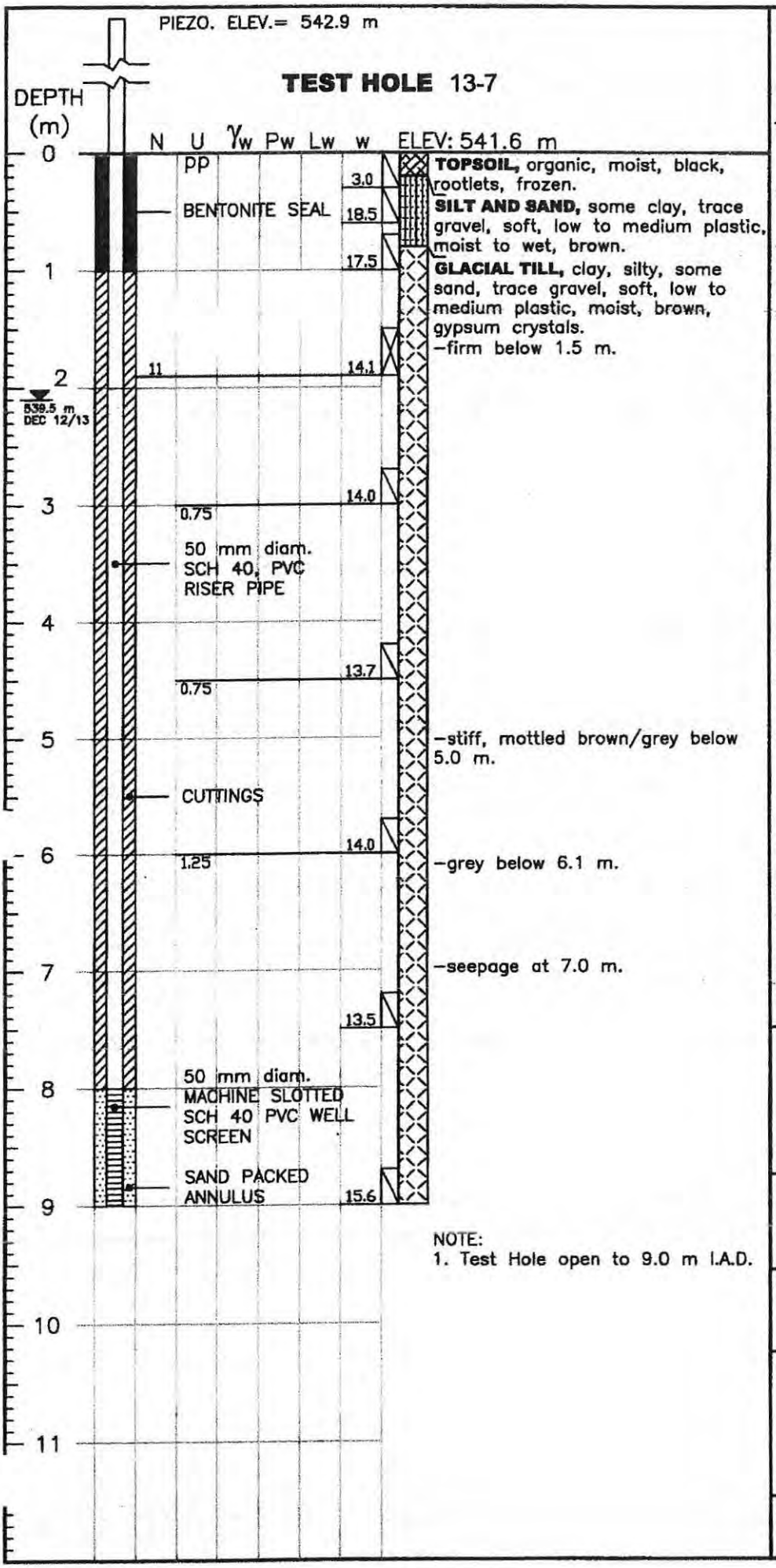
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773392 **EASTING:** 401200

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-7



NOTE:
1. Test Hole open to 9.0 m I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773227 **EASTING:** 401174

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644.1-8

PIEZO. ELEV.= 544.0 m

TEST HOLE 13-8

ELEV: 543.0 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0		pp				17.2
				16	37	18.1
1						13.1
2						12.1
3						12.9

BENTONITE SEAL

50 mm diam. SCH 40 PVC RISER PIPE

SAND PACKED ANNULUS

50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN

DRY DEC 12/13

TOPSOIL, organic, moist, black, rootlets, frozen.

CLAY, silty, medium plastic, moist, brown.
—frozen to 300 mm.
—stiff below 300 mm.

GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, brown.

NOTE:
1. Test Hole open to 3.0 m I.A.D.

LEGEND:

TOPSOIL, FILL, GRAVEL, SAND, SILT, CLAY, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

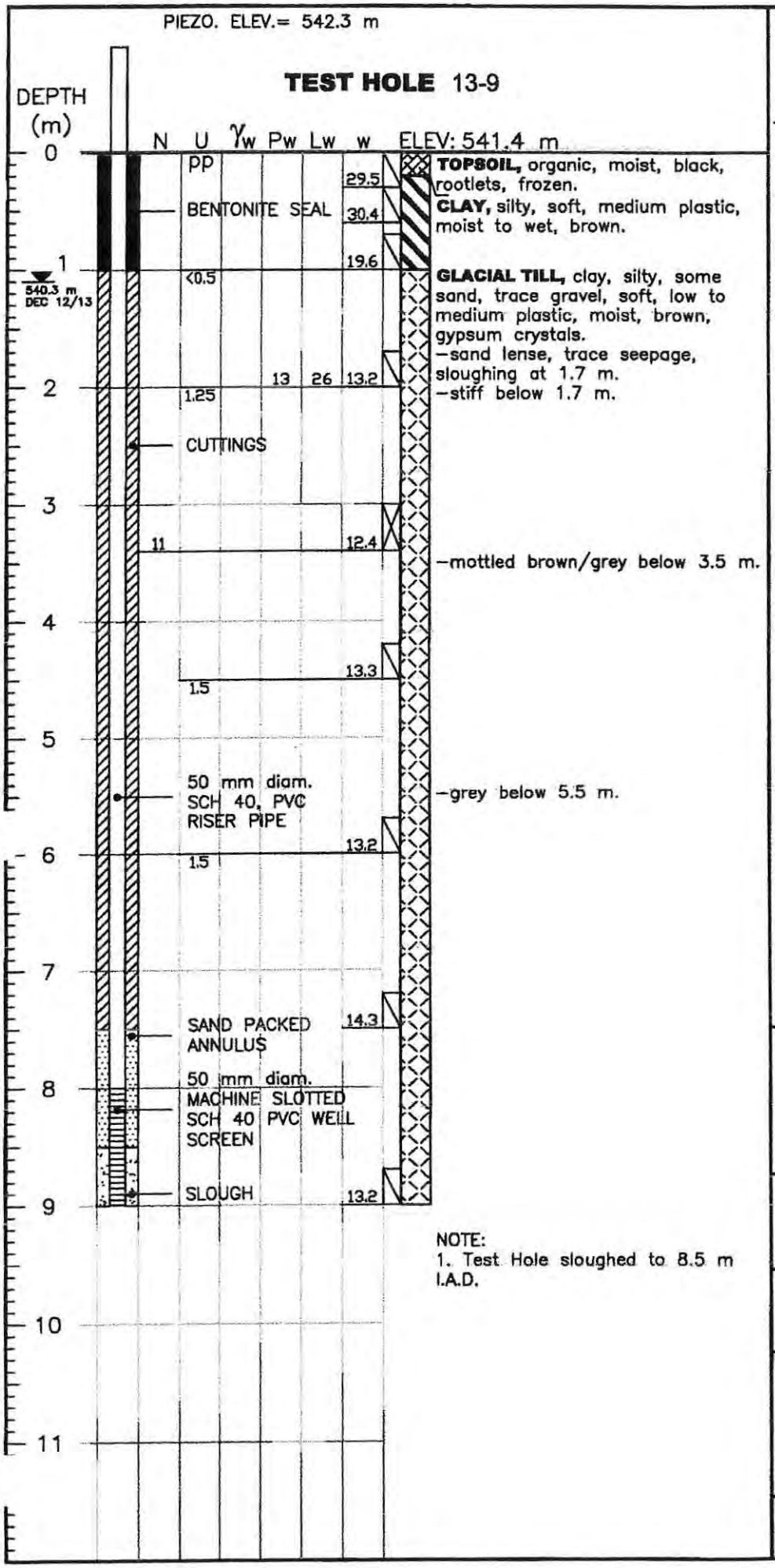
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773348 **EASTING:** 401338

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-9



NOTE:
1. Test Hole sloughed to 8.5 m I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLAC TIL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

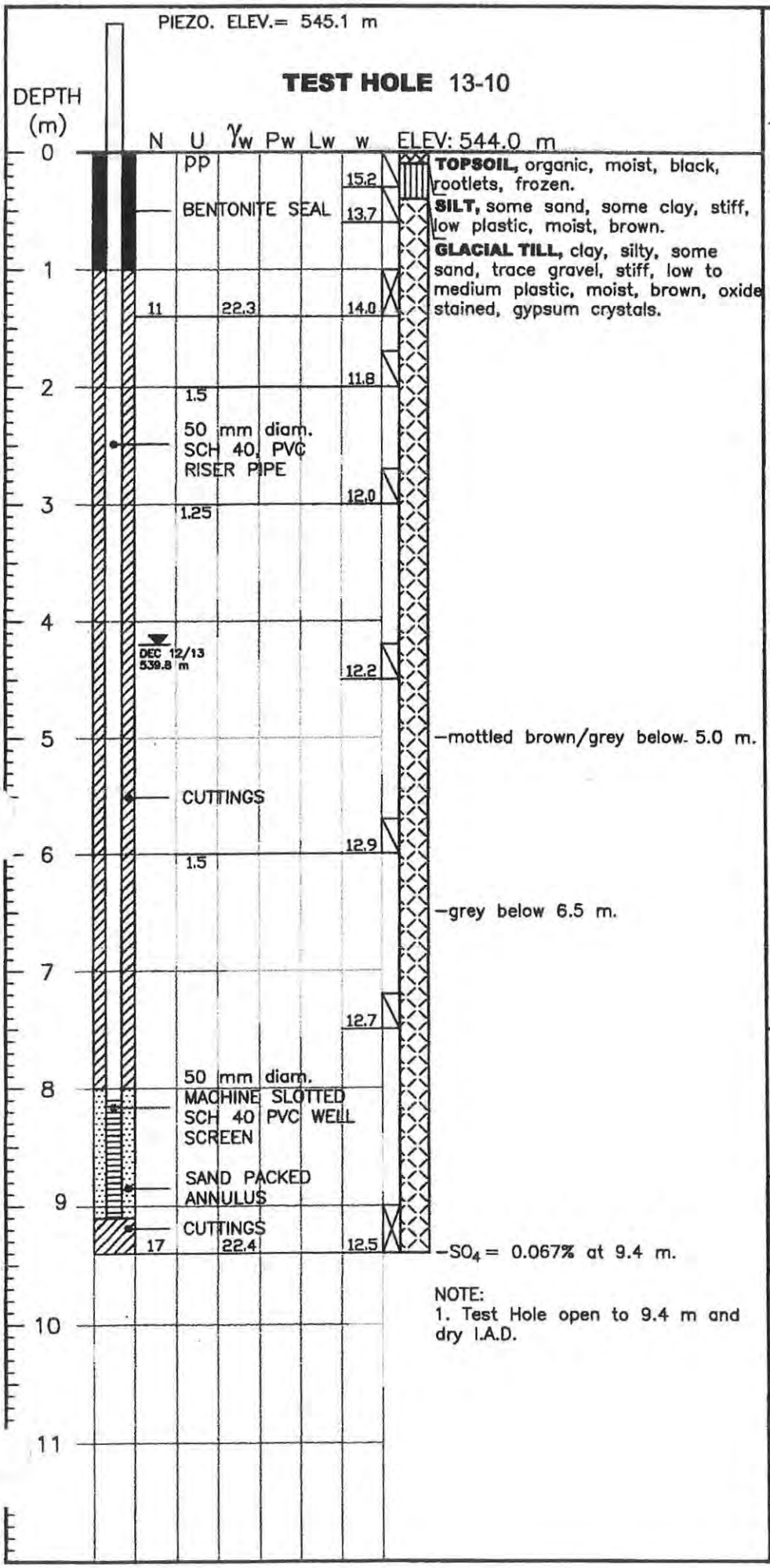
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

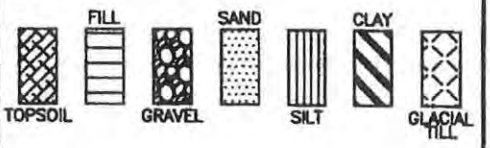
NORTHING: 5773333 **EASTING:** 401522

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644.1-10



NOTE:
1. Test Hole open to 9.4 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773537 **EASTING:** 401348

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644.1-11

PIEZO. ELEV.= 545.5 m

TEST HOLE 13-11

ELEV: 544.5 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0		pp				

TOPSOIL, organic, moist, black, rootlets, frozen.

SILT, sandy, trace clay, low plastic, moist, brown, frozen.

GLACIAL TILL, clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, gypsum crystals.

–firm to stiff below 1.0 m.

BENTONITE SEAL

–stiff below 3.1 m.

50 mm diam. SCH 40, PVC RISER PIPE

–grey below 5.5 m.

–oxide stained to 8.0 m.

SAND PACKED ANNULUS

50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN

DRY DEC 12/13

NOTE:
1. Test Hole sloughed to 10.1 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773567O **EASTING:** 401474

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-12

PIEZO. ELEV.= 545.5 m

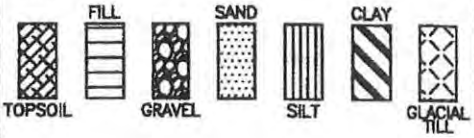
TEST HOLE 13-12

ELEV: 544.5 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w	
0	PP			14	22	10.1	**TOPSOIL,** organic, moist, black, rootlets, frozen.
	BENTONITE SEAL					15.9	**SILT,** sandy, trace clay, low plastic, moist, brown, frozen.
0.75						14.5	**GLACIAL TILL,** clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, gypsum crystals. –firm to stiff below 1.0 m.
1.0						11.5	
1.0						12.1	
1.0							–stiff below 3.1 m.
						11.9	
1.5							
	50 mm diam. SCH 40, PVC RISER PIPE						–grey below 5.5 m.
						12.7	
1.75							
	CUTTINGS						
						12.2	
1.75							
							–oxide stained to 8.0 m.
						12.3	
1.5							
						11.5	
1.5							
	BENTONITE SEAL						
				12	28	12.4	
2.0							

CONTINUED ON NEXT PAGE

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

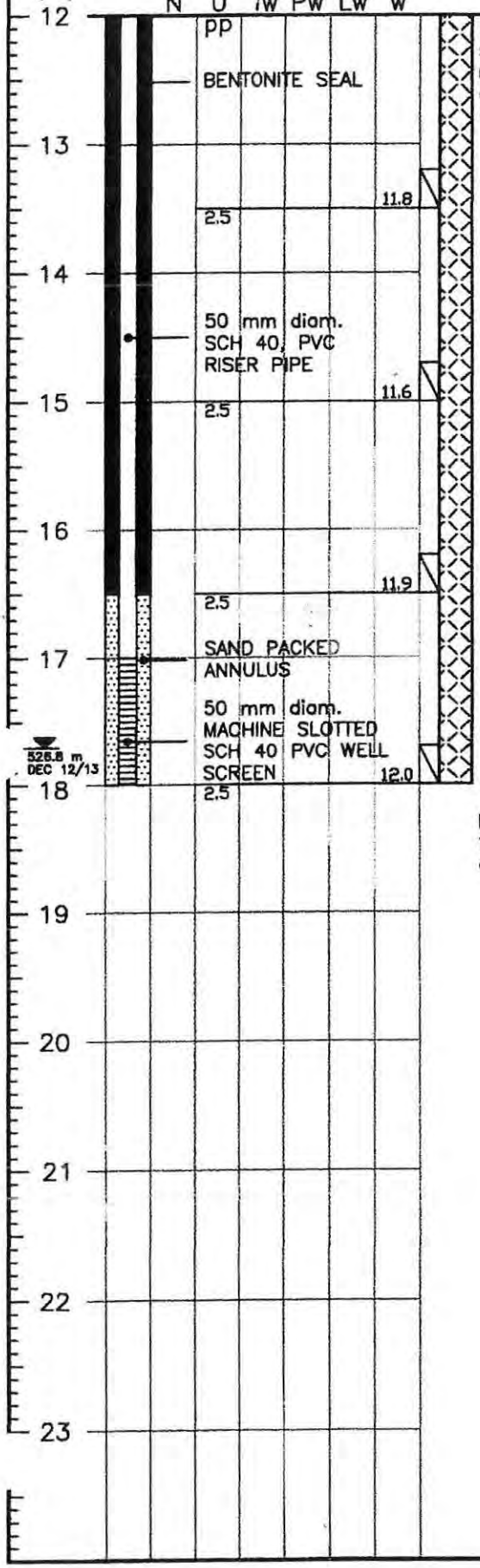
LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

DATE DRILLED:	**DRAWING NUMBER:**
NOV 27/13	S13-8644.1-13

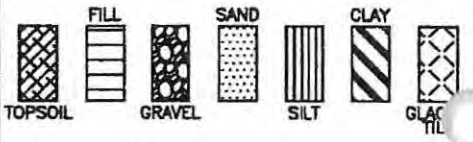
TEST HOLE 13-12



GLACIAL TILL, clay, silty, some sand, trace gravel, stiff, low to medium plastic, moist, grey, gypsum crystals.
–very stiff below 12.1 m.

NOTE:
1. Test Hole open to 18.0 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m^3)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm^2)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

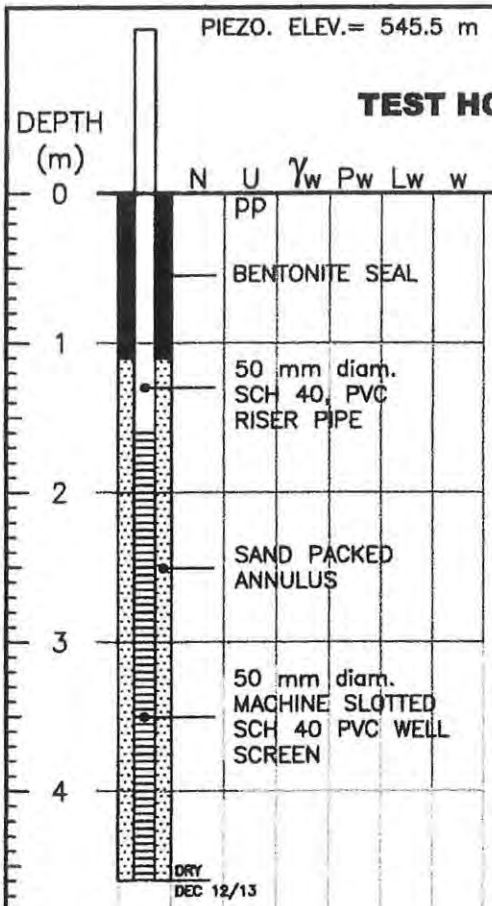
DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-13A

PIEZO. ELEV.= 545.5 m

TEST HOLE 13-13

ELEV: 544.5 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w
0	PP					



TOPSOIL, organic, moist, black, rootlets, frozen.

SILT, sandy, trace clay, low plastic, moist, brown, frozen.

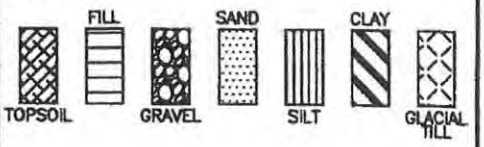
GLACIAL TILL, clay, silty, some sand, trace gravel, firm, low to medium plastic, moist, brown, gypsum crystals.

–firm to stiff below 1.0 m.

–stiff below 3.1 m.

NOTE:
1. Test Hole open to 4.6 m and dry I.A.D.

LEGEND:



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 57735670 **EASTING:** 401474

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-14

PIEZO. ELEV.= 543.2 m

TEST HOLE 13-14

ELEV: 542.3 m

DEPTH (m)	N	U	γ_w	Pw	Lw	w	
0		PP				11.3	**TOPSOIL,** organic, moist, black, rootlets, frozen.
				12	28	14.1	**GLACIAL TILL,** clay, silty, some sand, trace gravel, low to medium plastic, moist, brown, oxide stained.
1						13.0	–frozen to 300 mm. –stiff below 300 mm.
2						14.9	–soft below 2.0 m.
3						14.9	–firm below 3.1 m.
4						13.6	
5							
6						12.8	
7							
8							
9							
10							
11							

BENTONITE SEAL

50 mm diam. SCH 40, PVC RISER PIPE

CUTTINGS

539.6 m DEC 12/13

SAND PACKED ANNULUS

50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN

NOTE:
1. Test Hole open to 6.0 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY

TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4 .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

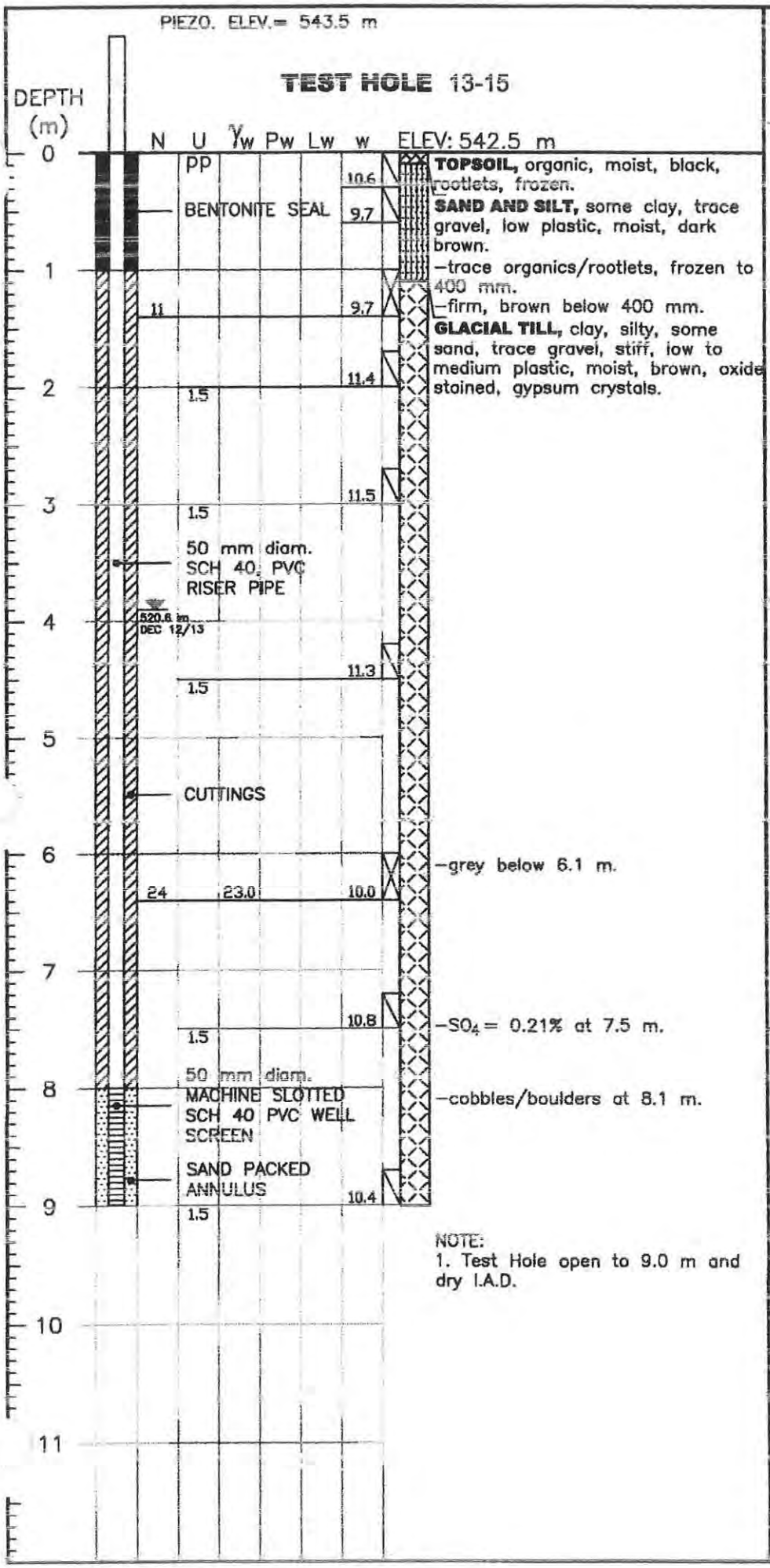
PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773537 **EASTING:** 401558

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-15



LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773664 **EASTING:** 401761

DATE DRILLED:	DRAWING NUMBER:
NOV 27/13	S13-8644.1-16

PIEZO. ELEV.= 540.9 m

TEST HOLE 13-16

ELEV: 539.8 m

N U γ_w Pw Lw w

DEPTH (m)

0 1 2 3 4 5 6 7 8 9 10 11

PP

BENTONITE SEAL

50 mm diam. SCH 40 PVC RISER PIPE

538.4 m DEC 12/13

SAND PACKED ANNULUS

50 mm diam. MACHINE SLOTTED SCH 40 PVC WELL SCREEN

15.5 18.0 14.7 13.7 12.7

TOPSOIL, organic, moist, black, rootlets, frozen.

GLACIAL TILL, clay, silty, some sand, some gravel, soft, low to medium plastic, moist to wet, brown, gypsum crystals.

–firm to stiff, moist below 1.6 m.

NOTE:
1. Test Hole open to 3.0 m and dry I.A.D.

LEGEND:

FILL, SAND, CLAY, TOPSOIL, GRAVEL, SILT, GLACIAL TILL

w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

γ_w...WET UNIT WEIGHT (kN/m³)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm²)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO_4.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)

SHELBY TUBE, SPLIT SPOON, CUTTINGS

LIMITATIONS: THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

P. MACHIBRODA ENGINEERING LTD.

FIELD DRILL LOG AND SOIL TEST RESULTS

PROJECT:

PROPOSED RURAL SUBDIVISION

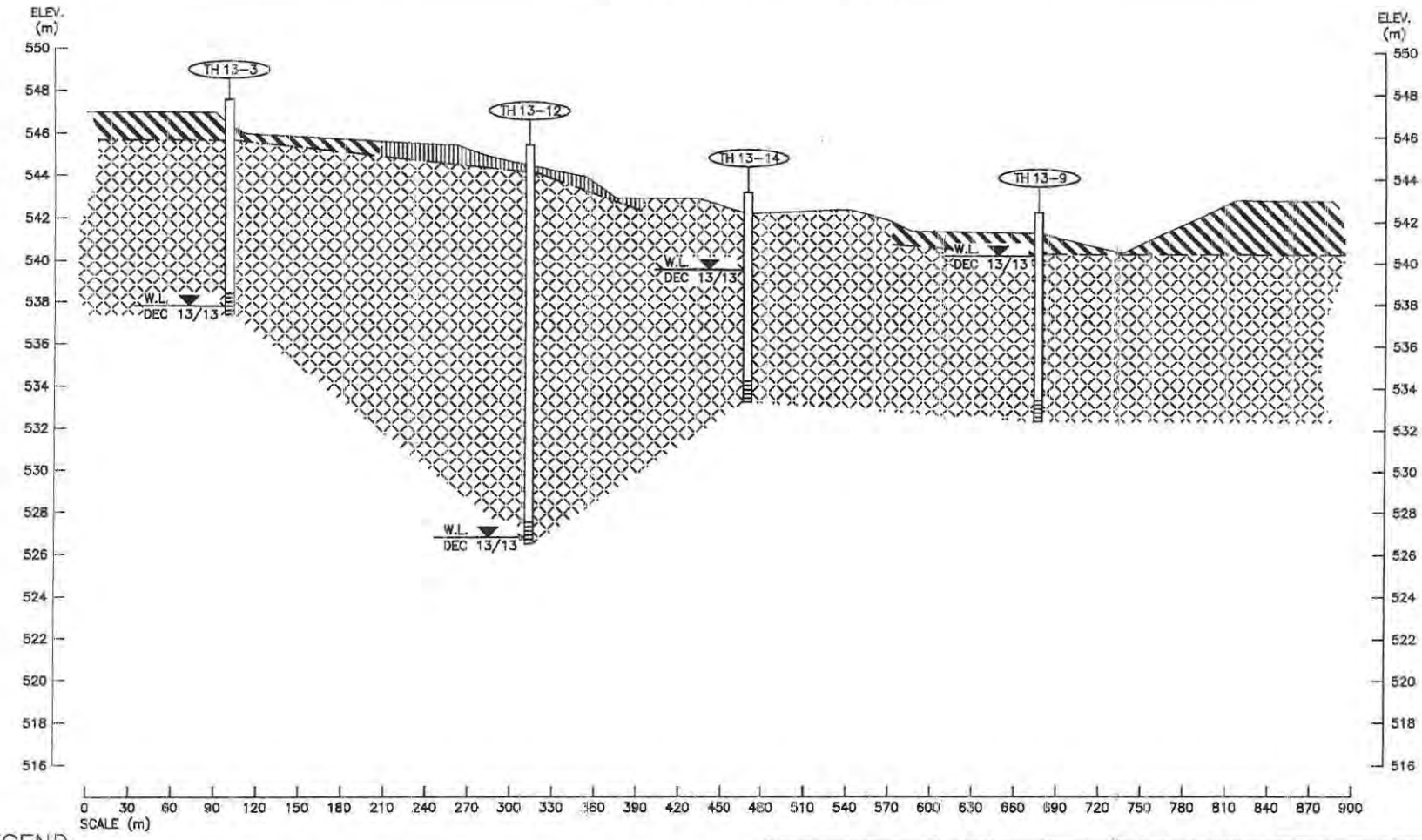
LOCATION:

SE-1/4-24-36-4-W3M,
NEAR SASKATOON, SK

NORTHING: 5773514 **EASTING:** 401813

DATE DRILLED:	DRAWING NUMBER:
NOV 26/13	S13-8644.1-17

STRATIGRAPHIC SECTION A–A'



LEGEND

TOPSOIL
SAND
GLACIAL TILL
FILL
SILT
W.L. DEC 13/13 RECORDED WATER LEVEL
GRAVEL
CLAY

LIMITATIONS

THIS STRATIGRAPHIC SECTION IS A SUMMARY OF SUBSURFACE FIELD CONDITIONS INFERRED FROM DATA ENCOUNTERED AT SPECIFIC TEST HOLE LOCATIONS AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS AND, IN TIME, MAY CHANGE AT THE SPECIFIC LOCATION OF ANY TEST HOLE.

P. MACHIBRODA ENGINEERING LTD.

CONSULTING
GEOENVIRONMENTAL
GEOTECHNICAL
ENGINEERS

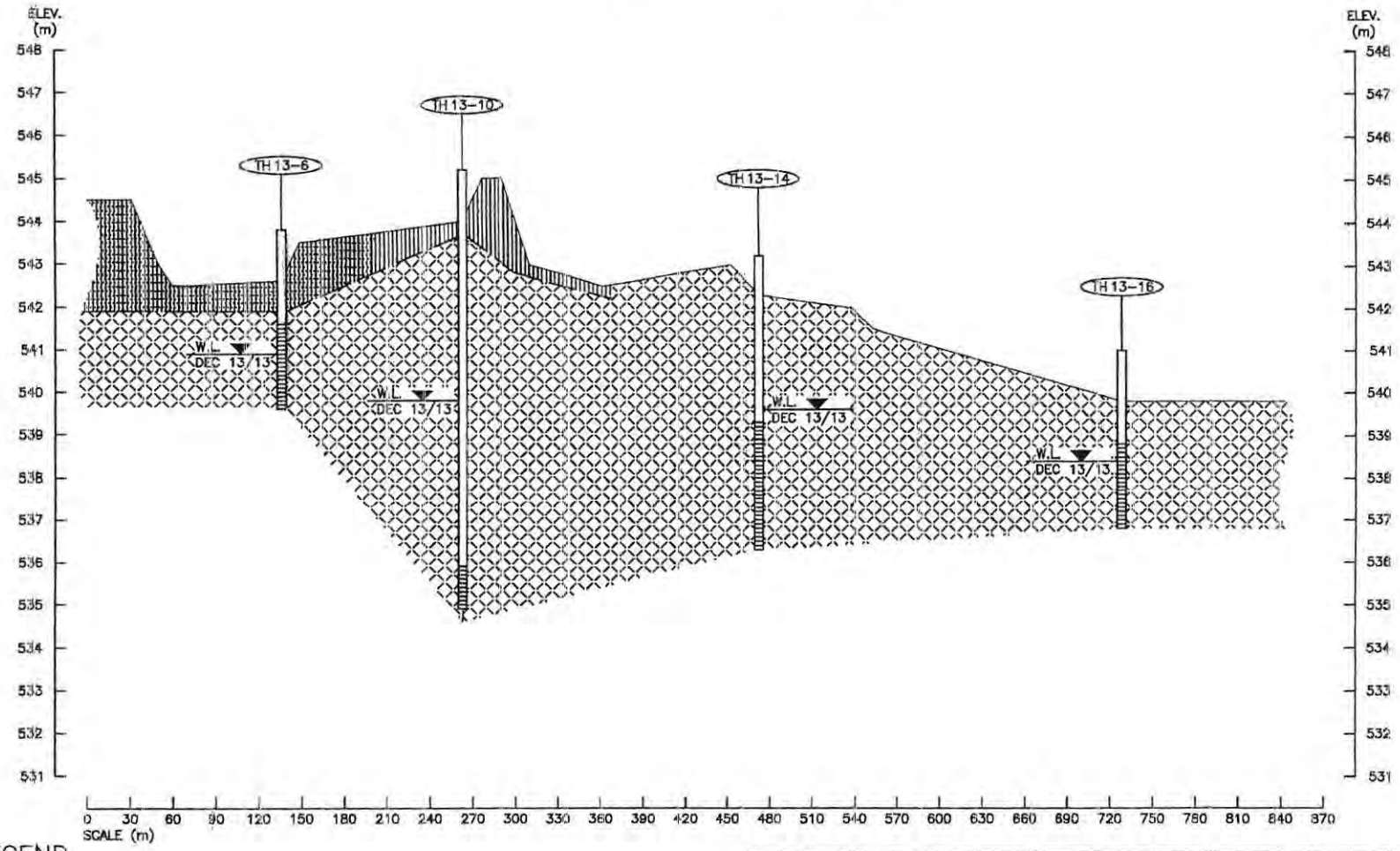
806 – 48th STREET EAST
SASKATOON, SK
S7K 3Y4

DRAWING TITLE: STRATIGRAPHIC SECTION A - A'

PROJECT: PROPOSED RURAL SUBDIVISION
SE-1/4-24-36-4-W3M, NEAR SASKATOON, SK

APPROVED BY:	DRAWN BY:
RM	BH
DATE: JANUARY, 2014	DRAWING NUMBER:
SCALE: AS SHOWN	S13-8644.1-18

STRATIGRAPHIC SECTION B-B'



LEGEND

- TOPSOIL
- FILL
- GRAVEL
- SAND
- SILT
- CLAY
- GLACIAL TILL
- W.L. JAN XX/10 — RECORDED WATER LEVEL

LIMITATIONS

THIS STRATIGRAPHIC SECTION IS A SUMMARY OF SUBSURFACE FIELD CONDITIONS INFERRED FROM DATA ENCOUNTERED AT SPECIFIC TEST HOLE LOCATIONS AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS AND, IN TIME, MAY CHANGE AT THE SPECIFIC LOCATION OF ANY TEST HOLE.

P. MACHIBRODA ENGINEERING LTD.

CONSULTING
GEOENVIRONMENTAL
GEOTECHNICAL
ENGINEERS

806 – 48th STREET EAST
SASKATOON, SK
S7K 3Y4

DRAWING TITLE: STRATIGRAPHIC SECTION B - B'

PROJECT: PROPOSED RURAL SUBDIVISION
SE-1/4-24-36-4-W3M, NEAR SASKATOON, SK

APPROVED BY:	DRAWN BY:
RM	BH
DATE: JANUARY, 2014	DRAWING NUMBER: S13-8644.1-19
SCALE: AS SHOWN	

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-1

Sample No.: 43

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	96
3/4"	19.1	91
3/8"	9.5	89
# 4	4.75	85
# 10	2.00	79
# 20	0.850	71
# 40	0.425	62.4
# 60	0.250	50.8
# 100	0.150	34.0
# 200	0.075	22.5

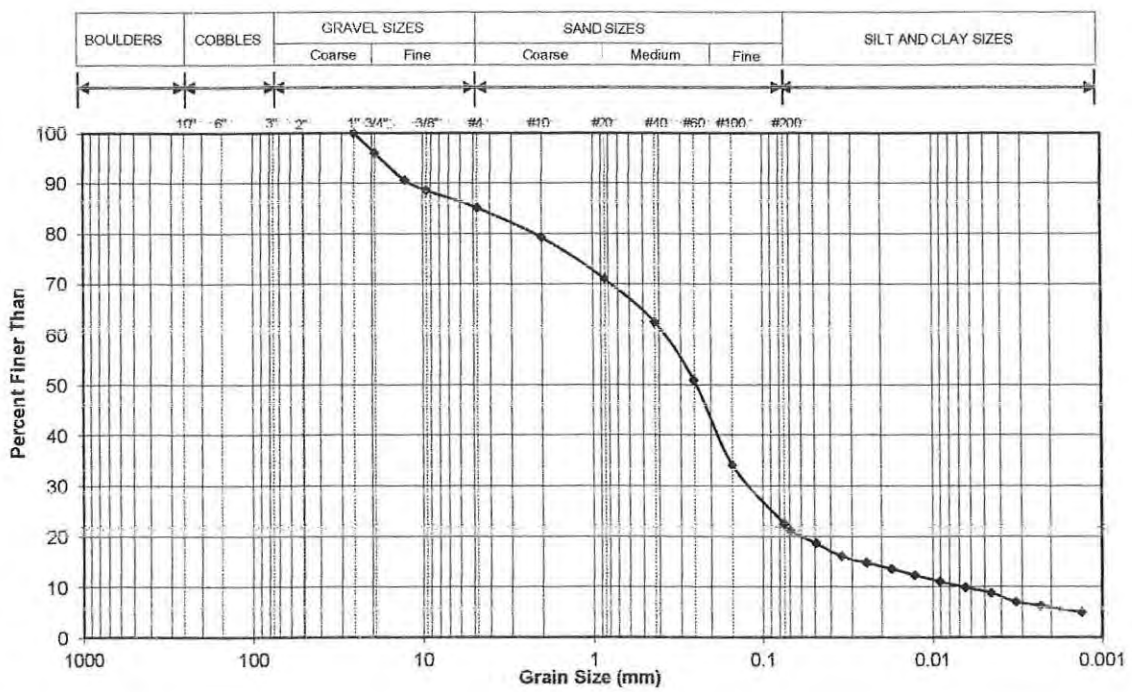
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0691	21.0
Sodium Hexametaphosphate	0.0488	18.6
	0.0345	16.1
	0.0245	14.8
	0.0174	13.6
	0.0128	12.4
	0.0091	11.1
	0.0064	9.9
	0.0046	8.8
	0.0032	7.0
	0.0023	6.3
	0.0013	4.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
15	63	16	6

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-20

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-2

Sample No.: 13

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	94
# 40	0.425	89.2
# 60	0.250	81.3
# 100	0.150	70.1
# 200	0.075	56.3

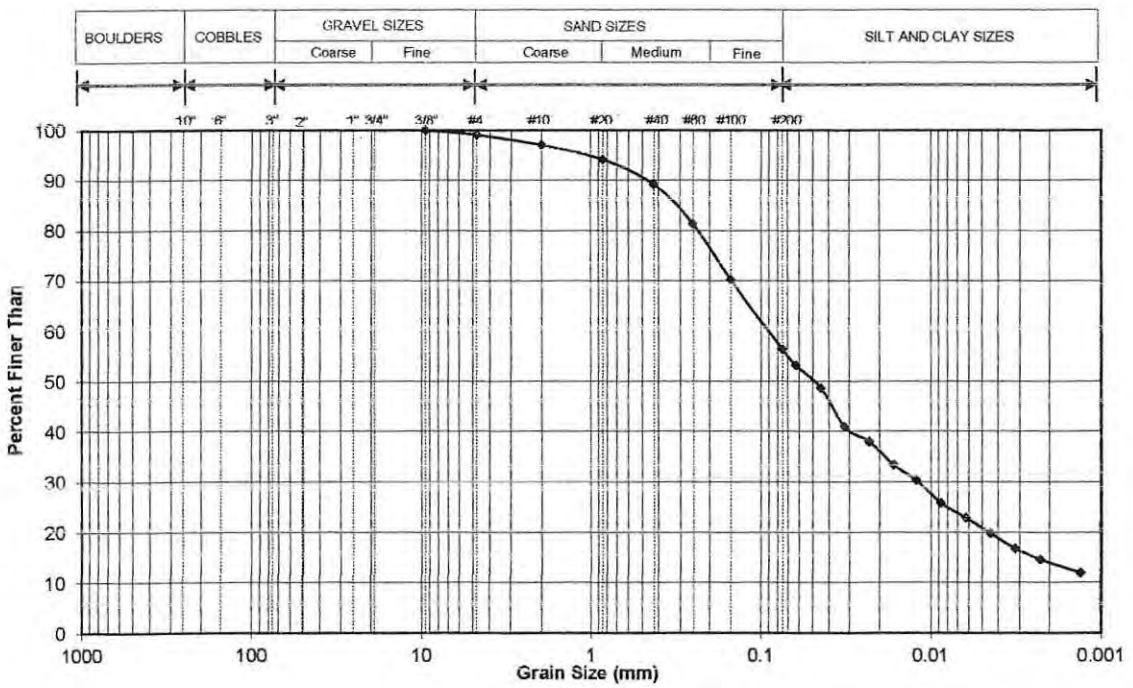
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0625	53.1
Sodium Hexametaphosphate	0.0445	48.6
	0.0320	40.9
	0.0229	37.9
	0.0165	33.3
	0.0121	30.3
	0.0087	25.8
	0.0062	22.9
	0.0044	19.8
	0.0032	16.7
	0.0023	14.6
	0.0013	11.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	42	42	15

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-21

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-3

Sample No.: 66

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	100
# 10	2.00	100
# 20	0.850	100
# 40	0.425	99.4
# 60	0.250	97.8
# 100	0.150	96.8
# 200	0.075	94.8

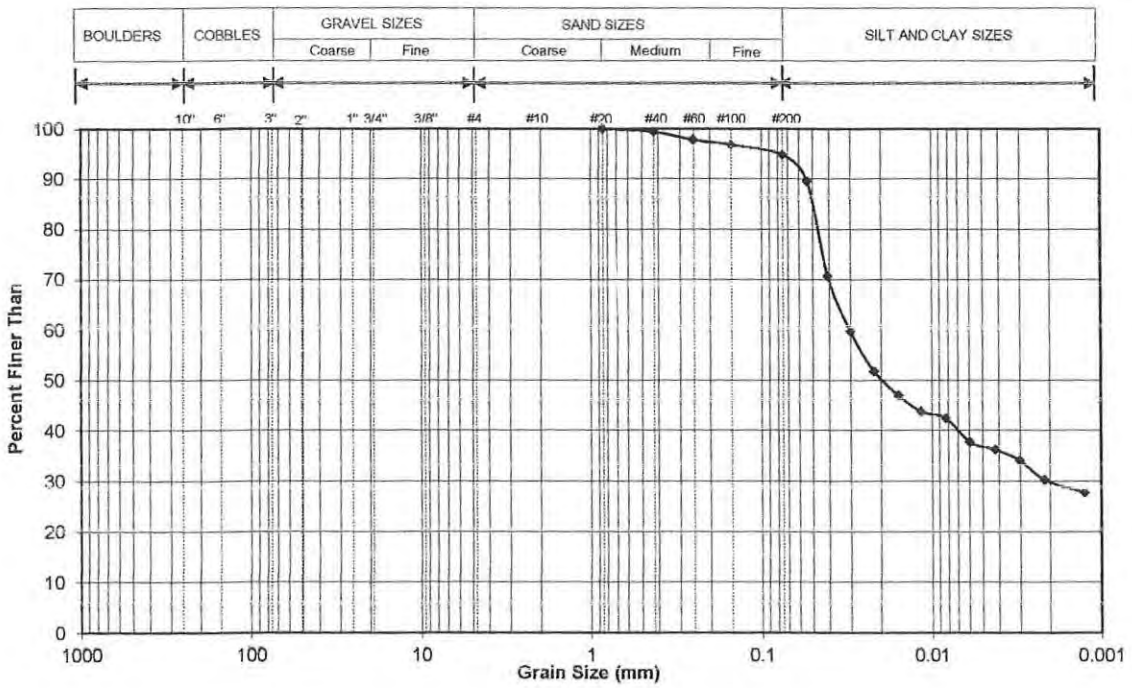
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0535	89.5
Sodium Hexametaphosphate	0.0409	70.6
	0.0299	59.6
	0.0218	51.7
	0.0157	46.9
	0.0116	43.8
	0.0082	42.4
	0.0059	37.7
	0.0042	36.2
	0.0030	34.0
	0.0021	30.2
	0.0013	27.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
0	5	65	30

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-22

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-4

Sample No.: 9

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	99
# 4	4.75	95
# 10	2.00	83
# 20	0.850	79
# 40	0.425	72.8
# 60	0.250	65.7
# 100	0.150	58.1
# 200	0.075	49.0

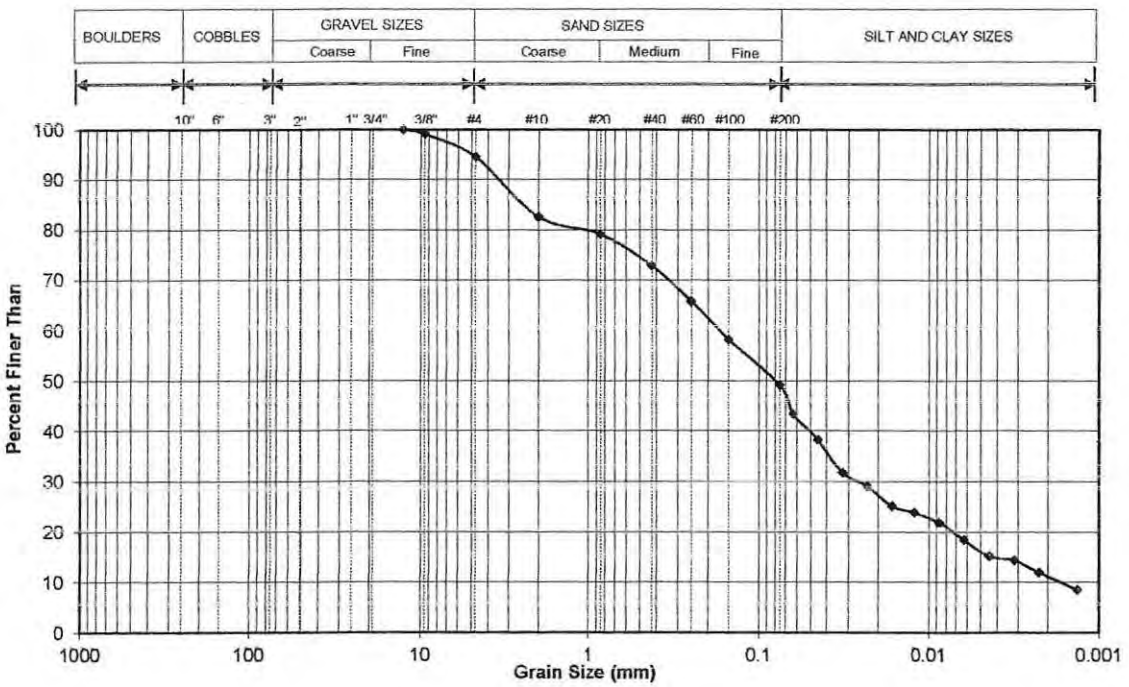
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0629	43.4
Sodium Hexametaphosphate	0.0449	38.2
	0.0323	31.7
	0.0231	29.0
	0.0166	25.1
	0.0122	23.8
	0.0087	21.8
	0.0062	18.4
	0.0045	15.2
	0.0031	14.4
	0.0023	12.0
	0.0013	8.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
5	46	37	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-23

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-5

Sample No.: 86

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	97
# 10	2.00	94
# 20	0.850	87
# 40	0.425	80.4
# 60	0.250	74.1
# 100	0.150	65.4
# 200	0.075	54.1

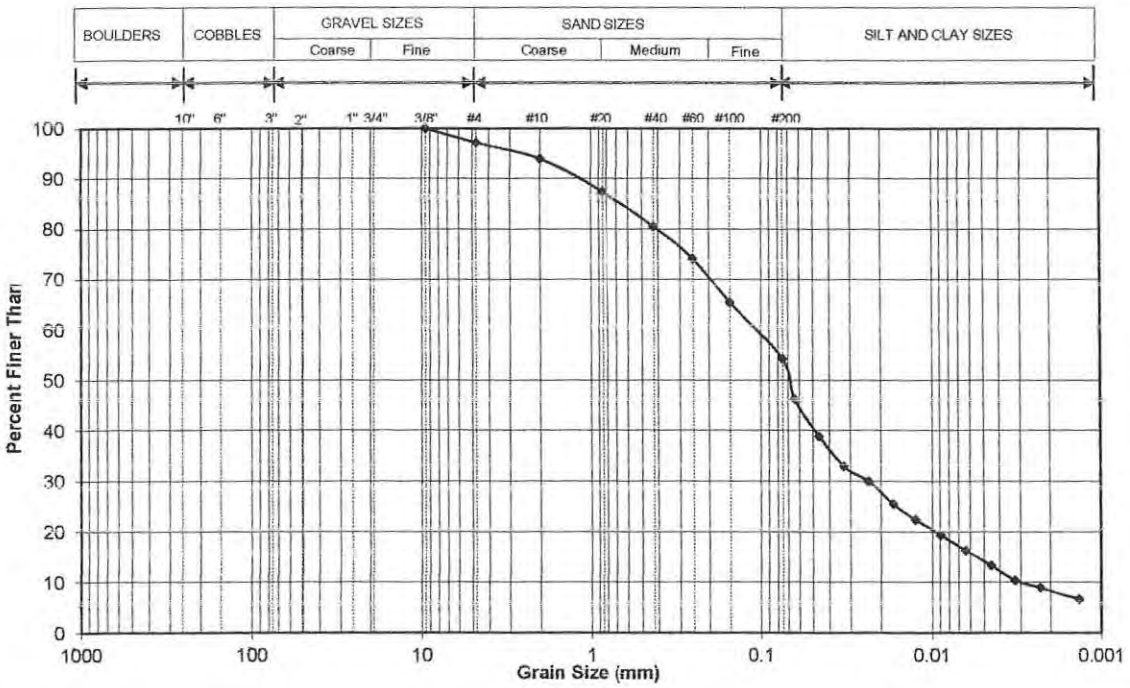
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0638	46.2
Sodium Hexametaphosphate	0.0458	38.8
	0.0327	32.9
	0.0234	29.9
	0.0168	25.4
	0.0124	22.4
	0.0089	19.3
	0.0063	16.3
	0.0045	13.4
	0.0032	10.4
	0.0023	8.9
	0.0014	6.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
3	43	45	9

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-24

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-6

Sample No.: 23

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	94
# 40	0.425	90.4
# 60	0.250	81.1
# 100	0.150	75.1
# 200	0.075	66.1

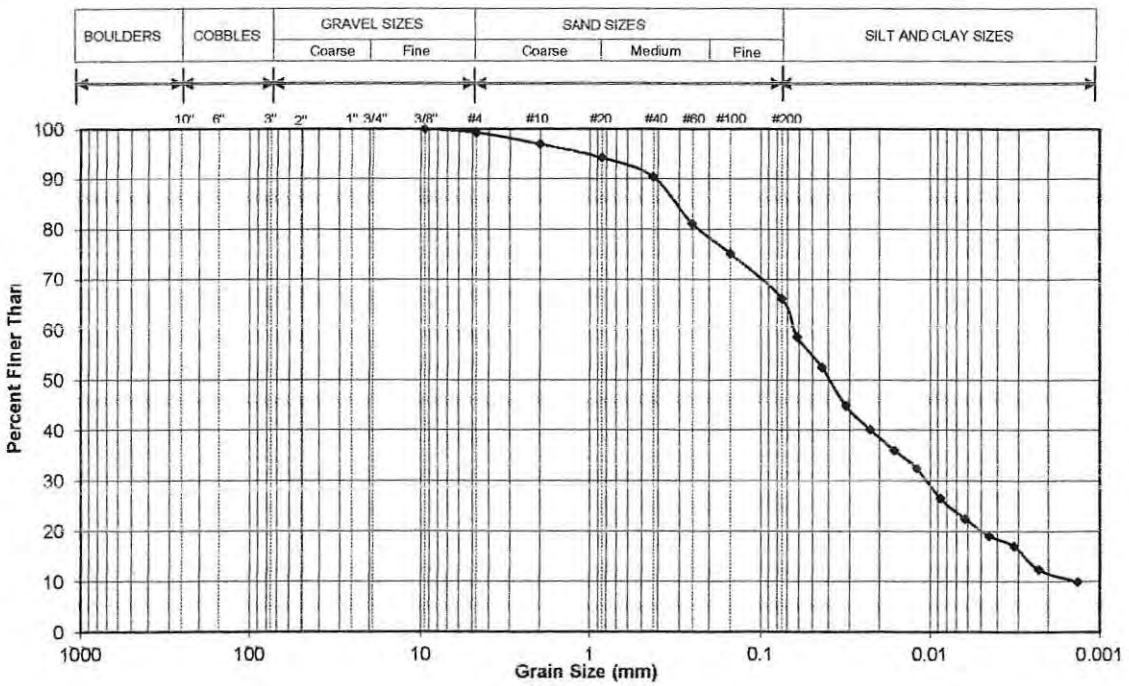
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0611	58.5
Sodium Hexametaphosphate	0.0437	52.5
	0.0314	44.8
	0.0226	40.1
	0.0163	36.0
	0.0120	32.4
	0.0087	26.5
	0.0062	22.4
	0.0044	19.1
	0.0032	17.0
	0.0023	12.4
	0.0013	10.0

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	33	54	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-25

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-7

Sample No.: 94

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	94
# 10	2.00	92
# 20	0.850	88
# 40	0.425	82.5
# 60	0.250	76.1
# 100	0.150	69.8
# 200	0.075	62.2

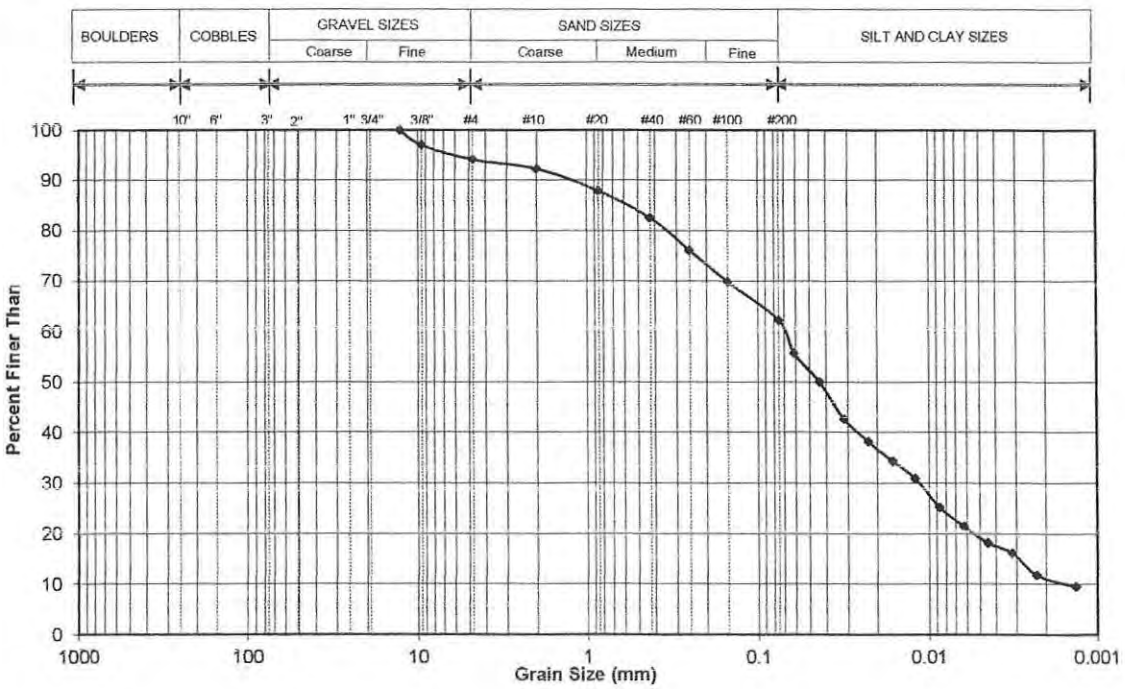
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0611	55.7
Sodium Hexametaphosphate	0.0437	50.0
	0.0314	42.6
	0.0226	38.2
	0.0163	34.3
	0.0120	30.8
	0.0087	25.2
	0.0062	21.4
	0.0044	18.1
	0.0032	16.2
	0.0023	11.8
	0.0013	9.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
6	32	50	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-26

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-8

Sample No.: 20

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	95
# 10	2.00	93
# 20	0.850	89
# 40	0.425	83.4
# 60	0.250	75.0
# 100	0.150	65.7
# 200	0.075	54.6

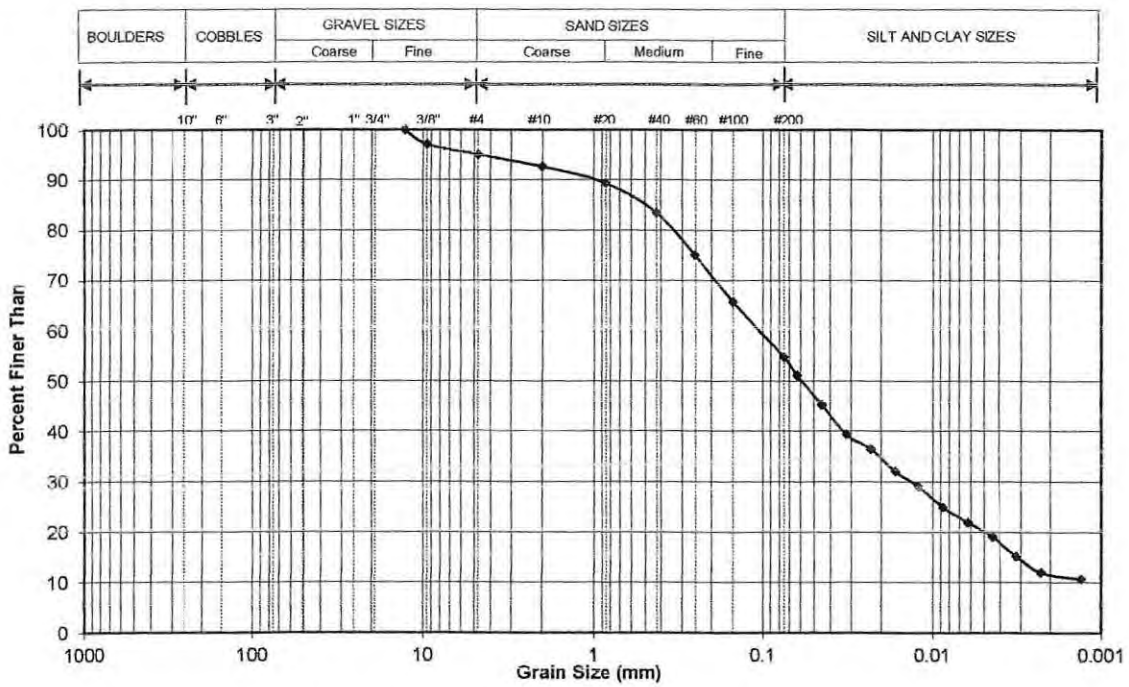
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0625	51.1
Sodium Hexametaphosphate	0.0447	45.2
	0.0320	39.3
	0.0229	36.4
	0.0165	32.0
	0.0121	29.1
	0.0087	24.9
	0.0062	21.9
	0.0044	19.0
	0.0032	15.2
	0.0023	12.0
	0.0013	10.7

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
5	40	43	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-27

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-9

Sample No.: 102

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	100
# 10	2.00	99
# 20	0.850	98
# 40	0.425	97.0
# 60	0.250	93.4
# 100	0.150	89.7
# 200	0.075	86.9

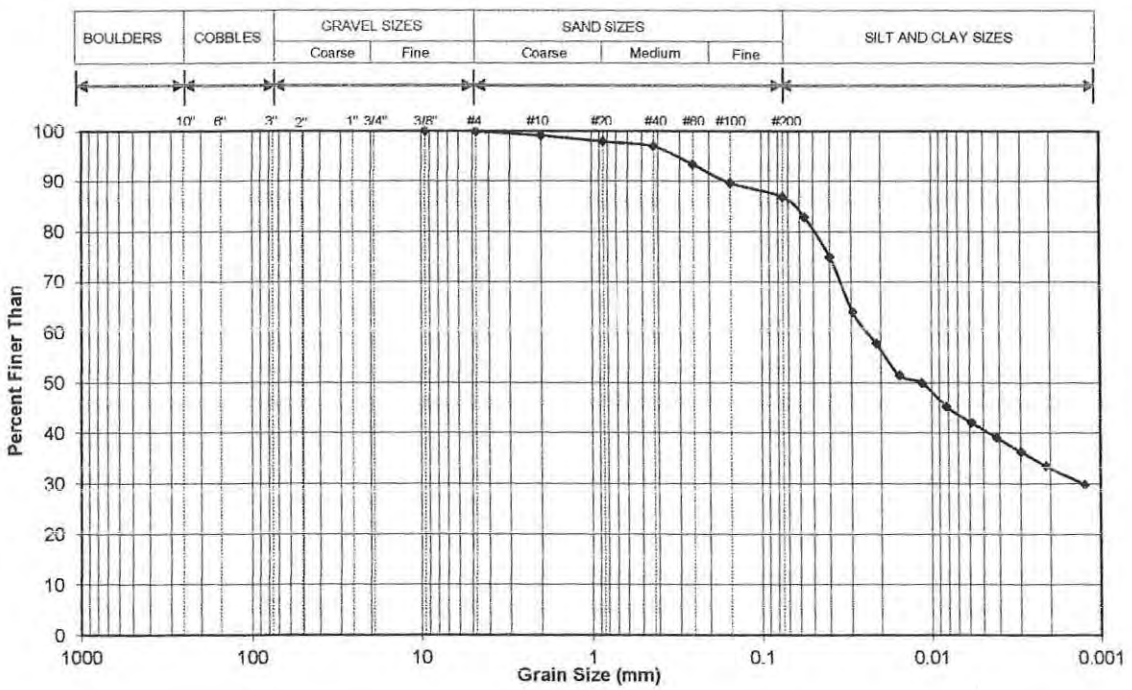
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0559	82.9
Sodium Hexametaphosphate	0.0399	74.9
	0.0293	64.0
	0.0213	57.7
	0.0154	51.4
	0.0113	49.9
	0.0082	45.2
	0.0058	42.1
	0.0042	39.1
	0.0030	36.3
	0.0021	33.5
	0.0012	29.8

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
0	13	54	33

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-28

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644

Date Tested: December 6, 2011

Test Hole No.: 13-10

Sample No.: 76

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	100
# 4	4.75	99
# 10	2.00	97
# 20	0.850	93
# 40	0.425	89.7
# 60	0.250	85.1
# 100	0.150	79.9
# 200	0.075	73.2

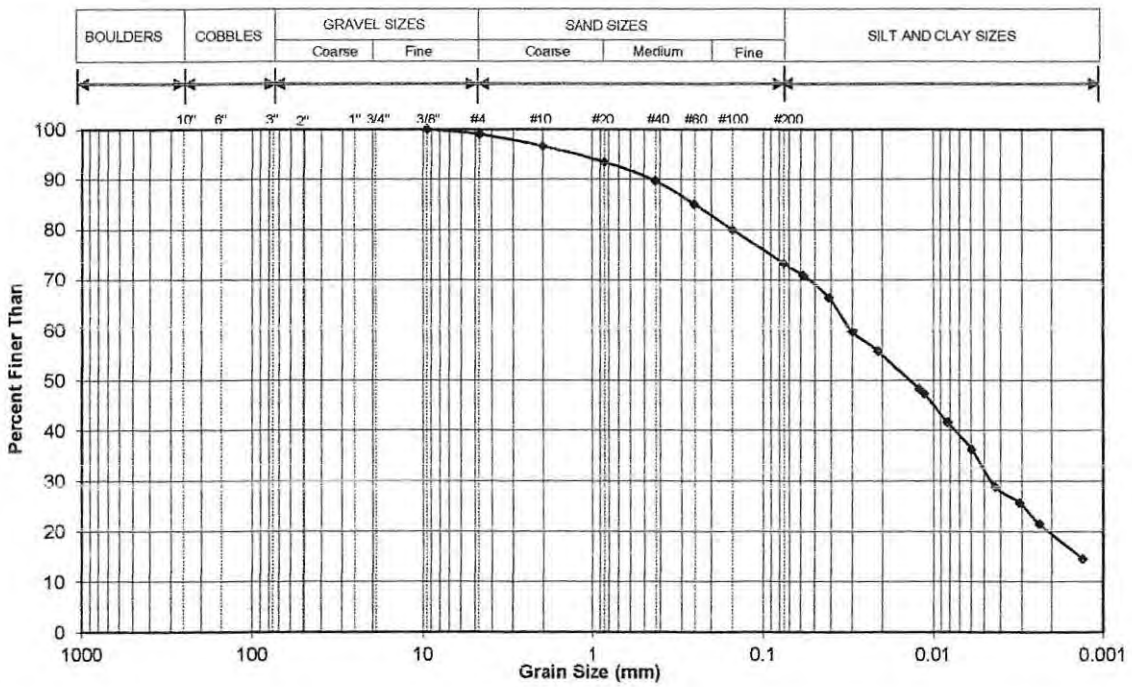
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0577	70.8
Sodium Hexametaphosphate	0.0411	66.4
	0.0297	59.6
	0.0212	55.8
	0.0122	48.2
	0.0114	47.3
	0.0082	41.6
	0.0059	36.2
	0.0043	28.8
	0.0031	25.6
	0.0023	21.4
	0.0013	14.6

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
1	26	52	21

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-29

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-12

Sample No.: 51

Depth (m): 0.2

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	97
3/8"	9.5	96
# 4	4.75	92
# 10	2.00	88
# 20	0.850	83
# 40	0.425	77.4
# 60	0.250	69.7
# 100	0.150	61.4
# 200	0.075	51.6

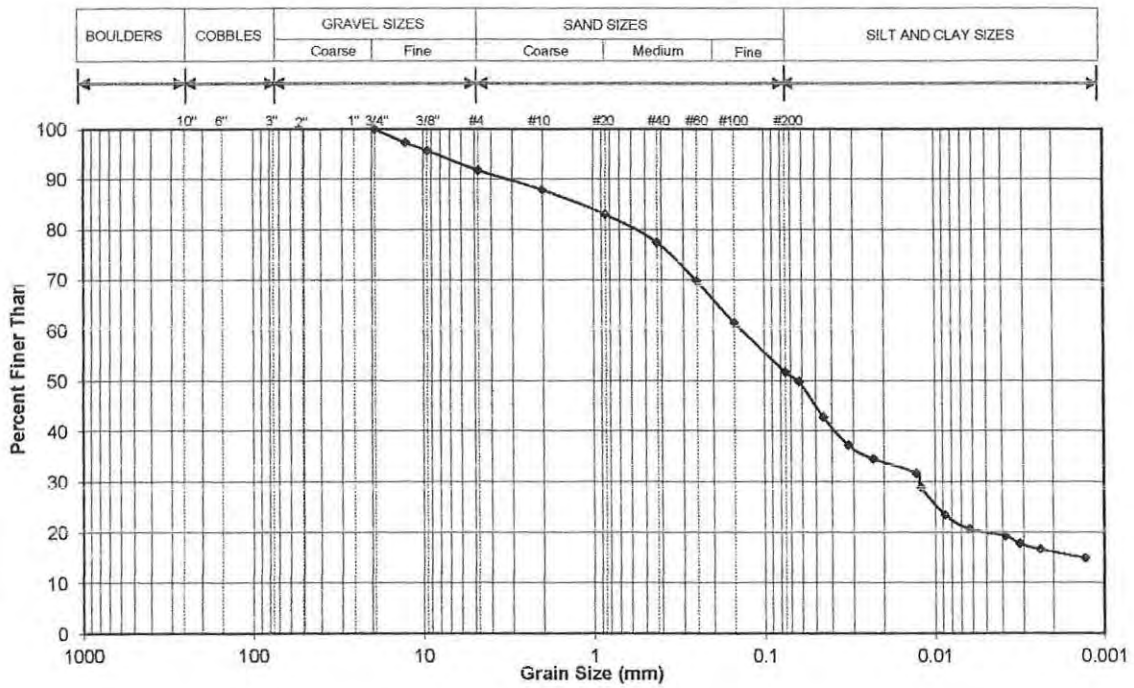
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0622	49.7
Sodium Hexametaphosphate	0.0448	42.7
	0.0321	37.2
	0.0229	34.4
	0.0129	31.6
	0.0121	28.8
	0.0087	23.4
	0.0062	20.6
	0.0038	19.2
	0.0031	17.7
	0.0024	16.6
	0.0013	14.9

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
8	40	35	17

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-30

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-12

Sample No.: 60

Depth (m): 10.5

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	99
# 4	4.75	97
# 10	2.00	94
# 20	0.850	89
# 40	0.425	83.3
# 60	0.250	75.8
# 100	0.150	67.5
# 200	0.075	57.2

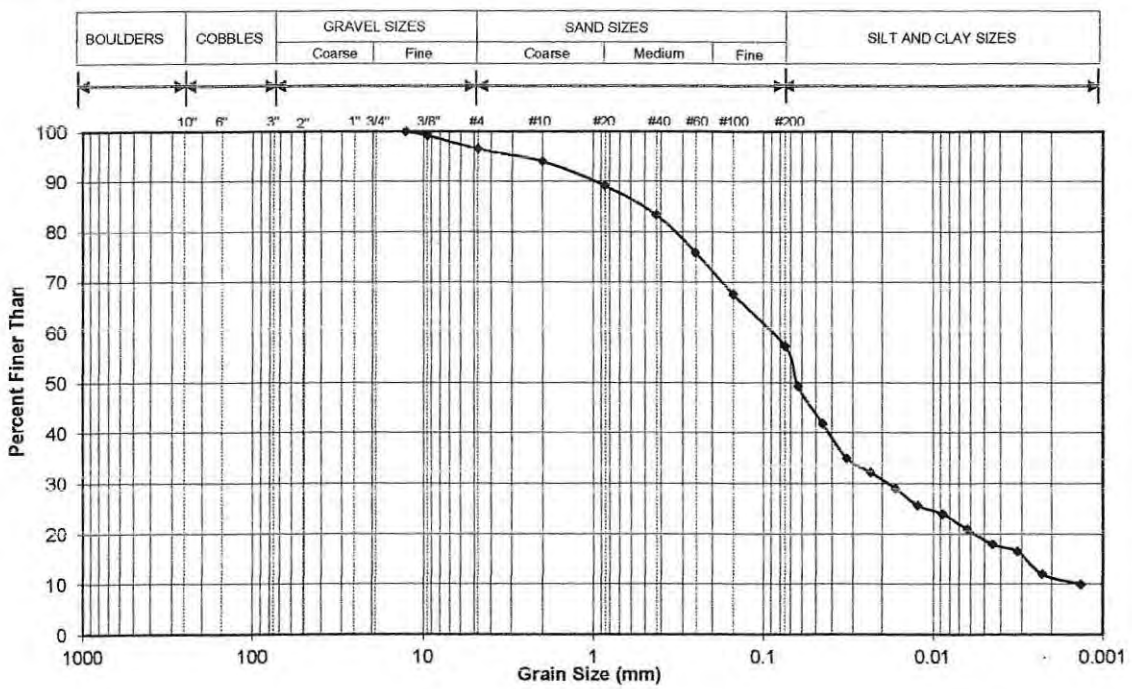
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0630	49.2
Sodium Hexametaphosphate	0.0453	41.8
	0.0325	34.9
	0.0233	32.1
	0.0166	28.9
	0.0123	25.6
	0.0087	23.9
	0.0062	20.9
	0.0045	17.9
	0.0032	16.5
	0.0023	12.0
	0.0013	10.0

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
3	39	46	12

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-31

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1-32

Date Tested: December 6, 2013

Test Hole No.: 13-14

Sample No.: 1

Depth (m): 0.3

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	94
3/8"	9.5	94
# 4	4.75	89
# 10	2.00	86
# 20	0.850	81
# 40	0.425	75.1
# 60	0.250	67.0
# 100	0.150	58.6
# 200	0.075	48.4

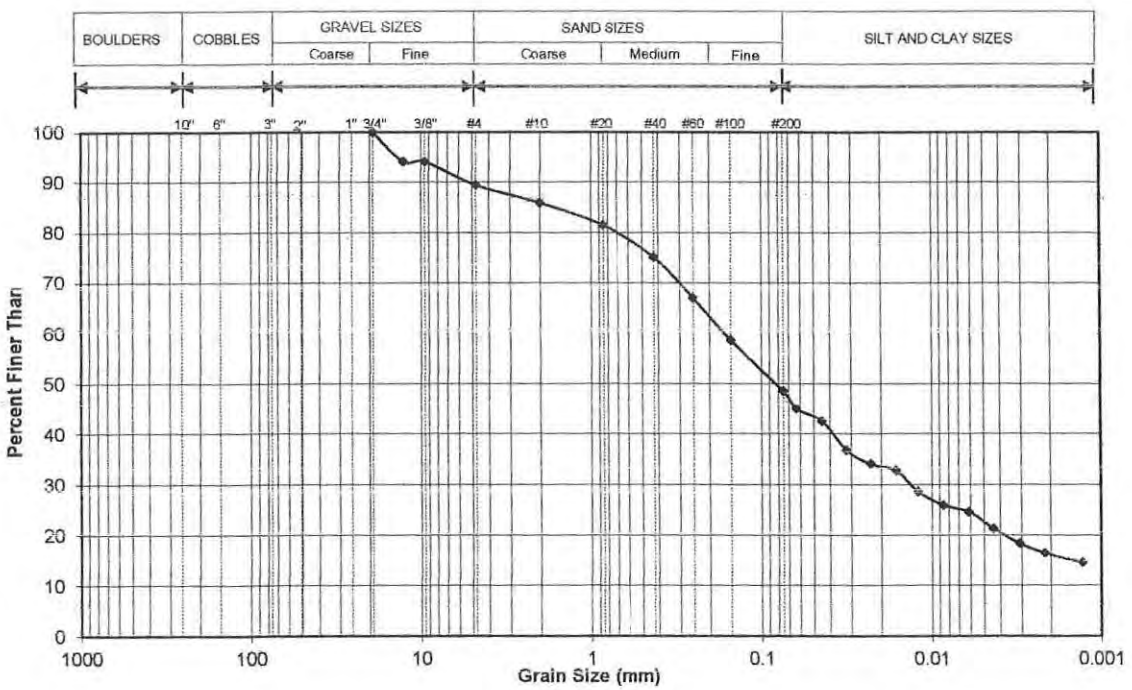
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0630	45.0
Sodium Hexametaphosphate	0.0445	42.5
	0.0319	36.8
	0.0228	34.0
	0.0162	32.7
	0.0121	28.5
	0.0086	25.9
	0.0061	24.5
	0.0044	21.2
	0.0031	18.3
	0.0022	16.4
	0.0013	14.6

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
11	41	32	16

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-32

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1-33

Date Tested: December 6, 2013

Test Hole No.: 13-15

Sample No.: 34

Depth (m): 0.6

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	97
# 4	4.75	96
# 10	2.00	94
# 20	0.850	92
# 40	0.425	89.3
# 60	0.250	81.6
# 100	0.150	63.6
# 200	0.075	50.0

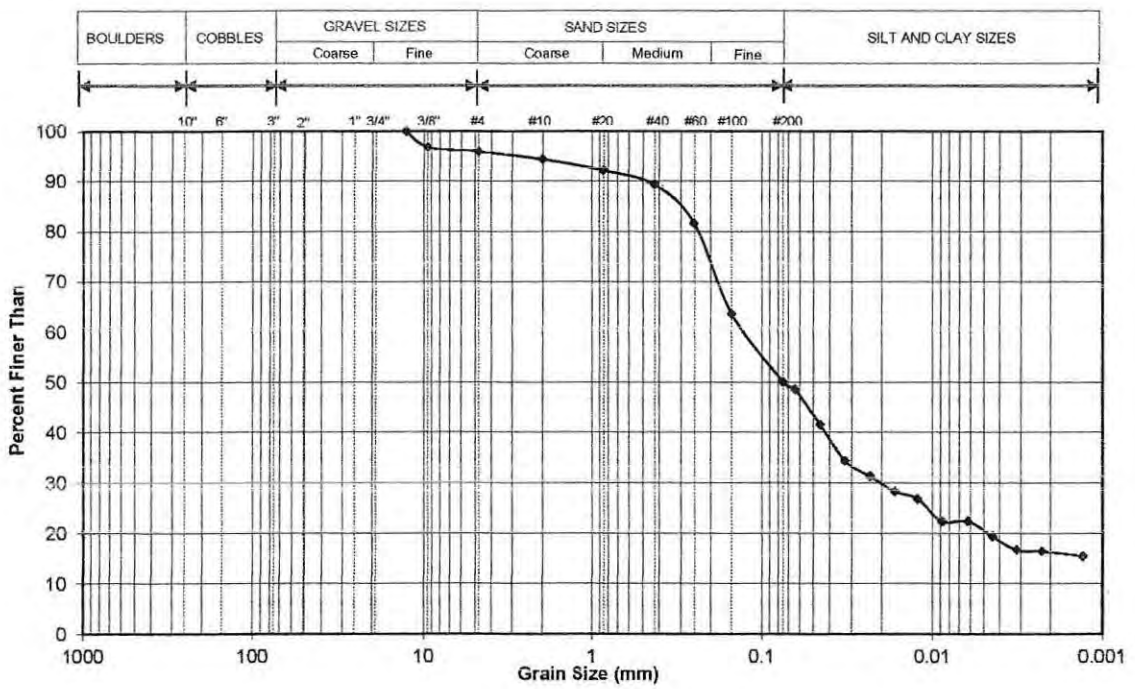
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0638	48.5
Sodium Hexametaphosphate	0.0455	41.5
	0.0326	34.3
	0.0233	31.2
	0.0167	28.3
	0.0122	26.8
	0.0088	22.3
	0.0062	22.4
	0.0044	19.4
	0.0032	16.7
	0.0022	16.4
	0.0013	15.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
4	46	34	16

Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-33

ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

Project: Proposed Rural Subdivision
Near Saskatoon, Saskatchewan

Project No.: S13-8644.1

Date Tested: December 6, 2013

Test Hole No.: 13-16

Sample No.: 30

Depth (m): 1.0

Sieve Analysis:

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	91
1"	25.4	91
3/4"	19.1	86
3/8"	9.5	85
# 4	4.75	83
# 10	2.00	81
# 20	0.850	77
# 40	0.425	71.1
# 60	0.250	63.5
# 100	0.150	55.2
# 200	0.075	44.7

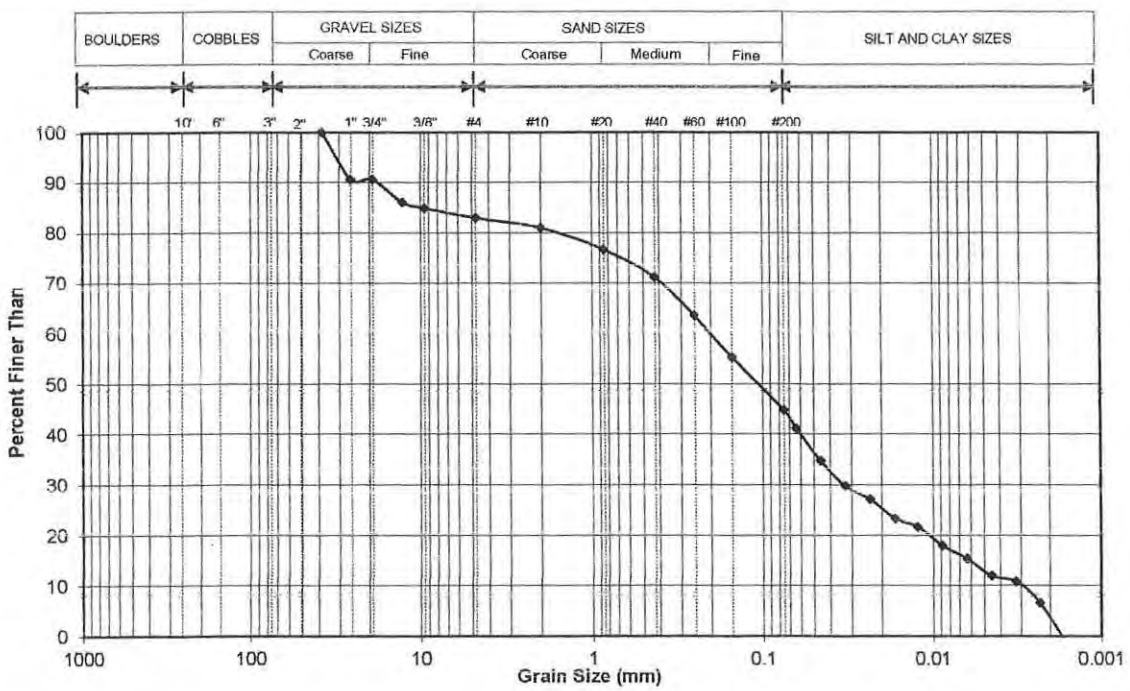
Hydrometer Analysis:

	Diameter mm	% Finer
Dispersing Agent:	0.0634	41.1
Sodium Hexametaphosphate	0.0456	34.7
	0.0325	29.7
	0.0233	27.0
	0.0167	23.2
	0.0123	21.6
	0.0088	18.0
	0.0063	15.4
	0.0045	11.9
	0.0032	10.8
	0.0023	6.6
	0.0014	-4.5

Material Description:

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
17	38	38	7

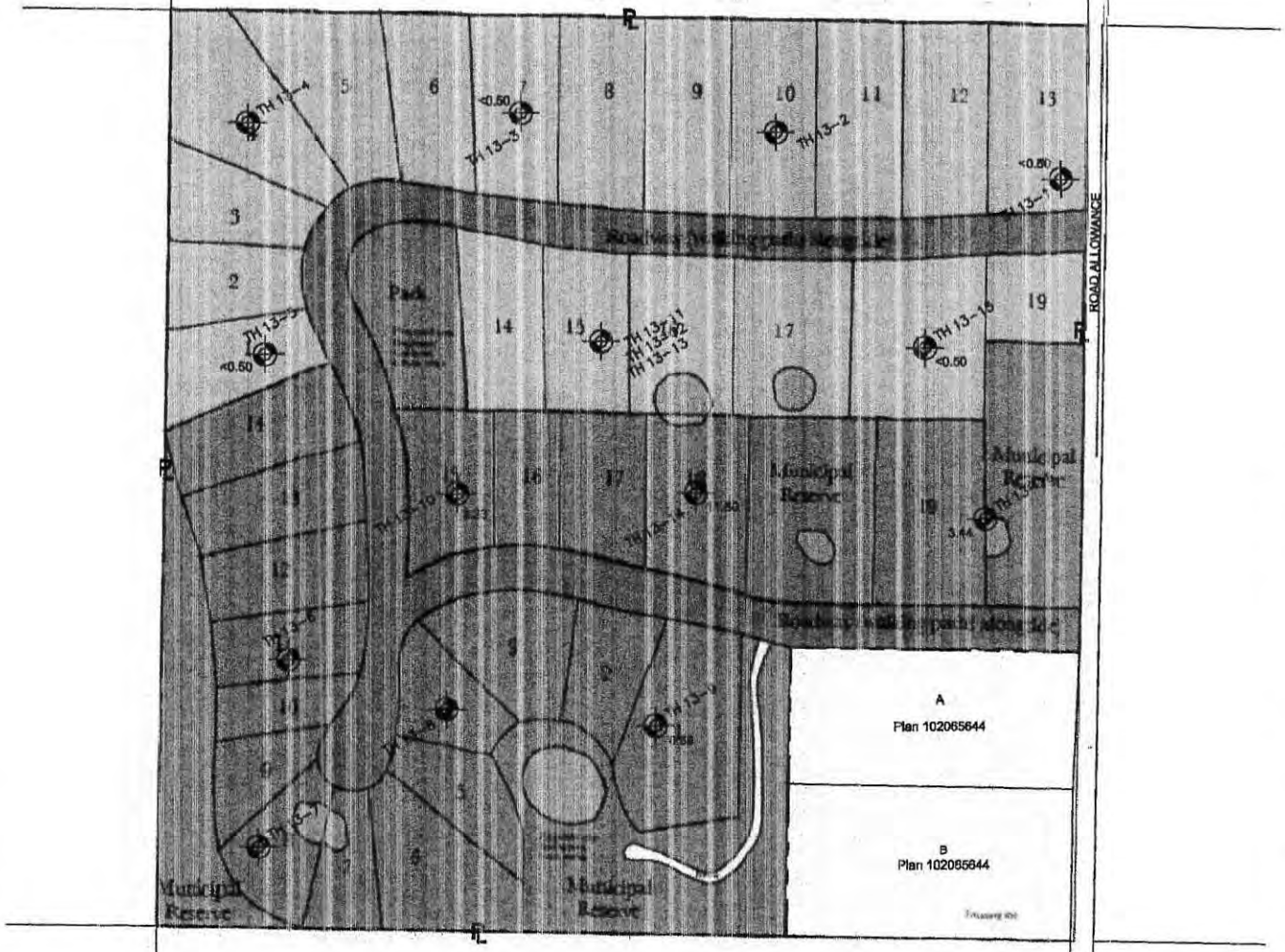
Remarks:



P. MACHIBRODA ENGINEERING LTD.

DRAWING NO.

S13-8644.1-34



SCALE (m)

0 100 200

NOTE:
1. THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.
2. THIS DRAWING WAS COMPILED FROM AUTOCAD FILE: 171226T-Client.dwg PROVIDED BY ALTUS GEOMATICS.

LEGEND

⊕ --PMEL TEST HOLE (PIEZOMETER INSTALLED)

PL --PROPERTY LINE

P. MACHIBRODA ENGINEERING LTD.

CONSULTING
GEOENVIRONMENTAL
GEOTECHNICAL
ENGINEERS

806 – 48th STREET EAST
SASKATOON, SK
S7K 3Y4

DRAWING TITLE:
EXISTING NITRATE N - (mg/L) CONCENTRATIONS

PROJECT:
PROPOSED RURAL SUBDIVISION
SE-1/4-24-36-4-W3M, NEAR SASKATOON, SK

APPROVED BY:	DRAWN BY:
RM	BH
DATE: JANUARY, 2014	DRAWING NUMBER:
SCALE: NOT TO SCALE	S13-8644.1-35

APPENDIX A

EXPLANATION OF TERMS ON TEST HOLE LOGS

CLASSIFICATION OF SOILS

Coarse-Grained Soils: Soils containing particles that are visible to the naked eye. They include gravels and sands and are generally referred to as cohesionless or non-cohesive soils. Coarse-grained soils are soils having more than 50 percent of the dry weight larger than particle size 0.080 mm.

Fine-Grained Soils: Soils containing particles that are not visible to the naked eye. They include silts and clays. Fine-grained soils are soils having more than 50 percent of the dry weight smaller than particle size 0.080 mm.

Organic Soils: Soils containing a high natural organic content.

Soil Classification By Particle Size

Clay – particles of size	< 0.002 mm
Silt – particles of size	0.002 – 0.060 mm
Sand – particles of size	0.06 – 2.0 mm
Gravel – particles of size	2.0 – 60 mm
Cobbles – particles of size	60 – 200 mm
Boulders – particles of size	>200 mm

TERMS DESCRIBING CONSISTENCY OR CONDITION

Coarse-grained soils: Described in terms of compactness condition and are often interpreted from the results of a Standard Penetration Test (SPT). The standard penetration test is described as the number of blows, N, required to drive a 51 mm outside diameter (O.D.) split barrel sampler into the soil a distance of 0.3 m (from 0.15 m to 0.45 m) with a 63.5 kg weight having a free fall of 0.76 m.

Compactness Condition	SPT N-Index (blows per 0.3 m)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	Over 50

Fine-Grained Soils: Classified in relation to undrained shear strength.

Consistency	Undrained Shear Strength (kPa)	N Value (Approximate)	Field Identification
Very Soft	<12	0-2	Easily penetrated several centimetres by the fist.
Soft	12-25	2-4	Easily penetrated several centimetres by the thumb.
Firm	25-50	4-8	Can be penetrated several centimetres by the thumb with moderate effort.
Stiff	50-100	8-15	Readily indented by the thumb, but penetrated only with great effort.
Very Stiff	100-200	15-30	Readily indented by the thumb nail.
Hard	>200	>30	Indented with difficulty by the thumbnail.

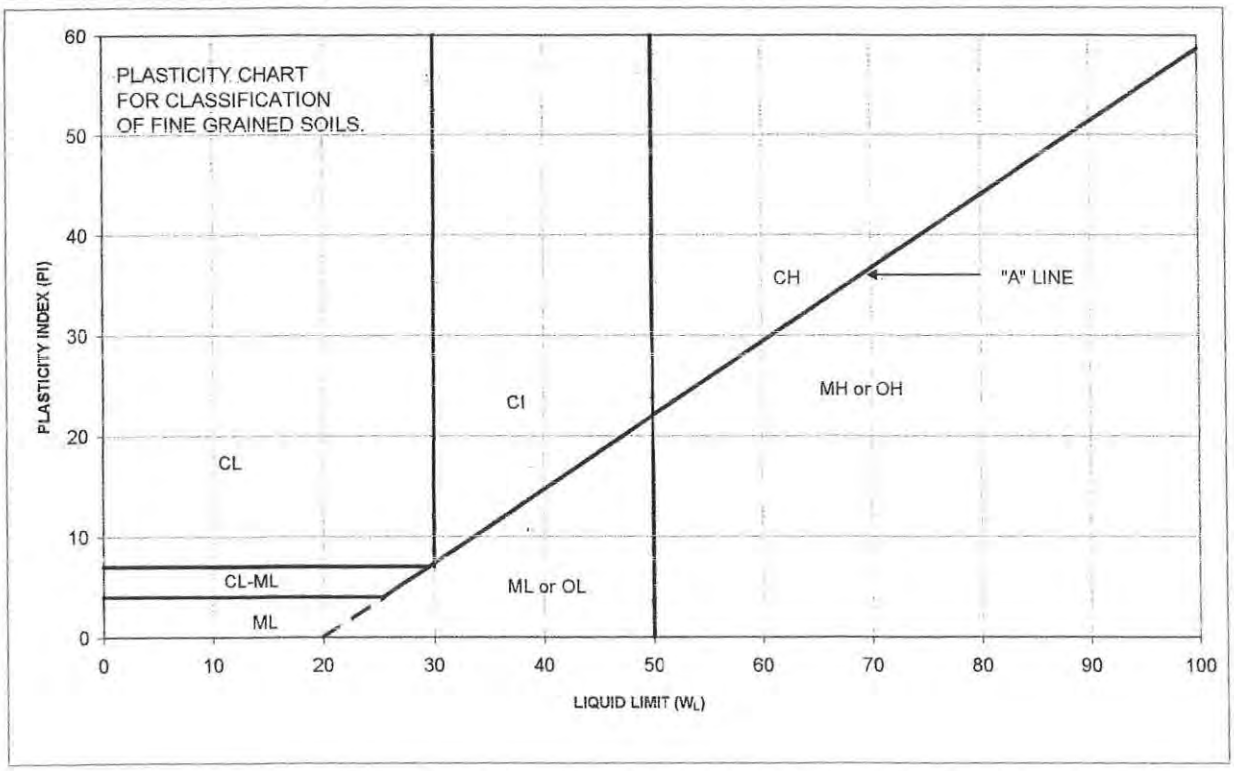
Organic Soils: Readily identified by colour, odour, spongy feel and frequently by fibrous texture.

DESCRIPTIVE TERMS COMMONLY USED TO CHARACTERIZE SOILS

Poorly Graded	- predominance of particles of one grain size.
Well Graded	- having no excess of particles in any size range with no intermediate sizes lacking.
Mottled	- marked with different coloured spots.
Nuggety	- structure consisting of small prismatic cubes.
Laminated	- structure consisting of thin layers of varying colour and texture.
Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks.
Fractured	- broken by randomly oriented interconnecting cracks in all 3 dimensions.

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR AND OFTEN FIBROUS TEXTURE
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS More than half coarse fraction larger than No. 4 sieve size	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4 \quad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			GP	POORLY-GRADED GRAVELS AND GRAVEL-SAND MIXTURES <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS FOR GW
		DIRTY GRAVELS	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR PI < 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH PI > 7
	SANDS More than half coarse fraction smaller than No. 4 sieve size	CLEAN SANDS	SW	WELL-GRADED SANDS, GRAVELLY SANDS MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6 \quad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			SP	POORLY-GRADED SANDS OR GRAVELLY SANDS <5% FINES	NOT MEETING ALL GRADATION REQUIREMENTS FOR SW
		DIRTY SANDS	SM	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR PI < 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH PI >7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSING NO. 200 SIEVE SIZE)	SILTS Below "A" line on plasticity chart; negligible organic content		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$
	CLAYS Above 'A" line on plasticity chart; negligible organic content		CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$
			CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	$W_L > 30 < 50$
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$
	ORGANIC SILTS & ORGANIC CLAYS Below "A" line on plasticity chart		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
			OH	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$



APPENDIX B

SASKWATER WATER WELL RECORDS

P. MACHIBRODA ENGINEERING LTD.

One Well Per Page

Land Location **304 036 24NW00**
WWDR# **014475**

CRAIG, ELWIN

Completion **04/24/1974**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	NW	24	036	04	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
400.00 ft from N/S Boundary **S**
100.00 ft from E/W Boundary **W**

Well Information

Driller #	**WIG'S SANDPOINT DRILL**
Water Use	**Domestic**
Hole #	**001**
Well Use	**Withdrawal**
Installation Method	**Jetted**
Depth	**27.00**
Water Level	**11.00**
Bit	**1.50**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	**24.00**	**1.50**	**Plastic**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
3.00	**27.00**	**3.00**	**10.00**	**Plastic**
0.00	**0.00**	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	**0.00**	

Pump Test

Draw Down	**0.00** ft	Rec. Pumping Rate	**2.00**
Duration	**1.00** hrs	Intake	**0.00**
Pumping Rate	**2.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,800.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
15.00	Sand	Yellow	Fine
27.00	Sand	Grey	Clay Streaks

One Well Per Page

Land Location **304 036 24SW00**
WWDR# **048641**

ANTONIUK, KEN

Completion **10/18/1976**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**24**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
200.00 ft from N/S Boundary **S**
600.00 ft from E/W Boundary **W**

Well Information

Driller #	**MITCHELL DRILLING (197**
Water Use	**Domestic**
Hole #	**001**
Well Use	**Withdrawal**
Installation Method	**Drilled**
Depth	**80.00**
Water Level	**11.00**
Bit	**6.20**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	**65.00**	**4.50**	**Black Iron**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

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	Rec. Pumping Rate	**25.00**
Duration	**24.00** hrs	Intake	**60.00**
Pumping Rate	**36.00** igpm	Aquifer	
Temp	**42.00** deg. F	E-Log	**SCANNED**
Elevation	**1,800.00** ft	Phys	**E22**

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

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031784**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**007**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**113.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	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

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031783**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		

Zone | Easting | Northing | Source | Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**006**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**112.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	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

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031782**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**005**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**112.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
16.00	Till	Green	Unknown
112.00	Till	Grey	Unknown

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031781**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**004**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**112.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	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

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **119562**

MENZIES, CALVIN

Completion **07/18/2002**

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**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
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**
Water Level	**0.00**
Bit	**42.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
46.00	**45.00**	**36.00**	**Porous Concrete**
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	Rec. Pumping Rate	**4.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,782.00** ft	Phys	**E22**

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

One Well Per Page

Land Location **304 036 13SE00**
WWDR# **086518**

FREEBORN, DON

Completion **04/15/1986**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SE**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
750.00 ft from N/S Boundary **S**
400.00 ft from E/W Boundary **W**

Well Information

Driller # **MITCHELL DRILLING (197**
Water Use **Domestic**
Hole # **1**
Well Use **Withdrawal**
Installation Method **Drilled**
Depth **330.00**
Water Level **32.00**
Bit **5.10**
Flowing Head **0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
290.00	**0.00**	**5.00**	**P.V.C.**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

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	Rec. Pumping Rate	**25.00**
Duration	**4.00** hrs	Intake	**150.00**
Pumping Rate	**65.00** igpm	Aquifer	
Temp	**41.00** deg. F	E-Log	**SCANNED**
Elevation	**1,760.00** ft	Phys	**E22**

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

One Well Per Page

316.00	Sand	Unknown	Fine-medium
340.00	Till	Grey	Unknown

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031779**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**002**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**112.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	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

One Well Per Page

Land Location **304 036 24NW00**
WWDR# **217618**

BOYCHUCK, FRED

Completion **06/10/2009**

RM	**344**
Major Basin	**06**
SubBasin	**30**
NTS Map	**73B01**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**NW**	**24**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**WELLEN BORING LTD**
Water Use	**Domestic**
Hole #	
Well Use	**Withdrawal**
Installation Method	**Bored**
Depth	**73.00**
Water Level	**35.00**
Bit	**42.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
75.00	**73.00**	**30.00**	**Fiberglass**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
25.00	**73.00**	**30.00**	**70.00**	**Fiberglass**
0.00	**0.00**	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	**0.00**	

Pump Test

Draw Down	**0.00** ft	Rec. Pumping Rate	**3.00**
Duration	**2.00** hrs	Intake	**70.00**
Pumping Rate	**3.50** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,804.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
20.00	Till	Brown	Unknown
60.00	Till	Grey	Boulders
67.00	Till	Grey	Sand Streaks
73.00	Till	Grey	Unknown

One Well Per Page

Land Location **303 036 30SE00**
WWDR# **031569**

SASKATOON S & G

Completion **12/15/1962**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	30	036	03	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**J & D DRILLING**
Water Use	**Domestic**
Hole #	
Well Use	**Withdrawal**
Installation Method	**Drilled**
Depth	**182.00**
Water Level	**90.00**
Bit	**4.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	177.00	4.00	Steel
0.00	0.00	0.00	
0.00	0.00	0.00	

Screens

Length (ft)	Btm (ft)	Dia (in)	Slot (in)	Description
5.00	182.00	4.00	25.00	Unknown
0.00	0.00	0.00	0.00	
0.00	0.00	0.00	0.00	

Pump Test

Draw Down	**15.00** ft	Rec. Pumping Rate	**8.00**
Duration	**8.00** hrs	Intake	**0.00**
Pumping Rate	**8.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,775.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
50.00	Clay	Brown	Unknown
170.00	Clay	Grey	Unknown
182.00	Sand & Gravel	Unknown	Unknown

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **119562**

MENZIES, CALVIN

Completion **07/18/2002**

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**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
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**
Water Level	**0.00**
Bit	**42.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
46.00	**45.00**	**36.00**	**Porous Concrete**
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	Rec. Pumping Rate	**4.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,782.00** ft	Phys	**E22**

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

One Well Per Page

Land Location **304 036 13SW05**
WWDR# **116889**

SASK HIGHWAYS & TRAN

Completion **07/25/1989**

RM	**344**
Major Basin	**06**
SubBasin	**30**
NTS Map	**73B01**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
05	**SW**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,781.00** ft	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

One Well Per Page

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

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **012381**

LINDEN, DALE

Completion **05/01/1974**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	13	036	04	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
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**
Installation Method	**Bored**
Depth	**28.00**
Water Level	**0.00**
Bit	**0.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	0.00	0.00	**Porous Concrete**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,700.00** ft	Phys	**E03**

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

One Well Per Page

Land Location **304 036 24SW00**
WWDR# **112621**

THURSTON, KEVIN

Completion **05/01/1991**

RM	**344**
Major Basin	**06**
SubBasin	**30**
NTS Map	**73B01**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**24**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**HAYTER DRILLING LTD**
Water Use	**Domestic**
Hole #	**001**
Well Use	**Withdrawal**
Installation Method	**Drilled**
Depth	**360.00**
Water Level	**123.00**
Bit	**4.50**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
330.00	**328.00**	**5.00**	**P.V.C.**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

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	Rec. Pumping Rate	**15.00**
Duration	**3.00** hrs	Intake	**300.00**
Pumping Rate	**15.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,770.00** ft	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

Water Security Agency

One Well Per Page

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

One Well Per Page

Land Location **303 036 18 00**
WWDR# **031567**

FREEBORN, H A

Completion **07/01/1935**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00		18	036	03	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
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**
Installation Method	**Unknown**
Depth	**163.00**
Water Level	**63.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**0.00** ft	Phys	**E03**

Lithology List

Depth (ft)	Material	Colour	Description

Water Security Agency

One Well Per Page

Land Location **304 036 13NW00**
WWDR# **110409**

TOUCHER, PAUL

Completion **09/22/1998**

RM	**344**
Major Basin	**06**
SubBasin	**30**
NTS Map	**73B01**

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 (197**
Water Use	**Domestic**
Hole #	**001**
Well Use	**Withdrawal**
Installation Method	**Drilled**
Depth	**260.00**
Water Level	**16.00**
Bit	**5.10**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
73.00	**71.00**	**5.00**	**P.V.C.**
0.00	**0.00**	**0.00**	
0.00	**0.00**	**0.00**	

Screens

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	Rec. Pumping Rate	**8.00**
Duration	**2.00** hrs	Intake	**60.00**
Pumping Rate	**10.00** igpm	Aquifer	
Temp	**44.00** deg. F	E-Log	**SCANNED**
Elevation	**1,771.00** ft	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

One Well Per Page

Land Location **303 036 18SW00**
WWDR# **031568**

FREEBURN, HOWARD

Completion **06/16/1964**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SW	18	036	03	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
500.00 ft from N/S Boundary **S**
200.00 ft from E/W Boundary **W**

Well Information

Driller #	**INTERPROVINCIAL**
Water Use	**Domestic**
Hole #	
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**100.00**
Water Level	**0.00**
Bit	**5.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,760.00** ft	Phys	**E03**

Lithology List

Depth (ft)	Material	Colour	Description
1.00	Topsoil	Unknown	Unknown
60.00	Clay	Yellow	Unknown
100.00	Clay	Blue	Unknown

One Well Per Page

Land Location **303 036 30SE00**
WWDR# **087325**

PRIDDY FARMING LTD

Completion **12/04/1987**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SE**	**30**	**036**	**03**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**WELLEN BORING LTD**
Water Use	**Domestic**
Hole #	**1**
Well Use	**Withdrawal**
Installation Method	**Bored**
Depth	**43.00**
Water Level	**22.00**
Bit	**44.00**
Flowing Head	**0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
45.00	**43.00**	**30.00**	**Steel**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**2.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,800.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
16.00	Till	Brown	Unknown
22.00	Till	Grey	Unknown
27.00	Sand	Grey	Silty
43.00	Till	Grey	Unknown

One Well Per Page

Land Location **304 036 23SE00**
WWDR# **080788**

ANTONUK, KEN

Completion **06/18/1985**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	SE	23	036	04	3		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
600.00 ft from N/S Boundary **N**
800.00 ft from E/W Boundary **E**

Well Information

Driller # **MITCHELL DRILLING (197**
Water Use **Domestic**
Hole # **1**
Well Use **Withdrawal**
Installation Method **Drilled**
Depth **100.00**
Water Level **22.00**
Bit **5.10**
Flowing Head **0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
70.00	0.00	5.00	P.V.C.
0.00	0.00	0.00	
0.00	0.00	0.00	

Screens

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	Rec. Pumping Rate	12.00
Duration	2.00 hrs	Intake	60.00
Pumping Rate	20.00 igpm	Aquifer	
Temp	41.00 deg. F	E-Log	SCANNED
Elevation	1,790.00 ft	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

One Well Per Page

Land Location **303 036 30SE00**
WWDR# **071260**

PRIDDY, DON

Completion **04/22/1982**
RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SE**	**30**	**036**	**03**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**TWEIDT WELLBORING SI**
Water Use	**Domestic**
Hole #	
Well Use	**Water Test Hole**
Installation Method	**Augered**
Depth	**75.00**
Water Level	**0.00**
Bit	**6.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**No**
Elevation	**1,800.00** ft	Phys	**E22**

Lithology List

Depth (ft)	Material	Colour	Description
1.00	Topsoil	Unknown	Unknown
55.00	Gravelly Clay	Yellow	Dry
75.00	Gravelly Clay	Blue	Dry

Water Security Agency

One Well Per Page

Land Location **304 036 23NE00**
WWDR# **031793**

PETKA, DAVID J

Completion **09/06/1968**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**NE**	**23**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
900.00 ft from N/S Boundary **N**
400.00 ft from E/W Boundary **E**

Well Information

Driller # **PRAIRIE WATER LTD**
Water Use **Domestic**
Hole #
Well Use **Withdrawal**
Installation Method **Bored**
Depth **50.00**
Water Level **28.00**
Bit **36.00**
Flowing Head **0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	**50.00**	**36.00**	**Porous Concrete**
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
Pumping Rate **0.00** igpm
Temp **0.00** deg. F
Elevation **1,790.00** ft

Rec. Pumping Rate **10.00**
Intake **45.00**
Aquifer
E-Log **No**
Phys **E22**

Lithology List

Depth (ft)	Material	Colour	Description
26.00	Clay	Brown	Unknown
27.00	Sand	Unknown	Unknown
42.00	Till	Grey	Unknown
48.00	Silty Clay	Black	Unknown
50.00	Till	Grey	Unknown

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031786**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**293.00**
Water Level	**0.00**
Bit	**0.00**
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	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	Phys	**E22**

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

One Well Per Page

217.00	Sand	Grey	Medium-coarse
252.00	Till	Grey	Unknown
293.00	Shale	Grey	Silty

One Well Per Page

Land Location **304 036 23NE00**
WWDR# **031792**

RIVERSIDE HUTTERITE CC

Completion **05/09/1967**

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**NE**	**23**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
450.00 ft from N/S Boundary **N**
800.00 ft from E/W Boundary **E**

Well Information

Driller # **PRAIRIE WATER LTD**
Water Use **Domestic**
Hole #
Well Use **Withdrawal**
Installation Method **Bored**
Depth **64.00**
Water Level **0.00**
Bit **36.00**
Flowing Head **0.00**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Description
0.00	**64.00**	**36.00**	**Porous Concrete**
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
Pumping Rate **0.00** igpm
Temp **0.00** deg. F
Elevation **1,790.00** ft

Rec. Pumping Rate **0.00**
Intake **0.00**
Aquifer
E-Log **No**
Phys **E22**

Lithology List

Depth (ft)	Material	Colour	Description
12.00	Clay	Brown	Unknown
14.00	Sand	Brown	Unknown
15.00	Gravel	Unknown	Coarse
23.00	Till	Grey	Unknown
24.00	Till	Grey	Sandy
64.00	Till	Grey	Sand Streaks

Water Security Agency

One Well Per Page

Land Location **304 036 13SW00**
WWDR# **031785**

SASK RESEARCH COUNCI

Completion

RM
Major Basin **06**
SubBasin **30**
NTS Map **73B00**

Well Location

LSD	Quarter	Section	Township	Range	Meridian	Reserve	Riverlot
00	**SW**	**13**	**036**	**04**	**3**		

Zone	Easting	Northing	Source	Accuracy

Location of Well (in Quarter)
0.00 ft from N/S Boundary
0.00 ft from E/W Boundary

Well Information

Driller #	**ELK POINT DRILLING CO**
Water Use	**Research**
Hole #	**008**
Well Use	**Water Test Hole**
Installation Method	**Drilled**
Depth	**112.00**
Water Level	**0.00**
Bit	**0.00**
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

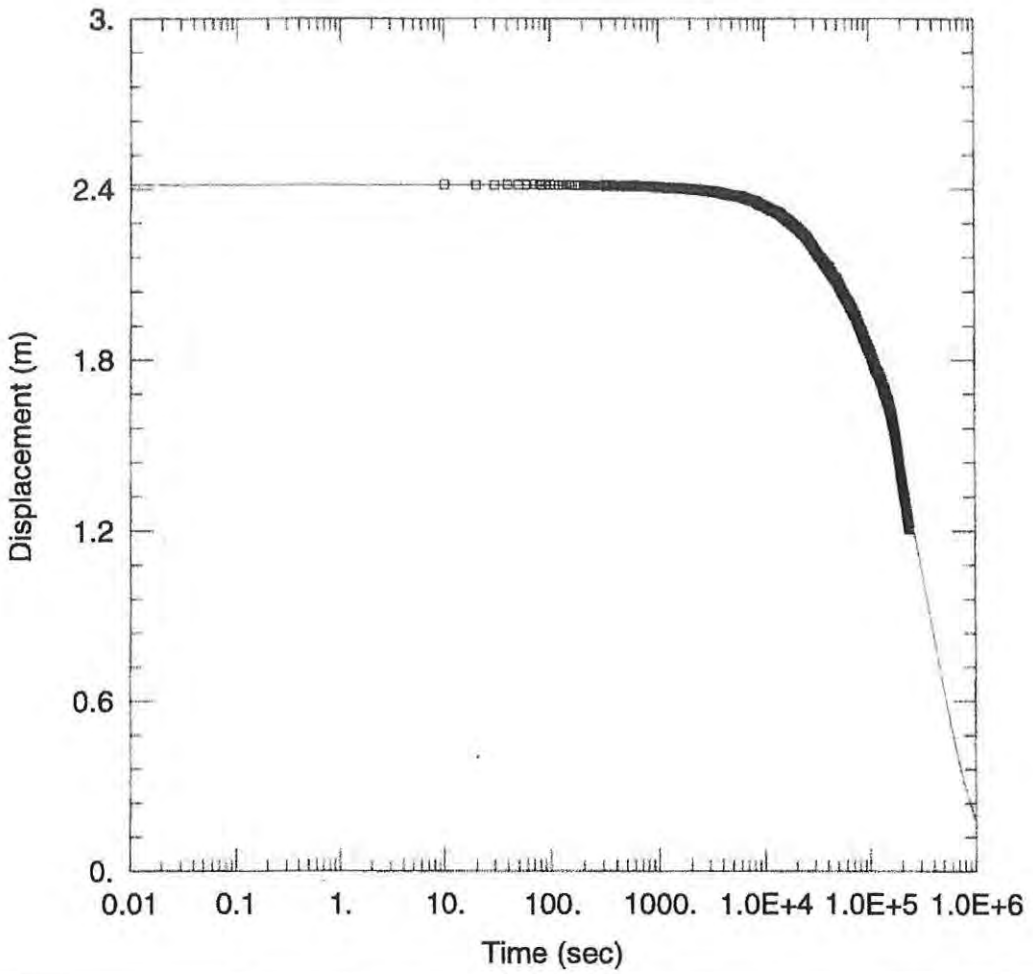
Draw Down	**0.00** ft	Rec. Pumping Rate	**0.00**
Duration	**0.00** hrs	Intake	**0.00**
Pumping Rate	**0.00** igpm	Aquifer	
Temp	**0.00** deg. F	E-Log	**SCANNED**
Elevation	**1,775.00** ft	Phys	**E22**

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

APPENDIX C

HYDRAULIC CONDUCTIVITY TEST RESULTS



WELL TEST ANALYSIS

Data Set: Y:\S13\8644.1\Leveloggers\13-1_KGS.aqt
Date: 01/08/14 Time: 11:37:39

PROJECT INFORMATION

Company: P. Machibroda Engineering Ltd.
Client: Phase II ESA
Project: S13-8644
Location: SE 24-36-4 W3M
Test Well: 13-1
Test Date: December 12 to 16, 2013

AQUIFER DATA

Saturated Thickness: 6.59 m

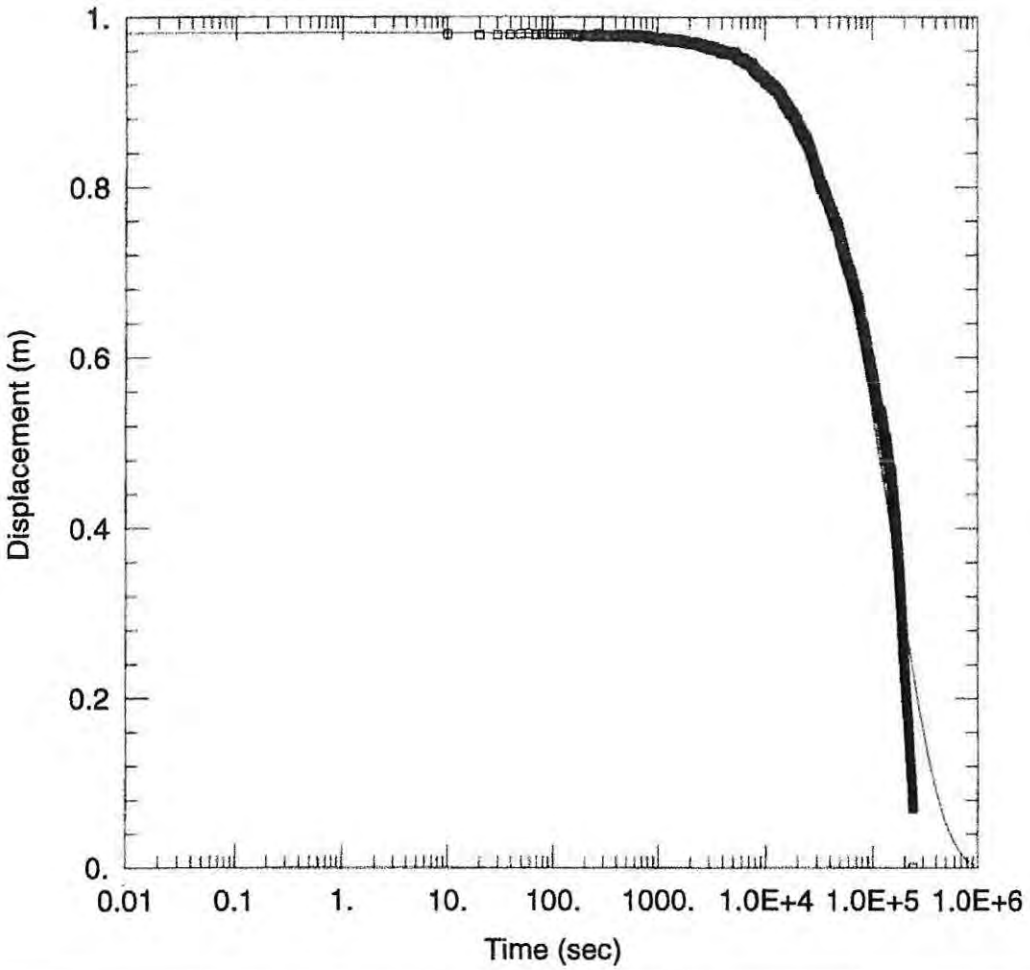
WELL DATA (13-1)

Initial Displacement: 2.414 m
Total Well Penetration Depth: 1. m
Casing Radius: 0.025 m
Static Water Column Height: 5.69 m
Screen Length: 1. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 2.311E-9 m/sec
Kz/Kr = 1.
Ss = 0.0001517 m^{-1}



WELL TEST ANALYSIS

Data Set: Y:\S13\8644.1\Leveloggers\13-5.aqt
Date: 01/13/14 Time: 17:20:59

PROJECT INFORMATION

Company: P. Machibroda Engineering Ltd.
Client: Phase II ESA
Project: S13-8644.1
Location: SE 24-36-4 W3M
Test Well: 13-5
Test Date: December 12 to 16, 2013

AQUIFER DATA

Saturated Thickness: 3.76 m

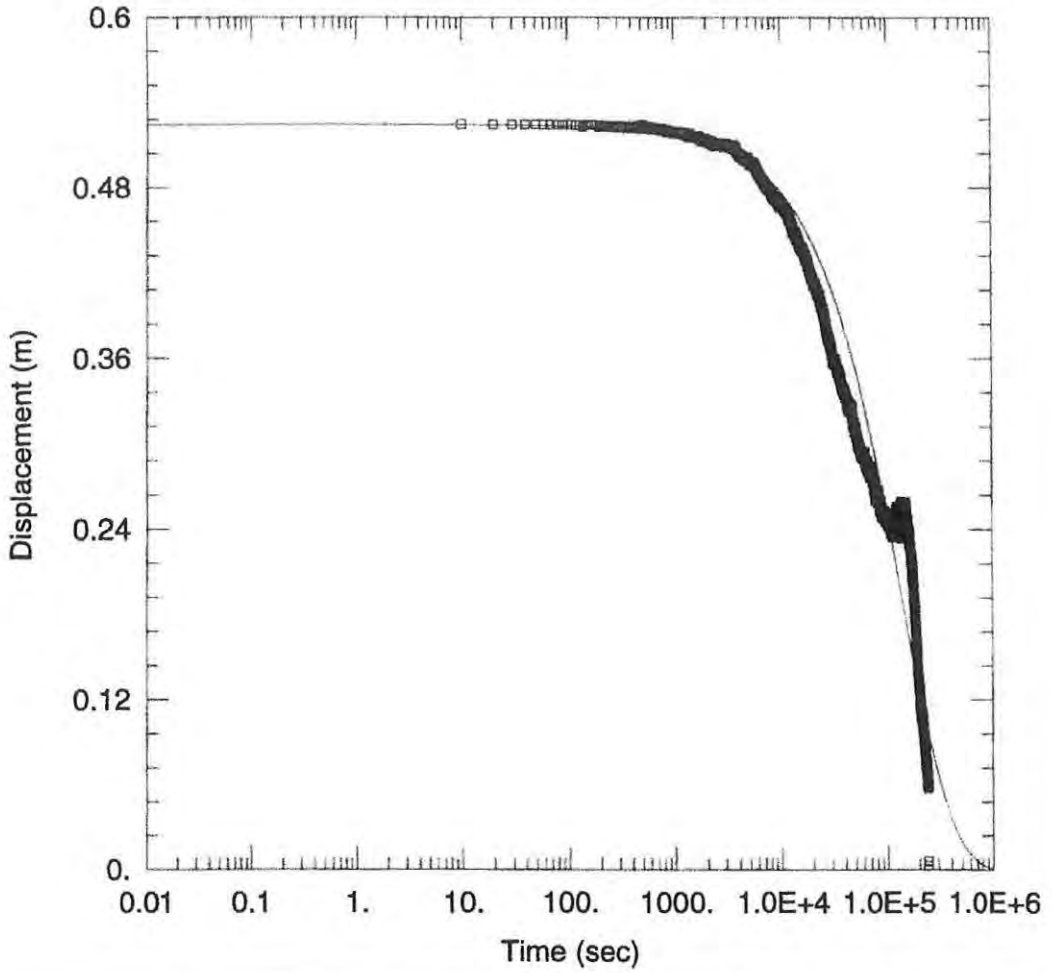
WELL DATA (13-5)

Initial Displacement: 0.9813 m
Total Well Penetration Depth: 1.025 m
Casing Radius: 0.025 m
Static Water Column Height: 3.76 m
Screen Length: 1. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 5.335E-9 m/sec
Kz/Kr = 1.
Ss = 2.66E-11 m^{-1}



WELL TEST ANALYSIS

Data Set: Y:\S13\8644.1\Leveloggers\13-10_KGS.aqt
Date: 01/16/14 Time: 09:15:22

PROJECT INFORMATION

Company: P. Machibroda Engineering Ltd.
Client: Phase II ESA
Project: S13-8644.1
Location: SE 24-36-4 W3M
Test Well: 13-10
Test Date: December 12 to 16, 2013

AQUIFER DATA

Saturated Thickness: 4.96 m

WELL DATA (13-10)

Initial Displacement: 0.5243 m
Total Well Penetration Depth: 4.96 m
Casing Radius: 0.025 m
Static Water Column Height: 4.96 m
Screen Length: 1. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 8.823E-9 m/sec
Kz/Kr = 1.
Ss = 0.0002016 m^{-1}

APPENDIX D

GROUNDWATER CHEMISTRY ANALYSIS

P. MACHIBRODA ENGINEERING LTD.

P.MACHIBRODA ENGINEERING LTD
ATTN: KAI RUNTZ
806-48th STREET EAST
SASKATOON SK S7K 3Y4

Date Received: 17-DEC-13
Report Date: 30-DEC-13 14:27 (MT)
Version: FINAL

Client Phone: 306-665-8444

Certificate of Analysis

Lab Work Order #: L1404231
Project P.O. #: NOT SUBMITTED
Job Reference: S13-8644.1 PROPOSED RWN SUBDIVISION
C of C Numbers:
Legal Site Desc:

Brian Morgan
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1404231-1 TEST HOLE 13-15 - SAMPLE 1							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	40		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	0.93		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	346.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	284		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	41.5		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	3890		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	512	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	27.2	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	350	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	131	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	2510	DLA	15	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	1.4	BL:INT		%		18-DEC-13	
TDS (Calculated)	3740			mg/L		18-DEC-13	
Hardness (as CaCO3)	2720			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.36		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-2 TEST HOLE 13-1 - SAMPLE 2							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	50		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	0.78		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	676.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	554		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	23.5		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	1850		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	206		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237

* 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
L1404231-2 TEST HOLE 13-1 - SAMPLE 2							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
ICP Cations							
Potassium (K)	11.0		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	139		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	53.2		2.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	515		3.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	4.0			%		18-DEC-13	
TDS (Calculated)	1280			mg/L		18-DEC-13	
Hardness (as CaCO3)	1090			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.43		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
404231-3 TEST HOLE 13-16 - SAMPLE 3							
npled By: CLIENT on 16-DEC-13							
trix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	120		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	2.73		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	374.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	307		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	138		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	9710		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	457	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	28	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	1570	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	677	DLA	20	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	7960	DLA	30	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	1.7	BL:INT		%		18-DEC-13	
TDS (Calculated)	11000			mg/L		18-DEC-13	
Hardness (as CaCO3)	7610			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	3.44		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
itrate+Nitrite-N	3.46		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.31		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							

* 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
L1404231-3 TEST HOLE 13-16 - SAMPLE 3							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-4 TEST HOLE 13-50 - SAMPLE 4							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	40		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	0.89		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	349.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	286		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	42.4		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	3930		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	538	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	27.6	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	361	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	132	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	2600	DLA	15	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	1.6	BL:INT		%		18-DEC-13	
TDS (Calculated)	3870			mg/L		18-DEC-13	
Hardness (as CaCO3)	2830			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.36		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-5 TEST HOLE 13-7 - SAMPLE 5							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	40		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	1.02		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	264.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344

* 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
L1404231-5 TEST HOLE 13-7 - SAMPLE 5							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Alkalinity by Auto. Titration							
Alkalinity, Total (as CaCO3)	217		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	25.5		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	2920		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	461	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	16.3	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	210	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	90	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	1860	DLA	15	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	1.0	BL:INT		%		18-DEC-13	
TDS (Calculated)	2790			mg/L		18-DEC-13	
Hardness (as CaCO3)	2020			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.20		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-6 TEST HOLE 13-10 - SAMPLE 6							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	110		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	2.50		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	367.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	301		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	99.5		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	6590		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	518	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	24.5	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	731	DLA	5.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	546	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	4570	DLA	15	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	2.9	BL:INT		%		18-DEC-13	
TDS (Calculated)	6680			mg/L		18-DEC-13	

* 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
L1404231-6 TEST HOLE 13-10 - SAMPLE 6							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Ion Balance Calculation							
Hardness (as CaCO3)	4300			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	3.15		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	0.080		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	3.23		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.28		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	7		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	7		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-7 TEST HOLE 13-5 - SAMPLE 7							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	30		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	0.41		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
icarbonate (HCO3)	511.		20	mg/L		18-DEC-13	R2762344
ydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	419		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	4.6		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	1170		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	144		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	9.1		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	72.8		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	23.8		2.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	247		3.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	2.8			%		18-DEC-13	
TDS (Calculated)	753			mg/L		18-DEC-13	
Hardness (as CaCO3)	659			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	<0.50		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.28		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
otal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844

* 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
L1404231-8 TEST HOLE 13-14 - SAMPLE 8							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	120		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	2.66		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	354.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	290		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	92.1		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	11000		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	420	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Potassium (K)	21	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	1750	DLA	10	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	898	DLA	20	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	9030	DLA	30	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	1.8	BL:INT		%		18-DEC-13	
TDS (Calculated)	12400			mg/L		18-DEC-13	
Hardness (as CaCO3)	8260			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	11.8		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	0.217		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	12.0		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.36		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	OVERGROWN		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844
L1404231-9 TEST HOLE 13-9 - SAMPLE 9							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
Miscellaneous Parameters							
Chemical Oxygen Demand	40		10	mg/L	18-DEC-13	18-DEC-13	R2762565
Total Kjeldahl Nitrogen	0.89		0.20	mg/L	30-DEC-13	30-DEC-13	R2766640
Routine Water Analysis							
Alkalinity by Auto. Titration							
Bicarbonate (HCO3)	881.		20	mg/L		18-DEC-13	R2762344
Hydroxide (OH)	<10.		10	mg/L		18-DEC-13	R2762344
Carbonate (CO3)	<10.		10	mg/L		18-DEC-13	R2762344
Alkalinity, Total (as CaCO3)	722		20	mg/L		18-DEC-13	R2762344
Chloride (Cl)							
Chloride (Cl)	16.4		1.0	mg/L	17-DEC-13	17-DEC-13	R2762129
Conductivity (Automated)							
Conductivity	2040		10	uS/cm		18-DEC-13	R2762344
ICP Cations							
Calcium (Ca)	143		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237

* 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
L1404231-9 TEST HOLE 13-9 - SAMPLE 9							
Sampled By: CLIENT on 16-DEC-13							
Matrix: WATER							
ICP Cations							
Potassium (K)	16.2		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Magnesium (Mg)	201		1.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sodium (Na)	76.7		2.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Sulfur (as SO4)	483		3.0	mg/L	18-DEC-13	18-DEC-13	R2762237
Ion Balance Calculation							
Cation - Anion Balance	4.6			%		18-DEC-13	
TDS (Calculated)	1370			mg/L		18-DEC-13	
Hardness (as CaCO3)	1180			mg/L		18-DEC-13	
Nitrate, Nitrite and Nitrate+Nitrite-N							
Nitrate-N	0.58		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrite-N	<0.050		0.050	mg/L	17-DEC-13	17-DEC-13	R2761997
Nitrate+Nitrite-N	0.62		0.50	mg/L	17-DEC-13	17-DEC-13	R2761997
pH by Meter (Automated)							
pH	7.64		0.10	pH		18-DEC-13	R2762344
Total and Fecal by Membrane Filtration							
Fecal Coliform							
Fecal Coliforms	<1		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762838
Total Coliform Membrane Filtration							
Total Coliforms	5		1	CFU/100mL	18-DEC-13	18-DEC-13	R2762844

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

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
L:INT	Balance Reviewed: Interference Or Non-Measured Component
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-SK	Water	Chloride (Cl)	APHA 4500-CL E

Chloride in aqueous matrices is determined colorimetrically by auto-analyzer.

COD-SK	Water	Chemical Oxygen Demand	APHA 5220 D-Micro Colorimetry

Sample aliquots are placed in closed culture tubes with a digestion solution containing dichromate. The tubes are digested at 150–5 C for 2 hours. Oxygen consumed is measured against standards at 420nm with a spectrophotometer.

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.

C-MF-WP	Water	Fecal Coliform	APHA 9222D
IONBALANCE-OP03-SK	Water	Ion Balance Calculation	APHA 1030-E
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-MF-WP	Water	Total Coliform Membrane Filtration	APHA 9222D

A sample of water is filtered through a membrane filter.The filter is placed on a selective broth. After incubation, the colonies are counted and confirmed. The results are reported as CFU/100 ml.

TKN-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.

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:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Laboratory Definition Code	**Laboratory Location**		
SK		ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA	
WP		ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA	
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, 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.

ALS Environmental

Quality Control Report

Workorder: L1404231 Report Date: 30-DEC-13

Client: P.MACHIBRODA ENGINEERING LTD
806-48th STREET EAST
SASKATOON SK S7K 3Y4
Contact: KAI RUNTZ

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-PCT-SK	Water							
Batch R2762344								
WG1806538-1 DUP		**L1404231-2**						
Alkalinity, Total (as CaCO3)		554	551		mg/L	0.6	20	18-DEC-13
WG1806538-2 LCS								
Alkalinity, Total (as CaCO3)			104.8		%		85-115	18-DEC-13
WG1806538-3 MB								
Alkalinity, Total (as CaCO3)			<20		mg/L		20	18-DEC-13
CL-SK	Water							
Batch R2762129								
WG1806574-2 DUP		**L1404231-6**						
Chloride (Cl)		99.5	99.2		mg/L	0.3	20	17-DEC-13
WG1806574-4 LCS								
Chloride (Cl)			104.5		%		70-130	17-DEC-13
'G1806574-1 MB								
hloride (Cl)			<1.0		mg/L		1	17-DEC-13
COD-SK	Water							
Batch R2762565								
WG1806695-1 DUP		**L1404231-5**						
Chemical Oxygen Demand		40	40		mg/L	2.5	20	18-DEC-13
WG1806695-2 LCS								
Chemical Oxygen Demand			100		mg/L		90-120	18-DEC-13
WG1806695-3 MB								
Chemical Oxygen Demand			<10		mg/L		10	18-DEC-13
EC-PCT-SK	Water							
Batch R2762344								
WG1806538-1 DUP		**L1404231-2**						
Conductivity		1850	1850		uS/cm	0.4	20	18-DEC-13
WG1806538-2 LCS								
Conductivity			100.5		%		90-110	18-DEC-13
WG1806538-3 MB								
Conductivity			<10		uS/cm		10	18-DEC-13
ETL-ROUTINE-ICP-SK	Water							
Batch R2762237								
WG1806728-2 DUP		**L1404231-3**						
Calcium (Ca)		457	447		mg/L	2.3	20	18-DEC-13
Potassium (K)		28	29		mg/L	1.0	20	18-DEC-13
Magnesium (Mg)		1570	1570		mg/L	0.0	20	18-DEC-13
odium (Na)		677	687		mg/L	1.4	20	18-DEC-13

ALS Environmental

Quality Control Report

Workorder: L1404231 Report Date: 30-DEC-13

Client: P.MACHIBRODA ENGINEERING LTD
806-48th STREET EAST
SASKATOON SK S7K 3Y4
Contact: KAI RUNTZ

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ETL-ROUTINE-ICP-SK	Water							
Batch R2762237								
WG1806728-2 DUP		**L1404231-3**						
Sulfur (as SO4)		7960	7970		mg/L	0.1	20	18-DEC-13
WG1806728-3 LCS								
Calcium (Ca)			102.2		%		70-130	18-DEC-13
Potassium (K)			104.0		%		70-130	18-DEC-13
Magnesium (Mg)			105.4		%		70-130	18-DEC-13
Sodium (Na)			105.2		%		70-130	18-DEC-13
Sulfur (as SO4)			101.4		%		70-130	18-DEC-13
WG1806728-1 MB								
Calcium (Ca)			<1.0		mg/L		1	18-DEC-13
Potassium (K)			<1.0		mg/L		1	18-DEC-13
Magnesium (Mg)			<1.0		mg/L		1	18-DEC-13
Sodium (Na)			<2.0		mg/L		2	18-DEC-13
Sulfur (as SO4)			<3.0		mg/L		3	18-DEC-13
FC-MF-WP	Water							
Batch R2762838								
WG1806988-1 DUP		**L1404155-1**						
Fecal Coliforms		<1	<1	RPD-NA	CFU/100mL	N/A	50	18-DEC-13
N2/N3-SK	Water							
Batch R2761997								
WG1806572-1 DUP		**L1404231-6**						
Nitrate-N		3.15	3.18		mg/L	0.8	20	17-DEC-13
Nitrite-N		0.080	0.082		mg/L	2.5	25	17-DEC-13
Nitrate+Nitrite-N		3.23	3.26		mg/L	0.9	20	17-DEC-13
WG1806572-3 LCS								
Nitrate-N			3.23		mg/L		2.55-3.45	17-DEC-13
Nitrite-N			0.519		mg/L		0.425-0.575	17-DEC-13
Nitrate+Nitrite-N			3.75		mg/L		3-4	17-DEC-13
WG1806572-2 MB								
Nitrate-N			<0.50		mg/L		0.5	17-DEC-13
Nitrite-N			<0.050		mg/L		0.05	17-DEC-13
Nitrate+Nitrite-N			<0.50		mg/L		0.5	17-DEC-13
PH-PCT-SK	Water							

ALS Environmental

Quality Control Report

Workorder: L1404231 Report Date: 30-DEC-13

Client: P.MACHIBRODA ENGINEERING LTD
806-48th STREET EAST
SASKATOON SK S7K 3Y4
Contact: KAI RUNTZ

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-PCT-SK	Water							
Batch R2762344								
WG1806538-1 DUP		**L1404231-2**						
pH		7.43	7.48	J	pH	0.05	0.2	18-DEC-13
WG1806538-2 LCS								
pH			6.87		pH		6.76-6.96	18-DEC-13
TC-MF-WP	Water							
Batch R2762844								
WG1806983-1 DUP		**L1404141-1**						
Total Coliforms		<1	<1	RPD-NA	CFU/100mL	N/A	50	18-DEC-13
TKN-CFA-ED	Water							
Batch R2766640								
WG1810783-5 DUP		**L1405343-9**						
Total Kjeldahl Nitrogen		<0.20	<0.20	RPD-NA	mg/L	N/A	20	30-DEC-13
G1810783-2 LCS								
Total Kjeldahl Nitrogen			99.5		mg/L		75-125	30-DEC-13
WG1810783-3 LCS								
Total Kjeldahl Nitrogen			84.2		mg/L		75-125	30-DEC-13
WG1810783-4 LCS								
Total Kjeldahl Nitrogen			97.5		mg/L		75-125	30-DEC-13
WG1810783-1 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	30-DEC-13
WG1810783-6 MS		**L1405343-9**						
Total Kjeldahl Nitrogen			98.0		mg/L		70-130	30-DEC-13

Quality Control Report

Workorder: L1404231 Report Date: 30-DEC-13

Client: P.MACHIBRODA ENGINEERING LTD
806-48th STREET EAST
SASKATOON SK S7K 3Y4

Contact: KAI RUNTZ

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: L1404231 Report Date: 30-DEC-13

Client: P.MACHIBRODA ENGINEERING LTD
806-48th STREET EAST
SASKATOON SK S7K 3Y4
tact: KAI RUNTZ

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	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	2	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	3	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	4	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	5	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	6	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	7	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	8	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM
	9	16-DEC-13	18-DEC-13 13:57	0.25	50	hours	EHTR-FM

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 L1404231 were received on 17-DEC-13 13:56.

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.

Appendix E
Public Opinion

NOTICE OF PUBLIC OPEN HOUSE

Monday, July 14th, 2014
Floral Community Centre, Floral Road
5:00-8:00 pm
(Come and Go)

To review and comment on a proposed multi-parcel country residential development:
Tuscan Ridge Estates
SE 24-36-04 W3M
R.M. of Corman Park

In August of 2013, the R.M. of Corman Park had a call for proposals for potential multi-parcel country residential subdivisions. Thirty one proposals were received and initially ranked according to high priority, medium priority, and low priority. Tuscan Ridge Estates was originally ranked in the "high priority" category.

In the following months a public opinion stage was carried out as well as a presentation to the R.M. of Corman Park Council. From this, the Council created a "short list" of proposed multi-parcel developments for further review and consideration. Tuscan Ridge Estates was one of the proposed developments which could proceed and complete the Comprehensive Development Review process.

Over the past number of months, extensive studies have been completed to ensure that the land proposed for the Tuscan Ridge Development is ideal. These studies included an Environmental Study, Hydrogeological Study, Geotechnical Study, Traffic Impact Study, and Drainage Study. All studies have shown favorable results confirming the suitability of the land for development.

A come-and-go Open House has been scheduled to provide an opportunity for neighboring property owners to review the concept plan, background information and mapping, and to discuss and provide comments. The Developer of Tuscan Ridge Estates, Greg Murdoch, will be on hand to meet neighbors and respond to any questions and concerns.

Enclosed please find a short summary overview of the proposed development, as well as a copy of the concept plan and a comment sheet. If you are unable to attend the Open House on the scheduled evening we would encourage you to submit any comments you have by email or mail at the address indicated below. Alternatively, you may choose to contact the Developer, Greg Murdoch, at the phone number below to arrange to meet and discuss this information. We request that all comments be received by July 14th, 2014.

Following the completion of the Open House we will incorporate comments as appropriate, and finalize an application for rezoning and subdivision for submission to the R.M. of Corman Park.

We look forward to meeting you.

Greg Murdoch
Developer

Phone: 306-290-4937
Email: Tuscanridgeestates@outlook.com
Mail: Greg Murdoch
423 Blackburn Terrace
Saskatoon, Sk
S7V 1E8

TUSCAN RIDGE ESTATES
DEVELOPMENT OVERVIEW

Subdivision Layout and Design:

- Family-centered development set on a well treed, gently rolling property only minutes from Saskatoon

- 43 lots ranging in size from 1.10 to 5.04 Acres, with an average lot size of 2.54 Acres.

- Total of 19 acres of Municipal Reserve designed to preserve natural areas

- Lot layout and road design adjusted to take advantage of natural terrain and minimize disruption to existing vegetation and natural drainage runs

- Restrictive Covenant on properties to specify development guidelines, and encourage maintenance of natural areas. This includes prohibiting the use of off road vehicles on any lots or open space, specifies that outside lights be designed and placed to screen glare and light on adjoining properties, and restricts the number of trailers and vehicles on the property

- Architectural and Construction Guidelines will include specifications for the size of houses, the construction and finishing of buildings, specifications on exterior cladding and roofing materials, as well as requirements for design and specifications of outbuildings

Unique Development Features:

- A centrally located 3-Acre Park/Playground will be the focus of this family-centered development. This will allow Tuscan Ridge Residents and neighbors alike to gather and enjoy building memories in this gorgeous setting. All neighbors within a one-mile radius will be permitted use of this community area.

- An innovative 40,000 kw/year Solar project will be incorporated into the development (first of its kind in Saskatchewan). This will qualify with the Small Power Producers Program with SaskPower and value for the power generated will be credited back to the residents of Tuscan Ridge Estates.

- Internal roads will be paved at 90% build out

Access:

- Access will be via Range Road 3040 – 2 points of access/egress to the Development

- At 90% build out it is the Developer's intention to pave Range Road 3040 from Patience Lake Highway to access to the development

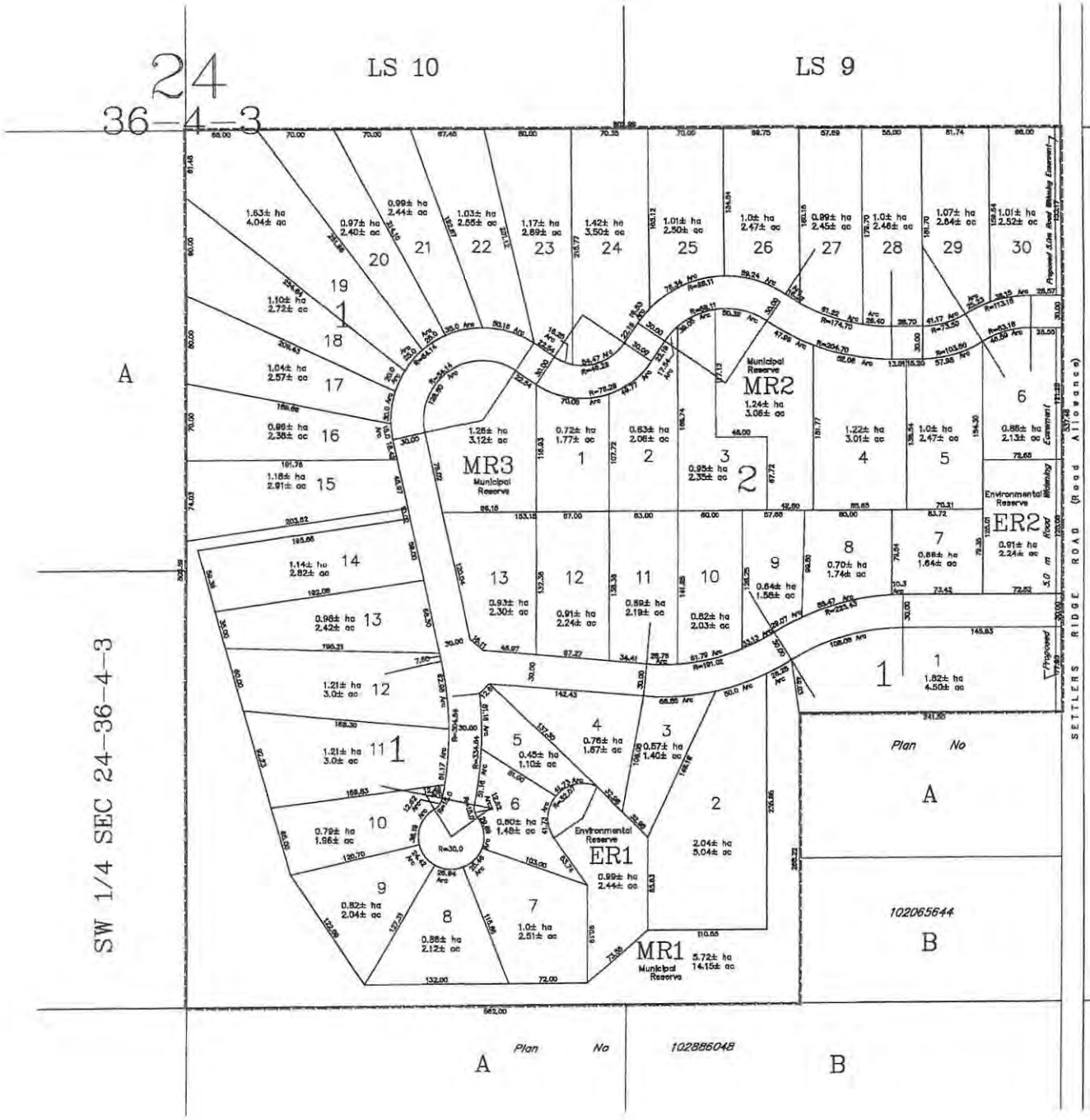
- U-shaped internal road will provide additional accessibility in the event of emergency situations

Utilities:

- Sewage Utility to be established to ensure long term monitoring and maintenance of sewage disposals systems.

- Confirmed capacity in existing water utility for Potable Water

- Access to weekly garbage pick up – no burning of garbage permitted



PLAN OF PROPOSED SUBDIVISION
PART OF SE 1/4 SEC 24-
TWP 36-RGE 4-W 3RD MER
RM OF CORMAN PARK NO 344
SASKATCHEWAN
BY T.R. WEBB, S.L.S.
SCALE 1:2000

Dimensions shown are in metres and decimals thereof.
Portion of this plan to be subdivided is outlined in red with a bold, dashed line and contains 58.25± ha (143.93± ac.) which includes 5.18± (12.8± ac) for roadways.
Distances are approximate and may vary by 5± metres.

Seal

T.R. Webb, July , 2014
Saskatchewan Land Surveyor

Registered Owner dd/mm/yy
The signature above indicates that I (we) approve the Plan of Proposed Subdivision as presented.

Prepared by
Webb Surveys
13-2507cw CAS

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
R.M. of Corman Park

Please provide your comments regarding the proposed development. Use additional paper as necessary:

_____

_____

_____

_____

_____

_____

Do you feel you have a clear understanding of the proposed development? YES ____ NO ____

Have you had sufficient opportunity to express your views? YES _____ NO _____

If you have concerns, do you feel they have been, or will be, addressed? YES _____ NO _____

If any concerns remained unresolved, are you willing to work with the developer to seek a mutually agreeable solution? YES _____ NO _____

Do you have any other opinions or suggestions, about this process, or about the proposed development? (Use additional paper as necessary)

ɔur Name _____Address _____

ɔur Contact Information (OPTIONAL) Phone: _____Email: _____

hank you for your input. Please leave this sheet at the Open House, or return to:

Greg Murdoch, Developer
Tuscan Ridge Estates
423 Blackburn Terrace, Saskatoon, SK
S7V 1E8

Email: tuscanridgeestates@outlook.com
Phone: 306-290-4937

PLEASE SUBMIT ALL COMMENTS BY JULY 14th, 2014

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
R.M. of Corman Park

1. Please provide your comments regarding the proposed development. Use additional paper as necessary:

Density too high for an acreage development?

Best pave 3040 before 70% it will take a long time to reach 90%.

2. Do you feel you have a clear understanding of the proposed development? YES ✓ NO ____

3. Have you had sufficient opportunity to express your views? YES ✓ NO ____

4. If you have concerns, do you feel they have been, or will be, addressed? YES ____ NO ____

5. If any concerns remained unresolved, are you willing to work with the developer to seek a mutually agreeable solution? YES ____ NO ____

6. Do you have any other opinions or suggestions, about this process, or about the proposed development? (Use additional paper as necessary)

Copied to RM

Your Name MARK SMITH Address PO BOX 25 RR5

Your Contact Information (OPTIONAL) Phone: _____ Email: _____

Thank you for your input. Please leave this sheet at the Open House, or return to:

Greg Murdoch, Developer
Tuscan Ridge Estates
423 Blackburn Terrace, Saskatoon, SK
S7V 1E8

Email: tuscanridgeestates@outlook.com
Phone: 306-290-4937

PLEASE SUBMIT ALL COMMENTS BY JULY 14th, 2014

July 17th, 1014

Mark Smith
P.O. Box 25, RR5
Corman Park,
SK

Dear Mark,

RE: Comments on proposed "Tuscan Ridge Estates"

Thanks for sending in your comments regarding the proposed Tuscan Ridge Estates. It is too bad I didn't get a chance to meet you in person at the open house a few nights ago. In response to your concerns;

1) Density - My whole objective with this development is to come up with a development that is not like every other development that surrounds Saskatoon. Many people love acreage living but I constantly hear complaints from people that the upkeep of the yard is just too much so they end up moving back into the City - this is why I have not designed a development consisting of fewer, larger lots. I do have a few 4-5 acre lots if people prefer but I don't think this is what the people I am developing this development for would want - including myself. I do plan to live in the development myself and I will be building on a 2 acre lot. A few years ago I did own a lot in Hidden Ridge and this is one of the reasons I sold it - the lot was just too big. Also, the RM of Corman Park does have an average lot size that you have to maintain, as well as a certain Percentage of undeveloped land (Municipal Reserve) and Tuscan Ridge Estates meets both of these criteria.

2) Pavement - Due to the huge cost of pavement it is just not financially possible to look at doing this until 90% build out is achieved. As stated I plan to live in the development so to have dust free access is very important to me, as well as all the surrounding residences. One thing I will be looking into is the possibility of having the road sprayed with Calcium Chloride at regular intervals in the summer months to help control the dust until the paved surface is put in.

Thanks again for your comments Mark and feel free to contact me if you have any further questions/concerns.

Sincerely,

Greg Murdoch
Tuscan Ridge Estates
423 Blackburn Terrace
Saskatoon, SK
S7V 1E8
306-290-4937

Print Close

Proposed Tuscan Ridge Estates Residential Development

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
Sent: July-17-14 10:56:59 PM
To: Jan Lahti [redacted]
1 attachment
PWK-MurdocPlayground-7CFDCA-24x36.pdf (9.1 MB)

Hello Jan and Todd,

Thank you for taking the time to send in your comments. It is too bad I didn't have the chance to meet you guys at the open house. In response to your concerns;

1) Traffic concern - In response to traffic concerns significant time and money was invested having an official Traffic Impact Study performed by Stantec. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands. The traffic analysis also took into consideration the nearby development of Ridgewood Estates which has a similar build out schedule. Projections were also made to consider the traffic at full build-out of the development. Further, Stantec specifically looked to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety.

They determined that,"the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates taking into account background growth and traffic generated by the nearby development of Ridgewood Estates. No additional intersection or roadway improvements are required."

I can certainly supply you with a copy of the study if you would like. Please let me know.

2) Demand - It is true that there are many Acreage Developments surrounding Saskatoon. The pace for Development for Applewood I would agree has been slow which I think can be attributed to a multitude of factors. Currently I think Applewood sits at 33% sold. However, if we consider nearby Developments of Saddleridge and Greenbryre they are moving at a much faster pace. Of the 143 lots in Greenbryre 60% of these lots are sold and Saddleridge currently sits at 61% sold.

I have a young family (kids 5 and 3) and I have designed Tuscan Ridge Estates as a community I plan to live in. I am catering to young families with a centrally located park/playground. Also, there is an innovative solar project planned for the development which will be the first of its kind in Saskatchewan. I feel these 2 factors make this development unique which will help to appeal to a different acreage market.

3) Drainage - Catterall & Wright Engineering Consultants were contracted to perform a drainage study for the proposed development. Because of the rolling topography of the land it was found that there is enough depression storage on the land to handle drainage and adjacent properties will not be affected. I can certainly send you a copy of the drainage study that was performed. Please let me know if you would like me to?

4) Access to Park - Concerning the park/playground I am definitely not trying to create a new party spot or hangout for teenagers. There is no common community centre building or area where teenagers can hang out undetected. It is designed as a playground area/park for families to enjoy and interact with their neighbours. I feel this is one of the most exciting parts of this development. Having young kids myself I spend a great deal of time at the parks. It is nice for the kids to be able to play while adults have a chance to meet and interact. I will try to attach a photo of the park/playground. Also please note that the park is centrally located in the development and is in the direct line of sight of 13 of the lots.

The park will be public space as it is located on Municipal Reserve so in reality it will be available for use to all of the public. I would assume that nearby neighbours would be the primary users but I would welcome it if neighbours from all around would come and use the park with their kids. As mentioned previously, an innovative solar project is planned for the development which will qualify under the small power producers program with SaskPower. The money generated from this fairly large solar project will be credited back to the Tuscan Ridge Community Association and they will be able to allocate the funds as they see fit. They can direct some of this money toward park maintenance as well as some of the money being credited back to the residents to offset their power bills.

Thanks again for sending me your comments and sorry for taking a couple days to get back to you. My wife has been a bit under the weather and I have been a full time Dad mode so not as much extra time as I would like!

Sincerely,

Greg Murdoch
Tuscan Ridge Estates

From: **Jan Lahti** [redacted]
Sent: July-14-14 11:39:07 AM
To: tuscanridgeestates@outlook.com
Cc: rrow@rmcormanpark.ca; Todd Lahti [redacted]

We are unable to attend this evening's open house so are submitting our comments/concerns by email.

The addition of 43 lots in Tuscan Ridge plus those available in Applewood Estates and the proposed Ridgewood Estates will greatly increase traffic along Highway 394. What measures are planned to increase safety along this highway? We feel the addition of left hand turning lanes in to the various developments, including Hidden Ridge, would be beneficial.

Is the demand for additional acreage lots justified? There are acreage developments being built all around Saskatoon, but many of these lots are still for sale or not yet built on. Applewood has been around for several years and the pace of development has been slow.

Proper drainage from surrounding developments is a concern.

How will access to the Municipal/Community Park be monitored so that only those within Tuscan Ridge and a one-mile radius have access? We have a concern that this type of out of town park could become a party spot for teenagers/young adults. Who is responsible for maintaining/patrolling the park?

Jan & Todd Lahti

24 Hidden Ridge Trail

[redacted]

PLAYWORKS
We bring play to life

System Type **R-3.5**

For Kids Ages **5-12**

Murdoc Playground

Project# 7CFDCA - DATE: 7/7/2014

This playground system design meets the requirements for access under the Accessibility Guidelines when properly installed over accessible surfacing.

WARNING: An impact absorbing safety surface is required under and around all playground equipment

IMPORTANT: The colors shown are for illustration purposes only. Actual colors may vary. Contact your Playcraft Rep for accurate color samples.

PLAYCRAFT SYSTEMS
Manufactured by Krauss Craft, Inc.

Tuscan Ridge Estates
306-290-4937

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
ent: July-13-14 8:34:46 PM
To: [redacted]
1 attachment
Tuscan Ridge Comments.pdf (2.4 MB)

From: **Donna Long** [redacted]
Sent: July-11-14 11:51:26 AM
To: tuscanridgeestates@outlook.com (tuscanridgeestates@outlook.com); rrow@rmcormanpark.ca (rrow@rmcormanpark.ca)
Cc: Murray Long [redacted]
1 attachment
Tuscan Ridge Comments.pdf (2.4 MB)

Hello Greg and Rebecca -

Please find attached our comments regarding the Tuscan Ridge development.

Sincerely,
Murray Long and Donna Zaleschuk
#11 Hidden Ridge Road

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
R.M. of Corman Park

1. Please provide your comments regarding the proposed development. Use additional paper as necessary:
Please see attached

2. Do you feel you have a clear understanding of the proposed development? YES ___ NO X

3. Have you had sufficient opportunity to express your views? YES ___ NO X

4. If you have concerns, do you feel they have been, or will be, addressed? YES ___ NO X

5. If any concerns remained unresolved, are you willing to work with the developer to seek a mutually agreeable solution? YES X NO ___

6. Do you have any other opinions or suggestions, about this process, or about the proposed development? (Use additional paper as necessary)
Please see attached

Murray Long +
Your Name Donna Zaleschuk Address Box 8 Site 515 RR5 Saskatoon, Sk

Your Contact Information (OPTIONAL) [redacted] Email: [redacted]

Thank you for your input. Please leave this sheet at the Open House, or return to:

Greg Murdoch, Developer
Tuscan Ridge Estates
423 Blackburn Terrace, Saskatoon, SK
S7V 1E8

Email: tuscanridgeestates@outlook.com
Phone: 306-290-4937

PLEASE SUBMIT ALL COMMENTS BY JULY 14th, 2014

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
RM of Corman Park

Our comments regarding the proposed development are as follows:

- **Traffic Concerns** - As main access to the Tuscan Ridge will be via Patience Lake Road, traffic will increase on the Patience Lake Road, especially when including Applewood Development. We would like the developer (ie. Greg Murdoch) and RM of Corman Park to ensure us that as part of approving this development there will be a safer traffic interchange at access road to Hidden Ridge (ie. left hand turning lane from Patience Lake road) when construction begins at Tuscan Ridge.

- **Acreage Market Demand Analysis** -- We are concerned, based on what we have seen at Applewood that development will be left with many unsold lots and or that construction build out will take a very long time. What market research supports the need for smaller acreage developments such as at Tuscan Ridge?

- **Drainage** - What type of appropriate drainage requirements have been included to ensure that water does not build up in the development, in a similar way that it has at Applewood?

- **Municipal/Community Park** - We have the same concern that we had with the community park concept in Applewood. Unless there is a strong police presence, there is a high risk that this becomes a "bush party place". Even with the playground/park being open to residents living near Tuscan Ridge, we do not support having this park in our community and these types of places are known to attract young partiers.

- **Water Utility** – Who will supply the water to this development? Will that have an impact on the water supply to residents at Hidden Ridge?

- **Architectural Guidelines and Restrictions** – How will the architectural construction guidelines and restrictions on off road vehicles, outside lights, etc be monitored or enforced? And for what duration?

Murray long and Donna Zaleschuk
#11 Hidden Ridge Road
Lot 6, BLK 3, NW Sec 13, TWP 36, RNG 4 – W3

Print Close

Tuscan Ridge Comments

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
Sent: July-18-14 6:13:40 PM
To: Donna Long [redacted] rrow@rmcormanpark.ca (rrow@rmcormanpark.ca)
1 attachment
PWK-MurdocPlayground-7CFDCA-24x36.pdf (9.1 MB)

Hi Murray and Donna,

Thank you for your comments regarding the proposed Tuscan Ridge Estates Development. It is too bad that I didn't have the opportunity to meet you guys at the open house a few nights ago. In response to your concerns;

1) Traffic - You are correct that the main access to Tuscan Ridge will be via Patience Lake Highway and I of coarse want to ensure that with the increase in traffic the adjacent traffic configuration is sufficient to support this. Therefore, significant time and money was invested having an official Traffic Impact Study performed by Stantec. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands. Projections were also made to consider the traffic at full build-out of the development. Further, Stantec specifically looked to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety. Stantec determined that the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates. No additional intersection or roadway improvements are required.

I can certainly supply you with a copy of the study if you would like. Please let me know.

2) Acreage Market Demand - It is true that there are many Acreage Developments surrounding Saskatoon. The pace for Development at Applewood I would agree has been slow which I think can be attributed to a multitude of factors. Currently I think Applewood sits at 33% sold. However, if we consider nearby Developments of Saddleridge and Greenbryre they are moving at a much faster pace. Of the 143 lots in Greenbryre 60% of these lots are sold and Saddleridge currently sits at 61% sold.

I have a young family (kids 5 and 3) and I have designed Tuscan Ridge Estates as a community I plan to live in. I am catering to young families with a centrally located park/playground. Also, there is an innovative solar project planned for the development which will be the first of its kind in Saskatchewan. I feel these 2 factors make this development unique which will help to appeal to a different acreage market. I feel that if every development was exactly the same as Applewood and Hidden Ridge then it would be a different story. I think Hidden Ridge is a very nice Development and I actually previously owned a lot at Hidden Ridge myself. However, I eventually sold it because I was wanting to live in a development that was different and that had a community gathering place and a spot for children to play and interact with neighbours. This is why Tuscan Ridge is designed the way it is.

I have talked with many people regarding acreage living and it is evident that the up keep of a 4 or 5 acre lot

is quite intimidating for a lot of people. Thus the incorporation of smaller acreage lots. I am designing this development for young families who will have the option to spend time together or play at the park, instead of having to maintain a very large parcel of land.

3) Drainage - The property where the development is proposed is quite beautiful - rolling landscape and fairly well treed - much like Hidden Ridge. Catterall & Wright Engineering Consultants were contracted perform a drainage study for the proposed development. Because of the rolling topography of the land it was found that there is enough depression storage on the land to handle drainage and adjacent properties will not be affected. I do realize that there is standing water at Applewood. However, with all the rain we have had and how wet everything is I think this is quite common all around Saskatoon. I know compared to a few years ago Hidden Ridge also has way more water built up than when I had my lot there.

I can certainly send you a copy of the drainage study that was performed. Please let me know if you would like me to?

4) Park/playground - Concerning the park/playground I am definitely not trying to create a new "bush party place." There is no common community centre building or area where teenagers can hang out undetected. It is designed as a playground area/park for families to enjoy and interact with their neighbours. I feel this is one of the most exciting parts of this development. Having young kids myself I spend a great deal of time at the parks. It is nice for the kids to be able to play while adults have a chance to meet and interact. I will try to attach a photo of the park/playground. Also please note that the park is centrally located in the development and is in the direct line of sight of 13 of the lots. I honestly feel that my land is way more likely to be used as a "bush party place" now undeveloped as it is secluded and has no one around. This seems to be types of areas these kids hang out at.

The park will be public space as it is located on Municipal Reserve so in reality it will be available for use to all of the public. I would assume that nearby neighbours would be the primary users but I would welcome neighbours from all around would come and use the park with their kids. As mentioned previously, an innovative solar project is planned for the development which will qualify under the small power producers program with SaskPower. The money generated from this fairly large solar project will be credited back to the Tuscan Ridge Community Association and they will be able to allocate the funds as they see fit. They can direct some of this money toward park maintenance as well as some of the money being credited back to the residents to offset their power bills.

5) Water Utility - Lost River Water has indicated they can supply water to the proposed Tuscan Ridge Development. I have been in contact with Rob Risling of Lost River Water and he assures me that there will be no impact on the water supply to Hidden Ridge residents.

6) Architectural Guidelines and Restrictions - The issues of architectural guidelines and restrictions on off-road vehicles, outside lights, etc will be addressed in the Restrictive Covenants. This will be monitored and enforced by the Tuscan Ridge Community Association that each person will become a member of when they buy a lot in the Development and will be on-going for as long as the Development exists.

Thanks again for sending me your comments Murray and Donna and please let me know if you would like me to send you a copy of any of the studies we had talked about.

Sincerely,

Greg Murdoch

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
R.M. of Corman Park

1. Please provide your comments regarding the proposed development. Use additional paper as necessary:

Owners should be aware there is a long standing potash mining & milling operation in the area.

2. Do you feel you have a clear understanding of the proposed development? YES ✓ NO ___

3. Have you had sufficient opportunity to express your views? YES ✓ NO ___

4. If you have concerns, do you feel they have been, or will be, addressed? YES ✓ NO ___

5. If any concerns remained unresolved, are you willing to work with the developer to seek a mutually agreeable solution? YES ✓ NO ___

6. Do you have any other opinions or suggestions, about this process, or about the proposed development? (Use additional paper as necessary)

Trevor Biers for

Your Name Potash Corp Patience Lake. Address PO Box 509, Saskatoon SK S7K 3L4

Your Contact Information (OPTIONAL) Phone: _____ Email: _____

Thank you for your input. Please leave this sheet at the Open House, or return to:

Greg Murdoch, Developer
Tuscan Ridge Estates
423 Blackburn Terrace, Saskatoon, SK
S7V 1E8

Email: tuscanridgeestates@outlook.com
Phone: 306-290-4937

PLEASE SUBMIT ALL COMMENTS BY JULY 14th, 2014

From: **tuscanridgeestates@outlook.com**
Sent: July-13-14 8:34:16 PM
To: [redacted]

1 attachment
tuscan ridge comments 001.jpg (1300.4 KB)

From: [redacted]
Sent: July-11-14 11:48:48 AM
To: tuscanridgeestates@outlook.com
Cc: rm344@rmcormanpark.ca

1 attachment
tuscan ridge comments 001.jpg (1300.4 KB)

Hi
Dont know if we can make the meeting so thought would send this out with our concerns.
Main jist of it is
- Want less density-- feels like a trailer park
- want access from 8th street also- so want 3040 built up from 8 th st - as on opti
- want off road vehicles to be allowed in development -(say they can have on thier own
- address the 90% sold issue - would like it to be paved at 75% sold ,otherwise why sel

cheers JODI W :)

Comments on proposed country residential development:
"Tuscan Ridge Estates"
SE 24-36-04
R.M. of Corman Park

1. Please provide your comments regarding the proposed development. Use additional paper as necessary: Are Against the pure density of housed
- same concerns: main concern is access - 43 lots equals at least 86 vehicles using 3040 we would like to see 3040 open all the way to 8th St. so property owners have an option to use 8th St if they want.
- we feel 43 lots is way to Dense - like a trailer park. 5 acre lots would make it less dense, like lots to be 4-5 acre
- feel road will NEVER get paved at 90% - why sell the last few properties only to lose money.

2. Do you feel you have a clear understanding of the proposed development? YES ✓ NO ____

3. Have you had sufficient opportunity to express your views? YES ✓ NO ____

4. If you have concerns, do you feel they have been, or will be, addressed? YES ____ NO ✓

5. If any concerns remained unresolved, are you willing to work with the developer to seek a mutually agreeable solution? YES ✓ NO ____

6. Do you have any other opinions or suggestions, about this process, or about the proposed development? (Use additional paper as necessary)
- also if cant use quads + snowmobiles on their property where do you think they will go with them? Thats right, down the road and into our fields!! Like kidding may does! I would like them to be allowed in your subdivision

Your Name Jod Randy Wakhl Address RR5 Box 26 B

Your Contact Information (OPTIONAL) Phone [redacted] Email: [redacted]

Thank you for your input. Please leave this sheet at the Open House, or return to:

Greg Murdoch, Developer
Tuscan Ridge Estates
423 Blackburn Terrace, Saskatoon, SK
S7V 1E8

Email: tuscanridgeestates@outlook.com
Phone: 306-290-4937

- corman park rm 344@ rmcormanpark ca

PLEASE SUBMIT ALL COMMENTS BY JULY 14th, 2014

Print Close

tuscan ridge comments and concerns

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
Sent: July-19-14 10:58:07 AM
To: [redacted]

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
Sent: July-19-14 10:57:13 AM
To: [redacted]

From: **tuscan ridge** (tuscanridgeestates@outlook.com)
Sent: July-18-14 12:05:41 AM
To: [redacted]
Cc: rm344@rmcormanpark.ca (rm344@rmcormanpark.ca)

Hi Jody,

hank you for your comments.

Regarding your concerns....Pavement - I am just passing on to you that it is not possible to pave RR 3040 until 90% build out. As stated previously because of the immense cost of pavement the development has to reach this point in order to make it economically viable. I realize that the dust from the gravel road is the issue and I did state that I will be looking into the application of Calcium Chloride to help control the dust in the interim. The only other option I could look at is possibly seal coating the road which would also give it a dust free finish. Because this is less expensive compared with pavement it is possible this could occur at the 75% build out level?

Quads - As stated previously because the development is focused on families and I expect a lot of children in the development, having quad access throughout the development is a safety issue. You had mentioned that you have a problem with Hidden Ridge people riding quads on your property. I am under the impression that quads CAN be driven throughout the Hidden Ridge development. This creates a situation where residents can drive their quads right out of the development, down the road, onto your property. In the case of my development where open quad use throughout the development is NOT permitted people will not be able to do this. They will have to load up and trailer their quads and then drive to their destination. I would think it would be unlikely that they would go to all this work and then drive a half mile and unload. This I feel would create a situation that is more favourable as they will likely travel a further distance to quad trails, etc..... Thereby resulting in less people likely to be quading on your land.

ensity - I do not feel that fewer, larger lots is a good option. I have talked with many people regarding acreage living and as I stated the upkeep of a 4 or 5 acre lot is quite intimidating for a lot of people. I am designing this development for young families who will have the option to spend time together or play at the

park, instead of having to maintain a 5 acre parcel of land.

Range Road 3040 - As I had stated previously I did present the option to Council to build up the road to 8th street. As you stated this is not a one year thing - it is a 100 year thing. I think I had discussed with Randy when I talked to him on the phone before Christmas that when the City constructs the perimeter road on the east side of Saskatoon I think this will result in a lot more development along 8th street - and subsequent build up of the roads. Please note that significant time and money was invested having an official Traffic Impact Study performed by Statec. The purpose of this study was to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands. Projections were also made to consider the traffic at full build-out of the development. Further, Stantec specifically looked to identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety. They determined that, "the traffic network will function satisfactorily at full build out of Tuscan Ridge Estates. No additional intersection or roadway improvements are required."

I can certainly supply you with a copy of the study if you would like? Please let me know.

Sincerely,

Greg Murdoch
Tuscan Ridge Estates

From: [redacted]
Sent: July-17-14 1:22:26 PM
To: tuscanridgeestates@outlook.com
Cc: rm344@rmcormanpark.ca

Thnaks for your reply - so basically I see none of our concerns, have or will be addressed , you have just provided answers as to why they wont be dealt with ..

I think the building up of 3040 is absolutely a MUST - that 8th street is in "poor shape " is a **horrible excuse** . especially if you are willing to pay the expense - I dont understand why council would Vedo it ??? .. .. Gosh this is not a one year thing- this is for the next 100 years - , amd with so much development and circle drive etc - this will not be an issue for long -and besides , there are MANY accesses to the development if that road was opened , not just from 8th street - people would be able to get to it from hwy 5 , and from the patience lake hwy and from the mine Highway - doesnt that just make more sense ???? 4 ways to access it - instead of 1 ??? AND in a year- what will 3040 look like ??? with an extra 100 cars driving on it ??? it will look just like 8th street... absolutley ridiculous ... I am afraid if none of our concerns are addressed, especially the 3040 access - I ,we DO NOT support this development and will go to next council meeting to express that ... thanks ..

cheers JODI W :)

From: **tuscanridgeestates@outlook.com**
Sent: July-17-14 12:07:58 AM
To: [redacted]

Hi Jodi and Randy,

Thank you for your comments. I wasn't sure if I would meet you guys at the open house so I am replying now. In response to your concerns;

) Density - My whole objective with this development is to come up with a development that is not like every other development that surrounds Saskatoon. Many people love acreage living but I constantly hear complaints from people that the upkeep of the yard is just too much so they end up moving back into the City - this is why I have not designed a development consisting of solely 4-5 acre lots. I do have a few that size if people prefer but I don't think this is what the people I am developing this development for would want - including myself. As I think I mentioned to you Jodi I do plan to live in the development myself and I will be building on a 2 acre lot. A few years ago I did own a lot in Hidden Ridge and this is one of the reasons I sold it - the lot was just too big. Also, the RM of Corman Park does have an average lot size that you have to maintain, as well as a certain Percentage of undeveloped land (Municipal Reserve) and Tuscan Ridge Estates meets both of these criteria.

2) Access - I do remember that this was a concern of yours when I had previously talked to you guys before Christmas. As part of the Development application process I did summarize the comments that I received from everyone and I presented these to the RM of Corman Park Council. I did say that I would be willing to build up the remainder of Range Road 3040 to access 8th Street but Council was not in favour of this because of the poor shape of 8th Street coming out of Saskatoon.

3) Pavement - Due to the huge cost of pavement it is just not financially possible to look at doing this until 90% build out is achieved. As stated I plan to live in the development so to have dust free access is very important to me, as well as all the surrounding residences along RR 3040. One thing I will be looking in ıe possibility of having the road sprayed with Calcium Chloride at regular intervals in the summer months to help control the dust until the paved surface is put in.

4) Quads - Residents will be permitted to use quads within the development on their own property for yard work, etc.. Tuscan Ridge Estates is designed with young families in mind and I expect a fair amount of foot traffic throughout the development from children going back and forth to the park/playground. Having quad use permitted freely throughout the Development would be a safety risk in my mind.

Thanks again for your comments. Jodi, I think I remember you mentioning before Christmas that you had friends with children that had moved to an acreage. They ended up not feeling part of a community and eventually moved back into the City. This sense of community is exactly what I am trying to achieve with Tuscan Ridge Estates.

Sincerely,

Greg Murdoch
Tuscan Ridge Estates
423 Blackburn Terrace
Saskatoon, Sk
S7V 1E8
)6-290-4937

initial mail out

November 1ST, 2013

TO CORMAN PARK RESIDENT:

Dear Neighbor:

RE: Proposed "Tuscan Ridge" Development

A proposal is being submitted to the Rural Municipality of Corman Park to rezone 144 acres of SE 24-36-4 W3 from Agriculture zoning to Country residential zoning. This will accommodate a 38 lot subdivision in addition to 2 existing lots (40 lots total).

You are being notified as you are a Corman Park taxpayer within 1 mile of the proposed rezoning OR you are a taxpayer in the adjacent R.M. of Blucher.

The proposed "Tuscan Ridge" development is consistent with the existing multi-parcel country residential development in the area. "Tuscan Ridge" will be a family centered development with a beautiful 4-acre park/picnic area/toboggan hill that will be available for residents within a 1 mile radius to use.

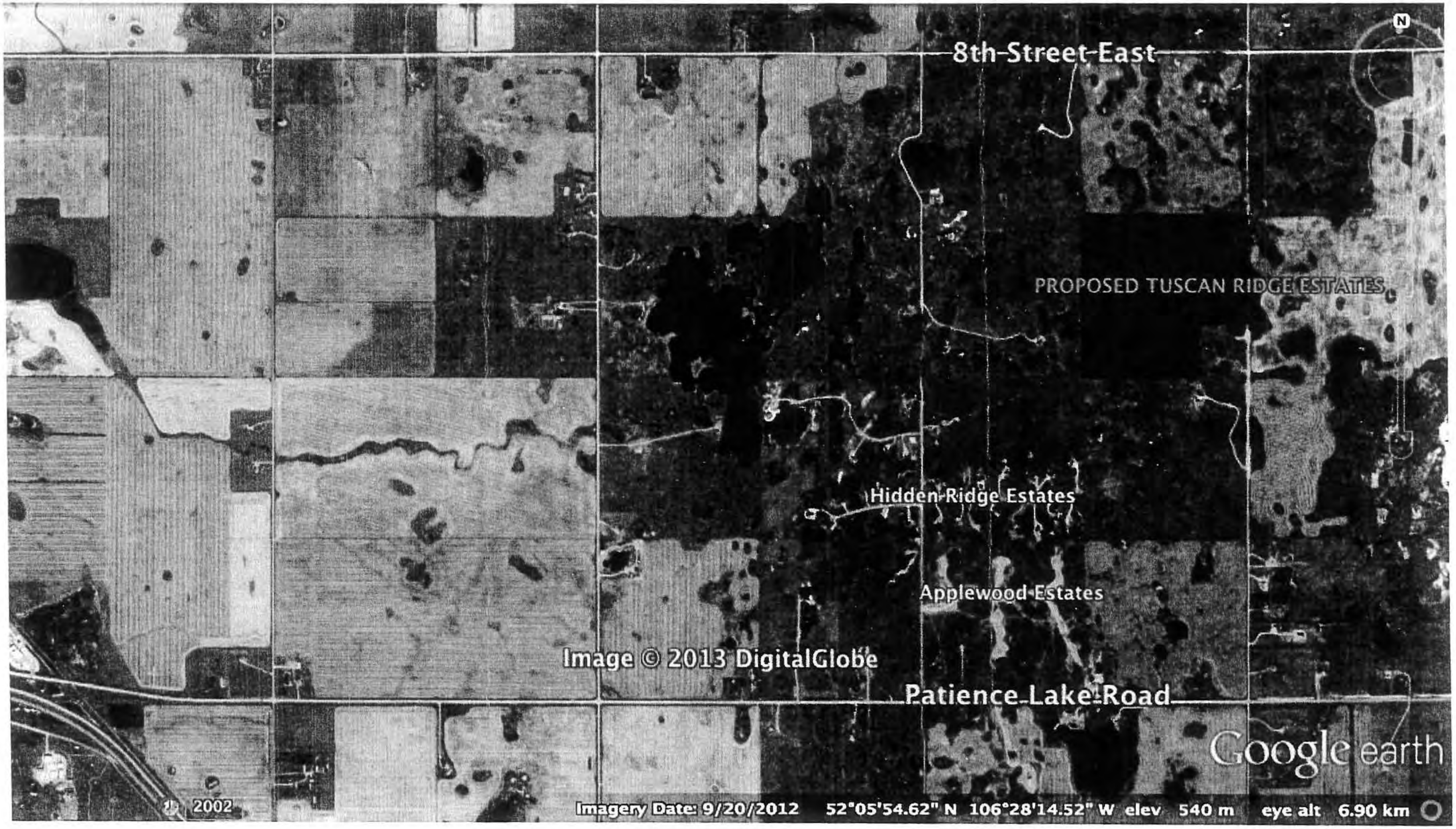
Residents of Hidden Ridge: Please note there is no abutment of this development with Hidden Ridge thereby allowing each development their own autonomy. Furthermore, the access to "Tuscan Ridge" will be via Range Road 3040 and will NOT increase traffic/wear on Hidden Ridge Road.

Enclosed please find a form inviting you to comment on this proposal. It would be appreciated if this form could be returned by November 15th, 2013. A stamped, self-addressed envelope has been provided for your convenience. These comments will be reviewed and/or addressed by the developer and submitted with the initial proposal to the R. M. of Corman Park.

If you have any further questions or wish to speak to the developer directly please feel free to call 306-290-4937.

Thank you very much for your time and your consideration.

Greg Murdoch
423 Blackburn Terrace
Saskatoon, SK
S7V 1E8
Phone 306-290-4937


8th-Street-East
PROPOSED TUSCAN RIDGE ESTATES
Hidden-Ridge-Estates
Applewood-Estates
Image © 2013 DigitalGlobe
Patience-Lake-Road
Google earth
2002
Imagery Date: 9/20/2012 52°05'54.62" N 106°28'14.52" W elev 540 m eye alt 6.90 km

initial mail out page 3 of 3

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME:

SIGNATURE:

DATE:

Edward J Kendall
21100 2105 8th Street East
Saskatoon SK
S7H 5N9

Greg Murdoch
423 Blackburn Terrace
Saskatoon, SK
S7V 1E8
[redacted]

Tuesday, November 12, 2013

Re: Proposed rezoning of SE 24 -36- 4 W3

Dear Mr. Murdock,

Thank you for contacting me in the course of your rezoning application to Corman Park. I received your letter today. From the information enclosed I note that you are intending to develop forty lots on your property. I offer my support for your application and wish you well with your development plans.

Please be aware that we use the 80 acres adjacent to your ~~east~~ West boundary to background cattle, raise horses and occasionally cultivate hay. I ask that you acknowledge this pre-existing use and make your future clients aware of it as well.

My wife and I welcome your development to the neighborhood and we appreciate the gesture of goodwill access that you provided in your letter. For our part we will do our utmost to be good neighbors to residents of Tuscan Ridge.

Very truly yours,

Edward and Rosalind Kendall
SW 24-36-4-W3

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

We are happy to learn that access to Tuscan Ridge will not be via 3041 (Hidden Ridge). Best of luck with your planning. Acreage living is absolutely incredible! Thank you for sending out this information. It is appreciated

NAME: Erin & Darren Stoudt

SIGNATURE: E&D Stoudt

DATE: Nov 12/13

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: JEFF DUMBA

SIGNATURE:

DATE: 11 Nov '13

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: Terrence Thomsen

SIGNATURE:

DATE: 15 NOV 2013

(2)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: Nicole + Ash DROBOT

SIGNATURE: N Drobot

DATE: Nov. 10/2013

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

(2.) I have been contacted regarding the above noted proposal and have the following comments:

- nothing enclosed?

NAME: Gary Grant

SIGNATURE:

DATE: Nov. 9/13.

(7)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: Trevor Berg

SIGNATURE:

DATE: Nov 12, 2013


8th Street East
PROPOSED TUSCAN RIDGE ESTATES
Hidden Ridge Estates
Applewood Estates
Image © 2013 DigitalGlobe
Patience Lake Road
Google earth
2002
Imagery Date: 9/20/2012 52°05'54.62" N 106°28'14.52" W elev 540 m eye alt 6.90 km

(6)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: Jan Lahti / Todd Lahti

SIGNATURE: Jan P. Lahti / [signature]

DATE: Nov. 11, 2013

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

Too many development around Saskatoon, but good luck!

NAME: MARK SMITH

SIGNATURE:

DATE: 15 November 2013

(7)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments: Concerns

my (our) only concern or question regarding this proposal is: Is grid road 3040 going to be built up N to allow access from 8th Street also? or will all traffic be coming from the PCS highway?

We live right on 3040 and are worried about if all the traffic is going to be coming past our house. We are not in favor of that

NAME: Jodi / Randy Walchuk

SIGNATURE: Jodi Walchuk

DATE: Nov 10/13

[redacted]

response

PHONE CONVERSATION RE COMMENTS FROM Jodi/Randy Walchuk

NOVEMBER 14TH, 2013 @ 8:00 PM

Contacted Jodi by phone to discuss development proposal and concern regarding traffic along range road 3040 off of patience lake road.

Jodi explained that they live a little further east of the turn off from Patience Lake highway to range road 3040 but they have a rental house along range road 3040 in the R.M. of Blucher. I explained that the primary access for the development will initially be from Patience Lake highway north 1 ¼ miles to access the development. However, there is also access from 8th street which will likely become used more in the future as 8th street becomes more developed and if the perimeter road becomes a reality. Therefore it is realistic that many of the residents of proposed "Tuscan Ridge" will access the development in both directions to remove some of the traffic load off of range road 3040. She was ok with this!

I discussed that the plan is to hopefully asphalt range road 3040 when 90% lot sales are reached to provide a dust free environment for residents along the road. She was very pleased to hear there will hopefully be a dust free road eventually and I assured her that regardless the road will have to be built up at my (the developers) expense. She was very happy as she felt this will increase the value of their rental property along range road 3040!

I explained the lot sizes and the layout of the development with a common park area in the middle where residents and their families can gather and play and visit. She thought this was a great idea and said that she has had friends that have moved to an acreage in the past and found that because of very large lots and lack of social gathering areas – they moved back to the city! She thought the smaller lot sizes and family park would appeal to many people!

She thanked me for the call.

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

Our concern with your proposed sub division would be the cost involved in upgrading / paving / maintaining roads. We are located just off PCS Hwy (paved) at Grid 3040. We are satisfied with our road access and are not wanting to be forced to pay for any road changes now or in the future in a lump sum or on our taxes.

NAME: Murray and Lisa Perehudoff

SIGNATURE:

DATE: Nov 26, 2013

response mailed Dec 4th/13.

December 3rd, 2013

Murray and Lisa Perehudoff
[redacted]
Saskatoon, Sk
S7K 3J8

Dear Murray and Lisa,

RE: "Tuscan Ridge" Proposal
Proposed rezoning of 144 acres of SE 24-36-4 W3

Thank you for taking the time to respond to the letter that was sent out. I just received it in the mail today. I think I actually tried to stop by your place one night when I was out but no one was home. I apologize that I did not get by to meet you both in person.

I do agree that you have great access as it is and I understand the concern regarding possible increased costs. I am hoping to offer future residents of Tuscan Ridge the same sort of dust free access as well, while at the same time benefitting the residents on both sides of range road 3040 as well.

I currently have a proposal with the R.M. of Blucher to give me direction on the type of surface they would like to see, and hopefully allow me to pave 3040 to the access of the development. But please be assured that the build up of the road or surfacing changes on the road will be done at my expense. I will be solely responsible for the costs of building up the road and the future surfacing of the road as well. Due to the huge expense, it is my goal to pave the road at the point I reach 90% lot sales.

I hope this puts your mind at ease that there will be no up front road costs or change in taxes to fund the building up of range road 3040.

Please feel free to contact me by phone (306) 290-4937 or by email wmurdoc@hotmail.com if you have any further questions.

Sincerely,

Greg Murdoch

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

NAME: Hengying Yang

SIGNATURE: 杨恒英

DATE: 2013. 11. 26

IN PERSON MEETING with Kathy Boychuk at her residence Nov. 5th, 2013 @ 8:45

- met Kathy at her house and discussed the current call for proposals and where the location of my land was.
- explained the proposed site plan and the development set up with a common park area/toboggan hill/picnic areas that will be available to residents of Tuscan Ridge and surrounding neighbors.
-she thought this was a great idea and liked the set up of the development. She stated that her son (Mike Boychuk) and his wife(Christie) who currently live on the southeast corner of the proposed Tuscan Ridge property would benefit from the park area as they have fairly young kids. I said that I had just been talking to them and they did seem excited.
- I also explained that I hope to asphalt range road 3040 so that residents of Tuscan Ridge as well as others along the road will have dust free access. She was very excited about this and said that is one thing they wish they had is a dust free route to their house.
- Kathy was very pleasant and seemed in favor of the development.
- I did leave the information and the comment card in case she wanted to get ahold of me or had further questions
- Kathy wished me the best of luck with the development!

PHONE CONVERSATION with Edward Kendall November 12th, 2013 (owns 80 acres adjacent to property on West side)

- Edward said he had received my letter with the info on the re-zoning and the comment sheet. He thanked me for sending this out.
- He said that they have to objections to the development and would welcome the Tuscan Ridge residents into the community!
- He said it is a beautiful piece of property with lots of trees and rolling landscape and he said he almost bought it years ago. He said it will be perfect for a development like this!
- I described the development to him in detail – the number of lots and size of lots and the fact that there will be a central park/toboggan hill for residents and neighbors to use as well
- He wanted to be sure I was aware that they use their property occasionally to background cattle, raise horses, and occasionally cultivate hay. He said he would appreciate if I could let future residents know this so they are aware that this is pre-existing land use.
- I assured him that I would do this and that his current land use will not cause an issue with future Tuscan Ridge residents.
- I told him that I wish all neighbors were as understanding as him and his wife!
- He thanked me very much for taking the time to call him and also to send out the information
- He said he would also forward an email to me (attached)

Edward J Kendall
[redacted]
Saskatoon SK
S7H 5N9

Greg Murdoch
423 Blackburn Terrace
Saskatoon, SK
S7V 1E8
306 955 2303

Tuesday, November 12, 2013

Re: Proposed rezoning of SE 24 -36- 4 W3

Dear Mr. Murdock,

Thank you for contacting me in the course of your rezoning application to Corman Park. I received your letter today. From the information enclosed I note that you are intending to develop forty lots on your property. I offer my support for your application and wish you well with your development plans.

Please be aware that we use the 80 acres adjacent to your ~~east~~ West boundary to background cattle, raise horses and occasionally cultivate hay. I ask that you acknowledge this pre-existing use and make your future clients aware of it as well.

My wife and I welcome your development to the neighborhood and we appreciate the gesture of goodwill access that you provided in your letter. For our part we will do our utmost to be good neighbors to residents of Tuscan Ridge.

Very truly yours,

Edward and Rosalind Kendall
SW 24-36-4-W3

IN PERSON MEETING with Mike and Christie Boychuk at their residence – NOV. 5TH, 2013 @ 8:00

Introduced myself and explained the process that the R.M. of Corman Park is currently going through with the call for proposals.

- I explained the development plan in detail and that I have Municipal Reserve surrounding their lot and the lot adjacent to them so that another lot is not directly backing on to their property. I also explained the park area/toboggan hill/picnic area that will be available for them to use with their kids. Both Christie and Mike seemed quite pleased about this.
- I also explained that I will be building up range road 3040 even further and will hopefully be paving this road when 90% lot sales is reached. This will provide them as well as residents of Tuscan Ridge a dust free environment. They also seemed very excited about this.
- I left them with a letter and comment sheet to send to me if they had any further questions or comments.
- No further comments received

IN PERSON MEETING WITH Murray and wife of M and L Rural services (2nd house in R.M. of Blucher along range road 3040) at their residence November 5th, 2013 @ 7:30 pm

-introduced myself and the current call for proposals through the R.M. of Corman Park
- explained what the plans are for the proposed development – the average lot sizes, layout and number of lots. Also discussed the common park area/toboggan hill that will be available to residents of Tuscan Ridge as well as neighbors and they said this was a good idea.
- I discussed plans to asphalt range road 3040 (which they live along) at 90% of lot sales. They seemed quite happy about this and said it would be great not to have to travel on gravel at all off of Patience Lake highway.
- they explained that they do the water and sewer for subdivisions such as this and expressed interest in possibly doing the septic and water for Tuscan Ridge.
- I said I would definitely keep them in mind when I get to that stage.
- I left them with the information and the comment card to send in if they had any further comments – none received.

IN PERSON MEETING at Steve Brissaw's residence November 5th, 2013 @ 7:00(closest residence to development on Blucher side along range road 3040)

- Steve was not home so went over information with 2 older kids and asked them to pass the information onto their Mom and Dad.
- Left development information and my contact information for parents to call me to discuss if any issues.
- None received.

IN PERSON MEETING with Richard and Heng Ying Yang at their residence on November November 26th, 2013 at 3:00 until 4:15. (own quarter at the corner of Patience Lake highway and range road 3040 SE 13-36-4 W3)

-introduced myself and went over the development plans including number of lots, lot layout, and size of lots.
- explained the application process with the R.M. of Corman Park for multiparcel country residential developments.
- Richard said that they too want to develop their land and wanted to know all the details and things that have to be done to have the development approved by the municipality.
- I explained that I plan to asphalt range road 3040 when 90% of the lots are sold and he was very excited about this as he felt this would help his development chances
- was mostly interested in how to do the proposal and wanted to photocopy all of my material.
- a friend of his then showed up who also owns land on the West side of Saskatoon in the R.M. of Corman Park and he wanted me to go over the development process with him as well.
- after a long conversation about the process I recommended that he contact the R.M. office to get more information about future proposals as I told him that the current deadline had passed.
- him and his wife Heng Ying said they have no issues with the development and wished me luck
- he thanked me for my time and said he would offer his help with my development because he wants experience to do his
- I said I would keep this in mind

Phone conversation with Don Priddy November 15, 2013

Called Don and told him that I had tried calling a couple times and stopped by his house a couple of times to discuss things but couldn't get a hold of him.

Explained the development over the phone to Don who owns the 3 quarters of farmland directly to the East of the development in Blucher. He said he has no problems with the proposal and the building up of range road 3040. He said he doesn't plan on doing any development down the road but if his kids decide to then the build up of the road will definitely be an advantage. He just stated that he hopes it won't be an issue if he drives his grain trucks on the road and I assured him this would not be an issue.

He wished me good luck with the development.

PHONE CONVERSATION with Jared Rodgers November 12th, 2013 at 8:00 PM (owner of North Lot located on the same quarter SE 24-36-4 W3)

- Introduced myself to Jared and said that I had previously talked with his mom and dad Lloyd and Anne Rodgers.
- Explained what was planned for the development – number of lots, size and layout of the lots
- Told him that I have Municipal reserve surrounding the back of his lot so that there is no residence directly backing his lot to the West. Also explained that they will likely be a roadway alongside the lot to the north
- Explained that there will be a common park/toboggan hill that will be available to use by the neighbours
- He said that was a great idea and he looks forward to that down the road when he has kids – currently he is too busy working!
- Also explained that I plan to asphalt range road 3040 from Patience Lake highway to the access of the development at 90 % lot sales. This means he will have a dust free drive to Saskatoon and he was very excited about this.
- He expressed interest in purchasing a lot in Tuscan Ridge in order to make his current lot larger so he can have more space. He said he would like to take a look at the plans sometime and see if we could work something out.
- I said I would talk to him once the planning got closer and discuss the lot layout details to see if this could be worked out.
- He thanked me for the call
- He had no concerns with the development

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

① CONCERNED BY INCREASE IN TRAFFIC ON PATIENCE LAKE ROAD IF THAT IS MAIN ACCESS. ESP. AT INTERSECTION WITH HIGHWAY #1 NEEDS TO BE A MERGE ACCESS LANE AT THE #16 TURN INTO SASKATOON.

② CONCERN THAT LAND WILL BE DEVELOPED AFFECTING WILDLIFE & THEN LIMITED OR NO CONSTRUCTION. E.G. APPLEWOOD IS SLOW IN COMPLETION. CONSTRUCTION ON ONLY ONE LOT THIS YEAR.

NAME: MURRAY LONG (#11 HIDDEN RIDGE ROAD)

SIGNATURE:

DATE: NOV 14/13

③ WILL DEVELOPMENT AFFECT WATER SUPPLY VOLUMES TO EXISTING HIDDEN RIDGE RESIDENTS.

④ ANY AFFECTS ON DRAINAGE?

- response letter

November 26th, 2013

Murray Long
#11 Hidden Ridge Road
[redacted]
Saskatoon, Sk
S7K 3J8

Dear Murray,

Re: Proposed rezoning of 144 acres of Se 24-36-4 W3
"Tuscan Ridge"

Thank you for your recent return of the comment form for the proposed "Tuscan Ridge" development.

1. Concerned by increase in traffic on Patience Lake Road – The primary access for the development will initially be Patience Lake Highway. However, the proposed area for rezoning is only a half-mile from the continuation of 8th Street. So I would expect that many residents would also use this for accessing the development. This in turn would reduce the traffic on Patience Lake Highway and merging onto Highway 16. Also, as Rosewood and The Meadows become more developed this will open up additional routes to the city.
2. The Proposed "Tuscan Ridge" development will have restrictions in place to minimize impact on wildlife. Lot placement and conditions for site development will be minimally invasive allowing many plant and animal species that currently reside here to continue to thrive. Also, there will be 22 acres of land set aside as municipal reserve and left in its natural untouched state. Development will hopefully follow soon after the infra-structure is in place. So just as Hidden Ridge has minimized the impact on wildlife, this will be the goal of "Tuscan Ridge" as well.
3. Water supply volumes – I have been in direct contact with Rob Risling of "Lost River Water" regarding this issue. To service the full development an additional 20 gal/min is needed. The main water supply line is along Highway 16 which carries approx. 300 gal/min. Once the development is started, an additional 20 gal/minute will be available on the line which also supplies Hidden Ridge. This will result in an excess of water that is available for some time until the development fills up and then the supply will be the same as its current level at Hidden Ridge.
4. Affects on Drainage – The proposed 144 acres has extensive vegetation and good contour that have created natural on site catchment areas to aid surface

drainage. However, as part of the development process a hydrogeological and geotechnical study have to be completed on the land. Based on this information the professional engineers decide if there is sufficient drainage in place or if additional steps need to be taken. All advice will be followed so that no adjacent properties notice any affects on drainage.

I certainly appreciate your comments Murray and please feel free to contact me by phone at 306-290-4937 or by email [redacted]

Sincerely,

Greg Murdoch

mailed Nov 30

Greg — copy as sent to RM Corman Park.
thx.
Lindy Pelletier

From: Robin Adair & Lindy Pelletier (taxpayer in adjacent RM of Blucher)

Date: Nov 14, 2013

Re: Proposed "Tuscan Ridge" Development

Our comments and recommendations with regards to the proposed development are as follows:

1) Given the significant increase in traffic along RR#3040, due explicitly to this new development, we expect the range road **between Highway 394 and 8th Street East** to be fully and professionally repaired where needed and then paved, upon lot sales beginning in this development. This would allow traffic to go north to 8th street rather than always using RR#3040. Currently, the range road is not in good repair north of this proposed development and therefore traffic (including heavy construction traffic at the outset of the building on these lots) would have no other alternative route other than south along RR#3040. This is not acceptable and would present challenges to those living along this road.

2) Consistent with the family focus of this new development, we kindly request that range road #3040 when paved, to include potentially some widening and an appropriate designated shoulder on the road for bike and pedestrian traffic along range road #3040 between Highway #394 and 8th Street East.

3) If this proposed development is approved, we expect no further multi-lot residential development to be approved in the same quarter section. We request the quarter section south of this proposed development remain **as agricultural, as originally intended**. There are already several new developments within a 2 mile radius of this proposed development – Hidden Ridge, Applewood and now Tuscan Ridge (if approved). These present traffic congestion and other issues on roads and in areas that were not designed for this level of traffic. We kindly request the RM of Corman Park consider this and not approve any further development in the quarter section south of Tuscan Ridge.

4) Along range road #3040, we request signage be put up indicating speed limits and possibly 'children at play' signage. There are several families with young children living along range road #3040 (nearer to highway #394) and this increased traffic as a result of this proposed development, especially in the building phase of this proposed development, presents risks. Likewise, the corridor along range road #3040 is a common playground for snowmobile traffic, quads, etc.

5) During the construction phase of any development, loose refuse and building material waste commonly ends up in ditches along roads and in fields. We kindly request the developer assume some responsibility for clean-up of this in ditches and along range road #3040 from 8th street East to Highway #394 during the construction phase.

With due consideration provided for these enhancements, provisions, and accommodations, as presented above, we would be pleased to actively support this proposed development.

Respectfully,

Lindy Pelletier & Robin Adair

-response

IN PERSON MEETING WITH Robin S. Adair and Lindy Pelletier at their residence (2nd last residence along range road 3040) on November 5th, 2013 @ 6:30

-introduced myself and explained the current process for the call for proposals in the R.M. of Corman Park
- explained the development detail including lot layout, number of lots, and lot sizes
- described the common park area/toboggan hill that will be available to surrounding neighbors and they seemed quite happy about this as they have young kids
- they expressed some concern regarding having more people around the area as they like the fact that there isn't a lot of people that live around there so their kids can quad all over the place and not have to worry.
- they also expressed concerns regarding increase traffic along range road 3040
- they had also heard that Chinese investors had bought the quarter section of land directly across from them and were wondering if this was going to be developed as well? I said I didn't know for sure but hadn't heard anything.
- they asked if my development was approved would it be more likely that the quarter across from them would be developed as well and I said I didn't know.
- I explained that I plan to asphalt range road 3040 when 90% of the lots are sold and they seemed quite pleased about this.
- I left more information about the development and a comment sheet and asked them to send this into me if they had any further comments.

November 14th, 2013 a comment sheet was received(please see attached)

- November 17th, 2013 @ 1:00 pm message left on answering machine to discuss concerns)
- November 19th call was returned and I discussed issues by phone:
  1. wants range road 3040 between Patience Lake highway(highway 394) and 8th street to be fully repaired and paved before any construction begins – Discussed with Lindy that to build up the road and then pave it is a huge expense. And that I had originally planned to build up 3040 to access the development but the remainder (approx. ½ mile) of range road 3040 would not be built up due to additional expense. However, after considering this it would help split the traffic load between the two routes so I said I may look at this option depending on the expense. However, range road 3040 would NOT be paved from the development access north to 8th street due to the high expense.

  - I also explained that range road 3040 will be built up from Patience Lake Highway to the access of the development (approx. 1.5 miles) at my (the developers) expense. However, asphalt will not be applied until 90% of lot sales is reached due to the huge expense. She said she was fine with this

  2. Widening of range road 3040 when paved to allow for bike and pedestrian traffic – I said that this would be difficult due to the increase in the expense. The

road will be built up wider than it is now on the northern park of the road close to the development.

3. They would like no more multi-parcel residential developments in the area – specifically on the quarter across the road from them SE 13-36-4 W3.

- I said this is out of my hands and is ultimately up to the R.M. of Corman Park. However, I said that I will be handing in all my public consult information to the R.M..

4. Children at play signage – I said this is a very good idea and I would do my best to ensure this was done

5. Refuse in ditches and along roads surrounding development. – I said when it comes time that people are building in the development I will take responsibility for this and ensure that it is cleaned up.

Lindy thanked me for the call and said she feels that I am doing what I can to address these issues at this time and they have no further concerns. She said she will send an email in this regard (please see attached)

response

From: **Robin Adair** [redacted] You moved this message to its current location.
Sent: November-19-13 7:58:50 PM
To: [redacted]
Cc:

To Whom it May Concern

Greg Murdoch recently contacted us to discuss the concessions and enhancements suggested on our response regarding the proposed Tuscan Ridge Development, dated November 14, 2013.

Through our discussions, Greg has provided assurances regarding several of our suggestions and to the extent possible at this point has addressed our concerns. Namely, he has confirmed the building up of RR 3040 between highway 394 and 8th Street East early on, and perhaps more importantly the paving of this same road upon 90% lot sales.

We trust Greg is going to ensure the further due diligence and investigation into some of our suggestions as the development process moves forward, should this development be approved. We believe Greg understands our concerns and suggestions and is doing what is within his power to address these.

Regards,

Robin Adair & Lindy Pelletier

(7)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

Attached

NAME:

SIGNATURE:

DATE:

Concerns regarding proposed Tuscan Ridge development SE 24-36-4 W3

1. Density of the development. The SE 24-36-4 W3 is one quarter mile from Hidden Ridge (30 lots) and one half mile from Applewood Estates (39 lots). This would make a total of 107 residences in high density configuration within a three-quarter mile radius, in addition to two eight-acre lots existing on SE 24-36-4 W3, four residences on 80 acre lots, and three residences on smaller lots. This raises concerns such as:
   - -groundwater pollution from septic systems
   - -light 'pollution' from yard/street lighting
   - -traffic on local roads
   - -fire protection
   - -policing
2. Road maintenance. The presumed main access to the development would be Range Road 3040 south to the Patience Lake Road. Once the development is complete, would Blucher RM be willing to maintain the road?
3. Provision of services such as telephone, electricity, natural gas and water. There seems to be no preplanning of routing of services to rural residences or multi-parcel developments, so services seem to be installed randomly, leading to a proliferation of almost overlapping lines across adjacent properties.

John and Fran Clare
Parcel B NE 13 36 4 W3
November 13, 2013.
cc RM of Corman Park, Greg Murdoch

- response letter
- mailed Nov 30

November 26th, 2013

John and Fran Clarke
Parcel B NE 13 36 4 W3
[redacted]
Saskatoon, Sk
S7K 3J8

Dear John and Fran,

Re: Proposed Rezoning SE 24-36-4 W3

It was good to talk to you the other night on the phone Fran and as I mentioned I stopped by your place in person to discuss the details of the proposal but I guess you didn't hear the door. Thank you for your further comments regarding the proposed rezoning of SE 24-36-4 W3. I will try to address your concerns in this letter.

1. Density of the development: It is true that there is some other development in the area. However, as you will note there is no current multi-parcel development that abuts the proposed "Tuscan Ridge". In my mind this gives an ideal scenario in which it is still possible to take advantage of existing infrastructure while giving each development their own autonomy.

If we look at the density in section 24, of which this quarter is part of, the density is actually quite low. There are actually only 6 residences for 640 acres. (**1 residence/106 acres**).

Even if we look at the density of the 2 south quarters of section 24 and the 2 north quarters of section 13 (again 1 square mile), the density still remains quite low. This does include the east side of Hidden Ridge (15 lots), but including all the other residences the density comes out to 21 residences for 640 acres (**1 residence/30 acres**).

In comparison, if we look at other areas in the R.M. of Corman Park where multi-parcel residential exist we find a much different story. One of the newer developments that is currently under construction is Grasswood Estates. This

development is proposing 80 lots plus 2 existing residences on 320 acres. This is immediately adjacent to Ashwood Estates which has a total of 29 lots on 320 Acres. This results in a total of 111 residences per 640 acres (**1 residence/5.8 acres**). And this is only a mere half mile from an additional 73 lots at Casa Rio Estates.

i. Groundwater pollution – As part of the development process a hydrogeological and geotechnical study will be performed that will determine the optimal design of septic systems to ensure there is no groundwater pollution. The most efficient design will be determined by the study and this will be followed.

ii. Light pollution from yard/street lighting – Methods will be encouraged to help reduce light pollution and ensure responsible lighting within the development. It will be recommended for residences to utilize motion detection lighting and shielding of lights. Also, lower wattage bulbs will be encouraged as well as potting lights into full cut-off fixtures for more efficient lighting. Solar lighting will be encouraged and there will also be an innovative 60,000 kw/year solar system integrated into the development – the first of its kind in any development in Saskatchewan.

iii. Traffic on local roads – With adding more residences there will obviously be an increase in traffic on the roads. However, the proposed "Tuscan Ridge" lies in an ideal location. The primary access to the development will be via Patience Lake highway then North along range road 3040. However, it will be possible for residents to access the development off of the continuation of 8th street and then south along range road 3040. This will help reduce the traffic impact by sharing the traffic between both routes.

iv. Fire Protection/Policing - Proper policing and fire protection will be ensured in a way not to increase risks to nearby residences.

2. Road Maintenance: As previously mentioned, the main access will be from Patience Lake highway and then north on range road 3040. If approved, the road will be built up at my cost. Ideally, I am planning on paving range road 3040 (at 90% lot sales) to access the development. Then similar to the road section that I had previously built up on range road 3040, future maintenance will be performed by the R.M. of Blucher. If there is additional arrangements to be made between the R.M. of Blucher and the R.M. of Corman Park, this has yet to be determined. But please note that an arrangement will be in place to ensure proper maintenance of this road.

3. Provision of services: There is electricity, natural gas, telephone, and water currently available on the quarter and I am hoping there will be minimal additional work needed to service the development.

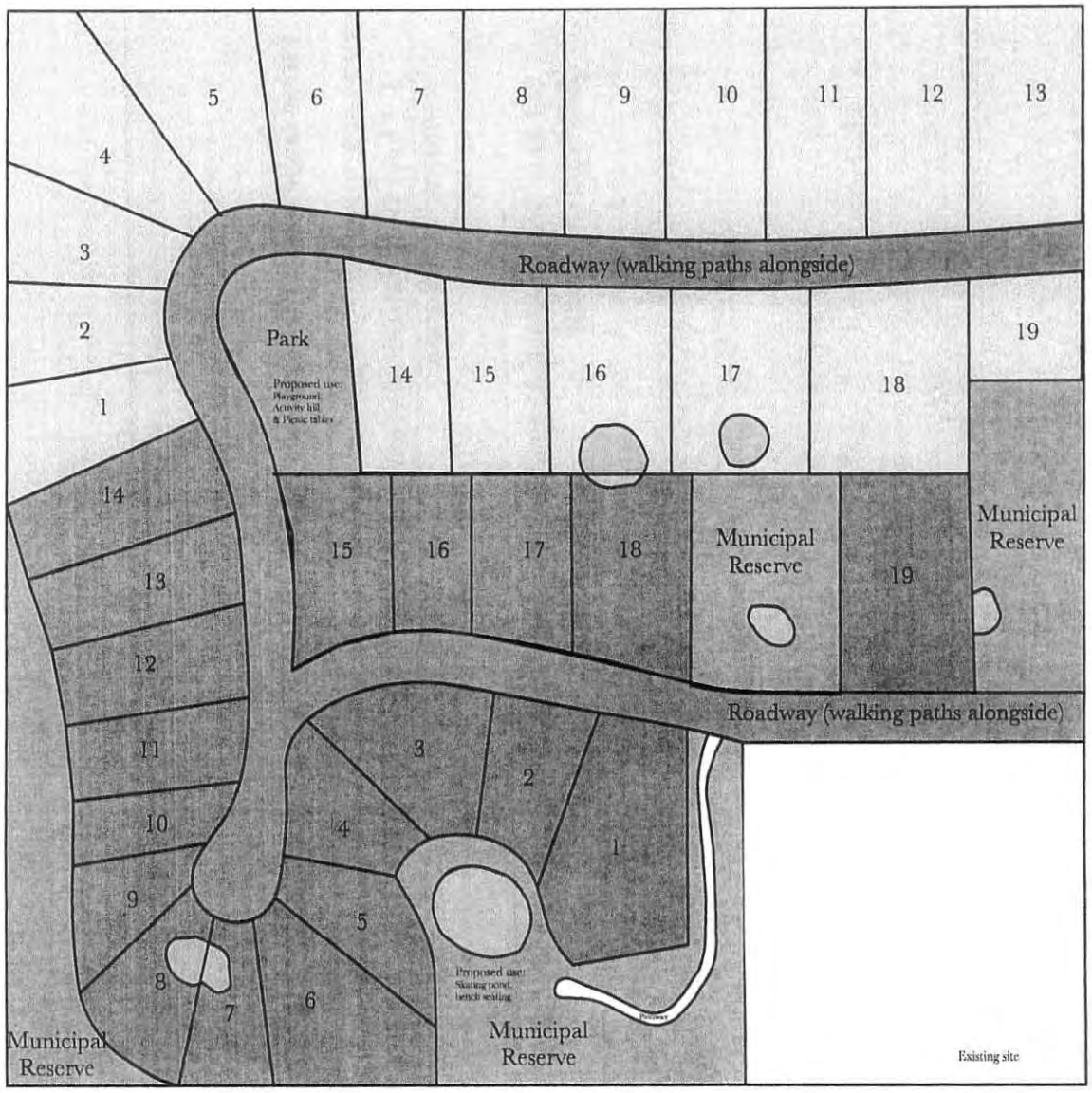
In summary, I have tried to address your concerns as best I can at this time. I have included a site plan of the proposed development. As I had discussed with Fran on the phone, there will be a 4-acre park/toboggan hill/ picnic area that is available for use to neighbors. The design also has municipal reserve surrounding the area immediately adjacent to your house to allow some space between your place and the development.

I do value you as neighbors and welcome any further comments you may have. You are welcome to contact me anytime by phone at 306-290-4937, by mail, or by email: [redacted]

Sincerely,

Greg Murdoch

Concept Drawing



Tuscan Ridge Estates

144 Acres of scrubland
98 Proposed Lot development Phase 1 79 Lots
Phase 2 19 Lots
22.6 Acres of Municipal Reserve
4.0 Acre Park

Phase 1		Phase 2	
Lot 1	4.75	Lot 1	3.18
Lot 2	1.83	Lot 2	3.14
Lot 3	1.91	Lot 3	3.10
Lot 4	1.29	Lot 4	3.75
Lot 5	1.64	Lot 5	3.85
Lot 6	1.69	Lot 6	2.70
Lot 7	1.59	Lot 7	3.10
Lot 8	1.74	Lot 8	2.64
Lot 9	2.71	Lot 9	2.31
Lot 10	2.0	Lot 10	2.67
Lot 11	2.59	Lot 11	2.30
Lot 12	3.20	Lot 12	2.57
Lot 13	3.32	Lot 13	2.83
Lot 14	2.78	Lot 14	3.13
Lot 15	3.86	Lot 15	3.21
Lot 16	2.85	Lot 16	2.86
Lot 17	3.25	Lot 17	3.10
Lot 18	2.59	Lot 18	3.43
Lot 19	2.64	Lot 19	2.10

* Concept plan only *

Phase 1

Phase 2

North

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

See attached

Susan E. Giesy

NAME: Susan E. Giesy

SIGNATURE:

DATE: 13 November, 2013

It is not possible to comment until you provide specific information.

There may be no abutment of this development with Hidden Ridge, however the development touches the corner of our property. We therefore have high interest in knowing exactly the manner in which this will be developed. Your proposal showing a dark blue area on an aerial view map provides us with absolutely no information to consider or to make any type of informed decision. I feel it is unethical not to share your plans with us.

We find your proposal sorely lacking in specifics such as where the roads will be, lot sizes, lot placement, deed restrictions, architectural guidelines, and utilities. We are especially concerned with water as our tank refills very slowly and we have previously run out of water especially in the summer when people are running sprinkler systems. Our tank will often sit at half full for several days at a time. We also need to know how the septic systems will be designed as there is potential for that to affect our property.

We are very concerned that Tuscan Ridge residents will use our acreage for ATVs and snow machines. Residents must understand that this is not permitted.

Until you provide more specific plans, I find it impossible to provide any additional comments at this time.

Response

Sue Giesy – owns house and 80 acres just to the south and west of proposed "Tuscan Ridge"

Left message on phone at 10:52 am November 17th to call to discuss comments and hopefully set up meeting to get together.

Meeting : Tuesday November 26th @ 6:15 at my office on 8th street.

-Apologized that there wasn't more detailed information given about the development but explained to her that this mail out was similar to mail outs done in the past by other developers.

-went through all of the specifics with her regarding the development and showed her the site plan, lot layout, lot sizes, park location, and location of Municipal reserve. Explained that the corner of the development that touches her property will actually be Municipal reserve so there will not be a lot right up to that corner. She said that ideally she would like to see less lots and have them larger in size similar to Hidden Ridge. She said this is why her and the residents of Hidden Ridge do not like Applewood Estates!! She said that people would much rather have larger acreage lots such as 5-6 acres. I kindly disagreed and said that I feel the trend is for people to want smaller lots because this results in less upkeep.

-I explained that lot placement and conditions for site development will be minimally invasive allowing many plants and animal species to continue to thrive. Also, no perimeter fencing is proposed. Lot development restrictions will be in place to encourage residents to leave the majority of the land in its natural state. There will also be architectural guidelines in place when building houses in the development.

Water Issue – Sue explained that they currently have issues with the water supply that they have and they are on Lost River Water. She said they have ran out of water in the summer when residents are watering the grass and that their tank will sit half full for a few days at a time.

- I explained that I had talked directly to Rob Risling at Lost River Water regarding this issue and the concerns that she has. I passed on to her that Rob said that the main supply line is along highway 16 and carries approximately 300 gal/min. To supply the whole Proposed Tuscan Ridge Development an additional 20 gal/min will be needed. If the development proceeds an additional 20 gal/min will be available through the current lines to Hidden Ridge Residents. Then as Tuscan Ridge is gradually filled in they will draw on this excess supply. SO, for many years until the development completely fills in, there will actually be MORE water available to Hidden Ridge residents and to Sue's home as well.
- Sue said she found that hard to believe. However, I told her that the info is coming directly from Rob Risling and he said there will not be an issue.

- Also told her that septic system design will be determined by the hydrogeological and geotech studies that have to be done and there should be no affect on their property.

ATV's and Snow Machines – I explained that I share some of the same views regarding people trespassing on others property to snowmobile and atv. I find it very annoying and I will ensure that this is not an issue. She asked if I was going to prohibit the use of the atv's in the development and I said I was not sure. Sue said she hates when Hidden Ridge residents are quading around on the roads and doesn't feel that it is safe. I told her that I would ensure that steps are taken with the residents of Tuscan Ridge so that no trespassing occurs onto her property. She was fine with this.

At the end of the meeting she said she does not have any specific problems with the development proposal. I thanked her for her time and for coming by the office.

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

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.

NAME: Applewood Estates

SIGNATURE:

DATE: November 21, 2013

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

The RURAL MUNICIPALITY OF CORMAN PARK NO. 344
Official Community Plan provides at section 5.2.3.2:

"Council shall consider the current demand for and existing inventory of undeveloped multi-parcel country residential lots when reviewing multi- parcel country residential subdivision proposals."

The current land inventory at Saddle Ridge, Greenbryre Golf and Country Estates, and Applewood Estates and current demand therefore does not warrant the approval of further Multi-Parcel Country Residential Subdivisions East of Saskatoon at the present time.

I am therefore opposed to the current application for proposed rezoning.

NAME: RANDY KLEIN

SIGNATURE:

DATE: Nov 18, 2012

(1)

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

I am generally opposed to taking agricultural land out of Commission. Please see how the owners want to take advantage of the land prices. I'm not sure how these developments will fit into future City plans. My land is going to end up as a Conservancy in the middle of the City!

NAME: Mrs. Gladys Murphy.

SIGNATURE: Mrs Gladys Murphy.

DATE: Nov. 6th, 2013.

5 1/- Part 25, T 36 R.4 W 3rd.

no address.

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

1. I have been contacted regarding the above noted proposal and have no comments at this time.

2. I have been contacted regarding the above noted proposal and have the following comments:

We are not in favour of this development due to impact on natural environment, increased noise levels, and increased light pollution.

NAME: Rob & Shannon Jakes

SIGNATURE:

DATE: Nov 13, 2013

response letter

November 28th, 2013

Rob and Shannon Jakes
Hidden Ridge Estates
[redacted]
Saskatoon, Sk
S7K 3J8

Dear Rob and Shannon,

Re: Proposed rezoning of 144 acres of SE 24-36-4 W3
"Tuscan Ridge"

Thank you for your recent comments regarding the proposed rezoning of "Tuscan Ridge Estates". I appreciate you taking the time to fill out the form and send in your concerns.

Obviously with any development there will be some impact on the environment. However, just as Hidden Ridge and its residents have minimized the impact on the surrounding environment, this will be the goal of "Tuscan Ridge" residents as well. Some of the same techniques that have made Hidden Ridge such a successful development will be implemented in this development as well.

Over 15% of the land will be left in its natural state and dedicated as Municipal Reserve. Lot placement and conditions for site development will be minimally invasive allowing many plant and animal species that currently reside here to continue to thrive. Restrictions will also be in place to encourage residents to leave the majority of the land in its natural state and minimize landscape modifications. This will allow a balance between people and the natural environment similar to the situation that currently exists at Hidden Ridge Estates.

The advantage of the proposed "Tuscan Ridge Estates" is that it is not immediately adjacent to any other multi-parcel development. This in turn allows each development its own autonomy while still being able to take advantage of existing infrastructure. Because of this reason each development has their own space and I do not feel noise concerns will be an issue.

For the residents of Tuscan Ridge Estates, practices will be adopted that encourage responsible lighting to help reduce "light pollution". Motion detection lighting and shielding of lights will be encouraged. Lower wattage bulbs and potting of lights into full cut off fixtures will result in more efficient lighting and less light pollution.

Rob and Shannon, thank you for your time and I hope I have addressed some of your concerns. Please feel free to contact me by email at [redacted] or by phone at 306-290-4937 if there are any further questions/issues.

Sincerely,

Greg Murdoch

"Tuscan Ridge" Proposal

Proposed rezoning – 144 Acres of

SE 24-36-4 W3

Please circle one of the following:

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The current land inventory at Saddle Ridge, Greenbryre Golf and Country Estates, and Applewood Estates and current demand therefore does not warrant the approval of further Multi-Parcel Country Residential Subdivisions East of Saskatoon at the present time.

I am therefore opposed to the current application for proposed rezoning.

NAME: RANDY KLEIN

SIGNATURE:

DATE: Nov 16, 2012

Acreage inquiry

From: **Jennifer Ritchie** [redacted] You moved this message to its current location.
Sent: November-30-13 3:38:29 PM
To: [redacted]

> Dear Mr. Murdoch,
>
> My name is Jennifer Ritchie and I am inquiring about your acreage development. My husband and I have been looking for acreage land close to the city and heard that you are planning a family oriented development. We are very interested in learning more about this opportunity, as we have small children and have been looking for a walkout lot that is less than 5 acres that will have play and recreation areas suitable for children.
>
> If you have any further information on your plans, such as layout of the division, property locations and prices, please send it to my attention.
>
> Sincerely,
>
Jen

>

RE: Acreage inquiry

From: **william murdoc** [redacted]
Sent: November-30-13 7:16:48 PM
To: Jennifer Ritchie [redacted]
1 attachment
Tuscan-SITE PLAN(3)-2.pdf (388.9 KB)

Hi Jen,

Thanks for your interest! Can I ask how you heard about the development?

I am in the early stages of planning "Tuscan Ridge Estates". It will definitely be a family-oriented development and will have a 4 acre park/toboggan hill as well as picnic areas for families to take advantage of. I plan to live at "Tuscan Ridge" with my wife and 2 young kids as well so I have tried to design the ideal family development. My Wife and I have been searching for an acreage development with very attractive lots for many years now and have not found anything. The advantage of "Tuscan RIdge" is that families can meet and play at the park or toboggan hill and it provides a centre for social contact with neighbours. It is also ideal as it is only 4 miles East of the Saskatoon City limits!

There will be 38 lots in total - 19 lots released in the first phase and 19 lots released in the second phase. The ood news is the large majority of the first phase lots will be south facing with at least half being walkouts. In ..y mind nothing is better than a south-facing walkout lot to take advantage of our Saskatchewan sun! Lot sizes for phase 1 will vary from 1.29 acres to 4.75 acres.

As I mentioned, it is still early in the process and I am not sure how far in the future it will be before you could start to build? However, I am optimistic that things should move along at a good pace. You are certainly welcome to drive by and check out the property if you like? If you are travelling out of Saskatoon heading East on highway 16, right after the exit to Boychuk you turn left (North) onto Patience Lake Highway. You immediately turn right(East) and follow Patience Lake Highway for 4 miles and turn left (North) onto range road 3040 and the property starts 1 mile down this road and then ends at 1.5 miles. The development will be designed to preserve and enhance the natural beauty of the gently rolling hills, well treed landscape, and gorgeous vistas. I have attached a site plan to give you an idea of the layout of "Tuscan Ridge".

Thanks again for your interest Jen and please feel free to contact me by email with further questions or call me direct at 306-290-4937. I will keep you posted with the development progress and timeline!

Sincerely,

Greg Murdoch

RE: Acreage inquiry

From: **william murdoc** [redacted]
Sent: December-01-13 9:03:43 PM
To: Jennifer Ritchie [redacted]

Hi Jen,

Thanks for getting back to me.

As far as price goes I am not sure exactly where the price will come in but the walkouts will probably be in the $310-330,000 range fully serviced(gas, electricity, phone, water). But I will keep you posted!

Thanks again for your interest Jen. I appreciate it!

Greg

---

bject: Re: Acreage inquiry
From [redacted]
Date: Sun, 1 Dec 2013 19:52:19 -0600
To: [redacted]

Hi Greg,

Thanks for the info. We actually heard about the development from a friend of ours who was talking to a home builder that told them about it. I think it was Ward homes? They had gotten your email from him.

Just one last question I forgot to ask - do you have any idea what the prices will be for the walkout lots?

Thanks,

Jen

On 2013-11-30, at 7:16 PM, william murdoc [redacted] wrote:

> Hi Jen,
>
> Thanks for your interest! Can I ask how you heard about the development?

Notification of Public presentation

December 7th, 2013

Dear Neighbor,

Re: Proposed rezoning of SE 24-36-4 W3
"Tuscan Ridge Estates"

Recently I had contacted you about the proposed rezoning of 144 acres of SE 24-36-4 W3 from agriculture zoning to Country residential zoning to accommodate a 38 lot subdivision (Tuscan Ridge Estates).

I have been notified by the R.M. of Corman Park that I will be given an opportunity to do a brief presentation on the proposed Tuscan Ridge Estates project. This will occur this Friday December 13th, at 8:45 am.

I thought I would let you know as the public is welcome to attend. The Direct notice from the R.M. of Corman Park is that " this is an open council meeting where the public is invited to sit in the gallery to observe the discussion. However, this is not a public hearing or a public forum where the gallery will be invited to speak."

Sincerely,

Greg Murdoch
423 Blackburn Terrace,
Saskatoon, Sk
S7V 1E8
306-290-4937

Notification of Tuscan Ridge Presentation

- Mailed notification Dec 9, 2013

→ Robin Adair: Lindy Pelletier
→ Gladys Murphy
→ Edward : Rosalind Kendall (emailed)
→ Applewood ~~Estates~~
→ Jodi Walchuk
→ John: Fran Clarke
→ Sue: John Giesy
→ Murray: Lisa Perehudoff
→ Murray Long -address
→ Hengying Yang address
→ Rob: Shannon Jakes -address

Appendix F
Confirmation of Potable Water Supply

Lost River Water Utility
259 Beechmont Crescent
Saskatoon, SK
S7V 1C8

November 15, 2013

Dear Mr. Murdock,

This letter is to confirm Lost River Water Utility has excess capacity in the main waterline located 0.5 KM from your proposed Tuscan Ridge development. 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 G
Heritage Sensitivity

Print Close

RE: Heritage sensitivity - Subdivision in SE 24-36-4 W3

From: **Friesen, Nathan TPCS** (Nathan.Friesen@gov.sk.ca)
Sent: June-19-13 3:46:34 PM
To: 'william murdoc' (wmurdoc@hotmail.com)

Our File: 13-979

Hello,

There are no recorded sites within the proposed area for development. In reviewing the aerial photography, and including the information you conveyed to me about past land uses, it would appear that the entire quarter has been cultivated at some time in the past, excluding areas around the fringes of wet/low areas. This being the case, we would expect than any archaeological sites within this area have already been previously disturbed, as these low/wet areas would have only low potential for significant, intact sites. Accordingly, we do not have any further concerns with your subdivision proceeding as planned.

Thanks,

Nathan P. Friesen
Senior Archaeologist

Phone: (306) 787-5774
Fax: (306) 787-0069

Heritage Conservation Branch
Saskatchewan Parks, Culture and Sport
2nd Floor, 3211 Albert Street

Regina, Saskatchewan

S4S 5W6

From: william murdoc [mailto:wmurdoc@hotmail.com]
Sent: Tuesday, June 18, 2013 12:02 PM
To: Friesen, Nathan TPCS
Subject: Heritage sensitivity

Hi Nathan,

As per our phone conversation yesterday, I was inquiring whether there was any heritage sensitivity on 144 acres in the RM of Corman Park where I was possibly doing a 38 lot subdivision.

The location of the land is SE 24-36-4 W3 ext1. I have attached a proposed lot plan for your review.

Thanks very much for your help!

Greg Murdoch

Appendix H
Traffic Impact Assessment

Tuscan Ridge Estates
Traffic Impact Study

Stantec

Prepared for:
Whitewater Holdings

Prepared by:
Stantec Consulting Ltd.
100, 75 – 24th Street East
Saskatoon, SK S7K 0K3

June 13, 2014

Sign-off Sheet

This document entitled Tuscan Ridge Estates Traffic Impact Study was prepared by Stantec Consulting Ltd. for the account of Whitewater Holdings. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Prepared by _____
(signature)

Lindsay Nent, P. Eng.

Reviewed by _____
(signature)

Bryce Hunter, P.Eng.

Table of Contents

1.0 Introduction

1.1 BACKGROUND

The Tuscan Ridge Estates residential development is located on a quarter section parcel of land approximately 6 km east of Saskatoon, Saskatchewan. The project location is shown in Figure 1.1. The development will consist of 43 country residential lots ranging in size from 1 to 4 acres per lot. Figure 1.2 shows the concept plan for the development.

The developer, Whitewater Holdings (Whitewater), has retained Stantec Consulting Ltd. (Stantec) to complete a Traffic Impact Study (TIS) for this development. The purpose of the TIS is to assess the impacts that additional traffic generated by the proposed development will have on the adjacent transportation system and recommend improvements to the transportation system in order to meet those demands.

1.2 SCOPE

The purpose of the TIS is to evaluate the impact of the proposed development on the adjacent road network. The principal objectives of the TIS include:

- Determine the total number of new trips generated by the development for the weekday morning and afternoon peak hour time periods;
- Distribute the new trips to expected origins and destinations and assign them to specific routes to and from the development;
- Add the new trips generated by the development to the projected background traffic volumes at the full build-out condition;
- Evaluate traffic operating conditions at key intersections for the combined traffic volumes at full build-out of the development for the weekday morning and afternoon peak hour time periods; and,
- Identify potential locations of unacceptable congestion and determine roadway, intersection, and access requirements in terms of number of lanes, lane configuration, and intersection control to provide acceptable levels of service and safety.

The traffic analysis for Tuscan Ridge Estates will take into consideration the nearby development of Ridgewood Estates which has a similar build-out schedule.

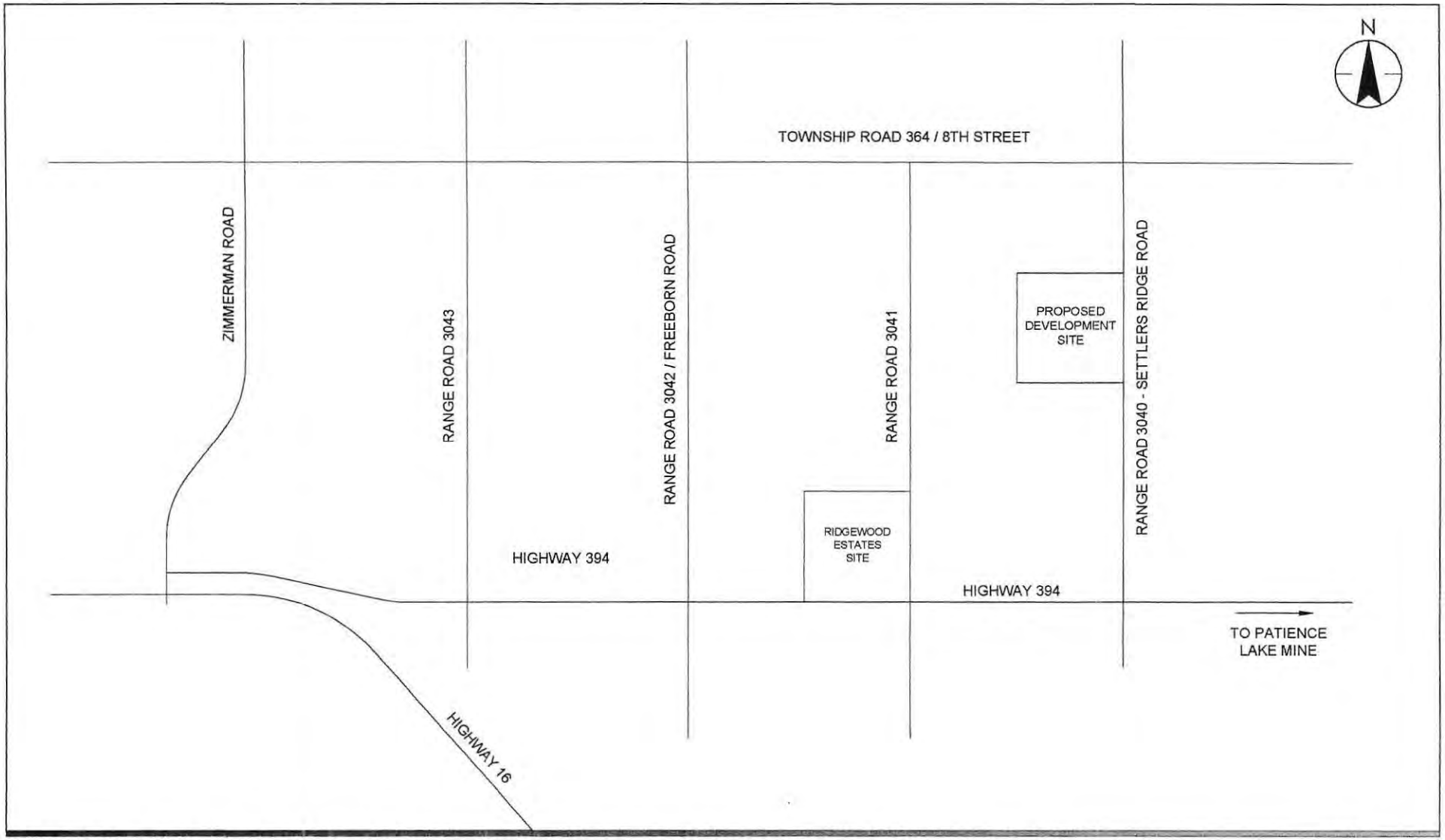

FIGURE 1.1 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Project Location

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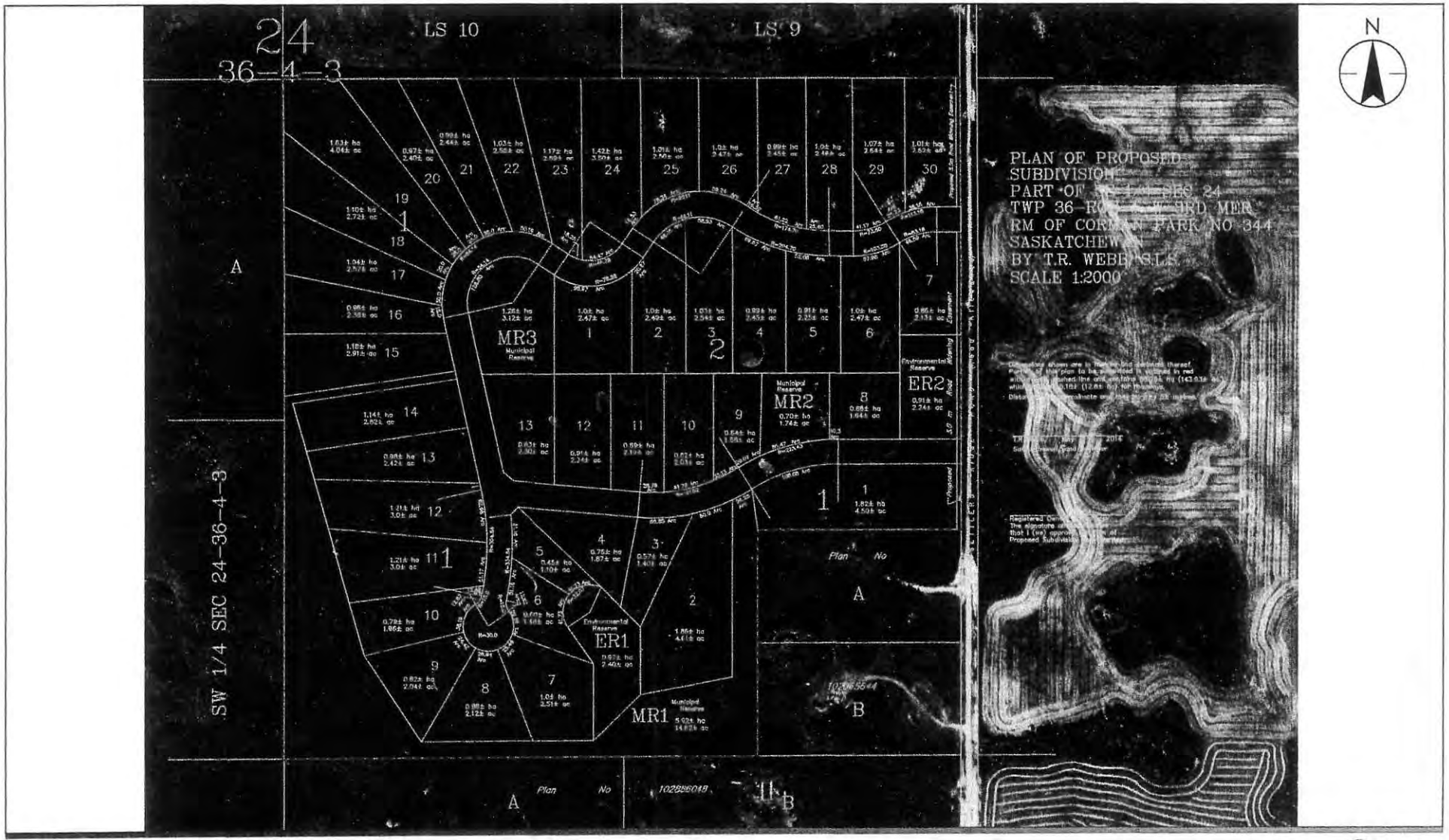

FIGURE 1.2 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Proposed Site Plan

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2.0 Development Site Conditions

Tuscan Ridge Estates is a country residential site located on Settlers Ridge Road, north of Highway 394 in the RM of Corman Park. The development is located on the southeast quarter of SE 24-36-04 W3M. Access to the site is provided via Settlers Ridge Road.

2.1 STUDY AREA ROADWAYS

Roadways adjacent to the proposed development site and their characteristics are as follows:

- **Highway 394** – Highway 394 is a two lane undivided paved roadway which provides access to the Patience Lake Mine in the east and Highway 16 (via Zimmerman Road) in the west.
- **Settlers Ridge Road/Range Road 3040** – Settlers Ridge Road is an unpaved rural roadway which currently provides access to residences on the east side of the road. This road is located on the boundary between the Rural Municipalities of Corman Park and Blucher.

The study area roadways are shown in Figure 2.1.

2.2 STUDY AREA INTERSECTIONS

Study area intersections within the development site include the following:

- **Intersection 1: Settlers Ridge Road & North Access** –this proposed access from the development site onto Settlers Ridge Road will be stop controlled in the eastbound direction.
- **Intersection 2: Settlers Ridge Road & South Access** –this proposed access from the development site onto Settlers Ridge Road will be stop controlled in the eastbound direction.
- **Intersection 3: Settlers Ridge Road & Highway 394** – this intersection is currently stop-controlled in the north/south direction, with a single all-directional lane in each direction.

The study area intersections are shown in Figure 2.1.

2.2.1 Zimmerman Road / Highway 16

Highway 394 currently terminates in a T-intersection at Zimmerman Road, approximately 7 km west of the project site. Zimmerman Road then provides direct access to Highway 16. These two intersections (Highway 394 & Zimmerman Road and Zimmerman Road & Highway 16) have not been chosen as study intersections at this time due to their distance from the project site.

Additionally, future development plans in this area are uncertain due to the Rosewood neighbourhood and future Perimeter Highway. It is likely that these intersection configurations will be under review prior to full build-out of Tuscan Ridge Estates, rendering any current analysis irrelevant. Regardless, the few trips generated by Tuscan Ridge Estates would likely be immaterial compared to the trips expected for the expansion of the Rosewood neighbourhood.

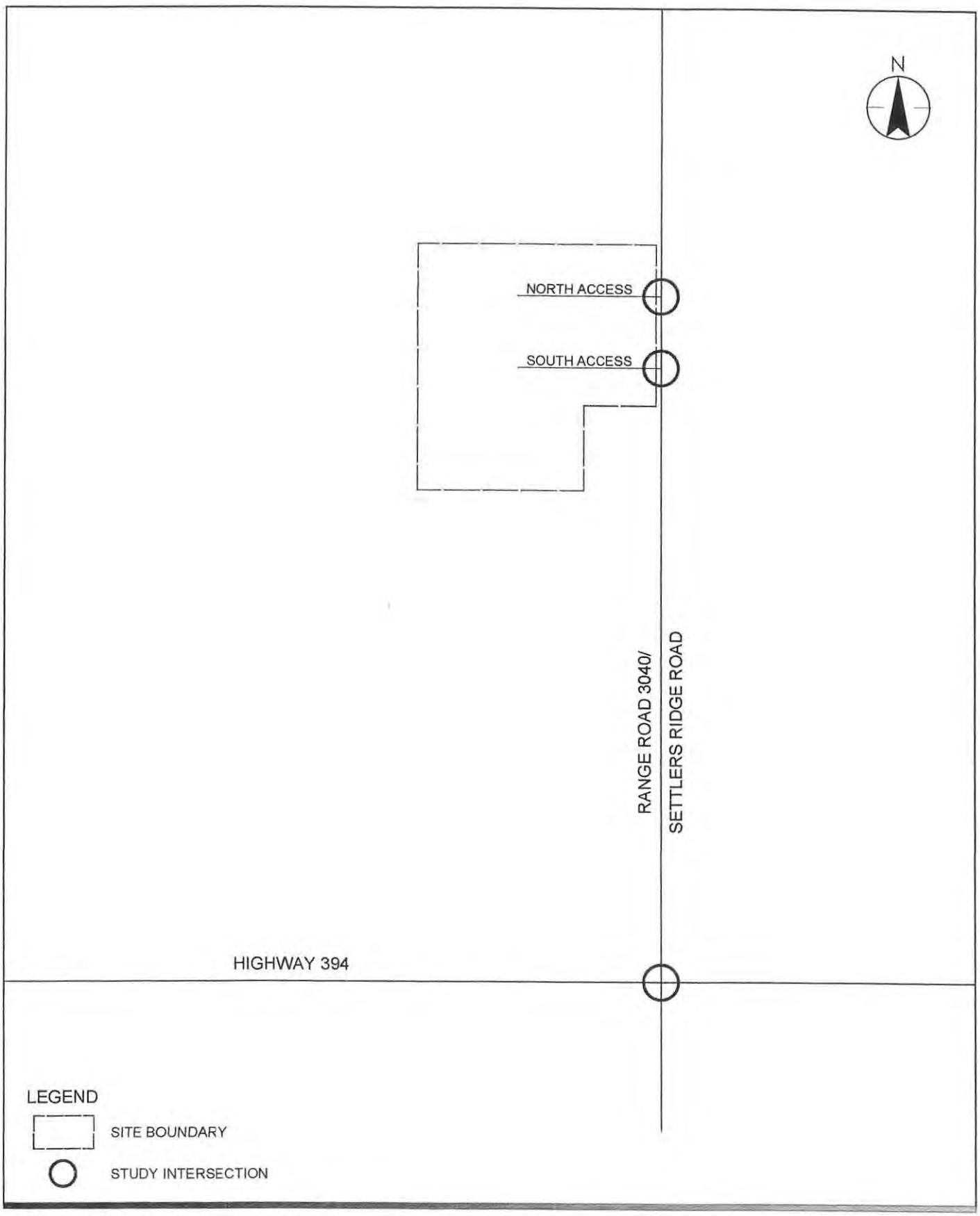

FIGURE 2.1 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Study Area Roadways and Intersections

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2.3 BACKGROUND TRAFFIC VOLUMES

Intersection turning movement counts were conducted at Settlers Ridge Road & Highway 394 during the morning and afternoon peak periods. Figure 2.2 illustrates the existing traffic volumes experienced in the project area.

In order to calculate the background traffic volumes at full build-out, the existing peak hour traffic volumes must be expanded to the design year. It is estimated that the average annual growth rate for the study area will be approximately 2% per year.

Using the equation listed below with a 2% annual growth rate; the expansion factor (Ef) for full build-out was calculated to be:

Equation:		where:		
E_f	$= (1 + G_r)^n$		E_f	= expansion factor
$E_{f\,(2024)}$	$= (1 + 2\%)^6 = \mathbf{1.126}$		G_r	= annual growth rate
			n	= no. of years

A six year build-out was assumed for the development based on expected market growth and information from the developer. The existing traffic volumes were then expanded to 2020 for full build-out conditions.

A similar residential development, Ridgewood Estates, is being developed on the southeast quarter of 14-36-04 W3M by a different developer. This site is located on Highway 394 approximately 1.6 km west of Tuscan Ridge Estates. The developments are expected to have similar build-out horizons, and as such, trips generated by Ridgewood Estates should be considered for this traffic analysis. Generated traffic volumes were calculated using the same trip generation and distribution assumptions stated in Section 3 of this report.

Figure 2.3 illustrates the projected background traffic volumes expected in the project area for the 2020 horizon. These volumes include the trips generated by Ridgewood Estates.

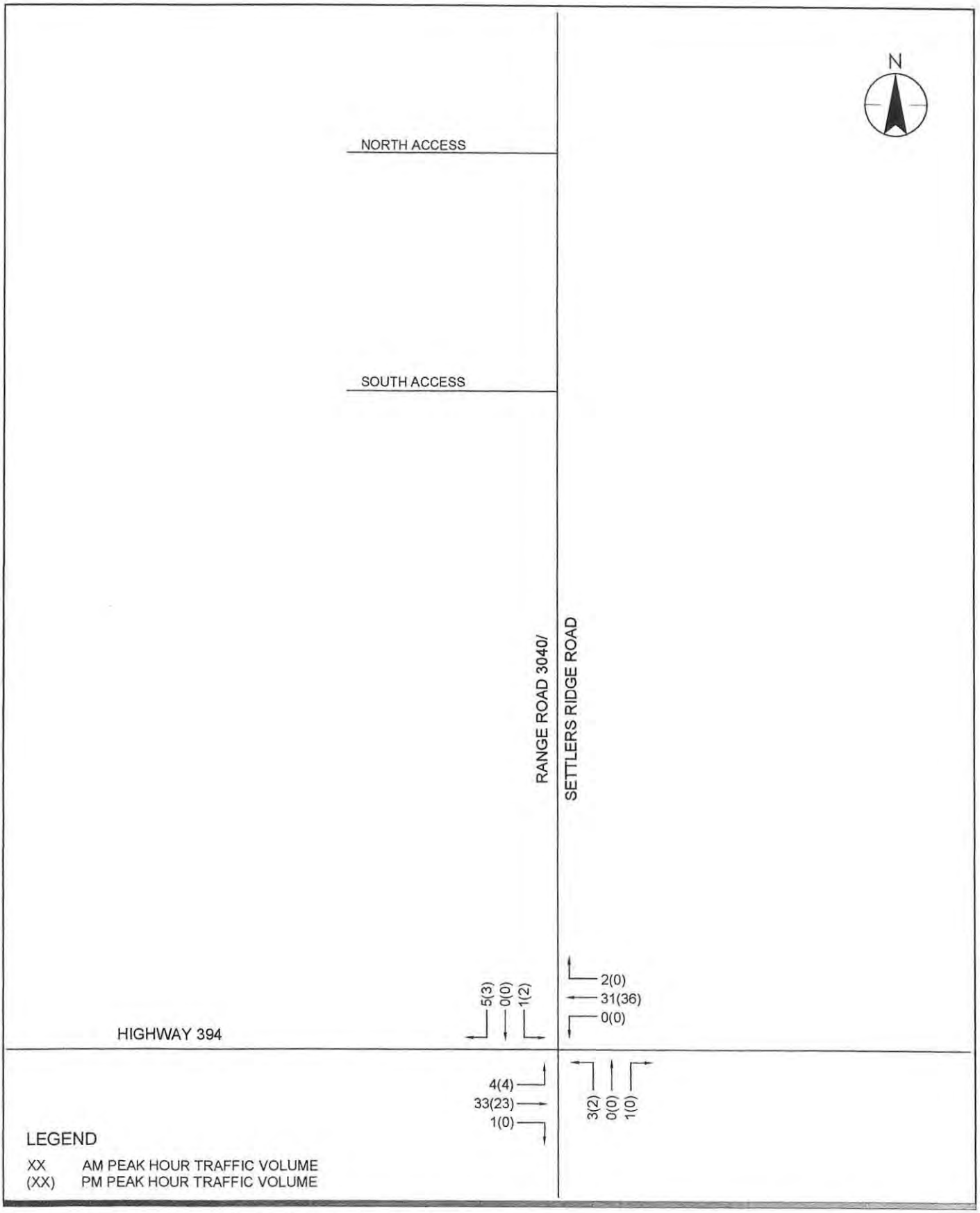

FIGURE 2.2 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Existing (2014) Traffic Volumes

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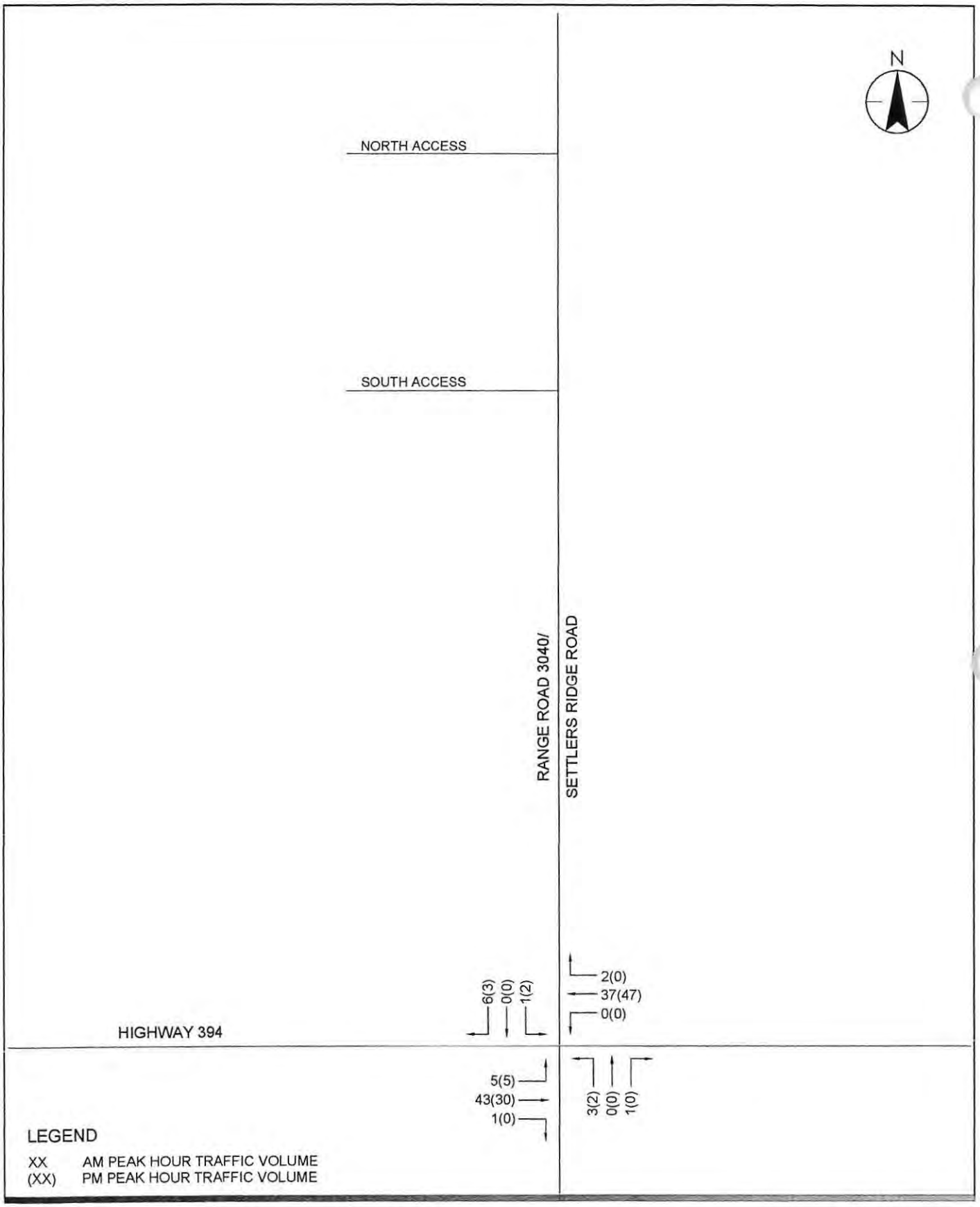

FIGURE 2.3 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Future (2020) Background Traffic Volumes

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3.0 Traffic Analysis

The analysis of traffic conditions related to the proposed development was completed for the weekday morning and afternoon peak hours of adjacent street traffic as these represent the busiest time periods.

3.1 TRIP GENERATION

Trips generated by the proposed development were estimated in accordance with the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*. This manual is a standard reference used by jurisdictions throughout Canada and the United States.

Tuscan Ridge Estates will consist of 43 residential lots. ITE Land Use 210 – Single-Family Detached Housing was used to calculate generated trips. Table 3.1 presents the total number and directional allocation of trips generated during the weekday morning and afternoon peak hour time periods.

Table 3.1 – Generated Trips

Time Period	Total	Entering	Exiting
Morning Peak Hour	32	8	24
Afternoon Peak Hour	43	27	16

3.2 TRIP DISTRIBUTION

The trips generated by the proposed development must be distributed and assigned to the roadway network. Trip distribution refers to the location of origins and destinations of trips generated by the proposed development.

The directional distribution of trips generated by Tuscan Ridge Estates was estimated based on knowledge of surrounding employment areas and verified by observing the current directional split of vehicles entering and exiting Settlers Ridge Road via Highway 394. The resulting trip distribution percentages are shown in Table 3.2.

Table 3.2 – Trip Distribution

Origin/Destination	Trip Distribution
To/From the West (City of Saskatoon)	80%
To/From the East (Patience Lake Mine)	20%

3.3 TRIP ASSIGNMENT

Trip assignment refers to the assignment of generated trips to the adjacent roadway network. Trips for Tuscan Ridge Estates were assigned to the street network using the directional distributions shown above.

3.4 TRAFFIC VOLUMES

3.4.1 Site Generated Traffic Volumes

The total site generated traffic volumes for the morning and afternoon peak hour time periods are shown in Figure 3.1. These volumes are based on the above trip generation, trip distribution, and trip assignment.

3.4.2 Combined Traffic Volumes

The combined traffic volumes were derived from the generated traffic volumes at full build-out added to the projected background traffic volumes discussed in Section 2.3 of this report. Combined traffic volumes at full build-out for the morning and afternoon peak hour time periods are shown in Figure 3.2.

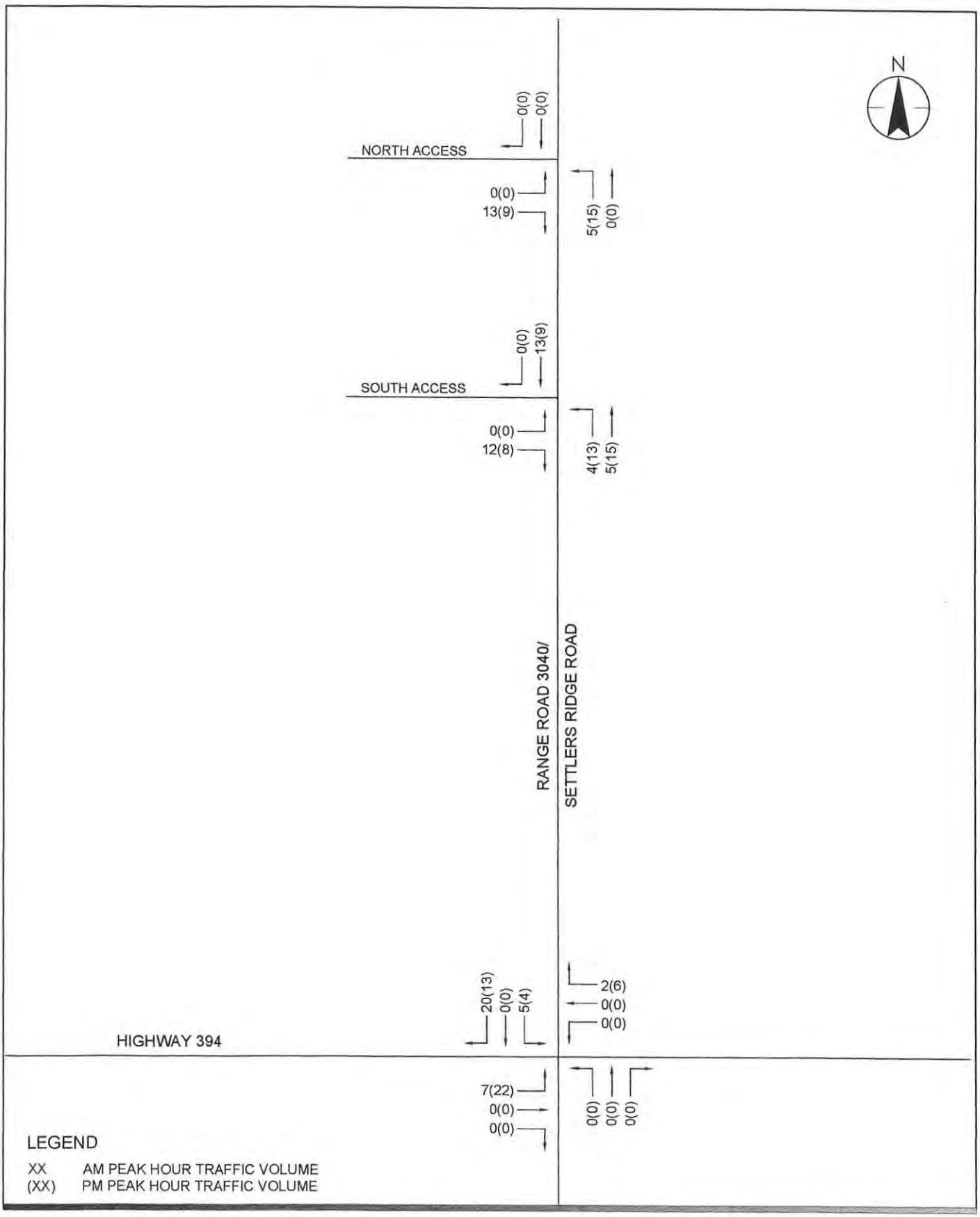

FIGURE 3.1 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Site-Generated Traffic Volumes

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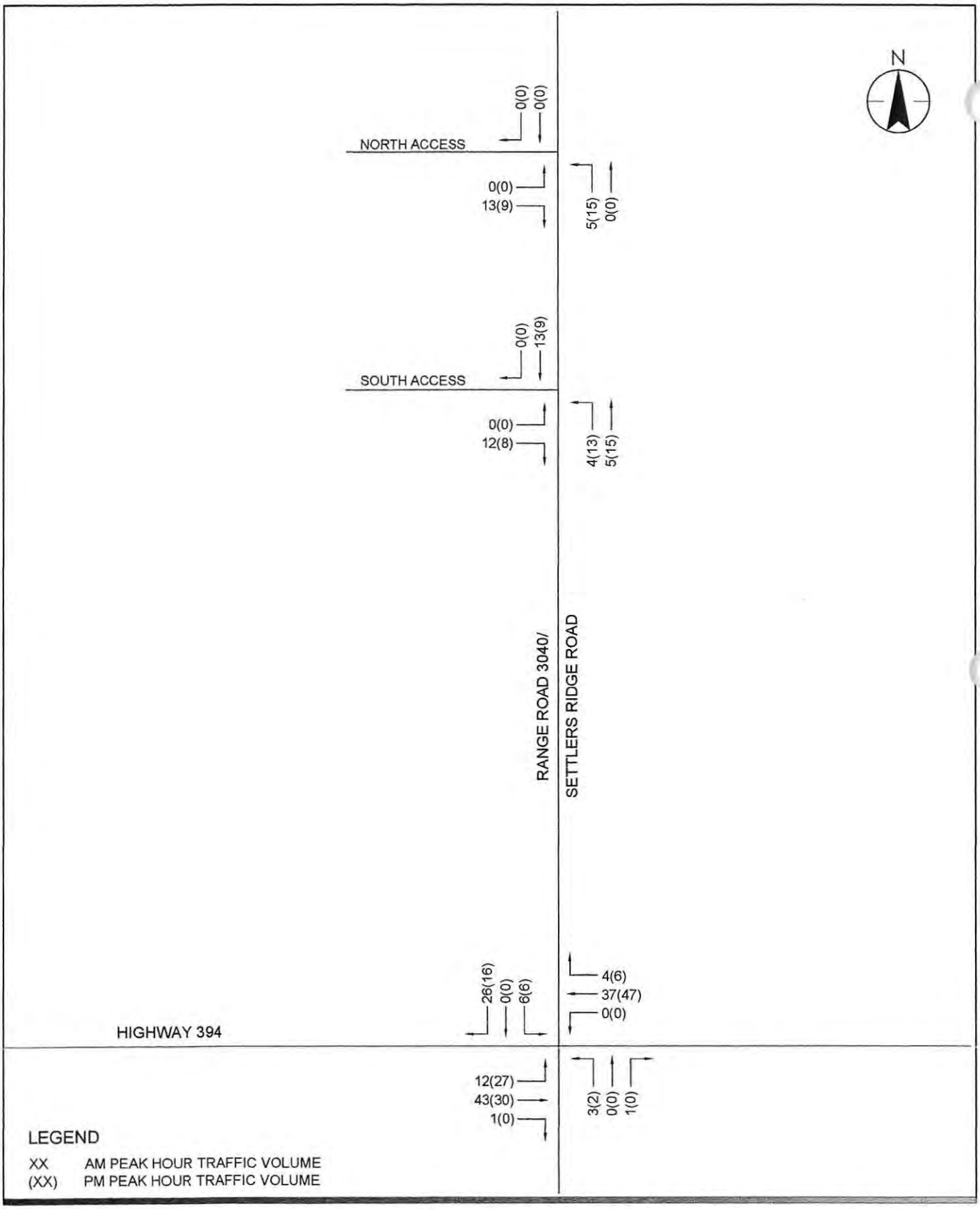

FIGURE 3.2 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Total Combined Traffic Volumes

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4.0 Traffic Analysis

Traffic analysis was conducted for the weekday morning and afternoon peak hour time periods at full build-out. Level of service (LOS), volume to capacity (v/c) ratio, and 95th percentile queue length are the three performance measures used to describe the quality and efficiency of traffic flow for the purposes of this TIS.

LOS is defined by the average delay sustained by motorists traveling through an intersection. LOS A represents the lowest range of average delay and therefore the best conditions, while LOS F represents the highest range of delay and therefore less than ideal conditions. Table 4.1 shows the ranges of delay associated with each level of service for un-signalized intersections.

Table 4.1 – Ranges of Delay for Levels of Service at Unsignalized Intersections

Level of Service	Delay per Vehicle (seconds)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

V/c ratios provide a quantitative value as to how much of the intersection's capacity to move traffic is used under the given traffic conditions. If this ratio is greater than one, the available capacity has been exceeded and traffic conditions begin to break down. 95th percentile queue lengths represent the longest queue of vehicles that can be expected for a particular movement with 95th percentile traffic volumes.

For the purpose of this analysis, a v/c threshold of 0.85, a LOS threshold of D, and a 95th percentile queue length of 100 metres were used to trigger identification of critical movements for which improvements should be considered.

The intersections within the study area were analyzed using the computer program Synchro 8. Synchro 8 analyzes intersections in terms of LOS, capacity, and queues according to the methodology detailed in the 2000 edition of the Highway Capacity Manual (HCM).

4.1 INTERSECTION CONFIGURATION

As discussed in Section 2.2 of this report, the intersection of Highway 394 & Settlers Ridge Road currently consists of a single all-directional lane in each direction. It is anticipated that this geometry will be sufficient to accommodate the projected traffic volumes at full build-out of Tuscan Ridge Estates.

The two local accesses for Tuscan Ridge Estates should be constructed with a single shared left/right turn lane in the eastbound direction, and no additional auxiliary lanes.

The developer has indicated that Settlers Ridge Road will be paved from Highway 394 to the north access road and possibly built up from the north access to 8th Street. Paving the south portion of the roadway will increase the durability of the road surface under the additional traffic loading from the development. Building up the road from the development north to 8th Street would encourage some drivers to utilize that route, relieving some traffic loading on Highway 394.

The recommended roadway and lane configurations for each of the study area intersections are shown in Figure 4.1. All results that follow are based on these configurations.

4.2 INTERSECTION ANALYSIS

Each study area intersection was analyzed to determine if it would operate at acceptable levels of service at full build-out. The following parameters were used for the traffic model:

- Peak hour traffic volumes as shown in Figure 3.2 were used for the analysis; and
- Intersection lane configurations as shown on Figure 4.1 were assumed for the analysis.

Synchro 8 was used to predict levels of service, v/c ratios, and 95th percentile queue lengths for each intersection, each approach, and each turning movement for the study area intersections.

4.2.1 Level of Service

Figure 4.2 shows the expected LOS during the morning and afternoon peak hour time periods for each intersection and turning movement at full build-out. All of the study intersections operate at LOS A with all movements operating at LOS A as well, showing that all study intersections will operate satisfactorily at full build-out.

4.2.2 Volume to Capacity Ratio

Figure 4.3 shows the expected volume to capacity (v/c) ratios during the morning and afternoon peak hour time periods for each intersection turning movement at full build-out. All of the study intersection movements have v/c ratios under the threshold value of 0.05, indicating that all study intersection are expected to reach less than 5% of their available capacity at full build-out.

4.2.3 Queue Analysis

Figure 4.4 shows the expected 95th percentile queue lengths during the morning and afternoon peak hour time periods for each intersection at full build-out.All of the study intersections have 95th percentile queue lengths under 1 m long, indicating that virtually no queuing is expected within the study area.

4.3 SUMMARY

Overall, the traffic network will function satisfactorily at full build-out of Tuscan Ridge Estates taking into account background growth and traffic generated by the nearby development of Ridgewood Estates. No additional intersection or roadway improvements are required.

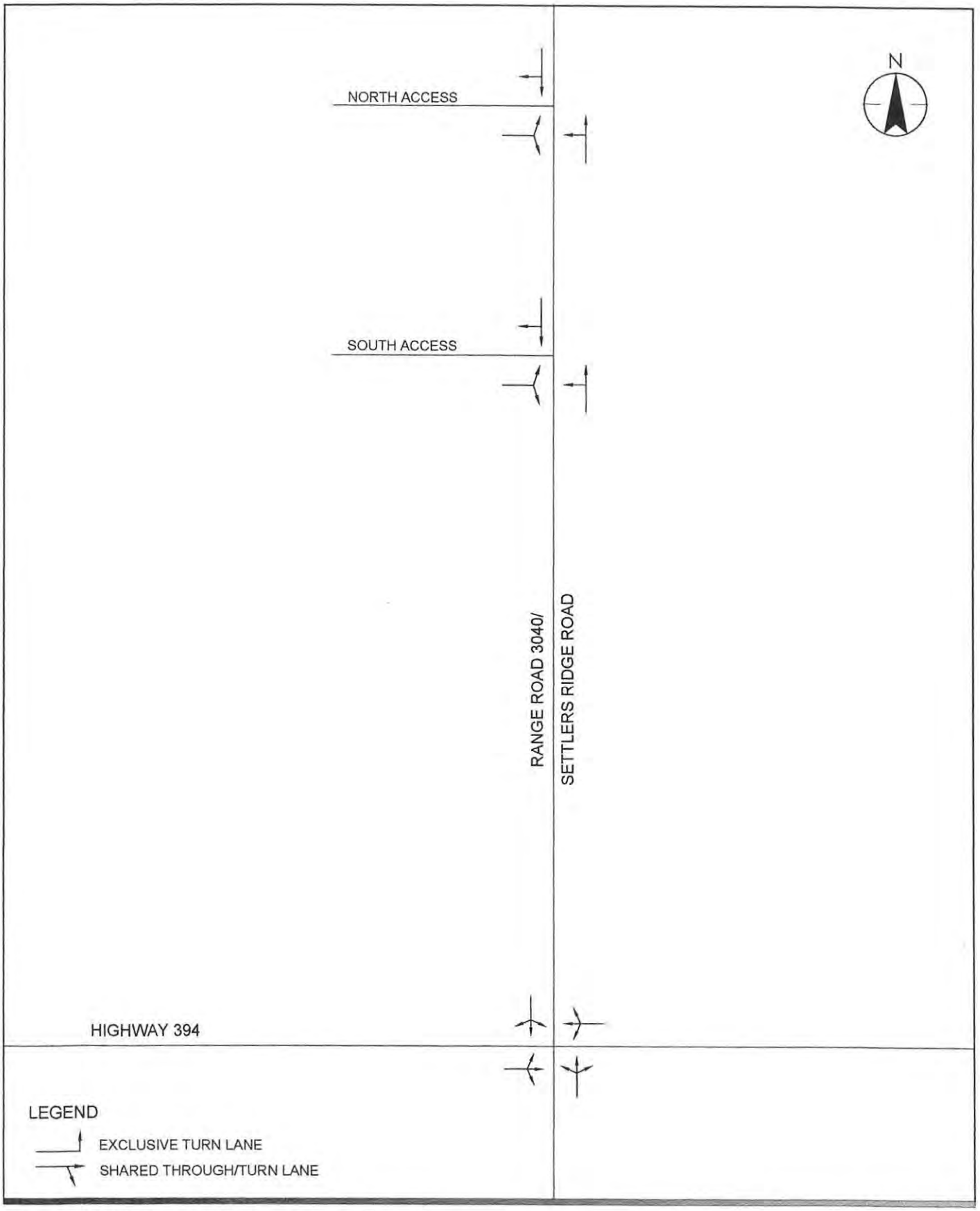

FIGURE 4.1 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Recommended Lane Configurations

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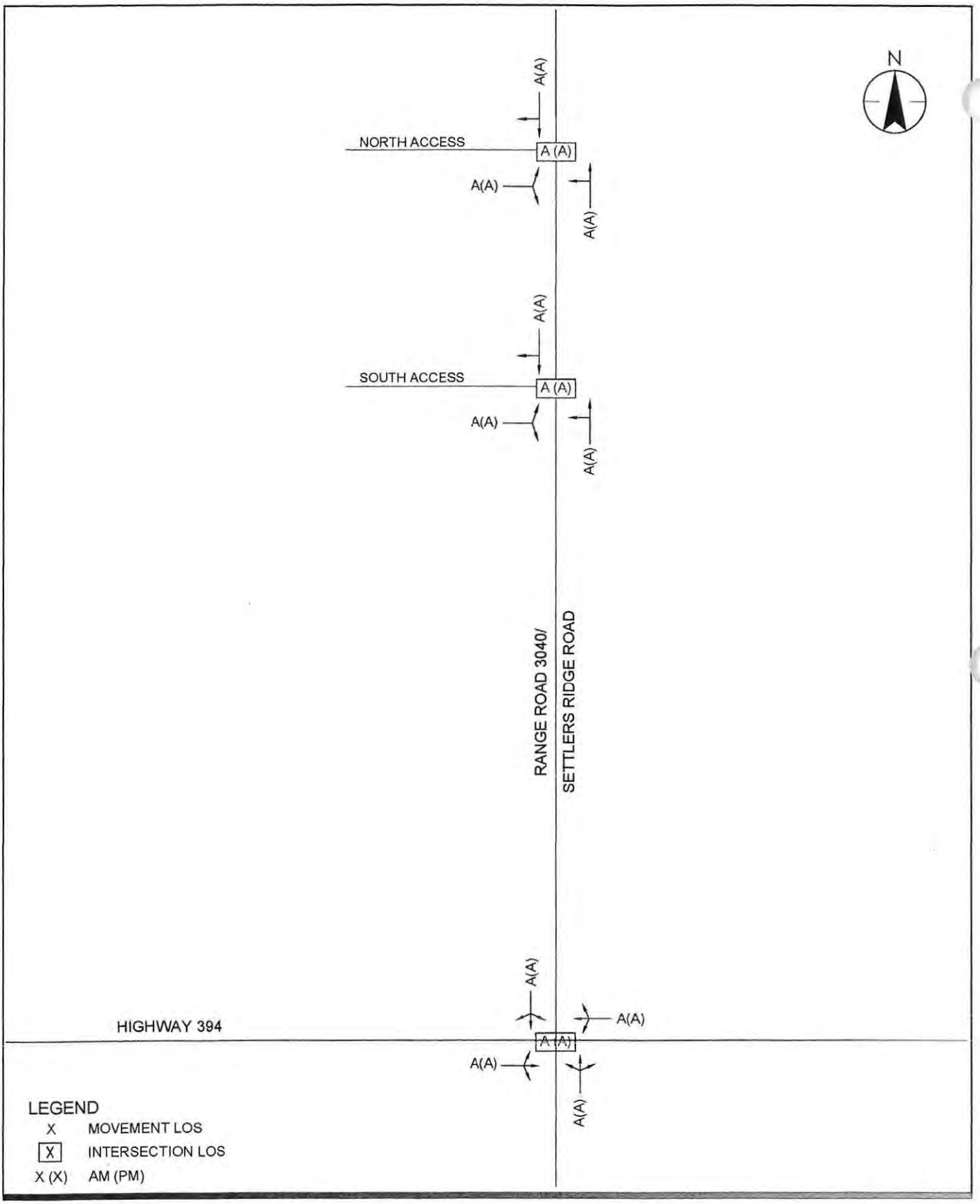

FIGURE 4.2 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

Level of Service

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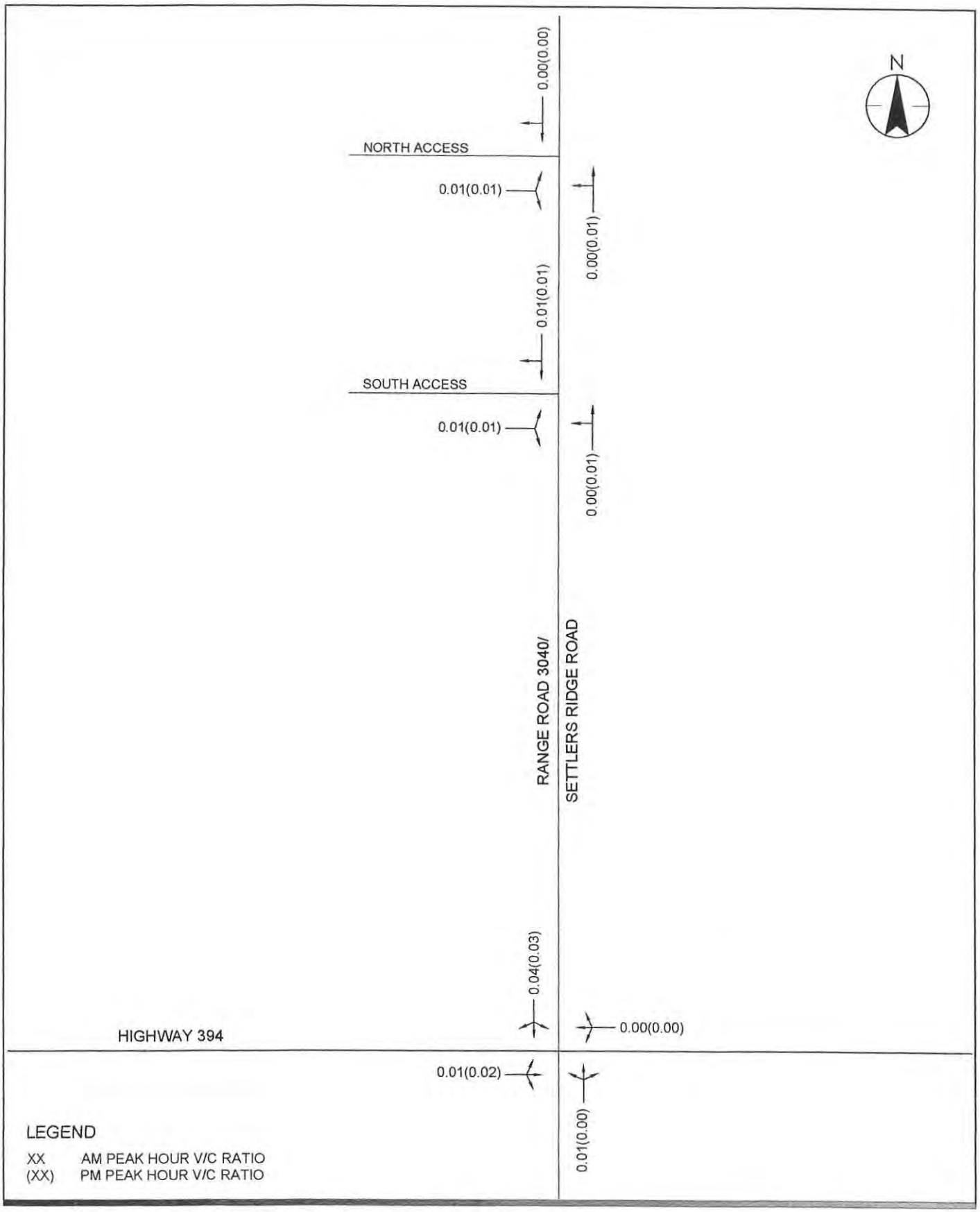

FIGURE 4.3 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

V/C Ratios

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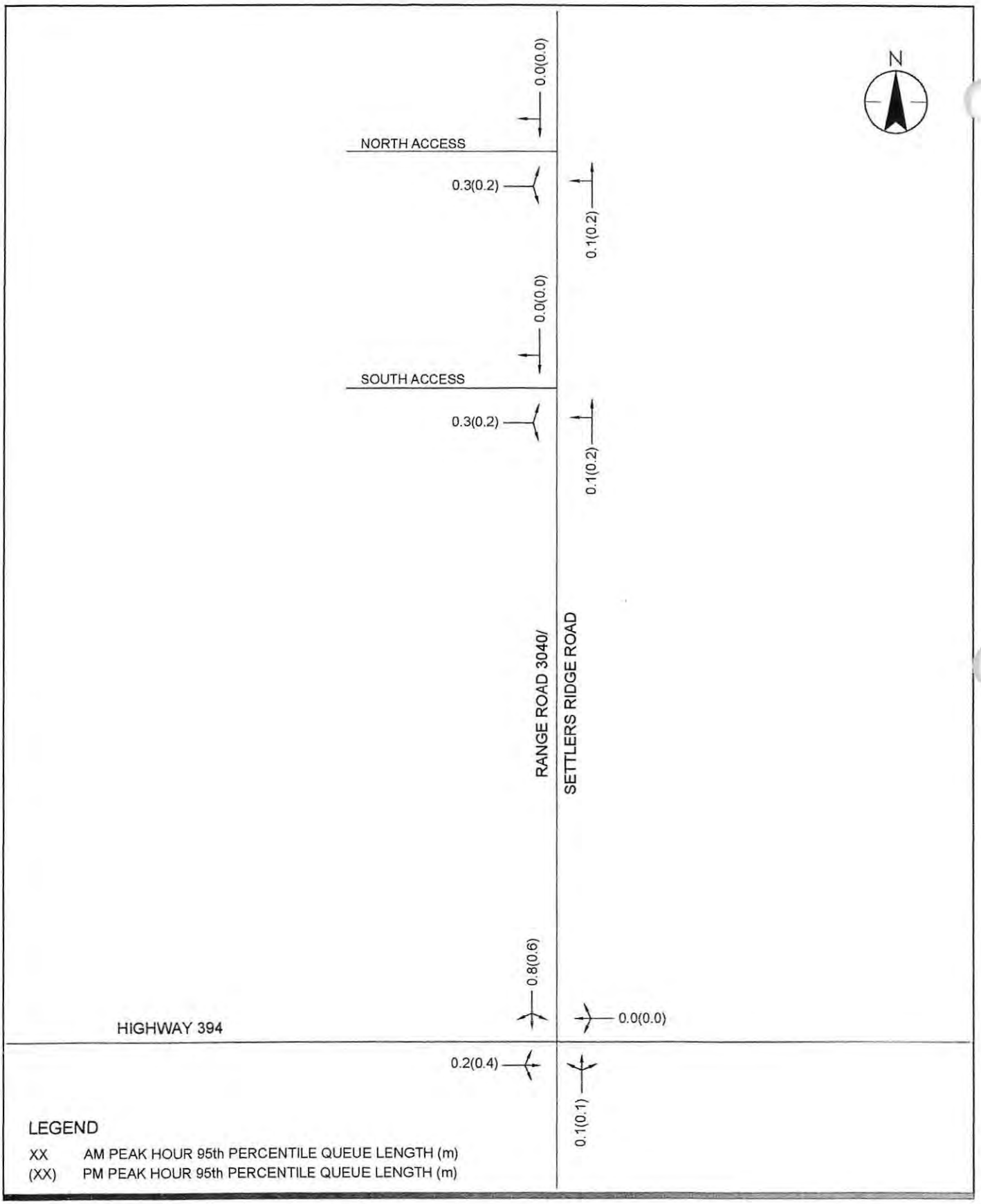

FIGURE 4.4 | TUSCAN RIDGE ESTATES TRAFFIC IMPACT STUDY

95th Percentile Queue Lengths

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5.0 Conclusions

Based on the analysis conducted, the roadway network as proposed is capable of handling the traffic volumes generated by Tuscan Ridge Estates at full build-out, taking into consideration the expected background growth and traffic generated by the nearby development of Ridgewood Estates. Recommendations for the roadway network are provided below:

- Construct each local access road with a single all-directional lane in the eastbound direction. Stop-control in the eastbound direction.
- No auxiliary lanes are required on Settlers Ridge Road or on Highway 394
- Monitor road conditions as required by the RMs of Corman Park and Blucher, which may include paving Settlers Ridge Road from Highway 394 to the north access into the development.

Appendix I
School Confirmation

Print Close

RE: Clavet Attendance

From: **Kerry Donst** (kerry.donst@spiritsd.ca)
Sent: July-03-14 3:24:20 PM
To: william murdoc (wmurdoc@hotmail.com); Karen McKee (karen.mckee@spiritsd.ca)
Cc: jim.shields@spiritssd.ca (jim.shields@spiritssd.ca)

William,

My apologies for the tardy reply!

We have reviewed projected enrollments for Clavet Composite School. The school should be able to accommodate students from the proposed development.

Thanks,

erry Donst

Facilities Planner

PRAIRIE SPIRIT
SCHOOL DIVISION
Learners for Life

School Services Building

Box 809, 523 Langley Avenue, Warman, SK, S0K 4S0

P: 306-683-2917 C: 306-260-9666 F: 306-244-1409

E: kerry.donst@spiritsd.ca W: www.spiritsd.ca

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om: william murdoc [mailto:wmurdoc@hotmail.com]
Sent: Thursday, July 03, 2014 9:21 AM

Appendix J
Example of Solar Project Schematic

SOLAR OUTPOST

Solar

GO SOLAR WITH SOLAR OUTPOST

WE TAKE CARE OF EVERYTHING

- Engineered design
- Utility applications
- 20% renewable energy grant and tax incentives available
- On-staff engineer
- Simple turnkey installation
- Utility inspections & final commissioning

Solar Outpost's pre-engineered grid-tie systems offer the best value for any customer. In addition to being mechanically complete, all of our systems include extensive documentation and detailed drawings making interconnection easy. With no moving parts and no maintenance solar power is a great investment in our Canadian Prairie climate.

HIGH QUALITY BRAND NAME PRODUCTS

Our systems are designed with many of the best quality and most durable components that also provide the best economics possible. We have a commitment to using leading manufacturers on the market today such as: inverters from SMA and Enphase Energy, panels from Trina Solar, and maximizer systems from Tigo Energy.

All components are cUL and CSA approved and chosen specifically for our harsh Canadian Climate.

Fencing has been added to our arrays to comply with the new 2013 Canadian Electric Code. Chain link fencing is provided by Nordic Industries Ltd out of Saskatoon.

The fence uses the actual structure of the solar array to enclose all the electrical components. This is not only a required safety feature, but also improves the aesthetics of the completed project versus a free standing fence.

SOLAR OUTPOST

Solar

FREE YOURSELF FROM POWER BILLS

- Produce your own clean renewable power on site
- Capital cost allowance available
- Insulate yourself from utility rate increases
- Increase your property value

Installing solar panels in Saskatchewan to off-set, or eliminate your electricity bill is an excellent solution to our rising energy costs.

CUSTOM SOLAR PACKAGES

- Fishing Camps
- Oil and Gas
- Security
- Telecom Networks
- Traffic Safety
- RV and Mobile Power
- Lighting
- Irrigation

We can customize any system to fit your needs, whether its remote power, or grid-tied power, we can design a system that offers the best solution. We provide dependable power solutions for equipment that doesn't have access to grid power while also lowering your installation and maintenance costs.

WARRANTY & MAINTENANCE

Our panels offer a minimum of 10 year manufacturer's workmanship warranty and a 25 year power warranty. With the simple concept of collecting the sun's energy our solar products require no regular maintenance and no hassle, only clean renewable energy that never runs out.

SASKATOON LOCATION	SWIFT CURRENT LOCATION
306 955 7772	306 773 4004
3711 Thatcher Avenue	10 - 1081 Central Avenue North
Saskatoon, SK	Swift Current, SK
S7R 1B8	S9H 4Z1

Your Alternative Energy Store

solaroutpost.ca

Appendix K
Drainage Report

CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 – 8th STREET EAST, SASKATOON, SASKATCHEWAN S7H 0S5
TEL: (306) 343-7280 www.cwce.ca FAX: (306) 956-3199

July 9th, 2014

White Water Holdings Inc.
c/o Greg Murdoch
423 Blackburn Terrace
Saskatoon, SK. S7V 1E8

Re: Tuscan Ridge Estates Subdivision – Drainage Report

Background

Catterall and Wright was commissioned to conduct a drainage study for the above project east of Saskatoon, Saskatchewan. Tuscan Ridge Estates is located on SE ¼ 24-36-4-W3, approximately 8 km east of Saskatoon. Tuscan Ridge is a proposed 43 lot subdivision on 58.56 hectares (144.7 acres ±) located in the Rural Municipality (R.M.) of Corman Park #344 with lots ranging in size from 1.3 to 4.8 acres. The property is currently rangeland / pasture and is surrounded by agricultural lands and sparse development areas. Significant localized sloughs, low areas and vegetated bluffs exist within this area of the RM.

Pre-Development Site Drainage Patterns

Analysis of rough topographical contours indicates that drainage from this area ultimately ends up in the Patience Lake basin located approximately 4km east of the development.

The site is currently divided into two separate localized catchment areas. Catchment #1, covering approximately 60% of the development area, has several small storage areas (sloughs) and a larger storage area (slough) located around ER1 and Lots 2 & 3 – Block 1. This low area appears to have a spill elevation of 541.75 metres. The remainder of the development (Catchment #2) drains in an easterly direction toward ER2, Lot 30 – Block 1 and Lot 7 – Block 2 with an apparent spill elevation of 539.5 metres (current top of road elevation).

A visual site reconnaissance was conducted on June 20th. There were several locations along Settlers Ridge Road that were overtopped with water flowing from the west to the east. Note that this inspection was conducted after a week of steady rainfall of approximately 75mm.

Pre and Post-Development Runoff Conditions

Each catchment will have different proportions of developed surface area due to the amount of road and development area within each catchment. Catchment #1 contains approximately 50% developed roads for the proposed subdivision as well as twenty four lots. Catchment #2 contains approximately 50% of the developed roadways and nineteen lots.

Each lot was assumed to have 465 square meters of impervious surface area and 240 square meters of gravel driveway. This assumption would result in approximately 5 acres of impervious area added to the watershed area as a result of the development. However, since these impervious areas will be flowing onto pervious surfaces and through natural drainage routes and collection areas we do not anticipate a significant increase in runoff rates from the development. Modelling of the development area shows the 1:100 year pre-development runoff volume to be 23,570m and the 1:100 year post-development runoff volume to be 23,840m . We therefore suggest that artificial storm water ponding will not be required for this development.

Recommendations

It is our recommendation that no ponds be developed as existing depression storage should be sufficient to accommodate additional runoff rates and volumes. The development should utilize existing low areas and vegetation to enhance and manage natural ponding. However, we would recommend the minimum finished ground elevation at all buildings in the subdivision be above the estimated peak water levels as indicated on the attached drawing (drawing 539-00101). It is critical that development be restricted along localized drainage paths and natural drainage pathways throughout the development. Restrictions include not allowing construction other than shallow access approaches. Each shallow access approach shall be constructed as a low level crossing or have a minimum 600mm culvert installed. Drawing 539-00102 shows the restricted development areas (not including MR1, MR2, MR3, ER1 & ER2) and potential building sites at or above the recommended safe building elevation for each lot.

We caution that development on Lots 2 & 3 of Block 1 may be difficult, but will be possible if a portion of these lots are filled with suitable material to bring a portion of the area to the minimum building elevation indicated on the drawing.

To assist with promoting and maintaining natural drainage paths within the development, we also recommend construction of a shallow swale as detailed on the west side of Lot 3, Block 1 to convey runoff from a small catchment north.

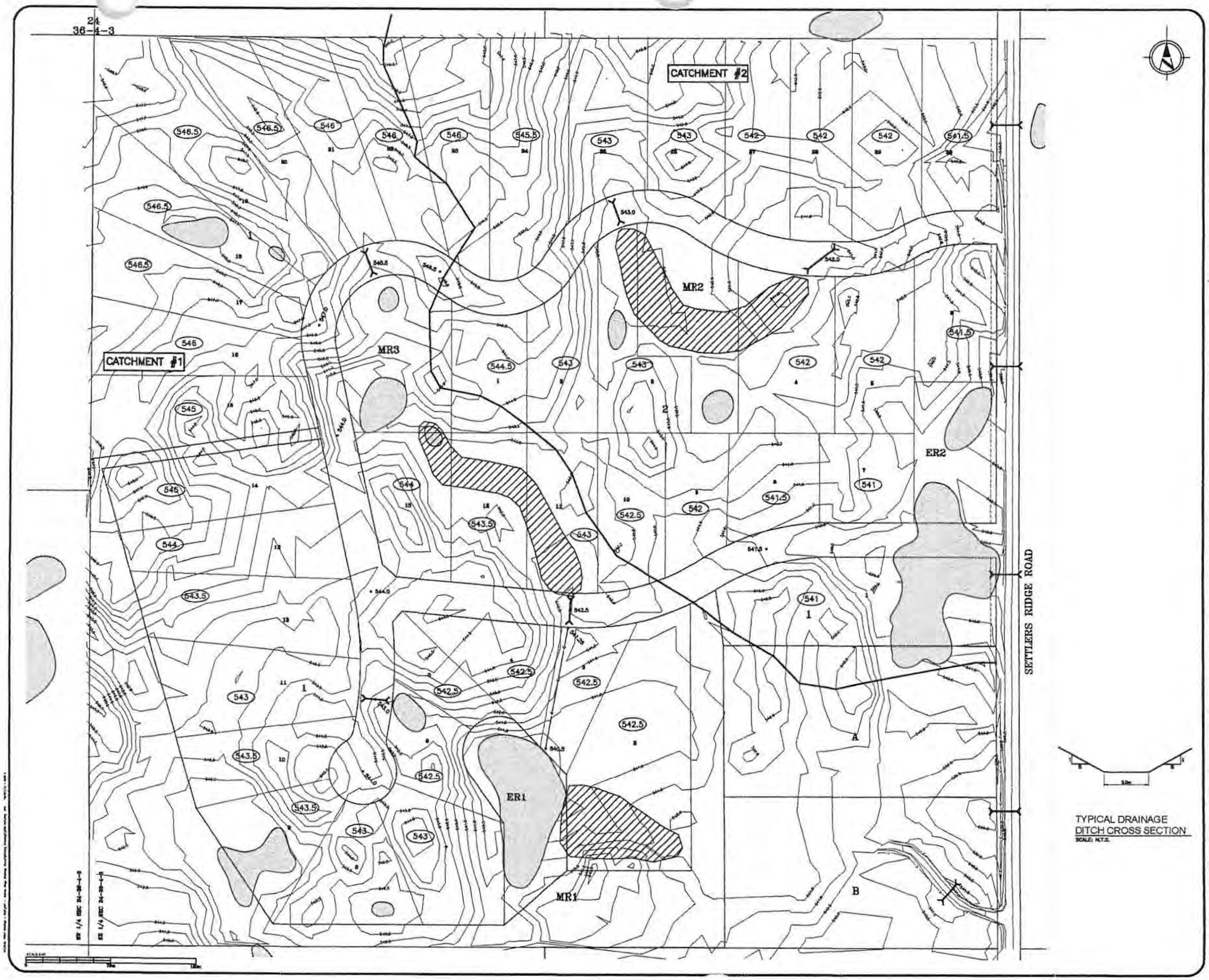
It is also recommended that a culvert be installed beneath the driveway of Parcel B. The driveway is currently impeding the natural drainage outlet of the areas to the west in and around ER1.

Recommendation Summary

- Minimize disturbance to natural topography and vegetation during construction of roadways and utilities.
- Buildings should be constructed at or above the safe building elevations noted on drawing 539-00101.
- All natural drainage pathways should be maintained to prevent flooding of upstream properties.
- A shallow swale with a minimum bottom width of 2 metres should be constructed along the western property line of Lot 3 – Block 1 to accommodate and maintain proper drainage conveyance from areas to the north.
- All culverts within the development shall be 450mm or larger in diameter.
- Culverts should be constructed beneath Settlers Ridge Road in the locations indicated on drawing 539-00101 to accommodate the natural flow of water and allow for equalization on both sides of the road.

Yours truly,
CATTERALL & WRIGHT
Per:

Brett LaRoche, P.Eng.



CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel: (306) 343-7280, Fax: (306) 956-3199

CERTIFICATE OF AUTHORIZATION
CATTERALL & WRIGHT
Number C848

LEGEND:

- EXIST. GROUND CONTOUR
- CATCHMENT BOUNDARY
- EXIST. SLOUGH
- (542) MINIMUM FINISHED GROUND ELEV. AT DWELLING
- RESTRICTED DEVELOPMENT AREAS
- • XXX.XX SUGGESTED ROAD ℄ ELEV.
- PROPOSED DRAINAGE SWALE
- PROPOSED CULVERT (MINIMUM 450mm)

SCALE VERIFICATION
WHEN DRAWING IS PLOTTED FULL SIZE THIS LINE IS 60mm IN LENGTH.

DATE	REVISION
14/07/10	ISSUED FOR APPROVAL

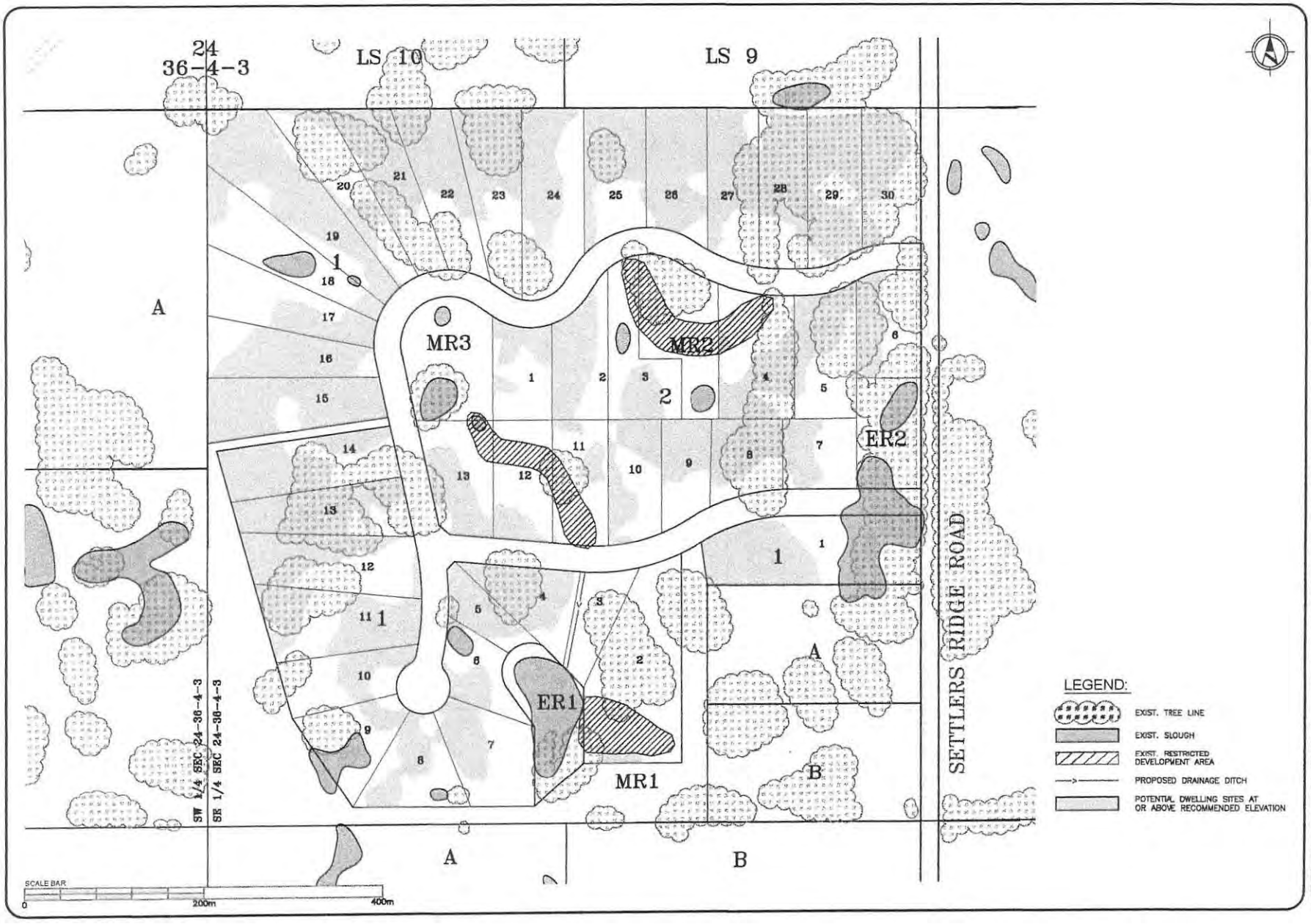
OWNER
WHITE WATER HOLDINGS LTD.

LOCATION
RM CORMAN PARK, SE 24-36-4-W3M

PROJECT
TUSCAN RIDGE DRAINAGE REVIEW

SHEET TITLE
EXISTING SITE CONDITIONS & RECOMMENDED DWELLING ELEVATIONS

SCALE 1:1600	DESIGNED BAL
DRAWN ERL	CHECKED PLS
DATE 14/06/17	SHEET 1 of 2
DRAWING NUMBER 5[illegible]0101	



CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel. (306) 343-7289, Fax. (306) 956-3199

PROFESSIONAL ENGINEER
B. A. LABOSKI
SASKATCHEWAN 12395
PROVINCE OF SASKATCHEWAN

SCALE VERIFICATION
WHEN DRAWING IS PLOTTED FULL SIZE THIS LINE IS 50mm IN LENGTH

DATE	REVISION
14/07/10	ISSUED FOR APPROVAL

OWNER
WHITE WATER HOLDINGS LTD.

LOCATION
RM CORMAN PARK, SE 24-36-4-W3M

PROJECT
TUSCAN RIDGE DRAINAGE REVIEW

SHEET TITLE
RESTRICTED DEVELOPMENT, VEGETATION & POTENTIAL BUILDING SITE LOCATIONS

SCALE	DESIGNED
1:4000	BAL
DRAWN	CHECKED
ERL	PLS
DATE	SHEET
14/06/27	2 of 2

DRAWING NUMBER
539-00102

Appendix L
Potable Water Contract

WATER DISTRIBUTION AGREEMENT

THIS AGREEMENT made as at and effective the Effective Date, as identified in Schedule "A" hereto.

BETWEEN: The person or persons more particularly identified as the "Owner" in Schedule "A" hereto, and successive owners of the Lot (as that term is hereinafter defined)

(hereinafter referred to as the "**Owner**")

AND: **LOST RIVER WATER CO. LTD.**, a corporation incorporated pursuant to the Laws of the Province of Saskatchewan

(hereinafter referred to as "**Lost River**")

WHEREAS:

A. The Owner purchased certain lands located in part of [redacted] (the "**Lot**"), as more particularly described in Schedule "A" hereto.

B. It is a condition of the agreement of purchase and sale of the Lot that the Owner execute and deliver this Agreement.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the mutual covenants and agreements herein contained and for further and other good consideration, receipt and sufficiency of which is hereby acknowledged, the parties hereto do agree as follows:

1. The Owner shall supply and install a ¾ inch water meter in imperial measurement with an external reader on the residential dwelling on the Lot as outlined in Schedule "B" attached hereto and forming part of this Agreement. Such water meter shall be in working order. The Owner shall also install and supply the following as outlined in Schedule "B" attached hereto and forming part of this Agreement:

a) a shut off valve;
b) a dual check valve (backflow);
c) a ½ gallon/minute flow restriction choke;
d) a float valve and float; and
e) a black, blue or green-coloured storage tank.

Where the storage tank referenced in Paragraph (e) above is located in a dark room with no windows or natural light, the said storage tank may be opaque in colour. The Owner acknowledges that Lost River shall not be responsible for any algae growth in opaque storage tanks.

2. The Owner hereby grants an easement or easements granting Lost River the right to enter, locate, erect, install, inspect, operate, maintain, and read meters, together with any necessary rights of egress thereto.

3. The Owner agrees to pay monthly charges to Lost River based on the going rates, as adjusted from time to time by Lost River, set out in Schedule "A" hereto (the "**Monthly Charges**") for supply of water to the Lot.

4. The Owner agrees that in the event of non-payment of the Monthly Charges, the amount unpaid is a charge upon and shall be a lien against the Lot and the Owner hereby grants and conveys to Lost River a lien upon the lot in the amount of the unpaid Monthly Charges, the said lien to be binding upon the Owner and the Owner's heirs, executors, administrators, successors and assigns. Further, if default be made in any of the Monthly Charges, Lost River, in addition to any other remedies it may have a law or in equity, may proceed in equity and enforce payment thereof throughout foreclosure upon and sale of the lot. The Owner agrees to pay the solicitor/client costs of Lost River in any action regarding non-payment of the Monthly Charges. Lost River may, as an additional remedy, cease water service to the Owner if the Owner defaults in any of the Monthly Charges. The Owner agrees to pay the charges for the ceasing and resumption of service along with the monthly charges due, prior to the resumption of the service.

5. Upon the installation by the Owner of the facilities necessary to supply water to the Lot, the Owner shall notify Lost River and request water service to the Lot. Within a reasonable time following such notification and request, Lost River shall supply water to the Lot.

6. Lost River does not guarantee the quantity or quality of water to be provided to the Lot, the water pressure supplied to the Lot or an uninterrupted supply of water.

7. The Owner may be subject to disruptions of service and shall conform to restrictions of water supply at the discretion of Lost River or SaskWater, as the case may be. The Owner acknowledges that Lost River obtains its water supply from SaskWater and that the Owner, and Lost River, may be bound by SaskWater restrictions on water supply in place from time to time.

8. Lost River is responsible for any and all water treatment and testing which may be required to comply with regulations which are applicable or may become applicable in regard to the utilization of the water supplied, including without limitation daily water testing and monthly bacterial testing. Lost River shall employ certified operators to conduct water treatment and testing. Lost River shall maintain a membership in good standing with the SaskRural Water Pipeline Association and the SaskWater and Wastewater Association.

9. The maximum volume of water supplied per consumer shall be seven hundred and twenty (720) imperial gallons of water per day at a maximum flow rate of 0.5 imperial gallons per minute.

10. The Owner acknowledges that Lost River is a corporate water utility provider and by signing this Agreement, the Owner acknowledges that the applicable municipality in which the Lot is located has no present or future obligation to install, operate, maintain or replace any water supply or system to the Lot.

11. Lost River may, at its own cost, register an interest based on this Agreement against title to the Lot in the Land Titles Registry.

12. This Agreement shall run with the land and shall be binding on the parties and their respective heirs, executors, administrators and assigns and all future owners of the Lot or any part thereof.

13. This Agreement may be amended, altered or varied from time to time by the parties by written memorandum signed by all of the parties and attached to this Agreement.

14. This Agreement constitutes the entire and only agreement between the parties hereto relating to the subject matter hereof and supercedes and cancels any and all pre-existing agreements and understandings between the parties. Any and all prior and contemporaneous negotiations and preliminary drafts and prior versions of this Agreement, whether signed or unsigned, between the parties leading up to the execution hereof shall not be used by either party to construe the terms or affect the validity of the Agreement. No representation, inducement, promise, understanding, condition or warranty not set forth herein has been made or relied upon by any party.

15. Time shall be of the essence of this Agreement.

16. This Agreement shall be interpreted and construed in accordance with the laws of the Province of Saskatchewan and for the purposes of legal proceedings this Agreement shall be deemed to have been made in such Province and to be performed there, and the Courts of such Province shall have jurisdiction over all disputes which may arise hereunder.

17. All references to currency in this Agreement shall mean legal tender of Canada.

18. In considering this Agreement, the words in the singular shall include the plural and vice versa, and the words importing masculine shall include feminine and neuter and vice versa, and the words importing persons shall include corporations and vice versa.

19. All provisions of this Agreement shall be treated as separate and distinct and if any provision hereof is declared invalid, the other provisions shall nevertheless remain in full force and effect.

20. Such headings and marginal notes as exist in this Agreement form no part of this Agreement and shall be deemed to have been inserted for convenience purposes only.

21. The reference to any statute shall include every regulation made pursuant thereto and all amendments to any statute or to any regulation in force from time to time and any statute or regulation which supplements, supersedes and/or replaces any such statute or any such regulation.

22. All of the parties to this Agreement do covenant, represent and warrant with each other that they are entering into this agreement as principals and not as agents or nominees for any other person or persons, firm or firms or entity or entities of any nature and kind whatsoever except where a representation has expressly been made to the contrary in this Agreement.

23. This Agreement may be executed in any number of counterparts and each such counterpart shall, for all purposes, be deemed an original and all such counterparts shall together constitute but one and the same Agreement.

[SIGNATURES ON THE FOLLOWING PAGE.]

Schedule "A" to Water Distribution Agreement

1. Effective Date [Style of Cause]: _____

2. Owner [Style of Cause]

Name(s): _____

Address, City, Postal Code: _____

Phone Number: _____

3. Lot [Preamble "B"]

Lot: _____

Block/Parcel: _____

Plan No.: _____

Extension: _____

As described on Certificate of Title: _____

4. Monthly Rates [Paragraph 4]:

(Per 1,000 gallons consumed, including GST) $ _____

Minimum Monthly Rate: $ _____

IN WITNESS WHEREOF the Parties, intending to be legally bound, hereto have hereunto set their hands and seals the _____ day of _____, 201____.

SIGNED, SEALED & DELIVERED)
in the presence of:)
)
)
_____)
Witness

_____
Owner:

SIGNED, SEALED & DELIVERED)
in the presence of:)
)
)
_____)
Witness

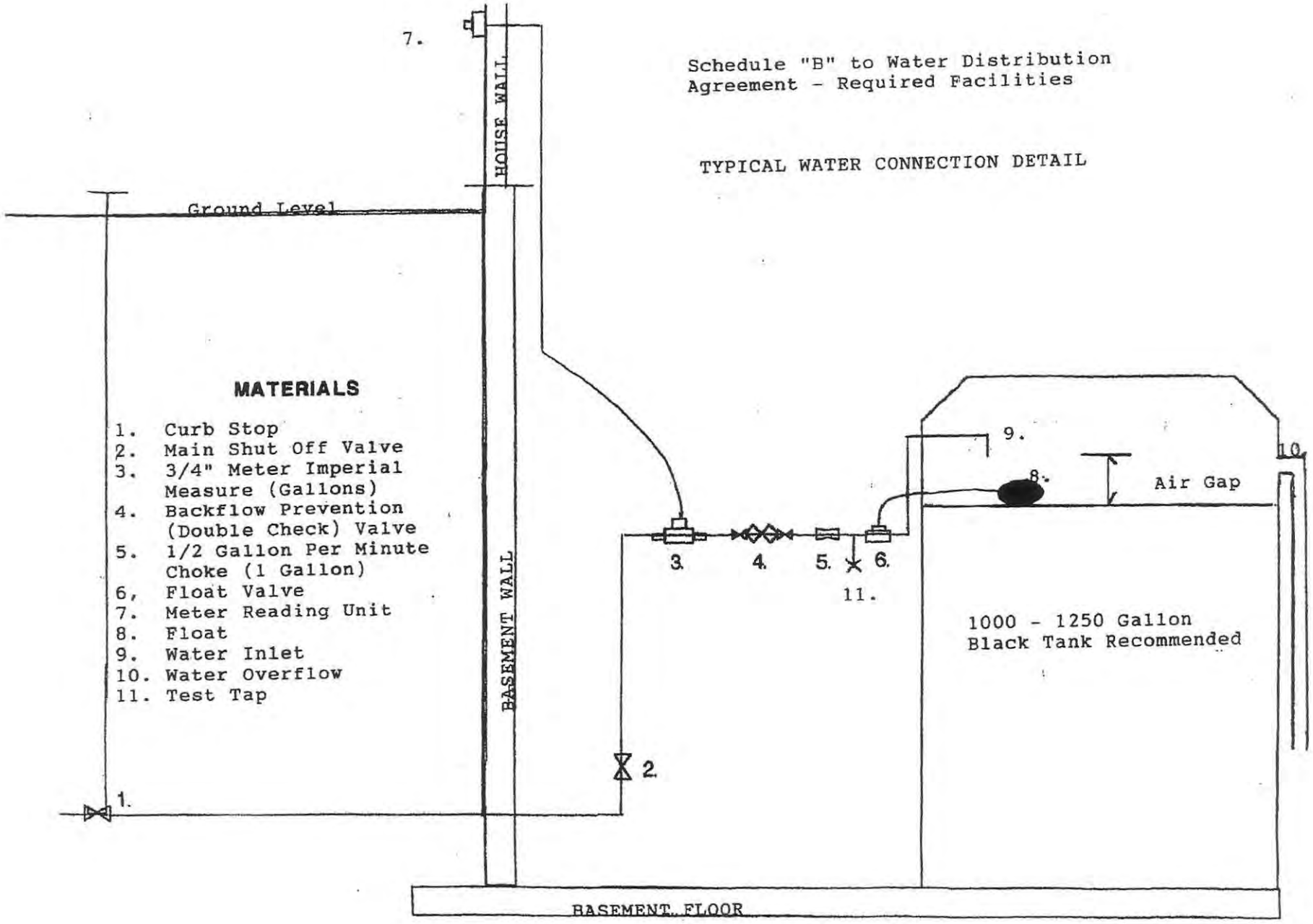
_____
Owner:

LOST RIVER WATER COMPANY LTD.

Per: _____

Schedule "B" to Water Distribution Agreement - Required Facilities

TYPICAL WATER CONNECTION DETAIL



MATERIALS

1. Curb Stop
2. Main Shut Off Valve
3. 3/4" Meter Imperial Measure (Gallons)
4. Backflow Prevention (Double Check) Valve
5. 1/2 Gallon Per Minute Choke (1 Gallon)
6. Float Valve
7. Meter Reading Unit
8. Float
9. Water Inlet
10. Water Overflow
11. Test Tap

THIS MEMORANDUM OF AGREEMENT MADE THIS _____ DAY OF _____, 2014.

BETWEEN:

AND:

LOST RIVER WATER CO. LTD.,
a corporation incorporated under the laws of
the Province of Saskatchewan

(referred to herein as the "Utility")

WHEREAS:

A. The Developer has subdivided the Lands in accordance with the Plan of Subdivision
B. There are 42 lots in the Subdivision
C. The Subdivision is situated within the geographic boundaries of the Rural Municipality of Corman Park
D. The Developer constructed and installed the Subdivision Distribution System on, under, over or through the Public Roads and constructed and installed Curb-Stops on the lots in the Subdivision
E. Pursuant to Section 12 of *The Municipalities Act,* the RM is responsible for the direction, management and control of the Public Roads

IN CONSIDERATION of the respective covenants and agreements contained in this Agreement and for other good and valuable consideration (the receipt and sufficiency of which is mutually acknowledged), the parties covenant and agree as follows:

1. Definitions

(1) Defined Terms – As used in this Agreement, unless the subject-matter or context is inconsistent, the following terms shall have the following meanings:

(a) "Agreement" means this Memorandum of Agreement and all instruments supplemental to it or in amendment or confirmation of it;

(b) "Connections" shall mean the number of subscribers to the Utility pursuant to water pipeline connection agreements between the Utility and with landowners or lessees and the number of lots in subdivision to be served by the Utility pursuant to water pipeline connection agreement between the Utility and Developer of subdivision;

(c) "Curb-Stop" shall mean the on-off valve installed by the Developer on each lot in the Subdivision for the connection of the service for the delivery of potable water through the Delivery Works on a lot from the Subdivision Distribution System to the Water Meter corresponding to that lot;

(d) "Delivery Works" shall mean the underground water supply pipeline from the property line separating the Public Roads and a lot to the Water Meter installed in the Improvement constructed on a lot or to be constructed or on a lot, excluding the Curb-Stop;

(e) "Design Drawings" means all of the design drawings related to the Subdivision Distribution System and Curb-Stops;

(f) "Distribution System" means the entire water distribution system to be constructed by the Developer and owned and operated by the Utility that is to be connected to the SaskWater Facility, but for greater certainty excluding the Delivery Works, which shall be or is the property of the lot owner;

(g) "Improvement" shall mean a residential dwelling house or any other improvement constructed on a lot;

(h) "Lands" shall mean the lands referenced in Schedule "A";

(i) "Lot" shall mean a subdivided lot created in accordance with the Plan of Subdivision, whether or not such lot is owned by the Developer at the time of execution of this Agreement;

(j) "Lot Owner" means an owner of a lot in the Subdivision, including, where applicable, the Developer;

(k) "Parties" means the Developer and the Utility, collectively, and "Party" means either one of them;

(l) "Person" means any individual, corporation, partnership, incorporated syndicate, unincorporated organization, trust, trustee, executor, administrator or other legal representative;

(m) "Plan of Subdivision" shall mean the final plan of subdivision respecting the Lands, agreed to in writing between the Developer and the RM, as registered under the Saskatchewan Land Titles System;

(n) "Public Roads" means that portion of the Lands dedicated as public roads in the Subdivision as shown in the Plan of Subdivision;

(o) "SaskWater" means the Saskatchewan Water Corporation;

(p) "SaskWater Facility" shall mean the contemplated water supply facility to be constructed by Saskatchewan Water Corporation to supply potable water to the Utility;

(q) "Schedule" means the schedule mentioned in subsection 1 (2) herein;

(r) "Subdivision" shall mean, in the aggregate, all of the lots subdivided from the Lands, and all roadways and municipal reserve dedicated pursuant to the Plan of Subdivision. For the sake of clarity, the term "Subdivision" may be used interchangeably with the term "Lands";

(s) "Subdivision Distribution System" means the system of underground water pipelines, excluding Curb-Stops, installed by the Developer on the Public Road in the Subdivision for the purposes of being able to deliver potable water to lots in the Subdivision;

(t) "Water Meter" shall mean the water meter installed or to be installed in the Improvement constructed or to be constructed on each lot, being the connecting point from the Delivery Works to the Improvement;

(2) Schedules – Attached to and forming a part of this Agreement is the following Schedule:

Schedule "A" – Land Description of Subdivision

(3) In this Agreement, unless there is something in the subject matter or context inconsistent with the same:

(a) The singular includes the plural and the plural includes the singular;
(b) A reference to any statute extends to and includes any amendment or re-enactment of such statute;

(c) The masculine includes the feminine.

2. **Incorporation of Subdivision Distribution System into Distribution System**

(1) Subject to the terms and conditions of this Agreement, the Utility agrees to incorporate the Subdivision Distribution System into the Utility's Distribution System. For the purposes of this Agreement, "incorporation" of the Subdivision Distribution System into the Utility's Distribution System shall mean that the Subdivision Distribution System is integrated into and connected with the rest of the Utility's Distribution System such that the Subdivision Distribution System is delivering potable water to subscribers of the Utility, which subscribers shall have entered into water supply agreements with the Utility, residing in the Subdivision. The terms "incorporate" and "incorporated" shall have corresponding meanings.

(2) The Developer has designed the Subdivision Distribution System in accordance with the planning and design created by_____.

3. **Representation and Warranties of the Developer**

(1) *Representations, etc.* The Developer represents, warrants and covenants with the other Parties as follows and the Developer confirms that the other Parties are relying on such representations, warranties and covenants as an inducement to enter into this Agreement:

(a) the Subdivision Distribution Systems, is located entirely on Public Roads and each Curb-Stop is situated on a lot;

(b) the Developer has delivered to the other Parties all Design Drawings in connection with the Subdivision Distribution System and Curb-Stops and such drawings accurately depict the location of where the Subdivision Distribution System and each Curb-Stop was installed;

(c) the Subdivision Distribution System is free of any contaminants(s) such that water distributed through the Subdivision Distribution System is safe to human health when used as drinking water or for personal use and satisfied all government and health requirements for use as a distribution system for drinking water and personal use;

(d) Curb-Stops have been installed to and are situated on all lots (not on the Public Roads) in the Subdivision

(2) *Survival of representations, etc.* All representations, warranties, covenants and agreements contained in this Agreement on the part of the Developer shall survive the completion of the transactions contemplated in this Agreement; provided, however, that all representations and warranties contained in subparagraph 3 (1) of this Agreement shall survive for a period of one (1) year from the date that the Subdivision Distribution System is incorporated into the Utility's Distribution System after which time, if no claims shall, prior to the expiry of that period, have been made by a Party with respect to any incorrectness in or breach of any representation or warranty or covenant made by the Utility, the Developer shall have no further liability with respect to that representation or warranty or covenant.

4. **Covenants**

(1) Developer. The Developer covenants and agrees with the Utility as follows:

(a) It shall pay all costs associated with connecting the Subdivision Distribution System to the distribution system;
(b) It shall pay the sum of Four Thousand Dollars ($4,000.00) to the Utility, to cover the cost of the Waterworks System Assessment (WSA) report which is required by the Water Security Agency after the Subdivision Distribution System has been in operation for the required term;
(c) By a date that is mutually satisfactory to the Developer and the Utility, and in any event prior to the Subdivision Distribution System being incorporated into the Utility's Distribution System, the Developer at its own expense shall, under the supervision of the Utility or its agents or any relevant government authority and to the satisfaction of the Utility (at its sole discretion):

(i) cause the Subdivision Distribution System and, with the consent of each Lot Owner, the Delivery Works on each lot up to and including the Curb-Stop to be super-chlorinated;
(ii) cause the Subdivision Distribution System and, with the consent of each Lot Owner, the Delivery Works on each lot up to and including the Curb-Stop, to be pressure tested;
(iii) cause the Subdivision Distribution System and, with the consent of each Lot Owner, Delivery Works up to and including the Curb-Stop on each lot to be tested by appropriately qualified or certified persons in order to satisfy the standards or requirements of any relevant government authority. In the event that upon any such testing the Subdivision Distribution System and the Delivery Works fails to meet the standards of any relevant government authority, the Developer shall at its own expense cause any remediation work to the Subdivision Distribution System and the Delivery Works up to and including the Curb-Stop on each lot that may be required before the Subdivision Distribution System may be used as a distribution system of drinking water to be done;

The Developer acknowledges and agrees that the Utility shall be under no obligation whatsoever to incorporate the Subdivision Distribution System into the Utility's Distribution System until the Developer has completed the foregoing to the satisfaction of the Utility;

(d) The Developer shall use its best efforts to cause each Lot Owner in the Subdivision, where the Developer is not the Owner of a lot in the Subdivision, to enter into a water supply agreement with the Utility to become a subscriber to the Utility, which agreement shall be in a form that is satisfactory to the Utility and shall include the acknowledgement and agreement of each subscribing Lot Owner that the Utility is the owner of the Curb-Stop and provide that the Utility has an easement onto the Lot in order to have access to the Curb-Stop;
(e) The Developer shall cause ownership of the Subdivision Distribution System to be transferred to the Utility upon discharge of the mortgage registered against the Lands by RBC;
(f) The Developer shall cause all easements, if required, to be registered and shall grant to the Utility all necessary access to the Lands;
(g) The Developer shall carry a minimum of Three Million Dollars ($3,000,000.00) third-party liability insurance with respect to the Lands;
(h) The Developer will, subject to the limitation period set forth in subparagraph 3 (2), indemnify and hold harmless the Utility from and against;

(i) any and all damage or deficiencies resulting from any misrepresentations, breach of warranty or non-fulfillment of any covenant on the part of the Developer under this Agreement or from any misrepresentation in or omission from any certificate or other instrument furnished or to be furnished to the Utility hereunder; and

(ii) any and all actions, suits, proceedings, demands, assessments, judgments, costs and legal and other expenses incident to any of the foregoing.

(2) Utilities

(a) The Developer shall construct the Distribution System and the Utility shall supply water at each Curb-Stop with a designated minimum consumption of 720 imperial gallons per day. Notwithstanding the foregoing, it is understood and agreed that the Utility does not guarantee:

(i) quantity of water
(ii) quality of water
(iii) pressure; or
(iv) an uninterrupted supply of water;

and the Developer acknowledges that the supply of water will be subject to disruptions of service and must agree to conform to restrictions of water supply required by the operations of the Utility, imposed by the Utility, or imposed by Saskatchewan Water Corporation;

(b) The Utility shall operate the Subdivision Distribution System to service the Lands. The Utility shall be responsible for all maintenance, testing, permitting, and billing of the Subdivision Distribution System. The Utility shall contract with and maintain a contract for water services with Saskatchewan Water Corporation for the supply of water to the Lands;

(c) The Utility shall obtain and maintain all necessary permits/licenses required to install and operate the Subdivision Distribution System;

(d) Completion of the Distribution System shall be by approximately _____. The Developer shall have discretion as to the manner in which the Distribution System is constructed. The completion date for the incorporation date of the Subdivision Distribution System into the Distribution System shall be at the discretion of the Developer as shall be the order in which lots in the Subdivision are connected to the Distribution System.

5. Conditions Precedent

(1) This Agreement is subject to the following condition precedent, which condition shall be satisfied, removed or waived with a reasonable period of time:

(a) The Utility entering into an agreement (the "SaskWater WSA") with SaskWater on terms and conditions satisfactory to the Utility for the construction of the SaskWater Facility.

6. General

(1) *Time.* Time shall be of the essence.

(2) *Notices.* Any notice or other writing required or permitted to be given under this Agreement or for the purposes of it to any party, shall be sufficiently given if delivered personally, or if sent by prepaid registered mail to that Party:

(a) in the case of a notice to the Utility at _____;
(b) in the case of a notice to the Developer at _____;

or at any other address as the Party to whom the writing is to be given shall have last notified the other Party.

(3) *Assignment.* Neither this Agreement nor any rights, remedies, liabilities or obligations arising under it or by reason of it shall be assignable by any Party without the prior written consent of the other Party. Subject thereto, this Agreement shall enure to the benefit of and be binding on the Parties and their respective heirs, executors, administrators, personal representatives, successors and permitted assigns.
(4) *Further assurances.* The Parties shall, with reasonable diligence, do all things and provide all reasonable assurances as may be required to consummate the transactions contemplated by this Agreement, and each Party shall provide further documents or instruments required by any other Party as may be reasonably necessary or desirable to effect the purpose of this Agreement and to carry out its provisions.
(5) *Entire Agreement.* The Agreement constitutes the entire agreement between the Parties and except as stated in it and in the instruments and documents to be executed and delivered, contains all the representations and warranties of the respective Parties. There are no oral representations or warranties or collateral agreements between the Parties of any kind relating to the subject matter herein. This Agreement may not be amended or modified in any respect except by written instrument signed by both Parties.
(6) *Applicable law.* This Agreement shall be interpreted in accordance with the laws of the Province of Saskatchewan and the laws of Canada applicable therein.

IN WITNESS WHEREOF each of the Parties have hereunto affixed their corporate seal, duly attested to by the hands of its proper signing officers in that behalf, on the day and in the year first-above written.

(seal)

Per: _____

Per: _____

(seal) **LOST RIVER WATER CO. LTD**

Per: _____

Per: _____

Lost River Water Utility
259 Beechmont Crescent
Saskatoon, SK
S7V 1C8

November 15, 2013

Dear Mr. Murdock,

This letter is to confirm Lost River Water Utility has excess capacity in the main waterline located 0.5 KM from your proposed Tuscan Ridge development. 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 M
Solid Waste Disposal

Print Close

Tuscan Ridge Estates Refuse pick up and recycling

From: **Jan Magnuson** (jan.magnuson@loraas.ca)
Sent: July-07-14 11:31:13 AM
To: william murdoc (wmurdoc@hotmail.com) (wmurdoc@hotmail.com)

Good Morning Greg,

"Tuscan Ridge Estates" 4 miles East of Saskatoon just North of Patience Lake Highway. SE 24-36-04 W3M Corman Park.

Please note there is a minimum of 6 subscriptions each of waste and recycle for service to begin as well as the roads competed for access of our trucks.

Upon the first resident interested in the program we will begin a wait list .

Pricing is as follows:

95 gallon Waste Cart

$ 21.00 per month plus Corman Park road levy, fuel surcharge & GST prepaid annual subscription, ($373.11) includes service of one level full container of household waste on a weekly basis, initial waste cart is provided by Loraas.

Service is offered on a weekly basis, cart must be level full with the lid closed and out roadside by 7am on collection day. Invoicing is done on a yearly pre-bill with the first year of service due upon ordering.

*Please note prices are subject to change without notice

95 gallon Single Stream Recycle Cart

$ 12.00 per month plus fuel surcharge & GST prepaid annual subscription (169.58) includes service of one level full container of household recyclables on a bi-weekly basis, initial cart is provided by Loraas.

ı conjunction with the waste subscription recycle service is offered on a bi-weekly basis, cart must be level full with the lid closed and out roadside by 7am on collection day. Invoicing is done on a yearly pre-bill with the first year of service due upon ordering.

*Please note prices are subject to change without notice

Loraas Disposal is a local company that has been servicing Saskatoon and area for over 40 years. Our reputation is known for reliable, quality service and complete customer satisfaction.

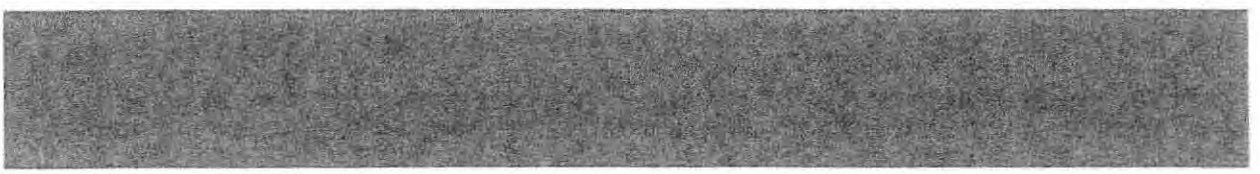
It would be an honor to have the opportunity to do business with you.

Any further questions please feel free in contacting us.

Sincerely,

Jan Magnuson | Customer Care| Loraas Disposal

805 - 47th Street East | Saskatoon, SK | S7K 8G7 | P (306)242-2300 | F (306)242-4994



Appendix N
Fire and Protective Services

Print Close

RE: Confirmation of coverage requested

From: **Rumpel, Dave (Fire)** (Dave.Rumpel@Saskatoon.ca)
Sent: May-20-14 12:32:57 PM
To: 'william murdoc' (wmurdoc@hotmail.com)

Mr. Murdoch,

I am confirming that your development is within the boundaries of the service agreement between the City of Saskatoon and the R.M. of Corman Park. Just to confirm that this is a fee for service as per schedule B of the agreement, and is dependent on our availability.

Don't hesitate to call me if you have any further questions.

DAVE RUMPEL

Deputy Chief, Saskatoon Fire Department
125 Idylwyld Drive S, Saskatoon, SK S7M 1L4
306.975.2520 | dave.rumpel@saskatoon.ca

From: william murdoc [mailto:wmurdoc@hotmail.com]
Sent: Monday, May 19, 2014 1:52 PM
To: Rumpel, Dave (Fire)
Subject: Confirmation of coverage requested

ear Deputy Chief Dave Rumpel,

My company Whitewater Holdings currently has a proposal in with the R.M. of Corman Park to subdivide 144 acres of land which is located at SE 24-36-04 W3M. I have received approval from the R.M. to proceed to the final Comprehensive Development Review stage to develop this land into a 43 lot subdivision called "Tuscan Ridge Estates". I have attached a copy of the plan of proposed subdivision.

As the R.M. of Corman Park pays the City of Saskatoon Fire Department for coverage in this area, I would appreciate if you could send confirmation of notification of this future development.

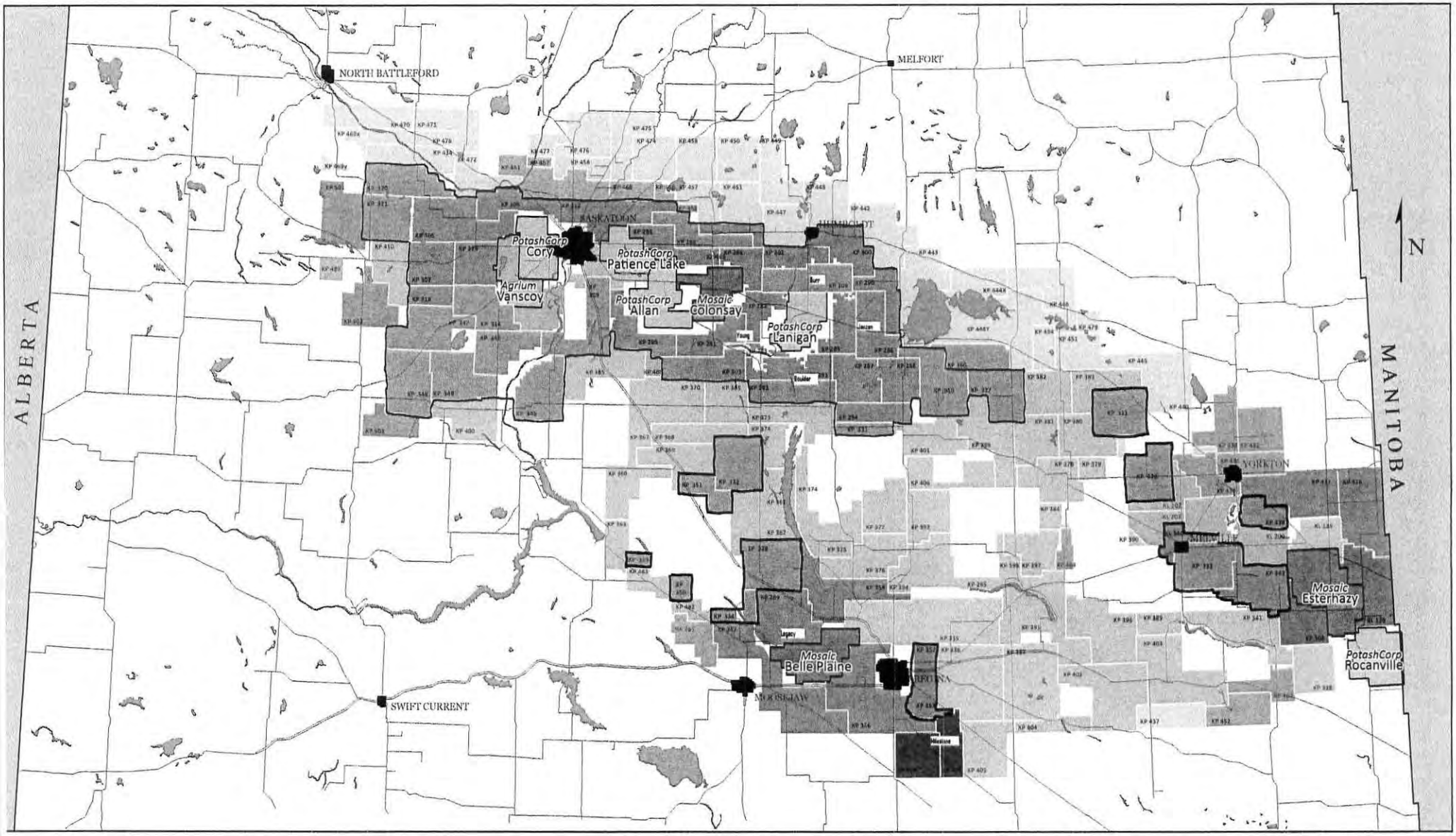
I certainly appreciate your time and look forward to receiving a return email. Please feel free to contact me at 306-290-4937 with any questions.

Sincerely,

Greg Murdoch

Whitewater Holdings

Appendix O
Potash Lease Map



- Athabasca Potash Inc
- Agrium Products inc.
- Acron of Russia
- BHP Billiton Diamonds Inc
- Canada Potash Corp
- Devonian Potash Inc.
- Encanto Resources Inc.
- Karnalyte Resources Inc.
- M & J Potash Corporation
- Mosaic Canada Inc.
- Potash Corp.
- Potash One Inc.
- Rick Walker
- Taiji Resources Ltd.
- Western Potash Corp.
- 101119524 Saskatchwan Ltd.
- 101119524 Saskatchwan Ltd.
- 485343 Canada Ltd.

Kilometers 20 0 20 40 60 Kilometers

POTASH DISPOSITIONS MAP
OCTOBER 21, 2009

Appendix P
Consultation: Trevor Berg PCS Patience Lake

Print Close

RE: Meeting?

From: **Trevor.Berg@potashcorp.com**
Sent: June-13-14 2:21:52 PM
To: william murdoc (wmurdoc@hotmail.com)

Hi Greg,

As a follow up to our call, your site visit and your request for information. There are no underground workings in the area below your land. Patience Lake is now a solution mine and we circulate brine through the old workings and do not have plans at this time to change this. There are many homes, land etc above potash mines in the province. There is subsidence that can happen over time but on a small scale. The mine working are in the range of 1 km below ground. We currently are not aware of any concerns this causes except subsidence as I mention.

Hope this helps.

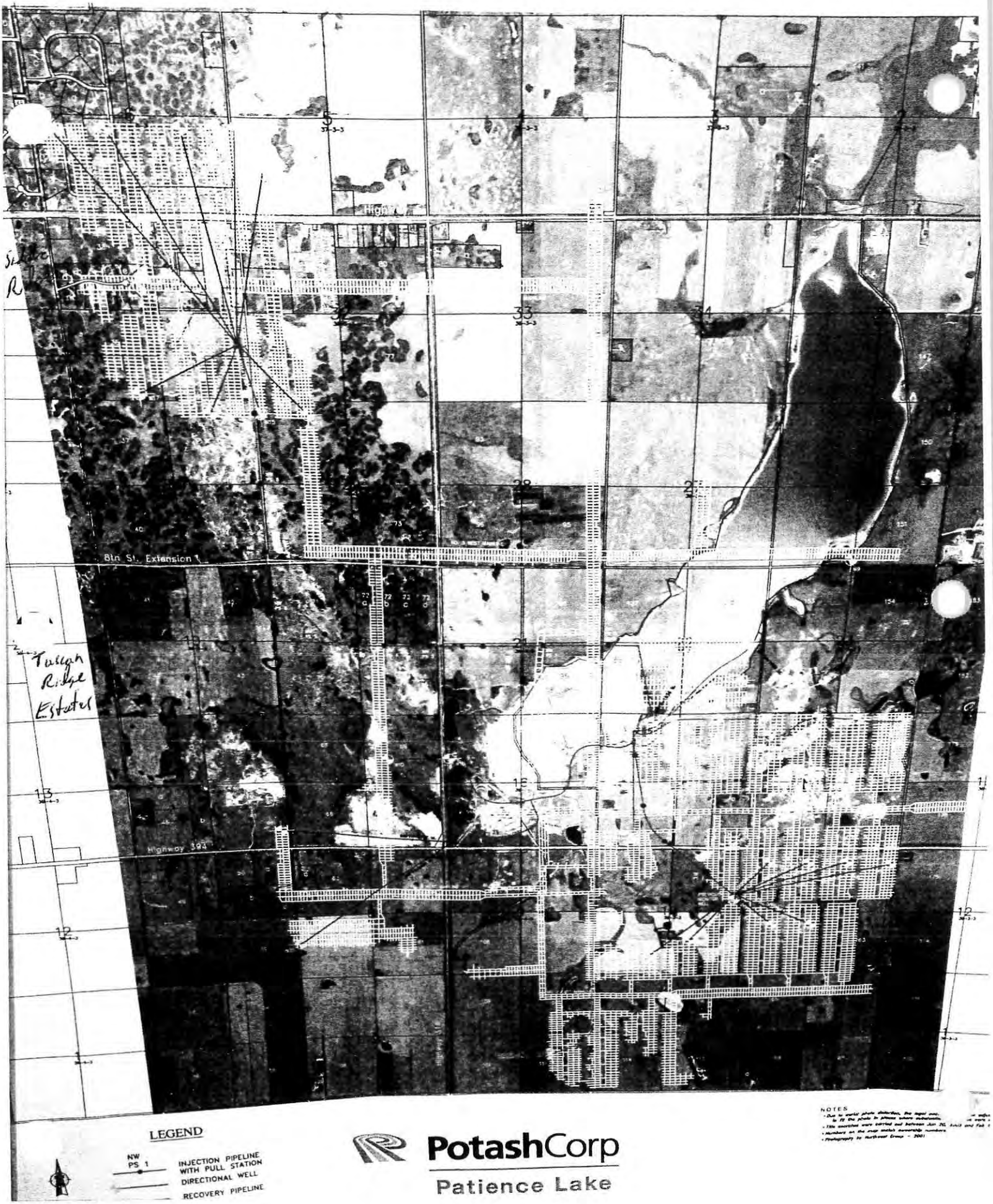
Trevor Berg
General Manager
PotashCorp - Patience Lake
(306) 667-4255

From: william murdoc <wmurdoc@hotmail.com>
To: "Trevor.Berg@potashcorp.com" <trevor.berg@potashcorp.com>
Date: 06/13/2014 01:13 PM
Subject: RE: Meeting?

To: wmurdoc@hotmail.com
Subject: Re: Meeting?
From: Trevor.Berg@potashcorp.com
Date: Thu, 13 Mar 2014 14:50:11 -0600

come to main entrance and park in our lot then proceed to the security inside the first door before the gate. They will call me when you arrive and I am just down the hall in that building.

Appendix Q
PCS Patience Lake Drift(Tunnel) Map



LEGEND

NW PS 1 — INJECTION PIPELINE WITH PULL STATION

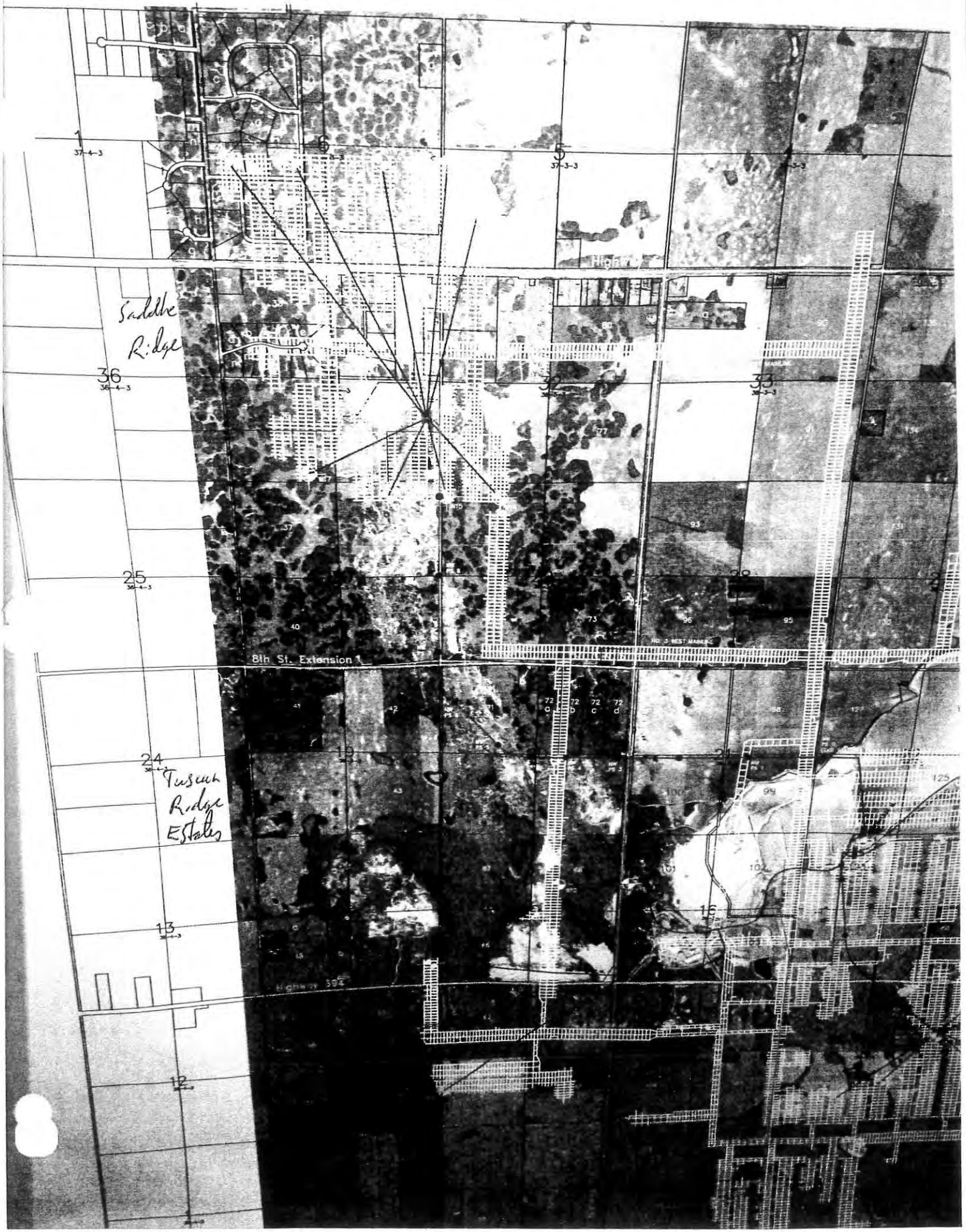
DIRECTIONAL WELL

RECOVERY PIPELINE

PotashCorp

Patience Lake

NOTES


Saddle Ridge
Tuscan Ridge Estates
81h St. Extension
Highway 394