DRAFT COMPREHENSIVE DEVELOPMENT REVIEW

BERNHARD RESIDENTIAL DEVELOPMENT

Prepared for:

THE RURAL MUNICIPALITY OF CORMAN PARK NO. 344

and

THE CORMAN PARK - SASKATOON PLANNING DISTRICT COMMISSION

Prepared By:

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In Association With:

Crosby Hanna & Associates

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And

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EXECUTIVE SUMMARY

Ken and Wendy Bernhard (the Developer) are applying to rezone a 7.68 ha (18.97 ac) portion of the SE 1/4 Section 4, Township 36, Range 5 W3M (Parcel B, Plan 75S00678) from DAG1 - D-Agriculture 1 District to DCR4 - D-Country Residential 4 District for the purpose of developing six (6) residential lots.

The proposed development is situated on lands located within the Corman Park-Saskatoon Planning District, approximately 1.2 km south of the City of Saskatoon west of Clarence Avenue and the unincorporated Hamlet of Grasswood. There is one existing single family dwelling located on the property and the remainder of the land is characterized by hayland and a small cluster of trees towards the southwest corner of the parcel. This document shall serve as the Comprehensive Development Review (CDR) required requesting the re-zoning designation from DAG1 - Agriculture 1 District to DCR4 - Country Residential 4 District.

Geotechnical investigations were undertaken by Clifton Associates. Site investigations and piezometer installations were conducted on May 16, 2014 with groundwater levels obtained within days of the installation. A total of four piezometers were installed to a depth between 11 m to 14 m. It was determined that the depth from surface to the normal groundwater levels varied from 1.5 m below ground surface to 2.5 m below ground surface. The shallowest groundwater levels were encountered in the southwest area of the subject site. It was determined that consideration be given to the potential of groundwater levels rising due to development, and elevations of basements designed accordingly. It was recommended that floors be designed to lie above the water table and that basement walls and floors be waterproofed to accommodate any future increase in groundwater levels that could lead to basement seepage. It was further recommended that perimeter subdrainage systems and be installed at the base of the footing at each site. In terms of foundations, it was recommended that structures be supported on shallow spread footings or piles. As significant slouging was encountered in sand during the field investigation, it was recommended that footing construction below the depth of the frost (expected at approximately 1.8 m below the surface) would be difficult. As such, shallow cut back angles for slopes and dewatering would likely be required, or footings could be constructed at a minimum depth of 600 mm below finished grade. Additional recommendations are made concerning floors, the potential for sulphate attack and frost action. It is recommended that site-specific geotechnical investigations be conducted prior to the development of each residence.

Preliminary monitoring of groundwater depths, groundwater chemistry, and hydraulic conductivity analysis was performed on each piezometer. Baseline groundwater chemistry results indicate exceedances occurred for coliforms and many of the metals, particularly iron and manganese. Additionally, hydrogeologic flow modelling used to predict groundwater flow and associated plume development was undertaken. Groundwater modeling results indicate that over a 100 year period, plumes from the proposed mounds will impinge on the capture zones of the existing well on the north east of site, based on the loading proposed. There are; however, shallow groundwater conditions on-site which impact the vadose retention times in the discharge areas. As such, it is advisable to ensure that the disposal systems are set at such an elevation that there is a minimum of 1.5 m from the base of the mound to the groundwater table. Clifton

Associates recommended that Type II mounds with a restrictive layer within the mound, be utilized as the type of wastewater management system on the subject site. Additionally, a monitoring program is recommended in the existing wells noted within the Clifton report to identify potential impacts to groundwater in this area.

Drainage analysis of the area indicated that an adequate outlet does not exist on site, therefore evaporation ponds are recommended to detain additional runoff from the development, and two options were provided to the developer. Both concepts are founded on the use of evaporation ponds to detain additional runoff generated from the development. The runoff analysis used 1:100 year: 24 hour +25% event from the City of Saskatoon extreme rainfall date to size the ponds and maintain a freeboard of 1 m from surrounding buildings. The option chosen for the drainage plan, was done so based on the road layout. Clifton Associates recommended that maintenance to the pond would consist of cutting cattails, weeds and mowing of the lawn. Additionally, a Homeowners Association will need to be established to collect dues and assume responsibility for the maintenance of the pond. Lastly, access and maintenance easements will need to be created on the pond areas.

Access to the proposed development will occur via Clarence Avenue. One proposed internal road with a graveled surface will service the subdivision. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately to the west of the subject site (Parcel C, Plan 75S00678). The Developer is currently working with the Developer of the neighbouring property to come to an agreement.). The approach and internal road will be constructed to the R.M.'s standards, at the expense of the developer.

SaskPower and SaskEnergy will provide services to the residences in the surrounding area. SaskPower provided a response indicating they will be able to serve the proposed development as an existing overhead power line is located along the west side of Clarence Avenue that can provide electricity to the subdivision. It was indicated that a distribution line and transformers will need to be constructed to service each lot at the developer's expense. SaskEnergy provided both a quote and a draft of the proposed pipeline right-of-way location. The R.M. of Corman Park indicated that it would be possible to connect to the existing R.M. of Corman Park water system.

The City of Saskatoon will provide the proposed development with fire protective services, based on an agreement between the R.M. of Corman Park and the City of Saskatoon - in which Saskatoon provides fire protective services to a number of areas within the R.M.. This agreement covers the proposed development site. Police services will be provided by the Corman Park Police Services and the Martensville Detachment of the Royal Canadian Mounted Police.

The proposed development is located on land that is not considered to have the potential to contain any unique historical or archaeological significance according to the Developer's Online Screening Tool at the Ministry of Parks Culture and Sport.

According to the Saskatchewan Conservation Data Centre, the proposed development is located in an area considered to have potential critical wildlife habitat. As such, the proposed development was referred to the Ministry of Environment for their review. A response was received from the MOE in April, 2014 and it was indicated that the species information was rated as S3, and

therefore there were no setback designated and development would have a negligible impact. As such, MOE had no further concern with the subdivision development proceeding at the subject parcel.

A Public Open House was held on Wednesday October 17, 2012 at the South Corman Park School. The Developer and members of the design team were present at the open house. A mail out was distributed to all neighbours within 1 mile (1.6 km) of the proposed subdivision, two weeks prior to the event. A total of sixteen (16) people attended the open house, and the development was well received. One written submission was received further to the open house indicating he was opposed to the development citing traffic concerns and wastewater management concerns. Clifton Associates recommended that Type II mounds be installed as a means of wastewater management.

1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide the Rural Municipality of Corman Park No. 344 and the Corman Park-Saskatoon Planning District with a Comprehensive Development Review to as per the requirements of both municipalities.

This review provides a framework for a proposed 18.97-acre (7.68 ha) residential subdivision on a portion of S.E. ¼ Section-4 Township 36 Range 5, W3M (Parcel B, Plan 75S00678). The Developer of the project are Ken and Wendy Bernhard. The Concept Plan for the Development is attached as Appendix "A" to this document.

Questions on the proposal or the material contained within this document should be directed to Jim Walters (306-665-3441).

1.2 OVERVIEW

It is the intention of the Developer to construct six residential lots on the subject site. The lots will complement the existing land uses in the area. The proposed subdivision is located adjacent to (west and north) the unincorporated Hamlet of Grasswood.

The proposed residential development is situated on land designated for future residential development on the Corman Park-Saskatoon Planning District Future Land Use Map.

The Developer intends to undertake the development of all six lots in one phase.

1.3 LAND USE CONTEXT

The proposed development will be situated on lands located within the Corman Park-Saskatoon Planning District. The subject parcel is bordered by Clarence Avenue to the east, and pastureland to the south. The proposed development is located approximately 1.2 km south of the City of Saskatoon proper (see Land Use Development Context Map on following page).

The site is currently zoned DAG1 - Agriculture 1 District, but the Developer is applying to rezone the parcel to DCR-4 - Country Residential 4 District to facilitate the proposed development.

The Existing Land Use Context of the Proposed Development is as Follows:

North

- Sandcastle Farms	Adjacent to north site line
- Country Residential Development	Approx. 500 m north of north site line
- Hill Road	Approx. 450 m north of north site line

South

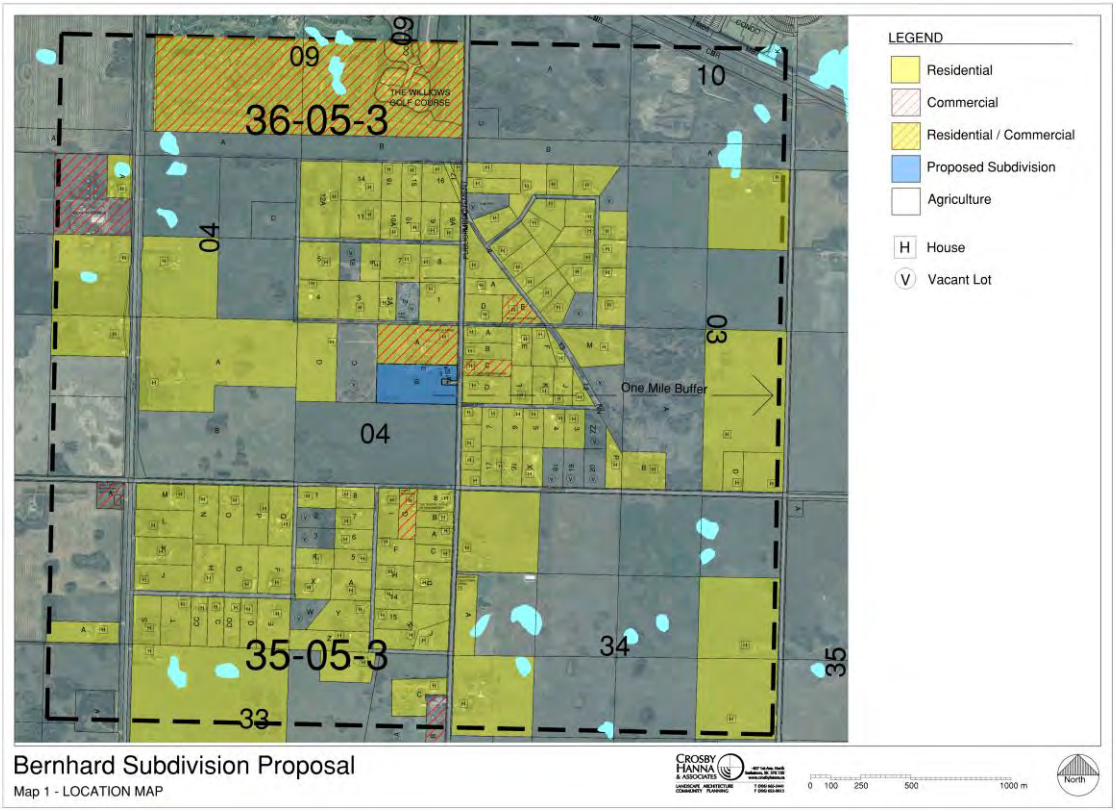
- Vacant land	Adjacent to south site line
- Grasswood	400 m south of south site line
- Grasswood Road	400 m south of south site line

West

- Vacant land	Adjacent to west site line
- Acreage	800 m west of west site line
- Lorne Avenue	2.4 km west of west site line

East

- Clarence Avenue	Adjacent to east site line
- Grasswood	Adjacent to east site line



Nearby Neighbourhoods Include:

In the R.M. of Corman Park:

- Grasswood	Adjacent to east site line and 500 m south
- Organized Hamlet of Casa Rio	Approximately 2.2 km south
- Organized Hamlet of Furdale	Approximately 2.2 km west
- Organized Hamlet of Riverside Estates	Approximately 3.3 km southwest

In Saskatoon:

- The Willows — Approximately 1.2 km north
- Stonebridge / Stonegate — Approximately 2.25 km north

1.4 POLICY CONTEXT

The proposed residential development has been designed to meet the requirements of the Official Community Plan (OCP) and Zoning Bylaw (ZB) for the Corman Park - Saskatoon Planning District Official Community Plan.

CORMAN PARK SASKATOON PLANNING DISTRICT OFFICIAL COMMUNITY PLAN

General Development Policies (Section 5.2)

- 5.2.1 - The Developer has referred the Hydrology and Hydrogeological Investigation to the Saskatoon District Health Region and the Water Security Agency. All comments that were received have been amended in the report undertaken by Clifton Associates (see report and associated amendments in Appendix C).

- 5.2.3 - A servicing agreement between the Developer and the R.M. of Corman Park is expected to address the following (but is not necessarily limited to):
  - Outline the requirement for site-specific geotechnical reports;
  - Identify roadway and approach specifications, including all internal roads;
  - Identify off-site servicing fees, payable to the R.M.;
  - Identify the value of the required performance bond or letter of credit.

- 5.2.5 - The proposed development is not located in any conflict (within one mile) of an existing ILO, landfill, waste disposal site, lagoon, industrial or commercial development, or gravel deposit (see attached correspondence in Appendix B).

General Location and Access Policies (Section 5.3)

- 5.3.1 The proposed development will have legal and year round, all weather physical access to a municipally maintained roadway. The internal road will be a graveled surface and will be constructed at the expense of the developer and maintained by the R.M. of Corman Park. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately to the west of the subject site (Parcel C, Plan 75S00678). The Developer is currently working with the Developer of the neighbouring property to come to an agreement).

- 5.3.2 - Hazard Lands – A drainage analysis was completed by Clifton Associates in May, 2014. It was determined that an adequate outlet does not exist on site, therefore evaporation ponds are recommended to detain additional runoff from the development, and two options were provided to the developer. The two drainage options are attached as

Appendix C to this report. The Hydrology and Hydrogeological Investigation, including drainage study, was referred to the WSA for review.

- 5.3.3 - Access - The proposed development will meet municipal regulations respecting access to and from municipally maintained roadways.

- 5.3.5 - Separation Distances - The proposed development is not located in any conflict (within one mile) of an existing ILO, landfill, waste disposal site, lagoon, industrial or commercial development, or gravel deposit (see attached correspondence in Appendix B).

Comprehensive Development Review (Section 5.6)

- This document shall serve as the Comprehensive Development Review (CDR) required, as the Developer is proposing to rezone and subdivide the land at the SE 1/4 Section 4, Township 36, Range 5 W3M, for new multi-parcel country residential development. It is the intent that this document shall include a complete overview of how the proposed development successfully integrates itself physically, socially, and financially with existing properties, owners, and development in the immediate vicinity. In addition to addressing matters of land use integration, this CDR is intended to assess the capacity of the supportive municipal and provincial infrastructure as it relates the demand created by the proposed development.

Multi-Parcel Country Residential Servicing and Development Policies (Section 5.7)

- 5.7.1 - Ecological Protection - According to the Conservation Data Centre (CDC) mapping tool, provided by the Ministry of Environment (MOE), the development is located in an area of potential wildlife habitat sensitivity. As such, the proposed development was referred to the MOE for their review and a response was received in April, 2014 where it was indicated that the species information was rated as S3 (see attached correspondence in Appendix D). As such no setbacks are required and it was determined that the proposed development would have a negligible impact.

- 5.7.2 - The Developer originally submitted a similar application to the R.M. in response to the R.M's call for innovative multiple parcel country residential development proposals in 2006, but was not selected. The R.M. cited an excess of inventory of unsold property within the R.M. of Corman Park as the reason for the rejection. However, on June 25, 2012, the former Director of Planning for the R.M. of Corman Park indicated that the Developer may proceed with the application, as Council had communicated that they would no longer be maintaining a three-year lot inventory of unsold properties. The former Director also indicated that this was the only item that hindered the proposed development (see attached correspondence in Appendix E).

- 5.7.3 - The proposed development is located immediately west of Clarence Avenue and as such, will make use of existing roadways. One internal road will be engineered and constructed to the R.M. of Corman Park's standards. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately

to the west of the subject site (Parcel C, Plan 75S00678). The Developer has contacted all utility companies (SaskEneregy and Sask Power). SaskPower provided a response indicating they will be able to serve the proposed development as an existing overhead power line is located along the west side of Clarence Avenue that can provide electricity to the subdivision. It was indicated that a distribution line and transformers will need to be constructed to service each lot at the developer's expense. SaskEnergy provided both a quote and a draft of the proposed pipeline right-of-way location. The R.M. of Corman Park indicated that it would be possible to connect to the existing R.M. of Corman Park water system (emails attached in Appendix F).

- 5.7.6 - The proposed lots range in size from 0.89 ha (2.2 acres) to 1.33 ha (3.3 acres), and as such meet the minimum and maximum lot sizes, as specified in the DCR-4 District. The overall average lot size is 1.08 ha (2.7 ac).

- 5.7.8 (c) - The proposed development was designed in order the complement the existing country residential lots in the vicinity in terms of lot size.

- 5.7.9 - A drainage analysis was completed by Clifton Associates in May, 2014. It was determined that an adequate outlet does not exist on site, therefore evaporation ponds are recommended to detain additional runoff from the development, and two options were provided to the developer. The two drainage options are attached as Appendix C to this report. "Option A" as attached to the drainage plan, was chosen, due to the associated road layout. Further to the original study, a letter was issued by Clifton Associates (also attached in Appendix C) detailing that the maintenance of the pond will consist of cutting cattails, weeds and mowing of the lawn. Additionally, Clifton notes that a Homeowners Association will need to be established to collect dues and assume responsibility for the maintenance of the pond and that access and maintenance easements will need to be created on the pond areas.

- 5.7.10 – An email from the Facilities Planner at the Prairie Spirit School Division indicated that the Grasswood area schools have sufficient enrollment capacity for the proposed residential development (see correspondence attached as Appendix G).

Access and Location Policies (Section 5.8)

- 5.8.1 - The proposed development is located within the designated "Future Residential Area" on the Corman Park-Saskatoon Planning District Map.

- 5.8.5 - The proposed development is located west, across Clarence Avenue, from the unincorporated Hamlet of Grasswood. As such, the lots sizes have been designed to be complimentary to those in the Hamlet of Grasswood, immediately east of the proposed Bernhard Residential Development.

- 5.8.6 (a) - According to the Conservation Data Centre (CDC) mapping tool, provided by the Ministry of Environment (MOE), the development is located in an area of potential

wildlife habitat sensitivity. As such, the proposed development was referred to the MOE for their review and a response was received in April, 2014 where it was indicated that the species information was rated as S3 (see attached correspondence in Appendix D). As such no setbacks are required and it was determined that the proposed development would have a negligible impact.

- 5.8.6 (b) - According to the soil agricultural capability map provided by Agriculture and Agri-Food Canada, the soil is classified as Class 4, or as having severe limitations that restrict the range of crops that could be planted in the area.

- 5.8.6 (c) - The proposed development is not located in any conflict (within one mile) of an existing ILO, landfill, waste disposal site, lagoon, industrial or commercial development, or gravel deposit (see attached correspondence in Appendix B).

- 5.8.8 - The proposed development is not located on land considered to have any heritage sensitivity, according to the Developers' Online Screening Tool, provided by the Heritage Conservation Branch at the Ministry of Parks Culture and Sport (see attached results in Appendix H).

Municipal Reserve Policies (Section 5.9):

- 5.9.1 - The Developer is proposing to pay cash-in-lieu of Municipal Reserve.

General Servicing Policies (Section 8.1):

- 8.1.1 One internal road will be engineered and constructed to the R.M. of Corman Park's standards and will consist of a graveled surface. The Developer has contacted all utility companies (SaskEneregy, Sask Power and the R.M. of Corman Park). SaskPower provided a response indicating they will be able to serve the proposed development as an existing overhead power line is located along the west side of Clarence Avenue that can provide electricity to the subdivision. It was indicated that a distribution line and transformers will need to be constructed to service each lot at the developer's expense. SaskEnergy provided both a quote and a draft of the proposed pipeline right-of-way location. The R.M. of Corman Park indicated that it would be possible to connect to the existing R.M. of Corman Park water system. SaskEnergy? A letter dated July 17, 2014 from Loraas Disposal indicated that the area is serviceable in terms of both waste and recycling once the roads are in place (correspondence attached as Appendix J).

General Transportation Policies (Section 8.2):

- 8.2.1 - The proposed development will be accessed by Clarence Avenue. One internal road will be engineered constructed to the R.M. of Corman Park's standards at the expense of the Developer. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately to the west of the subject site (Parcel C, Plan 75S00678). The Developer is currently working with the Developer of the

neighbouring property to come to an agreement.

- 8.2.3 - The proposed development will meet municipal regulations respecting access to and from municipally maintained roadways.

Water and Sewage Management Policies (Section 8.3):

- 8.3.1 – The developer has contacted the R.M. of Corman Park regarding potable water. It was indicated that the R.M. would be able to connect the development to the R.M. of Corman Park's water system that currently serves the region surrounding Grasswood around Clarence Avenue and Grasswood Road.

- 8.3.2 - Groundwater modeling results indicate that over a 100 year period, plumes from the proposed mounds will impinge on the capture zones of the existing well on the north east of site, based on the loading proposed. There are; however, shallow groundwater conditions on-site which impact the vadose retention times in the discharge areas. As such, it is advisable to ensure that the disposal systems are set at such an elevation that there is a minimum of 1.5 m from the base of the mound to the groundwater table. Clifton Associates recommended that Type II mounds with a restrictive layer within the mound, be utilized as the type of wastewater management system on the subject site. Additionally, a monitoring program is recommended in the existing wells noted within the Clifton report to identify potential impacts to groundwater in this area (see attached Clifton Associates report and amendments in Appendix C).

- 8.3.3 - As a condition of approval, a private onsite septic utility will be established and administered to monitor the ongoing operation and maintenance of the on-site wastewater systems.

- 8.3.4 – The Hydrology and Hydrogeological investigation and report completed by Clifton Associates recommends that Type II mounds be employed for wastewater management. It is noted that a restrictive layer within the mound is preferred (Appendix C).

Environmental and Heritage Resource Policies (Section 10.1)

- 10.1.1 - The proposed development is not located on land considered to have any heritage sensitivity, according to the Developers' Online Screening Tool, provided by the Heritage Conservation Branch at the Ministry of Parks Culture and Sport (see attached results in Appendix H). Additionally, the proposed development was referred to the MOE for their review and a response was received in April, 2014 where it was indicated that the species information was rated as S3 (see attached correspondence in Appendix D). As such no setbacks are required and it was determined that the proposed development would have a negligible impact.

Future Land Use Map Policies (Section 12.2)

- 12.2.2 - The proposed residential subdivision is located in an area identified on the Corman Park-Saskatoon Planning District Future Land Use Map as "Future Residential Area".

- 12.2.3 - No amendment is required to the Future Land Use Map.

Comprehensive Development Review Policies (Section 12.4)

- 12.4.1 - This document shall serve as the Comprehensive Development Review (CDR) required, as the Developer is proposing to rezone and subdivide the land at the SE 1/4 Section 4, Township 36, Range 5 W3M, for new multi-parcel country residential development. It is the intent that this document shall include a complete overview of how the proposed development successfully integrates itself physically, socially, and financially with existing properties, owners, and development in the immediate vicinity. In addition to addressing matters of land use integration, this CDR is intended to assess the capacity of the supportive municipal and provincial infrastructure as it relates the demand created by the proposed development.

Zoning Bylaw (Section 12.5)

- 12.5.6 - A servicing agreement between the Developer and the R.M. of Corman Park is expected to address the following (but is not necessarily limited to):
  - Outline the requirement for site-specific geotechnical reports;
  - Identify roadway and approach specifications, including all internal roads;
  - Identify off-site servicing fees, payable to the R.M.;
  - Identify the value of the required performance bond or letter of credit.

Public Participation Policies (Section 12.9):

- 12.9.1 - A Public Open House was held on October 17, 2012 at the South Corman Park School. The Developer and members of the design team were present at the event. A mail out was distributed to all neighbours within 1 mile (1.6 km) of the proposed subdivision two weeks prior to the event. A total of sixteen (16) people attended the open house, and the development was well received. Concerns brought forth by residents included wastewater management and traffic issues (see responses in Appendix I). Traffic and wastewater management concerns are both addressed in this document.

CORMAN PARK - SASKATOON PLANNING DISTRICT ZONING BYLAW

The Developer is applying to rezone a portion of the SE-4-36-5 W3M (Parcel B, Plan 75S00678) from DAG1 - Agriculture 1 District to CDR4 - Country Residential 4 District. Development standards and regulations within the District's Zoning Bylaw will be met.

2 DESIGN ELEMENTS

2.1 CONCEPT

The proposed development is located in an area adjacent to other existing country residential developments, grassland and pasture land. One existing single family dwelling is located on the property and five additional lots are proposed.

2.2 EXISTING LAND USE

The proposed development site consists of approximately 7.68 ha (19.97 acres) of land in a portion of the SE 1/4 Section 4, Township 36, Range 5, W3M (Parcel B, Plan 75S00678). In addition to the single family residence, a quonset, septic tank, asphalt court and mound are located on the property. Two small groves of trees are located at the southwest corner of the site. A SaskWater Pump House bisects the east side of the subject parcel.

Other land uses in the immediate area aside from vacant land include other country residential development, pasture land, and hayland. The City of Saskatoon is located approximately 1.2 km north of the subject parcel.

2.3 PROPOSED LAND USE

The proposed land use is a residential community that will complement the existing country residential developments in the area. A total of six lots are proposed at this development. An existing private residence is located in the northeast corner of the subject parcel and will be included in the development. The lots range in size from 0.89 ha (2.2 acres) to 1.33 ha (3.3 acres). The average lot size is 1.08 ha (2.7 ac).

2.4 SERVICING

The proposed subdivision will be provided with transportation access via Clarence Avenue. One internal roadway will be engineered and constructed to the R.M. of Corman Park's standards. This roadway will serve both the proposed Bernhard residential subdivision as well as the neighbouring subdivision. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately to the west of the subject site (Parcel C, Plan 75S00678). The Developer is currently working with the Developer of the neighbouring property to come to an agreement.

Potable water will be supplied by the R.M. of Corman Park as they operate a water system for the region surrounding Grasswood around Clarence Avenue and Grasswood road.

The Developer has submitted service requests to SaskPower and SaskEnergy. SaskPower provided a response indicating they will be able to serve the proposed development as an existing

overhead power line is located along the west side of Clarence Avenue that can provide electricity to the subdivision. It was indicated that a distribution line and transformers will need to be constructed to service each lot at the developer's expense. SaskEnergy provided both a quote and a draft of the proposed pipeline right-of-way location.

Loraas Disposal indicated that they are able to service the area, in terms of solid waste and recycling management once the acreages are complete and the roads are in place (see attached correspondence in Appendix J).

Drainage will be managed entirely on-site. Two drainage concepts have been provided to the Developer that were prepared by Clifton Associates. Both concepts are founded on the use of evaporation ponds to detain additional runoff generated from the development. The runoff analysis used 1:100 year: 24 hour +25% event from the City of Saskatoon extreme rainfall date to size the ponds and maintain a freeboard of 1 m from surrounding buildings (see attached report in Appendix C). Option A was chosen for the drainage plan, as a result of the proposed road layout. Also attached as Appendix C is a follow-up letter issued by Clifton Associates that details how the proposed drainage pond will be maintained. Clifton recommends that the maintenance of the pond will consist of cutting cattails, weeds and mowing of the lawn. Additionally, a Homeowners Association will need to be established to collect dues and assume responsibility for the maintenance of the pond; and, access and maintenance easements will need to be created on the pond areas.

Clifton Associates recommended that Type II mounds with a restrictive layer within the mound, be utilized as the type of wastewater management system on the subject site. Additionally, a monitoring program is recommended in the existing wells noted within the Clifton report to identify potential impacts to groundwater in this area (see attached report and amendments in Appendix C).

3 TRANSPORTATION AND MUNICIPAL SERVICES

3.1 COMMUNITY ACCESS

There is one access road (Clarence Avenue) into the proposed development on the east side of the subject parcel. The internal lots will be accessed via a graveled approach and a municipally designed and engineered roadway.

3.2 INTERNAL ROADS

One internal road is proposed at the subject parcel. The road will be engineered and constructed to the R.M. of Corman Park's standards and will consist of a graveled surface. The R.M. has requested that the Developer connect the proposed internal road with the proposed subdivision immediately to the west of the subject site (Parcel C, Plan 75S00678). The Developer is currently working with the Developer of the neighbouring property to come to an agreement. It is anticipated that the road will need to be managed by the R.M. of Corman Park, in terms of grading and ploughing in the winter months.

3.3 SEWAGE COLLECTION & WASTE WATER TREATMENT

Preliminary monitoring of groundwater depths, groundwater chemistry, and hydraulic conductivity analysis was performed on each piezometer. Baseline groundwater chemistry results indicate exceedances occurred for coliforms and many of the metals, particularly iron and manganese. Additionally, hydrogeologic flow modelling used to predict groundwater flow and associated plume development was undertaken. Groundwater modeling results indicate that over a 100 year period, plumes from the proposed mounds will impinge on the capture zones of the existing well on the north east of site, based on the loading proposed. There are; however, shallow groundwater conditions on-site which impact the vadose retention times in the discharge areas. As such, it is advisable to ensure that the disposal systems are set at such an elevation that there is a minimum of 1.5 m from the base of the mound to the groundwater table. Clifton Associates recommended that Type II mounds with a restrictive layer within the mound, be utilized as the type of wastewater management system on the subject site. Additionally, a monitoring program is recommended in the existing wells noted within the Clifton report to identify potential impacts to groundwater in this area (see attached report and amendments in Appendix C).

3.4 SOLID WASTE

A letter dated July 17, 2014 confirms that Loraas Disposal is able to service the area for the provision of solid waste and recycling management once the acreages and roads are finished (see correspondence attached as Appendix J).

3.5 POTABLE WATER SUPPLY AND DISTRIBUTION

The Developer contacted the R.M. of Corman Park to determine whether potable water could be supplied to the proposed development. It was indicated that the R.M. operates a water system for the region surround Grasswood around Clarence Avenue and Grasswood Road and that there shouldn't be an issue for the developer to connect to this system (see correspondence attached in Appendix F).

3.6 DRAINAGE

Drainage will be managed entirely on-site. Two drainage concepts, prepared by Clifton Associates, have been provided to the Developer. Both concepts are founded on the use of evaporation ponds to detain additional runoff generated from the development. The runoff analysis used 1:100 year: 24 hour +25% event from the City of Saskatoon extreme rainfall date to size the ponds and maintain a freeboard of 1 m from surrounding buildings (see attached report and amendments in Appendix C). Option A was chosen as the drainage plan, due to the road layout. Also attached as Appendix C is a follow-up letter issued by Clifton Associates that details how the proposed drainage pond will be maintained as well as an amendment clarifying drainage of a 1:100 year +25% event. Clifton recommends that the maintenance of the pond will consist of cutting cattails, weeds and mowing of the lawn. Additionally, a Homeowners Association will need to be established to collect dues and assume responsibility for the maintenance of the pond; and, access and maintenance easements will need to be created on the pond areas.

3.7 SHALLOW UTILITIES

SaskPower provided a response indicating they will be able to serve the proposed development as an existing overhead power line is located along the west side of Clarence Avenue that can provide electricity to the subdivision. It was indicated that a distribution line and transformers will need to be constructed to service each lot at the developer's expense. SaskEnergy provided both a quote and a draft of the proposed pipeline right-of-way location. (correspondence attached as Appendix F).

4 OTHER

4.1 GEOTECHNICAL

Geotechnical investigations were undertaken by Clifton Associates. Site investigations and piezometer installations were conducted on May 16, 2014 with groundwater levels obtained within days of the installation (see attached Clifton Report and amendments in Appendix C).

A total of four piezometers were installed to a depth between 11 m to 14 m. It was determined that the depth from surface to the normal groundwater levels varied from 1.5 m below ground surface to 2.5 m below ground surface. The shallowest groundwater levels were encountered in the southwest area of the subject site. It was determined that consideration be given to the potential of groundwater levels rising due to development, and elevations of basements designed accordingly. It was recommended that floors be designed to lie above the water table and that basement walls and floors be waterproofed to accommodate any future increase in groundwater levels that could lead to basement seepage. It was further recommended that perimeter subdrainage systems and be installed at the base of the footing at each site. In terms of foundations, it was recommended that structures be supported on shallow spread footings or piles. As significant slouging was encountered in sand during the field investigation, it was recommended that footing construction below the depth of the frost (expected at approximately 1.8 m below the surface) would be difficult. As such, shallow cut back angles for slopes and dewatering would likely be required, or footings could be constructed at a minimum depth of 600 mm below finished grade.

Additional recommendations are made concerning floors, the potential for sulphate attack and frost action. It is recommended that site-specific geotechnical investigations be conducted prior to the development of each residence.

4.2 FIRE AND PROTECTIVE SERVICES

The City of Saskatoon will provide the proposed development with fire protective services, based on an agreement between the R.M. of Corman Park and the City of Saskatoon - in which Saskatoon provides fire protective services to a number of areas within the R.M., including south to the Hamlet of Grasswood. This agreement covers the proposed development site.

Police services will be provided by the Corman Park Police Services and the Saskatoon Detachment of the Royal Canadian Mounted Police.

4.3 LAND CONSERVATION

According to the Heritage Conservation Branch at the Ministry of Parks Culture and Sport, the proposed development site is not located in an area considered to contain any significant archaeological resources (see Appendix H). As such, no further inquiries or investigations are required at this development parcel.

According to the Conservation Data Centre (CDC) mapping tool, provided by the Ministry of Environment (MOE), the development is located in an area of potential wildlife habitat sensitivity. As such, the proposed development was referred to the MOE for their review and a response was received in April, 2014 where it was indicated that the species information was rated as S3 (see attached correspondence in Appendix D). As a result of this rating, no setbacks are required and it was determined that the proposed development would have a negligible impact on any existing wildlife habitat areas.

5 STAGING AND IMPLEMENTATION

The proposed development (7.68 ha / 18.97 ac) will be developed in one phase. The proposed concept plan can be found in Appendix "A".

The Developer is requesting that Council rezone the entire site to DCR4 - Country Residential 4 District.

6 PUBLIC CONSULTATION

A Public Open House for the proposed development was held on Wednesday October 17, 2012 at the South Corman Park School. The developer and members of the design tem were present at the event. A mail out was distributed to all neighbours within 1 mile (1.6 km) of the proposed subdivision two weeks prior to the event.

A total of sixteen (16) people attended the open house, and the development was well received (attached as Appendix I). One written submission was received on October 24, 2102. The individual who submitted his comments indicated that he was opposed to the development citing traffic concerns and wastewater management concerns. It is anticipated that wastewater management will be handled through Type II mounds, as recommended by Clifton Associates. It was further recommended that water quality be monitored at the existing wells in the area to identify potential impacts to groundwater in this area. It is not anticipated that an increase in traffic volume will be experienced at full buildout, as there are only a total of six (6) residential lots proposed for the development.

A second letter was distributed to all neighbours within 1 mile (1.6 km) of the proposed subdivision on October 29, 2013. This letter indicated that the Developers were still intending on pursuing subdivision of the subject parcel. The letter invited further feedback from surrounding neighbours who may not have had the opportunity to attend the Public Open House or submit written questions/responses/concerns (attached in Appendix I).

An email, dated November 11, 2013, was received from one individual following the second mail-out. The individual wished to know what process was involved to allow for seven residential lots on the subject property, given the RM's recent move to a four-per-quarter subdivision policy. They also wished to know what water line would be supplying the lots and what type of sewage disposal system would be employed (attached in Appendix I).

A total of five individuals phoned Crosby Hanna & Associates pertaining to the second letter sent in October 2013. The following is an overall summary of the comments / issues / concerns:

- Concern over the close proximity of the development to neighbouring properties and the effect on acreage living;
- The size of the proposed lots being too small (i.e. some individuals believe that acreage lots should be 4-5 acres or more);
- The density of the proposed development does not match the current density of acreages in the area;
- Potential issues with the water table in the Grasswood area (one neighbor indicated that their basement floods annually due to rain, snow melt and sewer discharge);
- Concern over the contribution of this development adding to the groundwater discharge;
- There was interest in purchasing the lots once the development had been subdivided; and,
- Comments regarding the size of parcels decreasing in size (in a general sense), although no specific concern was listed concerning this development.

The proposed development was also referred to the Planning and Development Division at the City of Saskatoon. A letter, dated November 19, 2013 was received from Ms. Laura Hartney at the City in response to the referral. The City indicated that they have no concerns with the subdivision proposal at this time as the development is not located within a future growth area of the City of Saskatoon, and is designated as "Future Residential" on the Future Land Use Map for the Corman Park-Saskatoon Planning District Official Community Plan (attached in Appendix I).

7 APPENDICES

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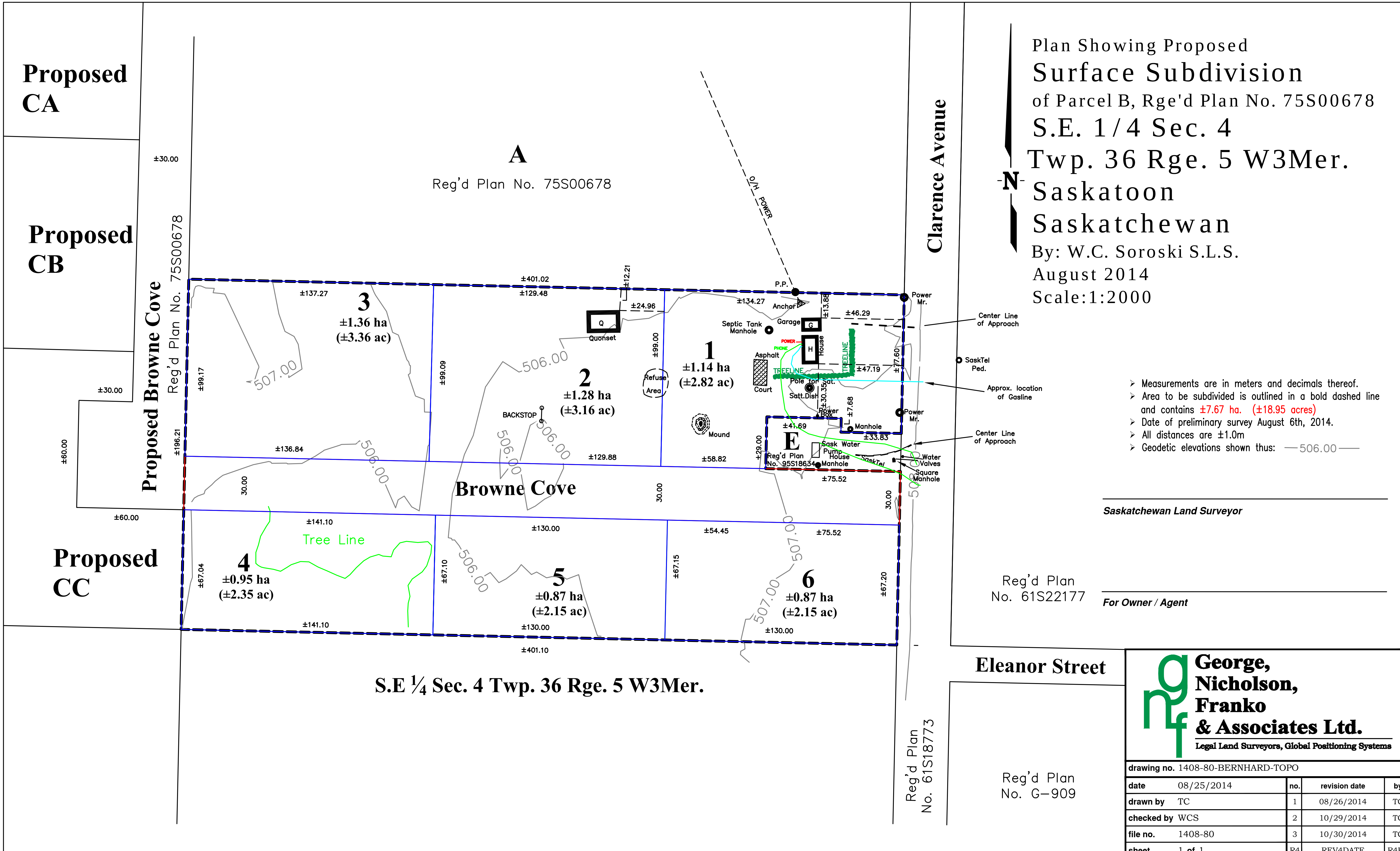
7 APPENDICES

Appendix "A"
Concept Plan



Plan Showing Proposed
Surface Subdivision
of Parcel B, Rge'd Plan No. 75S00678
S.E. 1/4 Sec. 4
Twp. 36 Rge. 5 W3Mer.
Saskatoon
Saskatchewan
By: W.C. Soroski S.L.S.
August 2014
Scale:1:2000
N
Proposed CA
Proposed CB
Proposed CC
Proposed Browne Cove
Reg'd Plan No. 75S00678
A
Reg'd Plan No. 75S00678
O/H POWER
Clarence Avenue
Browne Cove
Eleanor Street
1 ±1.14 ha (±2.82 ac)
2 ±1.28 ha (±3.16 ac)
3 ±1.36 ha (±3.36 ac)
4 ±0.95 ha (±2.35 ac)
5 ±0.87 ha (±2.15 ac)
6 ±0.87 ha (±2.15 ac)
E
Reg'd Plan No. 95S18634
Tree Line
Quonset
Refuse Area
BACKSTOP
Mound
Septic Tank Manhole
Garage
House
Asphalt
Court
Satt.Dish
Power Mr.
SaskTel Ped.
Center Line of Approach
Approx. location of Gasline
Sask Water Pump House
Manhole
Water Valves
Square Manhole
P.P.
Anchor
S.E 1/4 Sec. 4 Twp. 36 Rge. 5 W3Mer.
Reg'd Plan No. 61S22177
Reg'd Plan No. G–909
Reg'd Plan No. 61S18773
➤ Measurements are in meters and decimals thereof.
➤ Area to be subdivided is outlined in a bold dashed line and contains ±7.67 ha. (±18.95 acres)
➤ Date of preliminary survey August 6th, 2014.
➤ All distances are ±1.0m
➤ Geodetic elevations shown thus: —506.00—
Saskatchewan Land Surveyor
For Owner / Agent
George, Nicholson, Franko & Associates Ltd.
Legal Land Surveyors, Global Positioning Systems
drawing no. 1408-80-BERNHARD-TOPO
date 08/25/2014
drawn by TC
checked by WCS
file no. 1408-80
sheet 1 of 1
no. | revision date | by
1 | 08/26/2014 | TC
2 | 10/29/2014 | TC
3 | 10/30/2014 | TC
R4 | REV4DATE | R4BY

Appendix "B"
Setback Correspondence

Maggie Schwab

From: Cory Boudreau <cboudreau@rmcormanpark.ca>
Sent: Thursday, July 04, 2013 9:59 AM
To: Maggie Schwab
Subject: RE: Proposed Residential Development

Hi Maggie,

I spoke with our planning department and in regards to SE ¼, Section 4, Township 36, Range 5, W3M, and they don't see any conflicts in regards to ILO, Landfill or Waste Disposal Site, Lagoon, Industrial/Commercial Dev't, or Gravel Deposit within 1 mile, as Grasswood is within the same area. I will forward your concern regarding 35-38-4-W3 and try and get back to you on it as soon as I can.

Thanks,
Cory

From: Maggie Schwab [mailto:mschwab@crosbyhanna.ca]
Sent: Thursday, July 04, 2013 9:36 AM
To: Cory Boudreau
Subject: RE: Proposed Residential Development

Hi Cory,

Would you also mind checking any land use conflicts with a development (again, multiparcel residential subdivision) that we are helping with in Section 35-38-4 W3M?

Thanks again,
Maggie

From: Cory Boudreau [mailto:cboudreau@rmcormanpark.ca]
Sent: Wednesday, July 03, 2013 11:55 AM
To: Maggie Schwab
Subject: RE: Proposed Residential Development

Hi Maggie,

His Email should be auto forwarding but it appears it did not. I will look into this, and see what I can find out for you regarding surrounding land uses.

Cory

From: Maggie Schwab [mailto:mschwab@crosbyhanna.ca]
Sent: Wednesday, July 03, 2013 11:49 AM
To: cboudreau@rmcormanpark.ca
Subject: Proposed Residential Development

Hi Cory,

I sent this e-mail to Dwayne, but am unsure if it is auto-forwarding to you or not. If so, I apologize for the duplication.

Thanks,
Maggie

From: Maggie Schwab
Sent: Wednesday, July 03, 2013 11:42 AM
To: 'tech.services@rmcormanpark.ca'
Subject: Proposed Residential Development

Hi Dwayne,

We are working for a Developer in the R.M. of Corman Park with the intent of submitting a proposal for a multi-parcel country residential subdivision.

The property is located in the SE ¼, Section 4, Township 36, Range 5, W3M.

On Page 3 of the application form, the R.M. asks whether the Development is located within 1 mile of an ILO, Landfill or Waste Disposal Site, Lagoon, Industrial/Commercial Dev't, or Gravel Deposit (among other things that I can figure out on my own). Is there any way for me to find out the location(s) of any/all of these types of land uses?

I believe you have helped us with this same sort of thing with a previous CDR.

Any help/advice on where to look would be greatly appreciated.

Thanks,
Maggie

Maggie Schwab, M.A.
CROSBY HANNA & ASSOCIATES
407 1st Avenue North
Saskatoon, SK S7K 1X5
T (306) 665-3441
F (306) 652-9613
E mschwab@crosbyhanna.ca
www.crosbyhanna.ca

Spam
Not spam
Forget previous vote

Appendix "C"
Hydrological and Hydrogeological Report

07 November 2014

Attention: Ken and Wendy Bernhard
Company:
Address: 430 Egbert Avenue
Saskatoon, SK S7N 1X3

Bernhard Subdivision Investigation **File S2033**
Residential Subdivision
R.M. of Corman Park No. 344, SK

In response to an e-mail received from Maggie Schwab of Crosby Hanna and Associates on 03 November 2014, Clifton Associates (Clifton) has the following recommendations:

- Maintenance of the pond will consist of cutting cattails, weeds, and mowing of lawn;
- A Homeowners Association for the development needs to be created to collect dues and assume responsibility for the maintenance of the pond; and,
- Access and maintenance easements need to be created on the pond areas.

Also, there was some question as to the Right of Way width. The Right of Way width is 30 m with this site plan.

If you have any questions regarding this letter, please contact me at (306) 975-0401.

Yours truly,

Clifton Associates Ltd.

Jorge Ortiz PEng
Senior Design Engineer

JO/sdb

File S2033

Bernhard Subdivision Investigation

Residential Subdivision
RM of Corman Park, SK

Clifton Associates

Clifton Associates

7 August 2014

Attention: Ken and Wendy Bernhard
Address: 430 Egbert Avenue
Saskatoon, SK S7N 1X3

Bernhard Subdivision Investigation **File S2033**
Residential Subdivision
R.M. of Corman Park, SK

We are pleased to provide you the report for the Residential Subdivision in the R.M. of Corman Park, SK.

If you should have any questions or concerns, please feel free to contact myself by phone: 306-975-0401, or by email: cindy_friesen@clifton.ca.

Yours truly,

Clifton Associates Ltd.

Cindy Friesen BSc
Geoscientist in Training
CF/alg

Cc: Jim Walters and Maggie Schwab – Crosby Hanna and Associates

7 August 2014 S2033

Bernhard Subdivision Investigation

Residential Subdivision
R.M. of Corman Park, SK

Clifton Associates

Prepared by
Cindy Friesen GIT
Regional Manager
cindy_friesen@clifton.ca

Renee Mendoza MScArch
Civil Designer
renee_mendoza@clifton.ca

www.clifton.ca

Executive Summary

Clifton Associates Ltd. (Clifton) was retained to conduct a subdivision investigation of the proposed Bernhard Subdivision (Site) located south of the City of Saskatoon. The objective of the work was to characterize the groundwater conditions with particular emphasis on characterizing the geotechnical properties, cumulative impact of six individual proposed septic disposal fields, and provide a preliminary grading and drainage plan with associated earth volumes.

The Site is geologically situated in Lacustrine Delta of the Haultain unit. Site investigations and piezometer installations were conducted on 16 May 2014 with groundwater levels obtained within days of the installation. Four piezometers were installed to a depth of between 11 m to 14 m to characterize the soil conditions and measure the groundwater level. Preliminary monitoring of groundwater depths, groundwater chemistry, and hydraulic conductivity analysis was performed on each piezometer; however, to determine long term trends, a sequence of several years of monitoring would be required. The depth from surface to the normal groundwater levels varied from 1.4 m below ground surface (mbgs) to 2.5 mbgs. The shallowest groundwater levels were observed in the south west area of the Site. Deeper groundwater depths were observed in the north east area of the Site. Baseline groundwater chemistry results indicate exceedences occurred for coliforms and many of the metals, particularly iron and manganese.

A regional piezometric surface was developed, based on water level observations in groundwater wells within a 1 km radius. Groundwater elevations of these wells were tied into the newly drilled wells on-Site and a piezometric surface was created. There were some inconsistencies in water well elevations that challenged the preconception that groundwater flow occurred to the west toward the river. As yet, there are undefined conditions that affect local groundwater flow in this area. For the purpose of this assessment, local groundwater flow is expected to occur locally from the northwest to the east.

*Wh*AEM 2000, a hydrogeological flow model was used to predict groundwater flow and associated plume development from disposal mounds. Groundwater modeling results indicate that over a 100 year period, plumes from the proposed mounds will impinge on the capture zones of the existing well on the north east of site, based on the loading proposed. Also, shallow groundwater conditions on-Site will impact the vadose retention times in the discharge areas. It is adviseable to ensure that the disposal systems are set at such an elevation that there is a minimum of 1.5 m from the base of the mound to the groundwater table, specific trench sizes are recommended within the report.

Type II mounds are recommended. A restrictive layer within the mound is an option to mitigate 60 day retention zone risks. Additionally, a monitoring program is recommended in the existing wells noted within the report to identify potential impacts to groundwater in this area.

Drainage analysis of this area indicates that an adequate outlet does not exist, therefore the basis of design is founded on the use of evaporation ponds to detain additional runoff generated from the development. The runoff analysis used 1:100 yr: 24hr + 25% event from the City of Saskatoon extreme rainfall data to size the ponds and maintain a freeboard of 1 m from surrounding buildings. If permanent ponds are a desired feature, the concept can be changed to include this.

Two conceptual road layouts are provided for consideration. One option was used to calculate anticipated earthwork volumes for planning and estimation purposes. Effort was made to balance the cuts and fills for efficiency. Total volume of excavation does not exceed 7,000 m^3 and total haul is estimated at 966 m^3.

Prior to construction, it is recommended that the subgrade material be tested to verify strength properties as subbase material. For the purposes of this report, typical R.M. standards have been assumed to be appropriate.

Geotechnical considerations are primarily high groundwater table, potential for sulphate attack, and consideration for frost heaving. Stripping and excavations on-Site may be subject to sloughing and should be considered particularily in trenching and open excavations. Occupational Health and Safety standards will apply and should be referred to.

Table of Contents

1.0 Introduction

Clifton Associates Ltd. (Clifton) was retained on 15 May 2014 by Ken and Wendy Bernhard to conduct a Subdivision Investigation which includes a Level I Hydrogeological Assessment, hydrological, preliminary civil design, and preliminary geotechnical investigation of the proposed six lot residential subdivision, herein after referred to as Site. A subdivision proposal was submitted to the R.M. of Corman Park on 25 April 2014 and the project was selected to proceed with submittal of a Comprehensive Development Review (CDR). The Site is anticipated to be classified as a medium density area, with hydrogeological sensitivity in accordance with the Guidance Document for Developments and Subdivisions Where Wastewater Treatment Systems Are Proposed (GDDSWWTSAP) dated July, 2012. The objective of the work was to provide background information as a basis for rezoning for multi-residential purposes.

The proposed Site is located approximately 2.5 km south of Saskatoon, on Clarence Avenue. The Site Location Plan is shown in Drawing No. 01. See Appendix A for all drawings.

The legal land description is a portion of SE 04-36-05 W3M. The land is partially unused, although a residence exists on the north east corner of the site. It is also neighboured on the east, west, and north side by residential acreages. External land use is predominantly residential, with an equestrian facility located directly to the north.

A previous report completed by Clifton dated 22 October 2012, provided a desktop study of this area assessing preliminary volume of surface water generated by the subdivision. This report provides a conceptual plan utilizing data gathered in the desktop study, as well as field data from May to June, 2014.

2.0 Proposed Development

A conceptual layout was provided by Crosby Hanna and Associates defining the approximately 20 acre site. Six lots, 1 through 6, are proposed varying in size between 0.89 ha to 1.33 ha. A central through road is proposed gaining access from Clarence Avenue to the east and progressing west to access a neighbouring subdivision. See Drawing No. 01.

On-Site wastewater treatment systems are proposed. Communal water will from an outside source.

3.0 Scope of Work

As per the CDR checklist provided by the R.M. of Corman Park, Clifton Associates was retained to provide the following information to supplement the final CDR submittal to the R.M.; Regulatory authorities are included for reference purposes.

- Ground and Surface Water Evaluation - Water Security Agency
- Review of Waste Water Treatment System - Saskatchewan Public Health

- Preliminary Geotechnical Investigation - R.M. of Corman Park

Additionally, a conceptual grading, drainage, and road design was required to support development of a service agreement with the R.M. of Corman Park.

3.1 Regulatory Context

The GDDSWWTSAP, 2012, was used to define the scope for the hydrogeological portion of the study. Additionally, loading criteria set back distances and recommended disposal methods were referred from the Saskatchewan Onsite Wastewater Disposal Guide dated January, 2009. Saskatoon Public Health and Community Planning will provide review and recommendations for subdivision based on this report. Previous correspondence with the R.M. assisted with defining stormwater attenuation regulations for non-draining sites. It is anticipated that the R.M. of Corman Park and Water Security Agency will provide regulatory review and comment for this portion of the study.

R.M. of Corman Park Policy Number PW-12 was used for typical road design parameters.

4.0 Regional and Local Characteristics

4.1 Topography and Drainage

A survey was performed to determine the topography of the Site, and location of petinent features. The topography of the existing Site is shown in Drawing No. 02. More information regarding the survey is provided in section 5.5.

The site drains in a general direction from east to west, except for a low point/slough at the southwest edge of the property that may be improved and graded as one of the proposed evaporation ponds. The site is relatively plain, with a westward slope of 0.5 % to 3 %. The site is generally surfaced with sand overlain by topsoil. Clarence Avenue is considered a border from incoming flows from the east.

The site is part of the National Hydro Network Basin 05HG, Nelson River Drainage Area (Lower South Saskatchewan-Brightwater). A detailed drainage delineation map for the Site based on the topographic survey can be found in Drawing. No. 02 for existing conditions.

4.2 Geology

The regional stratigraphy was developed from a review of published literature, and from regional borehole logs from the Saskatchewan Watershed Authority water well database.

The bedrock in the area consists of units of the Bearpaw Formation (Saskatchewan Watershed Authority, May, 2011) that are overlain by the till of the Battleford and Floral Formations, overly this Formation. The Battleford Formation is overlain by clay, silt, and sand of the Haultain Unit. This unit is characterized as a lacustrine delta.

The surficial geology in the area consists of approximately 5 to 20 m of silts, sands, and gravels identified as the upper section (or part thereof) of the Haultain unit (Qh^3) by MDH (2011); which rests on 10 to 30 m of clays, silts, and sands of a lower portion of the Haultain (Qh^2 of MDH, 2011). These surficial stratified deposits rest upon till of the Battleford Formation, whose thickness in the area varies considerably ranging between approximately 4 m and over 100 m.

Data from the Saskatchewan Geological Atlas (Saskatchewan Energy & Resources, 2014) indicates the surficial deposits to be of deltaic origin with eolian landforms indicating subsequent modification by wind. Alternatively, prior mapping for the Lands Branch (Saskatchewan Urban Affairs, 1979) as part of their Regional Studies Program, indicate a predominantly lacustrine deltaic depositional environment, albeit with subordinate eolian areas or characteristics.

5.0 Field and Laboratory Investigation

5.1 Field Drilling

The subsurface investigation was conducted in one drilling event, dated 15 May 2014. The drilling and installation of the 100 series of piezometers and boreholes were conducted using a truck-mounted drill rig with a 150 mm diameter solid stem continuous flight auger and a 200 mm hollow stem, completed from surface to a depth of between 8 m and 12 m.

Boreholes were logged and sampled at approximate 0.75 m intervals. Laboratory soil testing consisted of determination of moisture content on all samples, Unified Soil Classifications (USC), hydrometers, lab vanes, pocket pens, and sulphates were performed on selected samples.

Piezometers were constructed using 50 mm diameter Schedule 40 PVC pipe with PVC screens. The piezometers were installed with 1.52 m screen length and the screen was surrounded with either frac-sand or slough material while the remainder of the annulus was backfilled with bentonite chip, and drill cuttings.

Piezometer locations and elevations were determined by GPS RTK survey (elevations are reported relative to average sea level, unless otherwise indicated). They were referenced to a post processed coordinate system developed near the Site.

Observations made during the field investigations, visual descriptions, and the results of laboratory tests are recorded in the Borehole Logs and Laboratory Test Data, and are provided in Appendix B to this report. An explanation of the symbols and terms used in the borehole logs is also included in Appendix B of this report.

Piezometer location plan is located in Drawing No. 03 and the stratigraphic cross section of the site is provided in Drawing No. 4.

5.2 Groundwater Monitoring

Groundwater elevations were monitored on 27 May 2014 using a 30 m Solinst water level tape. Water levels ranged from 1.38 m to 3.03 m during the May monitoring program. More details can be found in section 6.3. After elevations were recorded, the sampling program proceeded.

Piezometer Location Plan is included in Drawing No. 03.

Prior to sampling, the wells were purged using dedicated bailers. Purging was intended to remove standing water from the well and surrounding sand pack to ensure that representative formation water was being retrieved from the wells. Approximately three volumes of standing water were purged from the piezometers.

Groundwater samples were collected from BH101, BH102, BH103, and BH104 on 30 May 2014 and were submitted to ALS Analytical Labs (ALS) in Saskatoon. Groundwater samples were analysed for Routine Potable Water, Total Coliforms (TC) including *E. Coli* and Heterotrophic Plate Count (HPC), and total metals.

Groundwater samples were collected using dedicated bailers and nitrile gloves for each monitor well to reduce any cross-contamination. All samples were preserved in accordance with standard procedures as directed by ALS. The dedicated bailers remain in each monitor well for future monitoring and sampling.

5.3 Hydraulic Conductivity

Falling head (slug) tests were performed in all four of the piezometers installed in May, 2014. The test is used to determine the hydraulic conductivity of the soil immediately surrounding the piezometer screen. An automated Solinst levelogger was placed 1 m below water level, and a metal slug inserted into the groundwater to raise the water above its equilibrium level. The logger records the falling hydraulic head as it comes back to its equilibrium level.

5.4 Surrounding 1 Kilometre Water Well Investigation

Saskatchewan Watershed Authority website indicated that approximately 52 wells were potentially located within the surrounding 1 km of the Site. Attempts to locate these wells occurred between 29 and 30 of May 2014. As a result, 22 were identified, geo-referenced, and groundwater elevations recorded.

See Drawing No. 05 - 1 KM Radius Water Well Location Plan.

Pumping activities were not monitored prior to collection of groundwater elevations noted in this report and, as such, pumping influences were not considered. However, in spite of potential errors due to pumping of domestic wells, a consistent groundwater gradient was established. Based on conversations with local landowners, we understand that many of these wells are used for irrigation or livestock purposes and SaskWater supplies the majority of the potable water requirements in this area

5.5 Survey

A topographic survey of the Site was undertaken by Clifton on 27 May 2014. Boreholes were surveyed on 28 May 2014.

The survey was tied to the NAD83 (CSRS) epoch 1997 horizontal and CGVD28 vertical coordinate systems through a Precise Point Positioning solution provided by Natural Resources Canada (NRCan). The survey was tied to surveys completed during the previous years at the nearby Grasswoods Site so that topographic, hydrologic and surrounding well data from all areas could be used in the modelling process. All piezometer, ground water surface and top of cap positions related to this common survey surface.

The method of survey utilized ensures that the current data, data from previous surveys and freely available provincial data sets can be spatially integrated with no difficulty.

6.0 Hydrogeology Results and Analysis

6.1 Site Stratigraphy

The stratigraphy generally consisted of 4 m to 5 m of stratified glacial drift of clay, silt, and sand overlying glacial till of the Battleford Formation. There is between 10 mm to 200 mm of organic topsoil at the surface, underlain by primarily sandy loam, with less than 36% moisture content; and clay below at depths varying between 4.7 and 7.0 m depth.

6.2 Hydraulic Conductivity

Hydraulic conductivity data was analysed manually by hand for BH102 for verification purposes, as well as using Waterloo Hydrogeologic Aquifer Test program representations of the Hvorslev method analysis results are appended to this report in Appendix C (Graphical Analysis of Hydraulic Conductivity). The hydraulic conductivities of the piezometers, including their piezometer tip elevation, are included in Table 6.2-1. The piezometers from BH101 to 103 had their screen interval within a sand stratum which, generally, was some silt to silty, and had trace clay. Most of the piezometers were installed in sloughing conditions with the exception of BH104 which was installed in a clay stratum. This difference in lithology results in an order of magnitude difference in conductivity results, and therefore was not included in the geometric mean. The geometric mean of BH101 to 103 is 2.07×10^{-6} m/s or 0.18 m/day. See Appendix C.

Table 6.2-1 - Hydraulic Conductivity Results

Piezometer No.	Elevation of Piezometer Bottom (m)	K (m/s)	Stratum
101	503.06	1.94×10^{-6}	sand
102	500.63	7.42×10^{-7}	sand
103	502.25	2.18×10^{-5}	sand
104	494.85	2.63×10^{-8}	clay

6.3 Hydraulic Gradient

A piezometric surface was developed, based on local borehole groundwater elevations as well as from the regional water wells, within a 1 km radius of the site. All groundwater elevations were tied into the local coordinate system developed on-site using RTK GPS data collectors, accurate to within 5 cm and referenced to a coordinate system, which is detailed in the survey section of this report. Results of on-site groundwater readings are presented in Table 6.3-1.

Table 6.3-1 - Summary of Site Groundwater Monitoring

Piezometer	Top Casing Elevation (m)	Ground Elevation (m)	Piezometer Bottom (m)	Depth to Water (m)	Water Surface Elevation (m)	Water Level from Ground (mbgs)
BH101	508.54	507.46	503.06	3.03	504.43	3.03
BH102	506.95	505.83	500.63	1.38	504.45	1.38
BH103	508.25	507.05	502.25	2.30	504.75	2.30
BH104	507.43	506.45	494.85	1.96	504.49	1.96

Results for the surrounding 1 km radius investigation are provided in Table 6.3-2. Previous investigations were conducted in this area and 2013 groundwater elevations were provided for reference. The groundwater table has become shallower overall in this area within the past year; however, site specific conditions and usage will impact these values. This report does not constitute a forecast of groundwater level fluctuations.

Table 6.3-2 - Surrounding 1 Km Water Well Investigation

Point #	Northing	Easting	Ground Elevation	Groundwater Elevation 2014	Groundwater Elevation 2013	Difference 2013-2014	Address
3884	5770016	386477	507.72	499.12	499.10	0.02	515 Gabriel Rd
3887	5769590	386911	507.62	504.96	504.87	0.09	855 Hill St
3888	5769454	386776	508.16	504.96	504.94	0.02	735 Hill St
3889	5769445	386507	507.66	504.74	504.73	0.01	n/a
3890	5769183	387035	506.66	504.99	504.80	0.19	4410 Clarence Ave
3891	5769128	387081	507.24	504.62	504.68	-0.06	neighboring lot of 4410
3894	5768791	387160	506.74	502.99	503.99	-1.00	4545 Clarence Ave
3896	5769065	387553	505.14	503.24	503.39	-0.15	1271 Eleanor St
3897	5769053	387448	506.30	503.53	504.62	-1.09	1161 Eleanor St
3898	5769295	387611	506.32	503.20	503.34	-0.14	1280 Middleton Rd
3899	5769285	387439	504.44	503.86	-	NA	1180 Hill St
3900	5769508	387397	505.74	504.50	504.02	0.48	4352 Hill St
3901	5769465	387225	505.46	504.21	504.41	-0.20	1055 Hill St
3903	5769614	387335	507.04	504.29	504.15	0.14	4288 Clarence Ave
3904	5769683	387231	507.56	504.00	504.09	-0.09	4288 Clarence Ave
3907	5769776	387337	509.68	508.36	508.12	0.24	4251 Middletown Rd
3908	5768451	387062	504.51	502.33	502.45	-0.12	4750 Clarence Ave
3910	5768542	386428	508.45	503.69	506.50	-2.81	520 Grasswood Rd
3912	5768550	386006	505.67	503.33	503.34	-0.01	350 Grasswood Rd
3914	5768481	385829	505.42	503.67	503.67	0.00	280 Grasswood Rd
3915	5768323	386763	503.86	502.11	501.64	0.47	4821 Prairie Lane
3916	5768206	386616	506.05	501.51	501.48	0.03	4830 Prairie Lane
3919	5769263	386683	506.90	504.13	501.10	3.03	BH102
3920	5769103	386684	506.60	504.06	504.00	0.06	BH104
3921	5769095	386572	506.00	504.15	505.20	-1.05	BH103
3922	5769287	386533	506.90	504.30	505.30	-1.00	BH101

2014 readings occurred between May and June, 2014

2013 readings occurred between May and July, 2013

A plan of groundwater elevation based on measurements within the wells is provided in Drawing No. 06. A hydraulic gradient was estimated, based on this surface, and was used as an initial condition for modelling purposes.

The result of this analysis indicated that locally, flow mostly occurs from northwest to southeast. The highest point within the 1 km radius is 508.36 located northeast of the Site and the lowest groundwater elevation was noted in the northwest of Site at 499.31. The majority of the data was available on the north, east, and south sides of the Site, and only one point was available on the west. However, based on our knowledge of the area, we believe that regional flow does occur west towards the South Saskatchewan River.

6.4 Groundwater Modelling

6.4.1 *Wh*AEM

A groundwater model was prepared using W*h*AEM2000 (Wellhead Analytic Element Model). The program is public domain and was originally developed for and by the US Environmental Protection Agency to provide a relatively simple yet effective means of defining wellhead protection areas. By utilizing the analytic element method, it enables the development of steady state flow models with wells and boundary conditions. These various items can be assigned discharge/recharge rates and/or groundwater elevations to simulate the required scenario.

In this study, the 100 year capture zones for known water supply wells around the Site are modelled and compared to the 100 year release zone for six proposed disposal mounds to determine if there is a risk of the latter impinging on the former.

6.4.2 Set-Up & Initial Parameters

Regionally, the flow of groundwater is understood to be to the west, towards the South Saskatchewan River, as the surficial deposits extend towards the river's bank. The local measurements of the piezometric surface show a predominantly irregular pattern, but the groundwater elevation contours generally decrease to the southeast. The southeasterly flow direction is inconsistent with the regional flow, and the reason(s) for this are not presently understood. The following numerical analysis used the observed piezometric surface to develop the model.

As most of the groundwater contours around the Site appeared to indicate southeasterly flow, the gradient and direction (down-gradient) were originally calculated as 0.0031 and 150° respectively based on a selected measured point within the 1 km radius. These parameters were used to establish the 'regional' flow field across the Site; except that the relatively steep hydraulic gradient would have resulted in the model generating a piezometric surface, which in the northwest part of the modelled area, would have been above ground. Therefore, the overall hydraulic gradient was reduced to the more reasonable value of 0.0012.

An initial model utilizing the piezometric surface described above – Scenario 1.0 – had the following aquifer properties:

- Hydraulic conductivity (K) = 0.18 m/day (~2.07 x 10^{-6} m/s);
- Base elevation = 480 m;
- Thickness = 35 m; and,
- Porosity = 0.3.

While clay was encountered at relatively shallow depths (4.7 to 7.0 m) to end of hole in all holes drilled for this study, data from further afield suggests a model with a thicker aquifer would be more representative. Logs from water well drillers reports for holes in nearby properties indicate variable presence, depth, and thickness of clay suggesting variable horizontal continuity of the clay layers. In a broader context, MOH (2011) indicates the uppermost stratigraphy to locally consist of gravels, sands, and silts with a vertical extent of 30 to 40 m.

Localized conditions were:

- Pumping wells:
    - Radius of 0.38 m; and,
    - Discharge = 1.818 m^3/day (~1818 L/day).

- Disposal mounds:
  - Assumed radius of 8.5 m; and,
  - 'Recharge' due to disposal at mounds = 2.04 m^3/day (2,040 L/day).

For the purpose of this investigation, and to be conservative, it was assumed that average water usage consistent with a four bedroom house would be the average in this area. Area of trench required was calculated using 2,040 L/day and a vadose retention time of 60 days. The value was preliminary at the time of modelling and is considered to be appropriate.

In this study, the mounds have been sighted in the approximate middle of each lot with the expectation of the southeastern-most lot.

6.4.3 Results: Scenario 1.0

A plan view of the model for Scenario 1.0 is shown in Drawing No. 7. This scenario shows that the wells in the area distort the 'regional' flow towards 150° such that the flow appears to converge to a piezometric depression approximately 1 km southeast of the Site. Discharge from the mounds over a 100 year period, shown as red lines; extend down-gradient in a predominantly east-southeasterly direction towards the piezometric depression. Drawing No. 7 shows graphically for this scenario that the discharge from the mounds over a 100 year period would not impinge on any known source of domestic water off-Site. However, on Site wells, specifically points 3890 and 3891 may be impacted, which is the case for all subsequent scenarios.

6.4.4 Sensitivity to Hydraulic Conductivity (Scenarios 1.1 and 1.2)

Two further models to test the sensitivity of the groundwater regime to reasonable possible differences in K were conducted, keeping all other parameters the same. High and low values of K were used which correspond with results of similar tests performed by Clifton in the area recently. With the exception of the hydraulic conductivity determined in BH104 where the piezometers were screened in silty clay, the range of values of K are generally coincident. Scenarios 1.1 and 1.2 modelled a higher K value of 0.864 m/day, and lower value of 0.0864 m/day respectively. The results are shown in Drawing No. 8 and Drawing No. 9 respectively.

As expected, the contours of the piezometric surface in Scenario 1.1 are more consistent in orientation with the 'regional'. The higher conductivity permits greater migration of the discharge, which is reflected in the longer and more streamlined release plumes for each of the mounds. Despite the lengthening of the plumes relative to Scenario 1.0, this case also suggests that no water supply off-Site would be intercepted during the modelled time period.

Conversely, the pattern of piezometric contours for Scenario 1.2 show that the direction of flow is more strongly controlled by the apparent drawdown of the pumping wells to the east. The reduced migration results in a localized piezometric high as a result of the mounds, with easterly migration towards the broad piezometric depression located approximately 1 km to the east. The significantly shorter length of the flow lines, indicate it would also not intersect the source area of any known wells off-site.

6.4.5 Sensitivity to Flow Direction (Scenarios 2.1 and 2.2)

The sensitivity of the well capture and disposal plumes to flow direction was also tested. All parameters were the same as Scenario 1.0 except that the azimuths were changed ±30°. Scenario 2.1 was run with the azimuth of the flow direction as 180° and Scenario 2.2 with a direction of 120°.

The results are shown in Drawing No. 10 and Drawing No.11 respectively. Both scenarios, regardless of whether flow is directed more to the south or east, indicate that changes or inaccuracies in the direction of groundwater flow within the range estimated, will not intersect any off-Site water wells.

6.4.6 Summary of Model Results

Based on the available data and reasonable assumptions regarding the hydrogeological regime at and near the Site, the steady-state models utilizing *Wh*AEM suggest that 100 year disposal plumes should not impinge on the capture zones of the down-gradient water supply wells to the east and southeast within this specified time period. However, on-Site wells may be impacted and it is recommended that they be monitored should they be used for domestic purposes. We understand that a mound currently exists in this lot which may also contribute to any potential impact.

6.5 Groundwater Chemistry

The groundwater sampling results are presented in Table 6.5-1 - Water Analysis Results appended to this report (Appendix D) and the ALS laboratory report is attached in Appendix E. Drinking water quality guidelines (Saskatchewan Drinking Water Standards and Objectives) are presented for comparison purposes only. Within the development, a communal water supply will be provided and no direct use of groundwater is anticipated for domestic use.

Geochemistry indicates that exceedances occur, most notably HPC, coliforms, iron, and manganese, which exceeded the drinking water guidelines in all piezometers.

6.6 Wastewater Treatment System

The Site has been characterized in terms of groundwater characteristics, soil properties, and surficial geology; and this information is all required to assist with defining necessary mitigative measures for hydrogeological impacts of additional septic disposal sites in the area. The site can be characterized as suitable with limitations, in terms of wastewater disposal capabilities. Consideration of this has been made when compiling the cconceptual design of the system which is provided in this section.

In terms of wastewater treatment systems, there are a few options for this Site:

- Pressure chamber system;
- Type II mounds; and,
- Package treatment plants.

The required setbacks that will need to be considered are:

- Buildings - 9 m;
- Recreation Areas - 60 m;
- Property Boundary - 3 m;
- Walk/Driveway - 1.5 m;
- Cut or embankment - 3 m;
- Well - 30 m*;
- Water course - 15 m*; and,
- Groundwater table – 1.5 m.

*Indicates that these can be reduced by using a package treatment system to 9 m; however, this is not relevant to this particular site. Space limitation is not a concern.

Based on Saskatchewan Health Saskatchewan Onsite Wastewater Disposal Guide (SOWDG, 2009) the loading criteria for the wastewater system include:

- Clay textured soils are not suitable.
- Sixty (60) day vadose retention time.

Table 6.6-1 provides a summary of the particle size analysis and soil texture classification, which were assessed in accordance with the soil texture triangle provided within the symbols and terms appended to this report.

Table 6.6-1 – Summary of Particle Size Analysis and Soil Texture Classification of Upper Soil Units

Soil Type	BH #	Sample #	Depth	Gravel %	Sand %	Silt %	Clay	Soil Texture as per SOWDG
sand	101	JO2	1.22 m	0	83.4	4.6	12.0	loamy sand
sand	102	JO12	1.52 m	0	80.0	7.8	12.2	sandy loam
sand	103	JO24	1.37 m	0	71.3	14.2	14.5	sandy loam
sand	104	JO31	0.76 m	0	80.4	7.5	12.2	sandy loam

Additional information is provided in the report, *On Site Wastewater Treatment in Subdivisions (OSWTS, 2009)* for setback and retention times for disposal systems.

This site, does not meet the 1.5 m vertical separation requirement from the groundwater table on the southwest corner of the Site. The minimum depth to groundwater on Site is noted to occur in the south east, at BH102, where the depth to water is 1.38 mbgs.

The desired retention time in the vadose zone is 60 days. For example, the recommended application rate is 0.20 l gal/ft^2/day for a sandy loam. This is equivalent to a seepage rate of 0.01 m/day. The seepage velocity will be equal to the seepage rate divided by the soil porosity of 0.30. The resulting seepage velocity is 0.03 m/day. A seepage path length of 2.0 m is required to provide a 60 day hydraulic retention time for seepage through the vadose zone at this loading rate. Groundwater varies throughout the Site; therefore to ensure that all lots meet this requirement, loading rates have been recommended to achieve 60 day retention. See Table 6.5-2. Additionally, the natural soil has a relatively high hydraulic conductivity of 9.25×10^{-7} to 2.80×10^{-6} (0.07 m/day to 0.24 m/day). The hydraulic conductivity will accept water at a much higher rate than the recommended application rate. The effluent will then seep quickly to the groundwater table over an area much less than the mound design area. See Table 6.6-2 for recommended trench sizes and loading rates in the associated areas of each borehole.

Table 6.6-2 - Trench Sizes and Loading Rates		
As per Appendix 15 Loading Rates		
	Trench Size	Loading Rate
BH101	40.0 m²	0.63 gal/ft² or 30.87 L/m²
BH102 - 104	65.0 m²	0.45 gal/ft² or 22.05 L/m²
As per 60 - day retention time and 30% porosity.		
	Trench Size	Loading Rates
BH101	94.3 m²	0.31 gal/ft² or 15.14 L/m²
BH102	298.2 m²	0.14 gal/ft² or 6.84 L/m²
BH103	94.2 m²	2.40 gal/ft² or 21.66 L/m²
BH104	208.8 m²	0.20 gal/ft² or 9.77 L/m²

A restrictive layer of soil as described in GDDSWWSAP, 2012, Appendix 15, page A-46 can also be considered. The restrictive layer will limit the seepage velocity through the vadose zone and increase the hydraulic retention time enabling a smaller overall trench size. If using Appendix 15 loading rates this is recommended. If using custom loading rates as per 60 day retention time, it is not likely necessary.

Modelling results indicate that there is low probability of a plume intersecting an offsite existing well. However, to be conservative and due to the requirements as a medium sensitivity development, a Type II mound on all sites is recommended at minimum.

Pressure chamber systems were not considered at this time. However, package treatment systems are the most conservative option to ensure treatment of the waste and are recommended to be considered as an option.

7.0 Hydrology Analysis, and Results

The hydrology investigation phase was undertaken to determine the predicted flow direction and volume of storm water from the development; and will provide a basis for design of the grading, drainage, and road design for the Site.

The conceptual design proposed is based on preliminary hydrological works provided by Clifton in 2012 and revised in 2014, as well as the guidelines from the Federation of Canadian Municipalities, R.M. of Corman Park Multi Parcel Country Residential Development Guidelines, and in consideration of Saskatchewan Environment Storm Water Guidelines, April, 2006, and Saskatchewan Ministry of Environment.

This document exhibits rationale and calculations that were conducted to adequately size the proposed drainage structures.

7.1 Method of Hydrological Analysis

The digital elevation model (DEM) for the Saskatoon area based on Canadian Digital Elevation Data (CDED) from the GEoBase.ca portal (Centre for Topographic Information, Natural Resources Canada) indicates that there is no adequate outlet for the additional surface water that will be produced from the subdivision development. An adequate outlet consists of a drainage channel (a natural watercourse such as a stream or creek that flows for all or a portion of the year) that will direct surface water away from the development and also away from surrounding land. The R.M. of Corman Park will likely not allow surface water generated by the development onto an adjacent parcel of land if there is no natural drainage channel to receive it.

The effective drainage areas were defined by topographic survey done in May 2014 and site visits dated October 2012 and June 2014, resulting in the total contributing drainage area of 8.32 ha.

Precipitation inputs used were assessed by comparing the 24 hour storm duration from the Saskatoon Intensity Duration Frequency (IDF) and Environment Canada to determine extreme rainfall precipitations. The most conservative result was used:

- City of Saskatoon. Extreme Rainfall Depth (1:100 yr, 24 hr) = 90.24 mm
- Environment Canada. Extreme Rainfall Depth (1:100 yr, 24 hr) = 85.10 mm

This information provided the basis for the development of the evaporation ponds, ditches, and associated minimum building elevations. The Site has undulating topography characterized with high and low elevation points varying between 505.6 m to 507.3 m. The lowest elevation area is located in the southwest region of the Site. Drawing No. 04 shows the contour map.

The method described for the analysis of watersheds and determination of stormwater runoff, flow rates, and volumes, using the Manning runoff coefficients is called the 'Rational Method'. The calculations completed for this report used a 1:100 year 24 hour single storm event. A weighted runoff coefficient of 0.172 was used for the pre-developed conditions of the Site and a runoff coefficient of 0.33 for post-developed conditions based on the runoff coefficients table found in Appendix F.

A summary for the rainfall data that was used for detention pond volume calculation is presented in Table 7.1-1.

Table 7.1-1 – IDF Values	
Rainfall Extreme	24hr/100yr
Intensity	3.76 mm/hr
Extreme Rainfall Depth	90.24 mm

The analysis included assessment for post-development flows which analyzed on-Site runoff contributions. On-Site stormwater infrastructure is proposed to be sized according to the 1:100 year, 24 hour single storm event + 25% for consideration of evaporation ponds.

7.2 Detention Ponds

Four general detention ponds are proposed to detain stormwater runoff, two in the northern part of the property and two in the southwest part of the Site. See Drawing No. 12. Drainage structures are proposed to be sized to retain the additional runoff generated in a 1:100 year, 24 hour single storm event + 25 % in the area affected by the

proposed Site improvements. Runoff generated on-Site will be routed to the proposed detention ponds via roofs, rain gutters, surface swales, sheet flows, and minor culvert crossings under the proposed roadways as needed. Runoff volumes stored in the Site's detention ponds will dissipate via percolation into the ground or evaporation; however, calculations were not performed to determine dissipation times at this stage of reporting. Pond volumes can be found in Appendix F. See Drawing 13 for proposed developed conditions.

8.0 Grading, Drainage Ponds, and Roadway

8.1 General Considerations

The design criteria typically utilized for the grading plan and stormwater management system is to be capable of handling the rainfall and subsequent runoff from a large storm event that only occurs on average 1 in 100 years. As such, the scope of the work undertaken by Clifton included:

- Assessment of predevelopment and post-development stormwater conditions based on Site characteristics and historical climatological data;
- Provide stormwater management options to mitigate the effects of development on Site;
- Conceptual design of stormwater management system including pond sizing and layout, and structures such as roads and ditches which are pertinent to drainage; and,
- Minimum building elevation recommendations.

8.1.1 Pond Grading and Minimum Building Elevations

Two ponds are proposed to be located in the north part of the site and the other two ponds are proposed south of the access road towards the west part of the site, where a natural depression exists and will be graded to adequately store the required runoff. Each of the ponds was strategically placed in the low areas to capture the runoff from the natural drainage pattern and reduce the earth excavation and earth movements within the site. Ponds are graded with slopes of 5:1 to reach a bottom elevation of 505.00 m from the lowest elevation of the lots. A typical cross section of the evaporation pond can be seen in Drawing No.14.

Recommended building elevations are set to be 1 m higher than the highest pond water elevation. A summary of the building elevations, including pond features and functionality is provided in the table below and can be seen in Drawing No. 15.

Table 8.1-1 – Summary of Building Elevations

Critical Design Levels	Pond A	Pond B	Pond C	Pond D
Maximum water level (m.a.s.l)	505.68	505.52	505.42	505.43
Minimum Building elevation (m.a.s.l)	506.68	506.52	506.42	506.43
Storage Requirement (m^3)	268	254	349	537
Storage Volume (m^3)	585	555	761	1,173
Freeboard (m)	0.16	0.21	0.22	0.18

Lots 1, 3, and 4 have appropriate elevations for construction without filling the current lot with extra material or building pads. Lots 2, 5, 6, and 1 (if the lot owner decides to build towards the back of the lot) will require extra material to create building pads to comply with our Minimum Building Elevation recommendation.

There are two options for pond design stated in the following paragraphs:

Option 1: The pond will be designed for a short term storm event, rather than the cumulative effect of long term precipitation, evaporation, and groundwater inflow and outflow. It is important to mention that the spring run-off will not be considered in combination with the storm event. The ponds will be graded to 0.20 m above the groundwater surface elevation, as a recommendation per historical analysis and studies of the area performed by Clifton, in order to allow groundwater elevation fluctuation. The resulting minimum base elevation for the ponds will be 505.00 m. The excavated material will be used for road construction and to fill the low areas and the final shape for the ponds will be coordinated with the subdivision design in order to maximize the developable lots. The generated volumes for the site and storage requirement calculations for the detention ponds can be found in section 8.1.2 Road Grading and Earthworks.

Option 2: If a permanent feature within the ponds is requested, it can be accomplished by excavating the ponds to or below the water table.

Pond layouts proposed are conceptual. More aesthetically pleasing options can be considered.

8.1.2 Road Grading and Earthworks

Road alignment, geometry, and dimensions were designed in accordance with Policy PW-12 *Road Servicing Agreements*, issued June, 2011 by the R.M. of Corman Park. Sizing for the drainage ditches and culverts was

completed based on recommended dimensions from the R.M. The road alignment is shown in Drawing No. 16; typical cross sections of the road and ditch are provided in Drawing No. 14. At this level of design, typical sizing has been applied with ditches, conforming to R.M. standards as noted in Policy PW-12, of 4 m wide, 0.8 m to 1.0 m in height with a 4:1 sideslope and all required culverts (approach and driveway) to be 600 mm in diameter.

A preliminary earthworks analysis has been conducted for both road grading and pond excavation. Using geotechnical information gathered from site boreholes the following assumptions have been made: Topsoil design depth is to be 0.20 m. A shrinkage factor of 25 % has been used which should adequately represent the re-compaction of excavated materials. A thickness of 0.10 m topsoil replacement in ditches and ponds was considered. Preliminary roadwork grading consists of a balanced cut and fill with a total excavation of 6,935 m^3 of materials. See Table 8.1-2 and Table 8.1-3 for summary of preliminary quantities.

Table 8.1-2 – Topsoil Stripping

Item	Topsoil Totals (m^3)	Reused Topsoil (m^3)	Excess Topsoil (m^3)
Road/Ditches	2,209	824	1,386
Ponds	1,935	539	1,396
Total	4,144	1,363	2,782

Table 8.1-3 - Earth Movement

Item	Excavation (m^3)	Fill (m^3)
Road	1,202	2,829
Ponds	1,590	0
Total	2,792	2,829

If pavement is required by the R.M. a preliminary estimate of the total amount of materials is required to construct the road. The road structure consists of a 7.4 m wide paved lane with a depth of 25 mm. The paved lanes are to be constructed on a minimum (150 mm of base material; subbase material may be required following subgrade test results). The base structure will be constructed at a slope of 4:1 matching the ditch side slopes. See Drawing No.16 for a detailed cross section and Table 8.1-4 for preliminary volumes.

Table 8.1-4 – Preliminary Road Volumes

PAVING					
Item	Length (m)	Width (m)	Area (m^2)	Depth (m)	Volume (m^3)
Pavement	410	7.5	3075	0.025	77
BASE AND SUBBASE					
	Length (m)	Width (m)	Area (m^2)	Depth (m)	Vol (m^3)
Base	410	8.2	3362	0.15	504
Subbase	410	9.4	387	0.10	385

9.0 Foundation Design and Construction

The topography of the Site is relatively flat and located in a grassy field. Local soils consist generally of sand with some silt and trace clay in the upper 5 m or so. Landslides are not a concern. The information provided is for preliminary purposes only, and should not be relied upon for detailed design due to the variation in conditions across the Site. Prior to detailed design, foundation conditions, soil type, and allowable bearing capacity should be confirmed for specific sites. Once Site-specific investigations are completed, further recommendations regarding geotechnical parameters and design can be provided.

It is our understanding that the subdivision will primarily consist of single family dwellings. Structures will likely be one or two storeys over a full basement with a grade supported concrete floor. Geotechnical issues associated with this type of structure are requirement for foundations to support the proposed structures and potential for frost heave in the native upper soil. Groundwater levels measured were as high as 1.4 m below surface. Groundwater levels can be expected to vary with time, and may increase as a result of development.

Although fill material was not noted during this field investigation, its presence and condition should be noted if encountered during construction since it is not desirable to place foundations or floors on fill material of unknown composition and consistency. Foundations or floors should not be constructed on organic topsoil or organic soil.

9.1 Waterproofing and Subdrainage

The quantity of seepage and groundwater levels will vary seasonally, with precipitation or snowmelt, and with development due to irrigation and other factors. Rates of flow can be relatively high through sand and sandy strata.

Typical basement floors will be about 1.5 m to 2.0 m below finished grade. Given that water levels have been observed within 1.4 m below surface, it is possible that hydrostatic pressures could develop on basement walls and floors. Consideration should also be given to the potential of the groundwater levels rising due to development, and elevations of basements should be designed accordingly – it is recommended that floors be designed to lie above the water table. Basement walls and floors should be waterproofed to accommodate any future increases in groundwater levels that could lead to seepage into basements.

A perimeter subdrainage system should be installed at the base of the footing. This requirement can be reviewed depending on specific conditions for any home. The excavation should be backfilled with a free draining granular soil within about 0.6 m of surface to ensure that water can freely drain to a perimeter weeping tile system. Free draining means that there is less than 3 % silt and clay particles. Clay or clayey soil can be placed on the surface to reduce the amount of infiltration.

9.2 Foundations

The proposed structures may be supported on shallow spread footings or piles. Construction of augured cast in place concrete piles is expected to be difficult due to wet sloughing sand, and is not recommended. Driven steel or timber piles, or helical piles are suitable alternatives. Lightly loaded structures supported on shallow spread

footings on surficial sand may experience some vertical movement associated with changes in soil moisture. The anticipated vertical movement for footings on sand will typically be less than about 25 mm.

Significant sloughing was encountered in sand during the field investigation; therefore, footing construction below the depth of frost, which is expected to be about 1.8 m, is expected to be difficult. Shallow cut back angles for slopes and dewatering would likely be required. Alternatively, footings can be constructed at a minimum depth of 600 mm below finished grade, so long as insulation is incorporated into the design to ensure that footings and the soil below do not freeze.

For preliminary design, the allowable bearing capacity for a spread footing constructed on sand will be 100 kPa. Sand at the foundation elevation should be well compacted to minimize the potential for settlement. If sand or sandy soil is wet and excessive piping is encountered during compaction, the sand may be subcut 300 mm or more and replaced with a well graded, pit run material. A geotextile may be used as a separator at the base of the fill to reduce pumping of fines up into the fill, while still allowing water to escape.

Preliminary design parameters have been provided for driven steel or timber piles, and helical piles in Table 9.2-1 below. Driven piles and helical piles can be designed on the basis of skin friction and end bearing. Settlement of a properly designed and installed driven pile is expected to be less than 5 – 10 mm, and 15 – 25 mm for helical piles.

Table 9.2-1 - Summary of Allowable Pile Design Parameters; Driven or Helical Piles

Depth (m)		Soil	Ultimate Skin Friction	Ultimate End Bearing
from	to		(kPa)	(kPa)
0	2	Sand	0	-
2	7	Sand	10	700*
7	10	Clay	13	700
10	12	Clay	15	900

*Minimum pile depth is 6 m.

The skin friction contribution of the upper 2.0 m of pile below finished grade should be ignored in the determination of pile capacity for perimeter piles supporting a grade beam. This can be reduced to 1.0 m for interior piles.

The minimum length of piles should be 6 m. Grade beams should be constructed with a minimum 100 mm void space so that any heaving of the subgrade soil does not exert an upward force on piles, which can result in separation of the grade beam from the pile and distortion of the structure.

Landscaping around the structures should consider potential effects on foundation performance. Plantings of trees and large shrubs immediately adjacent the foundation should be avoided. Grading around the building should ensure positive drainage. Care should be taken to ensure that downspouts divert water away from the foundation.

9.3 Floors

Vertical movement due to moisture variation in the summer in the sand subgrade soils at this site is expected to be small – likely less than 25 mm, assuming a well-constructed floor with proper preparation. During winter, significant frost heave is possible at this site. Proper subgrade preparation will be critical to good performance of floors. Preparation will include, at a minimum, removal and replacement of the upper portion of the local sand with a well graded granular material with less than 3 % silt and clay particles, compaction of the native subgrade, and incorporation of insulation.

9.4 Potential for Sulphate Attack

The maximum water soluble sulphate content by dry weight of soil was measured in the laboratory as 0.28%. According to CSA A23.1, the potential for sulphate attack is severe, corresponding to an S-2 class of exposure. On this basis, sulphate resistant Type HS cement must be specified for all concrete in contact with the native soil. The maximum water to cement ratio should be 0.45, with a minimum specified compressive strength of 32 MPa at 56 days. Additional recommendations regarding sulphate resistant cement may be found in CSA A23.1.

9.5 Frost Action

The anticipated average depth of frost for the project area is 1.8 m, but could be 2 m or more for an extreme winter. Fine grained sand with some silt can be a frost susceptible material if water is present. Frost heave in the range of 50 mm/m of soil may be possible at this Site; therefore, it is critical that subgrades are well prepared, and that foundations are not allowed to freeze.

For non-residential structures that might not be heated on a continuous basis, a foundation can be constructed within the frost depth if insulation is incorporated in the design. Design of insulation is dependent on soil type, freezing index of the Site, and the building temperature. For unheated buildings, insulation should also extend horizontally away from the outside edges of the foundation and should also be placed under the floor of the structure.

The depth of burial for water lines or other lines that cannot be allowed to freeze should consider local practice. In general, it is recommended that water lines be buried at least 2.4 m below ground surface or finished grade to reduce the risk of freezing. Due to the expected difficult excavation conditions at this site, shallower lines may be necessary. Shallower lines can be protected using heat trace or closed cell extruded polystyrene insulation. The amount and extent of insulation required will be dependent on several factors, particularly the thermal regime around the pipe, including the depth of burial, surface conditions, and fluid temperature, if present.

10.0 Recommendations

10.1 Wastewater Treatment Systems

Existing conditions of the Site appear to have background coliforms, iron and manganese, potentially from neighbouring sources. This assumption is based on available data presented from the subsurface investigation. However, it would be prudent to assess the following to manage and mitigate existing conditions on-Site:

- Continuing groundwater monitoring to evaluate current site conditions in terms of groundwater chemistry elevation and flow direction; and,
- Develop all lots with a minimum Type II mound with recommended loading rates as per Table 6.5-2, and ensure all setbacks are met including the required vertical separation of 1.5 m from the base of the mound to the groundwater table.

10.2 Grading, Drainage, Ponds, and Roadways

A draft of the final grading and drainage plan has been provided for review. See Drawings No.'s 12 and 13. Pond orientation are conceptual, the difference between these two concepts are the cul-de-sac at the end of the road. At the time of this report it was not known if the through road could be achieved. These plans demonstrate the drainage pathways, including the roads and ditches that will convey surface water runoff to the ponds.

The recommended evaporative pond and associated conceptual grading plan summary is provided in bullet form below.

- The evaporation pond calculations have been conservative and it is likely that the ponds will not have a permanent water feature without deepening the proposed structures.
- The minimum building elevations are recommended to be 1 m above the maximum water level.
- Option A for pond design: The ponds are designed to hold the 1:100 year storm plus a 25 % more volume of freeboard.
- Option B for pond design: Ponds will be designed to have a permanent water feature if it is requested to start pond excavation in or below the water table.

10.3 Slope Stability and Excavation Considerations

- Significant sloughing was encountered in the sand during drilling at this site. Excavation conditions are expected to be difficult, and shoring or flat cutback angles are expected to be required, along with dewatering. Soil at this site is classified as Type 4 in the context of Saskatchewan Provincial Health and Safety Regulations. Excavation sideslopes should be no steeper than 3 horizontal to 1 vertical (3:1).
- Seepage is expected in excavations, and may lead to ravelling and slope failure, which may necessitate flatter cutback angles. Excavation conditions should be continually monitored and adjusted as required during construction. Once Site-specific investigations have been conducted, further recommendations regarding excavations can be provided.
- Water proofing and subdrainage systems are required.
- Spread footings or piles are recommended.
- Sulphate resistant concrete is advisable.
- Ensure foundations are not allowed to freeze.

11.0 Closure

This report was prepared by Clifton Associates Ltd. for the use of the Ken and Wendy Bernhard for specific application to the proposed Subdivision Development. The material in it reflects Clifton Associates Ltd. best judgment available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Clifton Associates 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.

This report has been prepared in accordance with generally accepted engineering practice common to the local area. No other warranty, expressed or implied, is made.

Our conclusions and recommendations are preliminary and based upon the information obtained from the referenced subsurface exploration. The boreholes and associated laboratory testing indicate subsurface and groundwater conditions only at the specific locations and times investigated, only to the depth penetrated, and only for the soil properties tested. The subsurface conditions may vary between the boreholes and with time. The subsurface interpretation provided is a professional opinion of conditions and not a certification of the Site conditions. The nature and extent of subsurface variation may not become evident until construction or further investigation. If variations or other latent conditions do become evident, Clifton Associates Ltd. should be notified immediately so that we may re-evaluate our conclusions and recommendations.

The enclosed report contains the results of our investigations as well as certain recommendations arising out of such investigations. Our recommendations do not constitute a design, in whole or in part, of any of the elements of the proposed work. Incorporation of any or all of our recommendations into the design of any such element does not constitute us as designers or co-designers of such elements, nor does it mean that such design is appropriate in geotechnical terms. The designers of such elements must consider the appropriateness of our recommendations in the light of all design criteria known to them, many of which may not be known to us.

Our mandate has been to investigate and recommend which we have completed by means of this report. We have had no mandate to design, or review the design of any elements of the proposed work, and accept no responsibility for such design or design review.

Clifton Associates Ltd.

Jorge Ortiz PEng

Dave Kent PEng

Association of Professional
Engineers of Saskatchewan
Cert. of Authorization No. 238

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SEE ANNEX FOR RAINFALL DATA OF ENVIRONMENT CANADA.

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Table 1, Definition of C,F,N,A and S classes of exposure Canadian Standards Association, Concrete Materials and Methods of Concrete Construction, July 2009.

Table B-1 Intensity-Duration-Frequency (IDF) Data. University of Saskatchewan and Saskatoon Airport [1926 to 1986 (61 years)] Source: Meteorological Service of Canada (formerly Atmospheric Environment Services), Environment Canada and the University of Saskatchewan.

Water Survey of Canada, Station 05HG002.

Appendix A

Clifton Associates
Drawings

Clifton Associates

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Saskatoon, SK S7K 6W1

T (306) 975-0401
F (306) 975-1076

saskatoon@clifton.ca
www.clifton.ca

KEY PLAN
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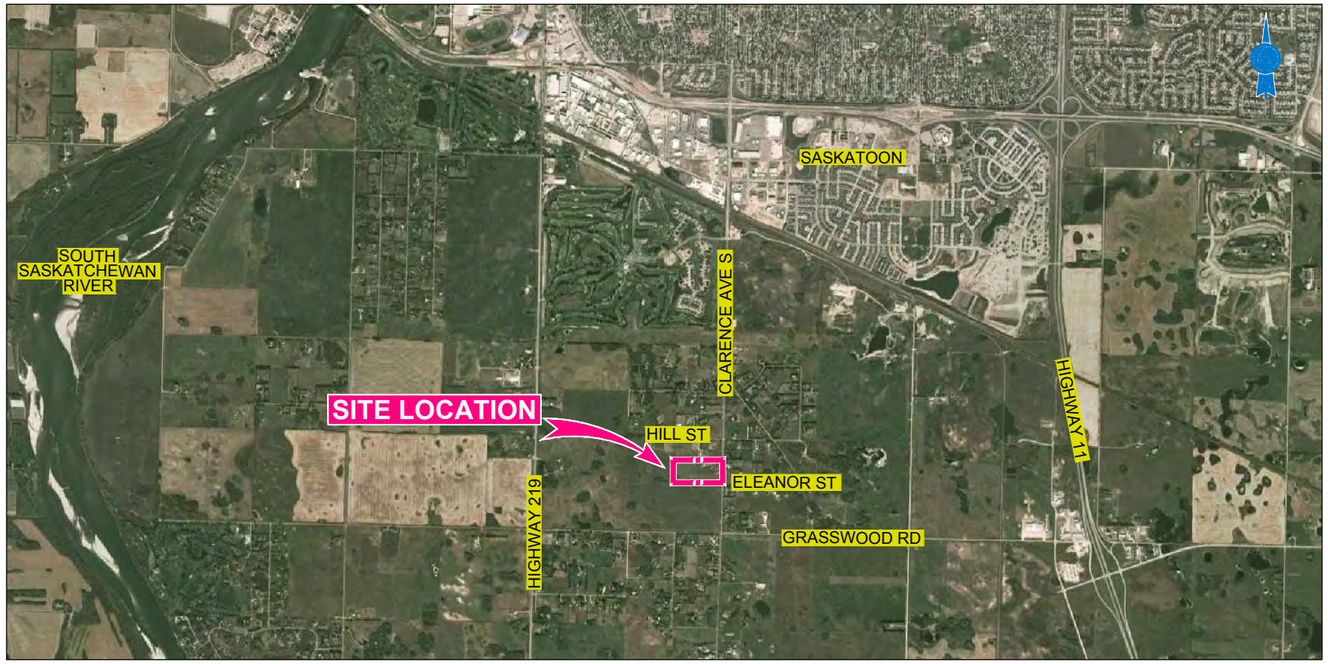

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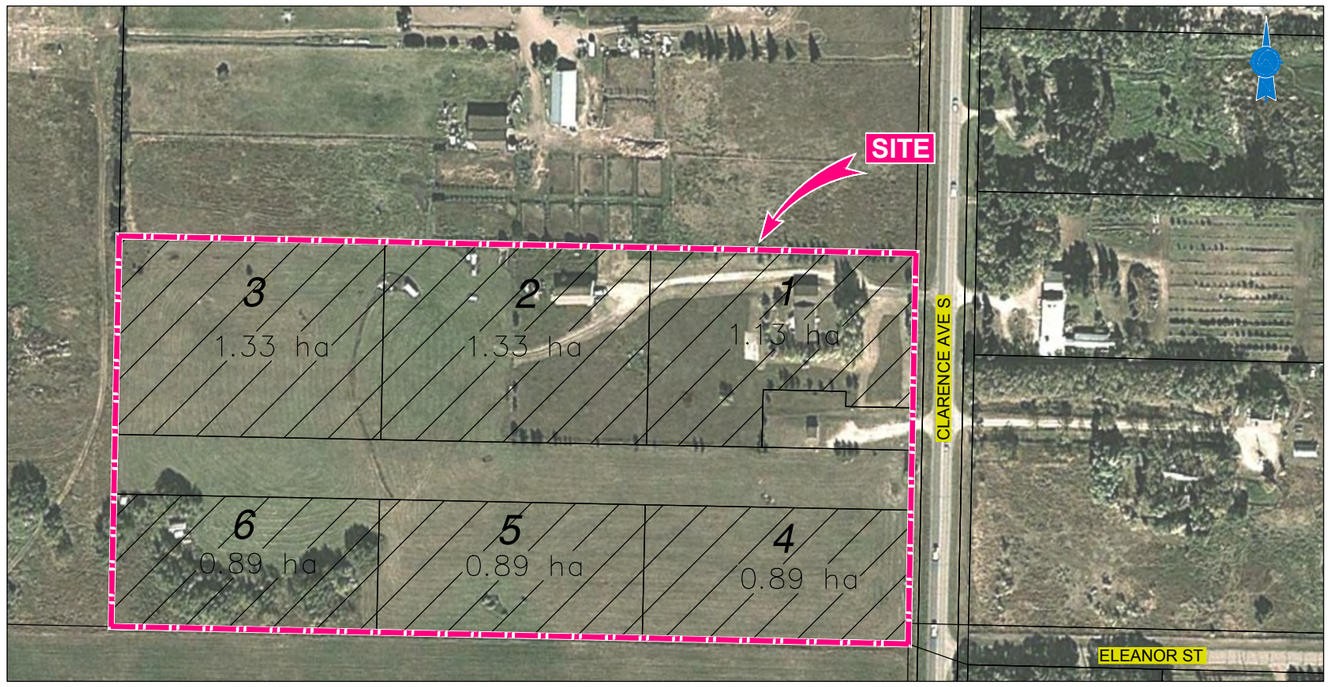

SITE PLAN
SCALE: 1:3000

LEGEND

SITE LOCATION

LEGAL FABRIC

LOT NUMBER 1

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER
Clifton Associates

CLIENT
KEN & WENDY BERNHARD

PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
SITE LOCATION PLAN

DESIGNED	CF	SCALE: AS SHOWN	DATE: 2014-05-26
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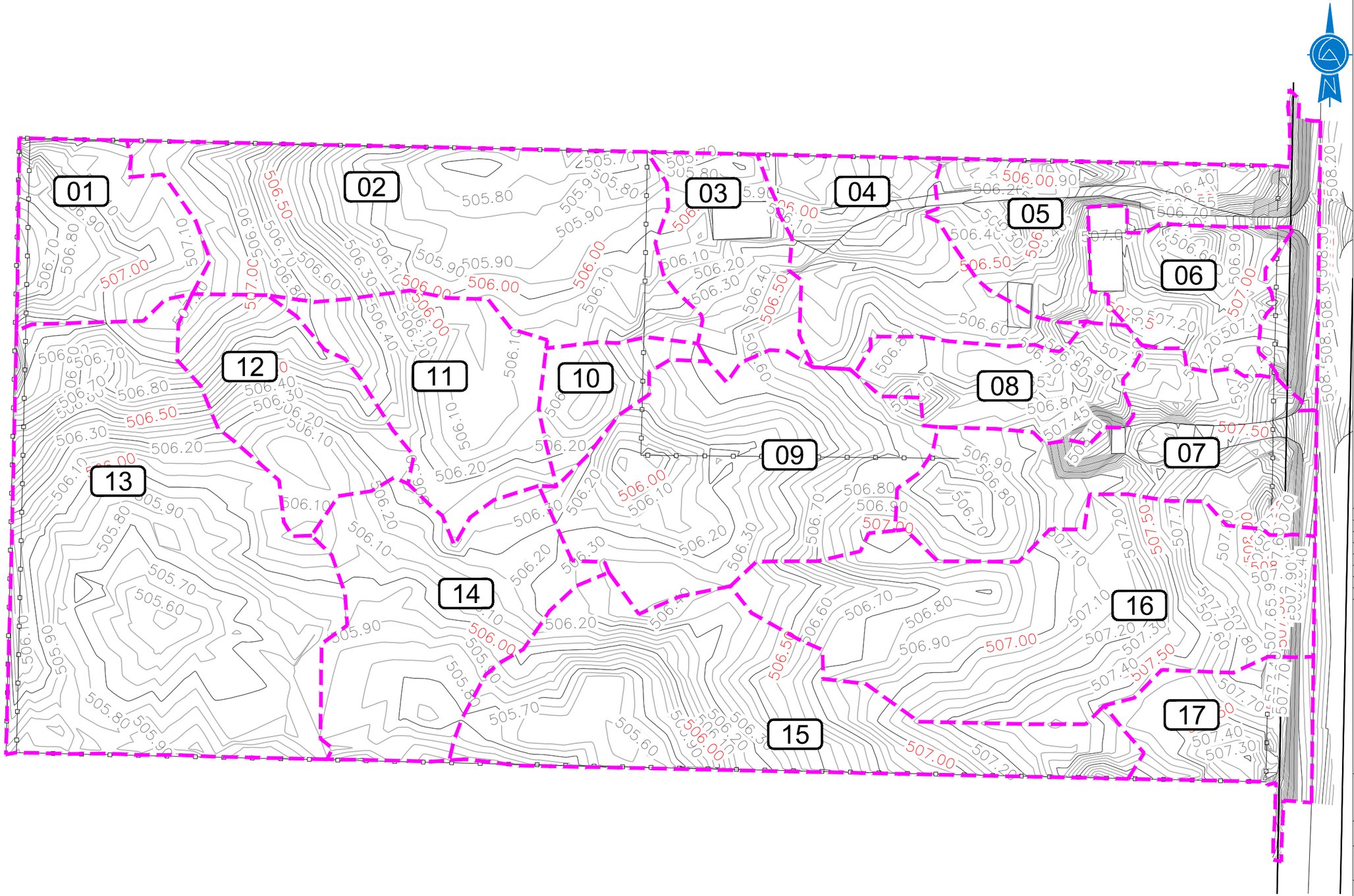
CHECKED	CF	FILE NO.: S2033-01	SHEET NO.: 01 OF 16



LEGEND

CATCHMENT AREA 05

DRAINAGE BOUNDARY

ORIGINAL GROUND CONTOUR (0.05m INTERVAL) -508.20-

LEGAL FABRIC

EXISTING DIRT ROADS

EXISTING BUILDING

EXISTING FENCE

NOTES:
1. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

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PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

PRE-DEVELOPED DRAINAGE PATTERNS

DESIGNED CF	SCALE 1:1250	DATE 2014-06-19
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CHECKED CF / JAO	FILE NO. S2033-DRGN-01	SHEET NO. 02 OF 16

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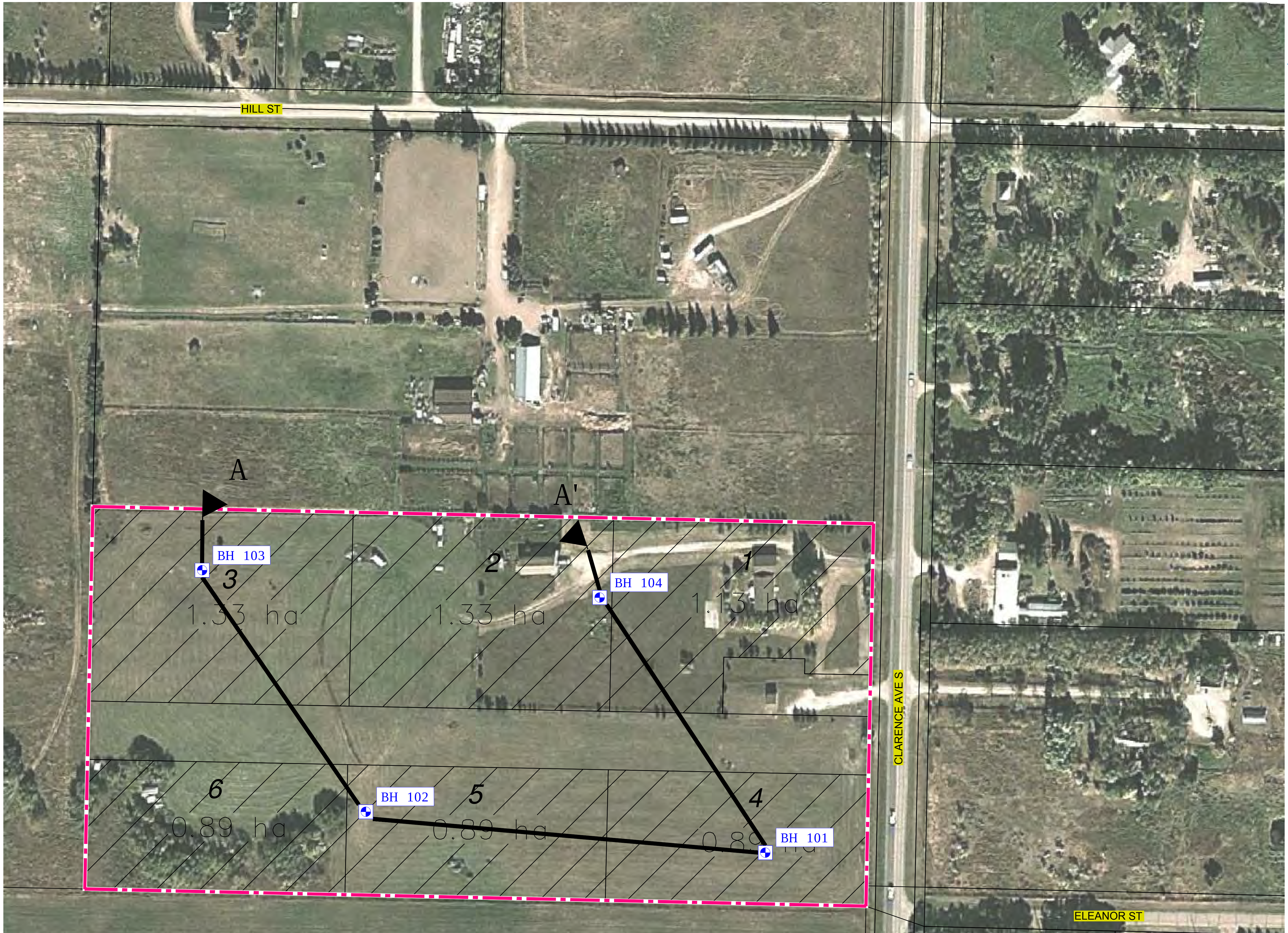

LEGEND

PIEZOMETER

SITE LOCATION

LEGAL FABRIC

LOT NUMBER 1

NOTES:

1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04–36–05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

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TITLE

PIEZOMETER LOCATION PLAN

DESIGNED CF	SCALE 1:2000	DATE 2014-05-26
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CHECKED CF	FILE NO. S2033-02	SHEET NO. 03 OF 16

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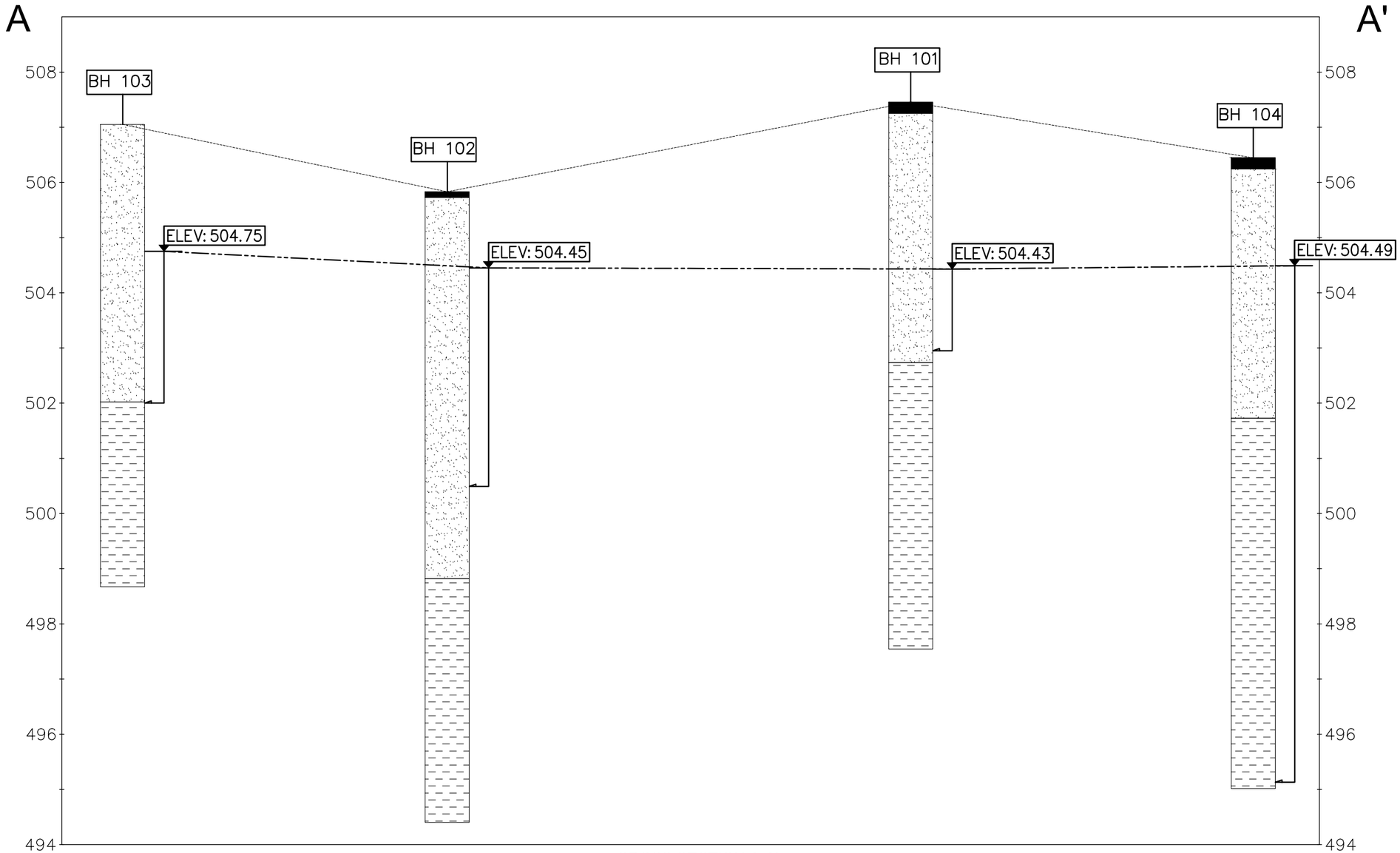

CROSS SECTION A-A'
SCALE: HORIZONTAL 1:2000
VERTICAL 1:80

LEGEND

ORGANIC SOIL

SAND

CLAY

GROUNDWATER ELEVATION

PIEZOMETER TIP

PIEZOMETRIC SURFACE

NOTES:
1. GROUNDWATER ELEVATION MEASUREMENTS OBTAINED 27 MAY 2014.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04–36–05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER
Clifton Associates

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PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
CROSS SECTION A - A'

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CHECKED: CF	FILE NO.: S2033-04	SHEET NO.: 04 OF 16

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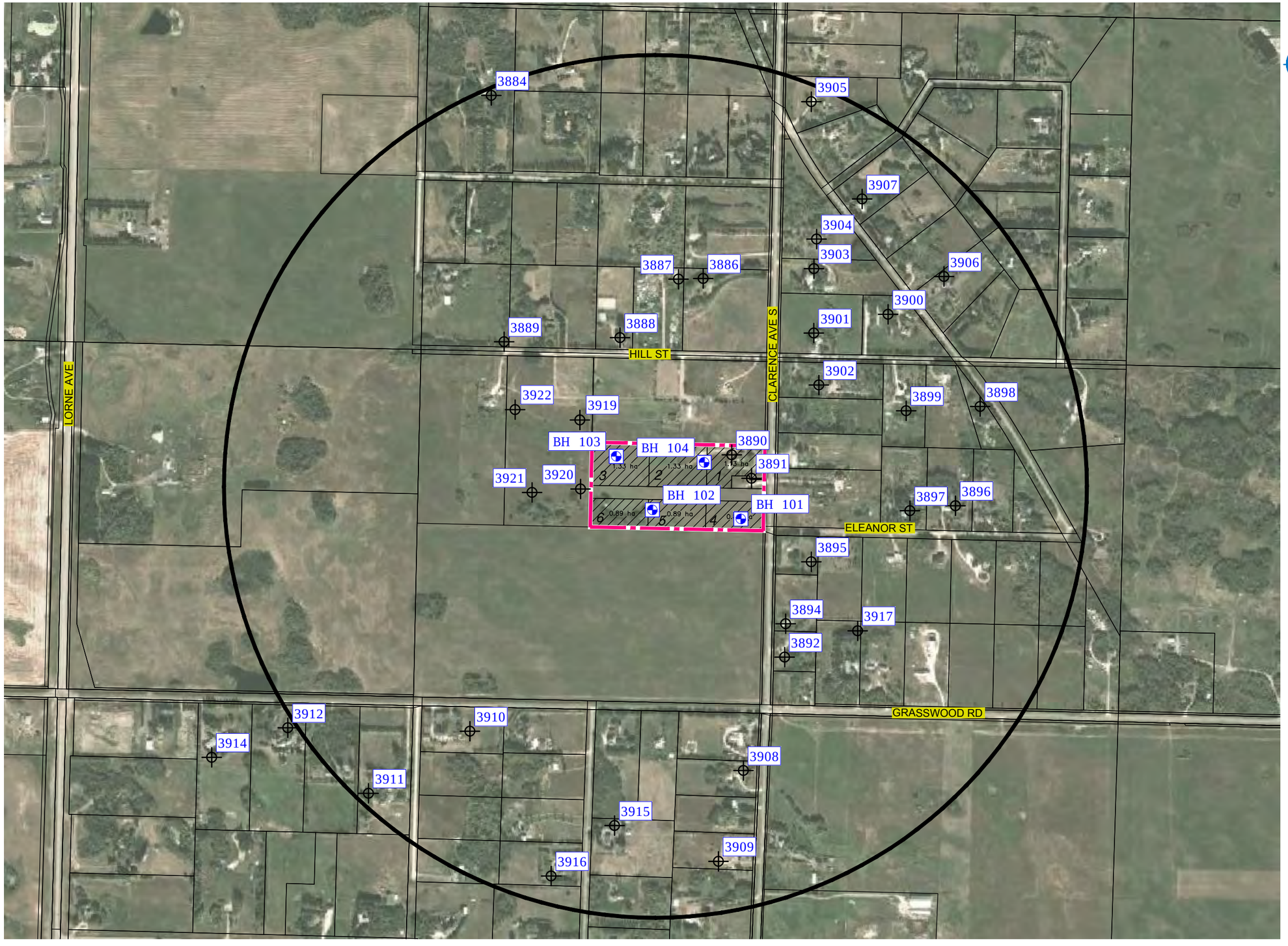

LEGEND

PIEZOMETER

WATER WELL

SITE LOCATION

LEGAL FABRIC

1KM RADIUS WATER WELL LOCATION

LOT NUMBER 1

NOTES:
1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

CLIENT
KEN & WENDY BERNHARD

PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
1 KM RADIUS
WATER WELL LOCATION PLAN

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CHECKED CF	FILE NO. S2033-03	SHEET NO. 05 OF 16

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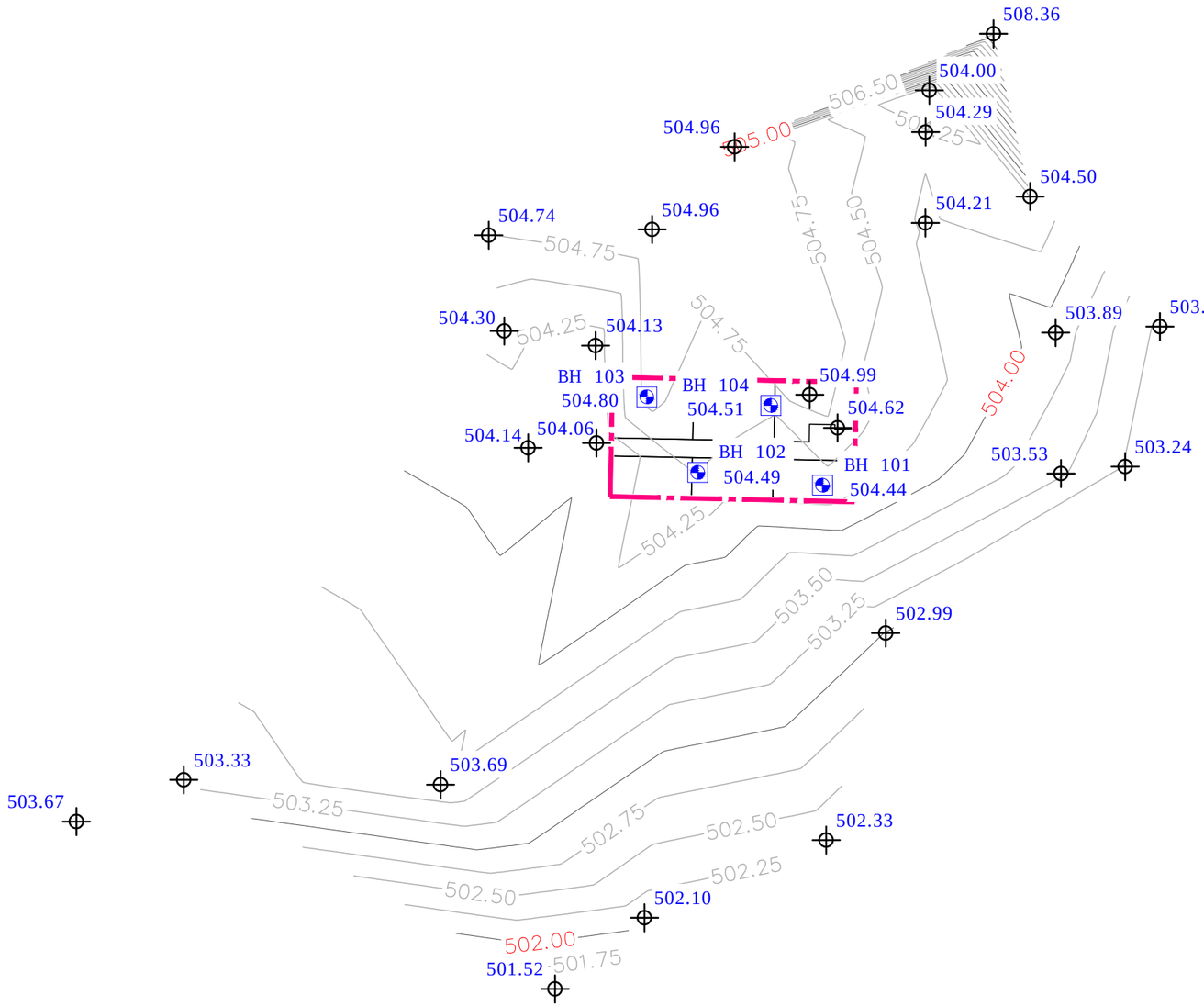

LEGEND

PIEZOMETER

WATER WELL

SITE LOCATION

MAJOR CONTOUR – 504.00 –

MINOR CONTOUR – 503.50 –

NOTES:

1. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04–36–05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

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PROJECT

BERNHARD SUBDIVISION INVESTIGATION
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TITLE

GROUNDWATER PIEZOMETRIC SURFACE

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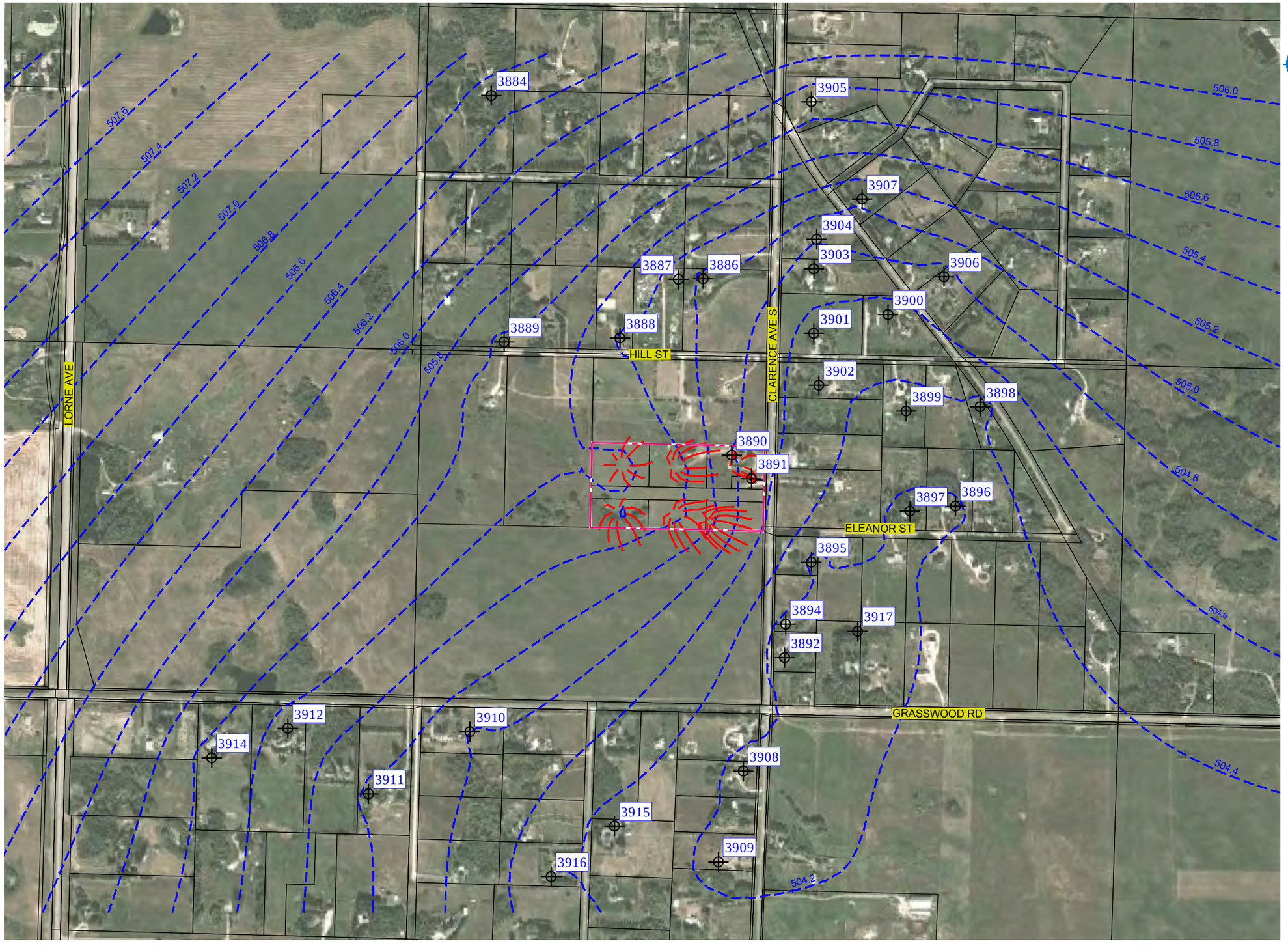

LEGEND

WATER WELL

SITE LOCATION

LEGAL FABRIC

GROUNDWATER CONTOUR

PATHLINES FROM DISPOSAL MOUNDS

NOTES:

1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

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PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

WhAEM MODELING
SCENARIO 1.0
AZIMUTH = 150°; K = 0.2056 m/day

DESIGNED AA	SCALE 1:9000	DATE 2014-05-26
DRAWN SP	PROJECT NO. S2033	DWG NO. 07
CHECKED CF	FILE NO. S2033-06	SHEET NO. 07 OF 16

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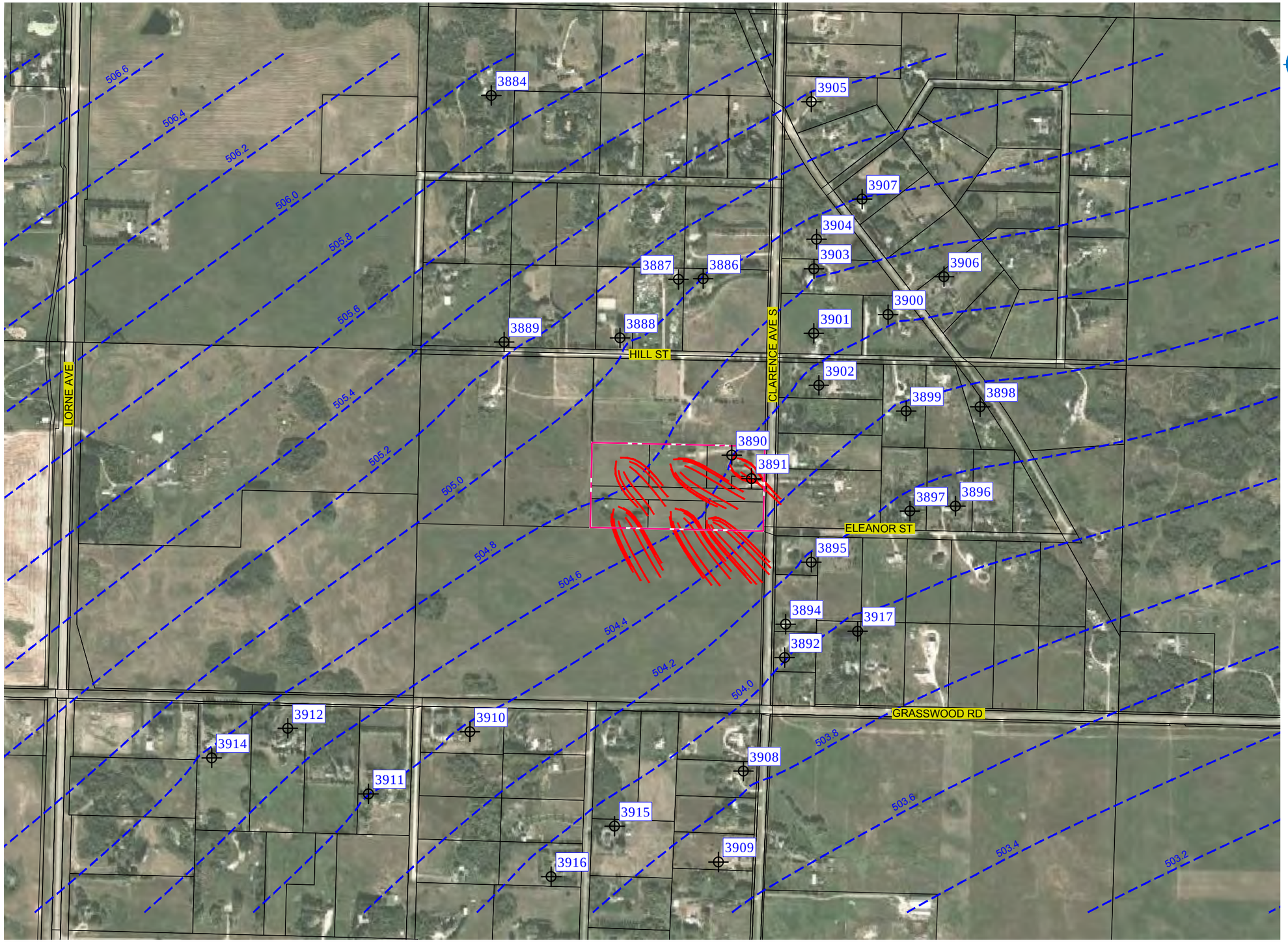

LEGEND

- WATER WELL
- SITE LOCATION
- LEGAL FABRIC
- GROUNDWATER CONTOUR
- PATHLINES FROM DISPOSAL MOUNDS

NOTES:

1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

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RESIDENTIAL SUBDIVISION

TITLE

WhAEM MODELING
SCENARIO 1.1
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DESIGNED: AA	SCALE: 1:9000	DATE: 2014-05-26
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CHECKED: CF	FILE NO.: S2033-07	SHEET NO.: 08 OF 16

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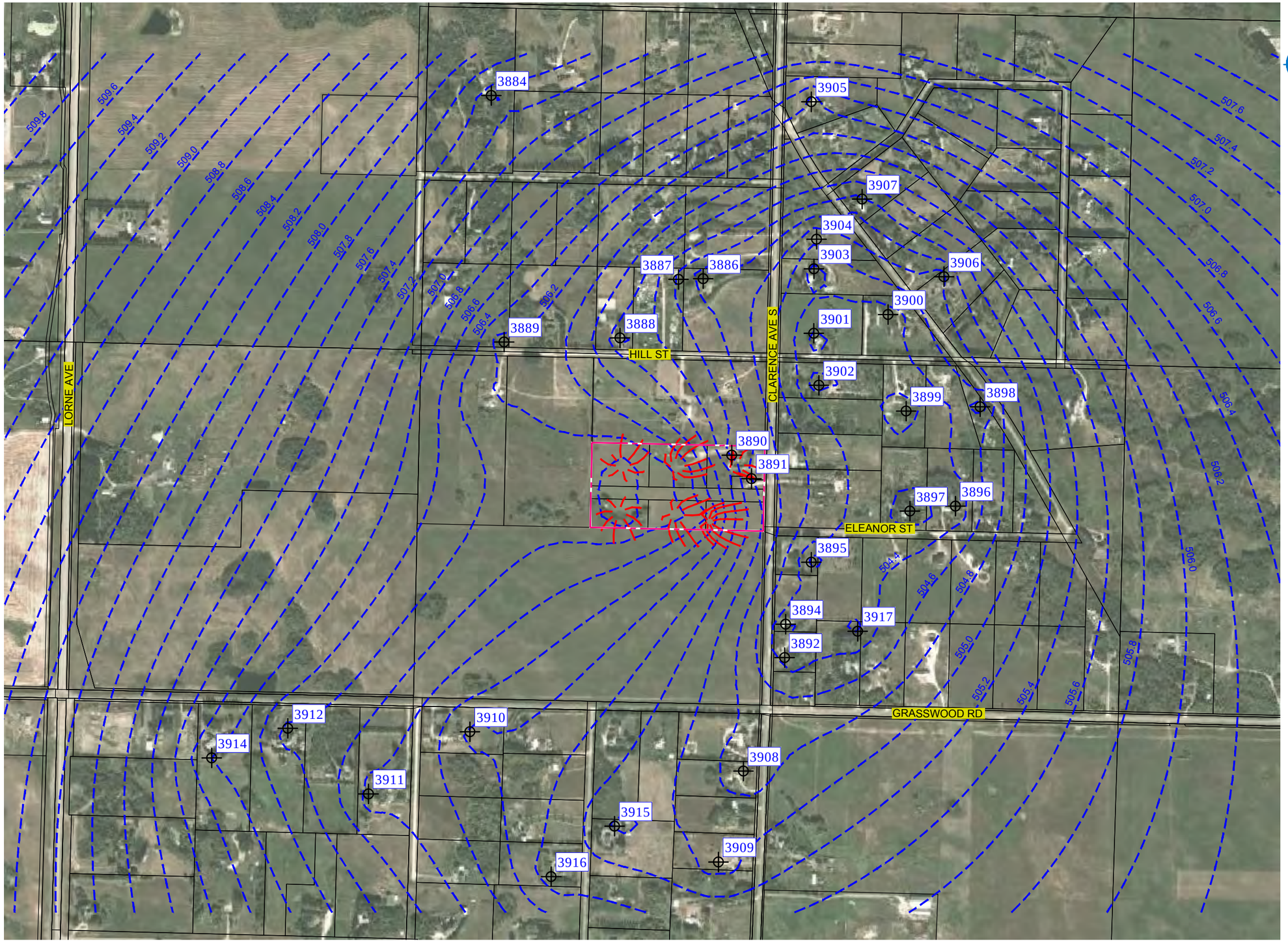

LEGEND

- WATER WELL
- SITE LOCATION
- LEGAL FABRIC
- GROUNDWATER CONTOUR
- PATHLINES FROM DISPOSAL MOUNDS

NOTES:
1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

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PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
WhAEM MODELING
SCENARIO 1.2
AZIMUTH = 150°; K = 0.0864 m/day

DESIGNED: AA	SCALE: 1:9000	DATE: 2014-05-26
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CHECKED: CF	FILE NO.: S2033-08	SHEET NO.: 09 OF 16

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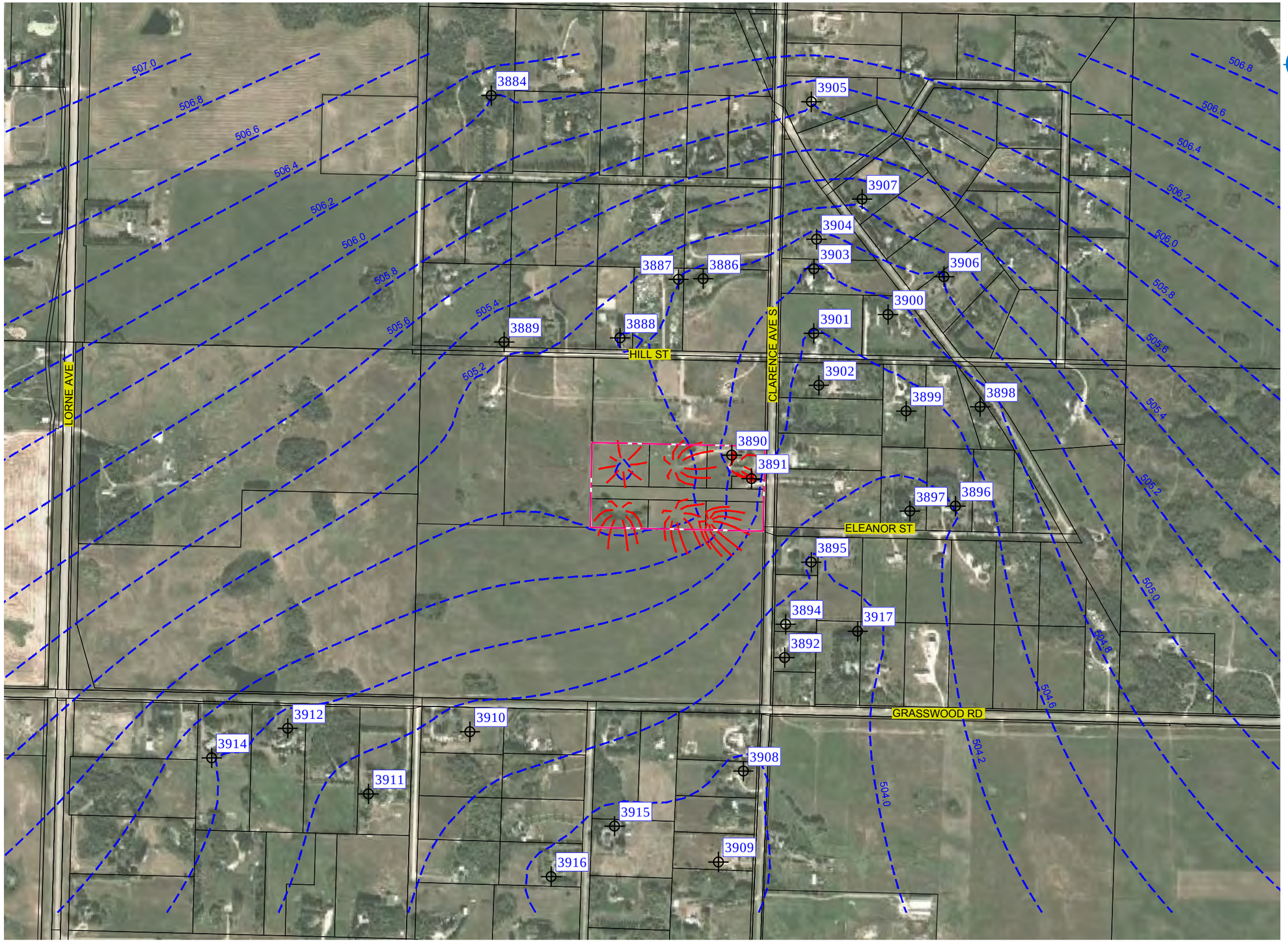

LEGEND

WATER WELL

SITE LOCATION

LEGAL FABRIC

GROUNDWATER CONTOUR

PATHLINES FROM DISPOSAL MOUNDS

NOTES:

1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

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PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

WhAEM MODELING
SCENARIO 2.1
AZIMUTH = 180°; K = 0.2056 m/day

DESIGNED: AA	SCALE: 1:9000	DATE: 2014-05-26
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CHECKED: CF	FILE NO.: S2033-09	SHEET NO.: 10 OF 16

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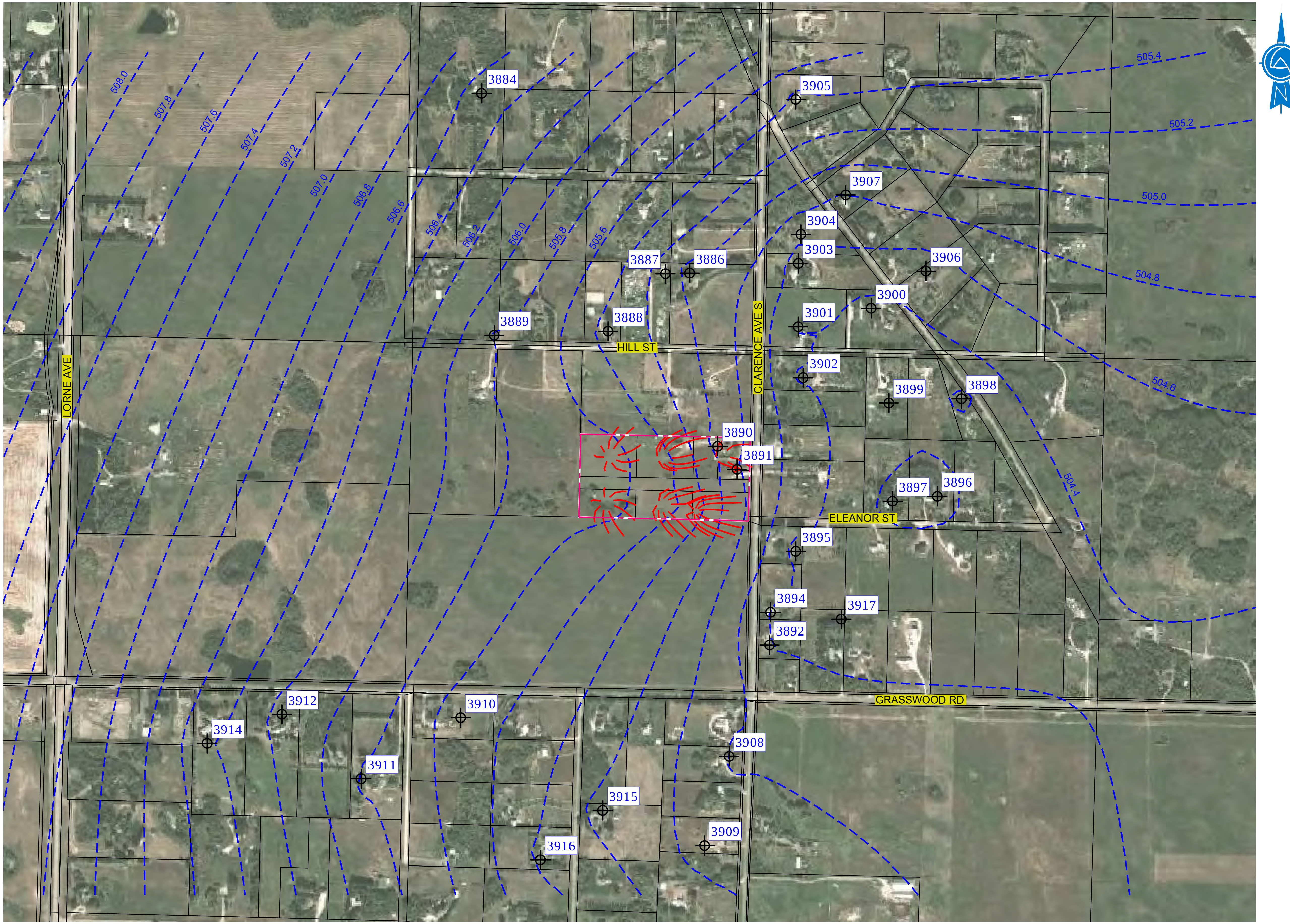

LEGEND

WATER WELL	⌖
SITE LOCATION	(pink dash-dot line)
LEGAL FABRIC	(black line)
GROUNDWATER CONTOUR	(blue dashed line)
PATHLINES FROM DISPOSAL MOUNDS	(red line)

NOTES:

1. IMAGE PROVIDED BY GOOGLE EARTH.
2. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04–36–05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

CLIENT

KEN & WENDY BERNHARD

PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

WhAEM MODELING
SCENARIO 2.2
AZIMUTH = 120°; K = 0.2056 m/day

DESIGNED	SCALE	DATE
AA	1:9000	2014-05-26
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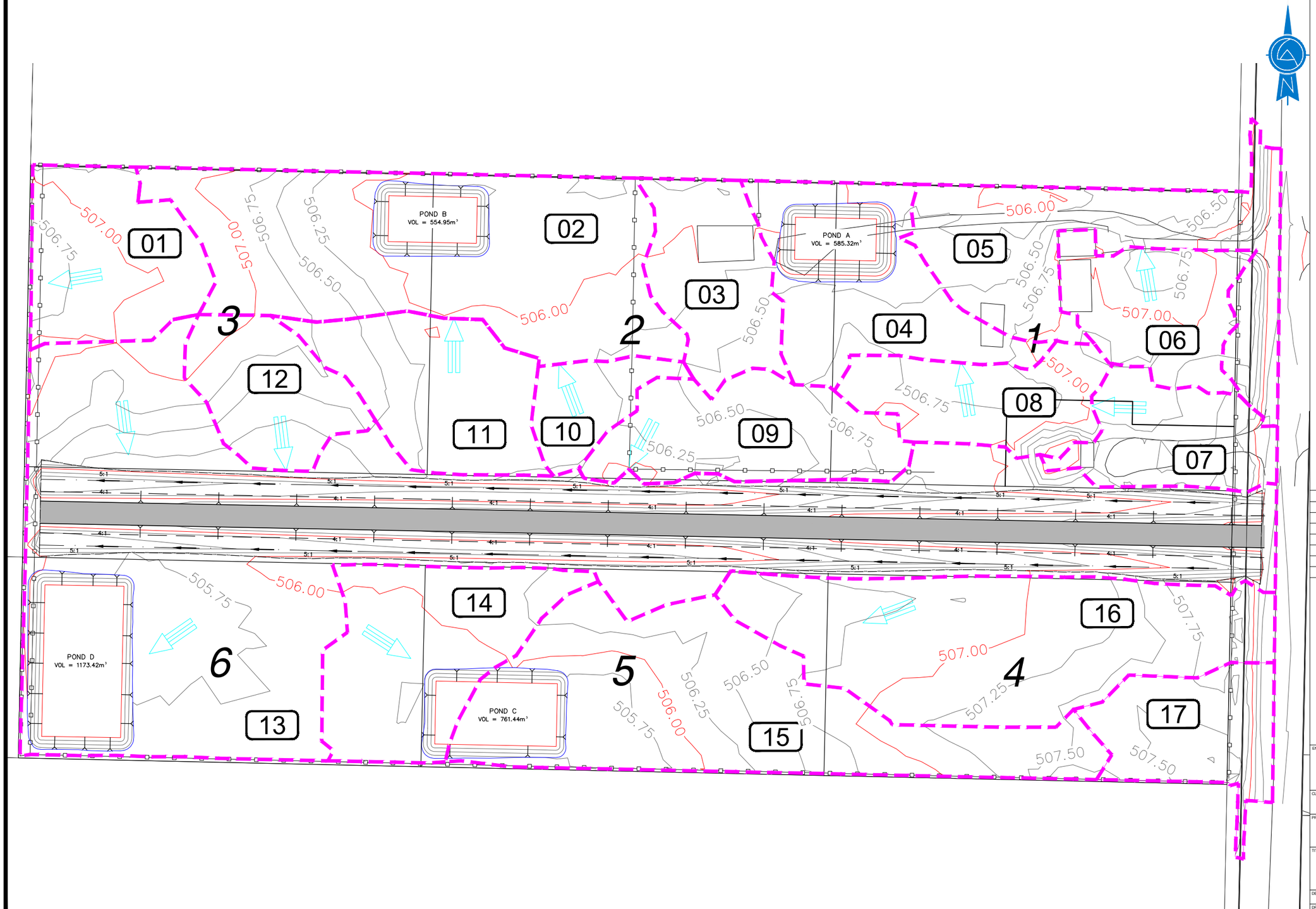
SP	S2033	11
CHECKED	FILE NO.	SHEET NO.
CF	S2033-10	11 OF 16

G:\Stoon_Proj\S2000's\S2030 – S2039\S2033 – KWEN Holdings – Hydrogeological Investigation\500_Data\S2033\!CURRENT DRAWINGS\S2033–10.dwg, 07/29/2014 3:30:35 PM



LEGEND

CATCHMENT AREA 05

DRAINAGE BOUNDARY

ORIGINAL GROUND CONTOUR (0.25m INTERVAL) -508.20-

LEGAL FABRIC

EXISTING DIRT ROADS

EXISTING BUILDING

EXISTING FENCE

PROPOSED LOT LINE

LOT NUMBER 5

FLOW LINE

DITCH FLOW LINE

ROAD

NOTES:

1. LEGAL DESCRIPTION: LSD 9&10, SE 04-36-05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

CLIENT

KEN & WENDY BERNHARD

PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

POST-DEVELOPMENT DRAINAGE EXHIBIT
OPTION A

DESIGNED CF	SCALE 1:1250	DATE 2014-06-19
DRAWN RMcL / RMM	PROJECT NO. S2033	DWG NO. 12
CHECKED CF / JAO	FILE NO. S2033-DRGN-02	SHEET NO. 12 OF 16

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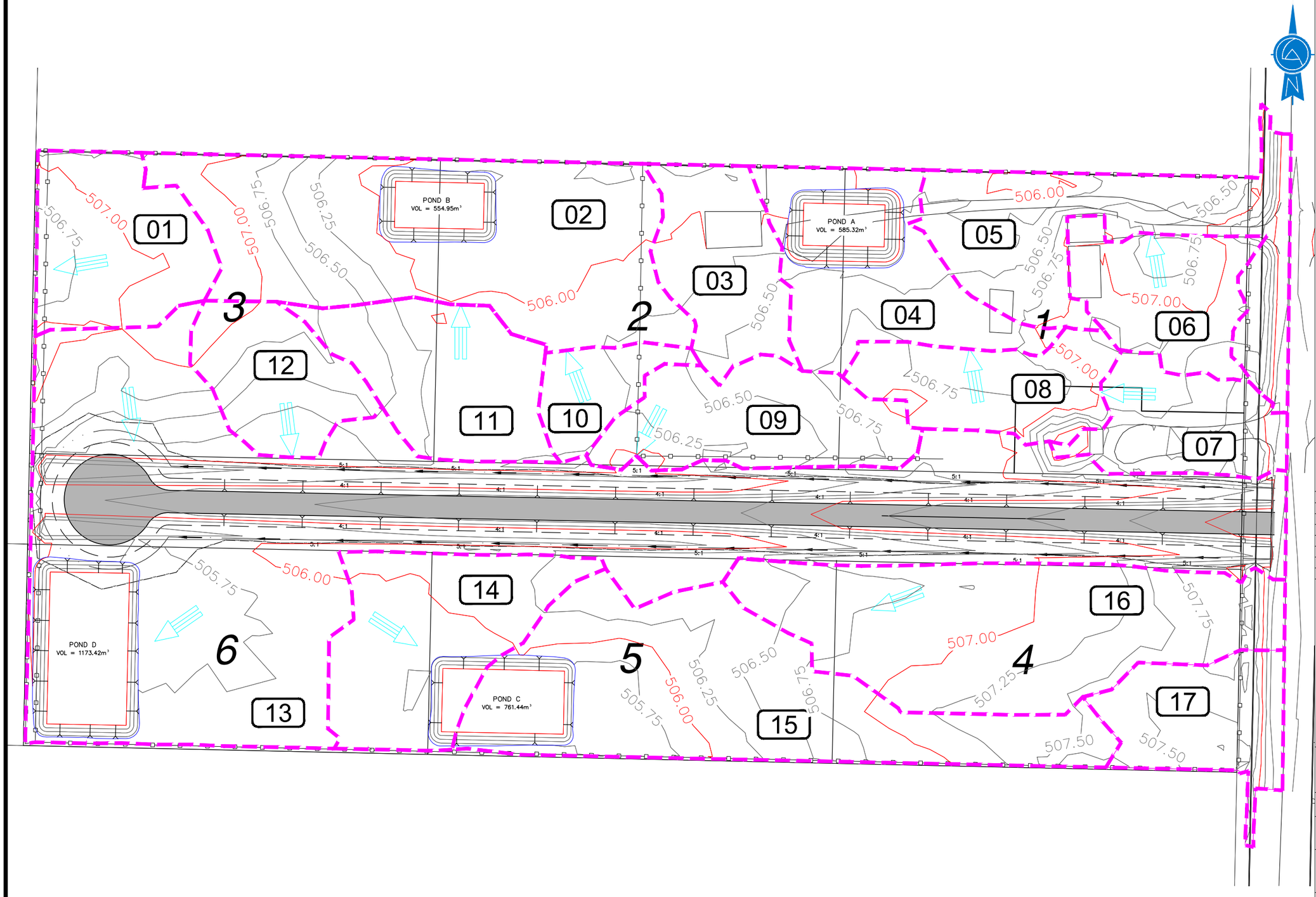

LEGEND

CATCHMENT AREA 05

DRAINAGE BOUNDARY

ORIGINAL GROUND CONTOUR (0.25m INTERVAL) -508.20-

LEGAL FABRIC

EXISTING DIRT ROADS

EXISTING BUILDING

EXISTING FENCE

PROPOSED LOT LINE

LOT NUMBER 5

FLOW LINE

DITCH FLOW LINE

ROAD

NOTES:

1. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04-36-05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

CLIENT

KEN & WENDY BERNHARD

PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

POST-DEVELOPMENT DRAINAGE EXHIBIT
OPTION B

DESIGNED CF	SCALE 1:1250	DATE 2014-06-19	
DRAWN RMcL / RMM	PROJECT NO. S2033	DWG NO. 13	
CHECKED CF / JAO	FILE NO. S2033-DRGN-03	SHEET NO. 13 OF 16	

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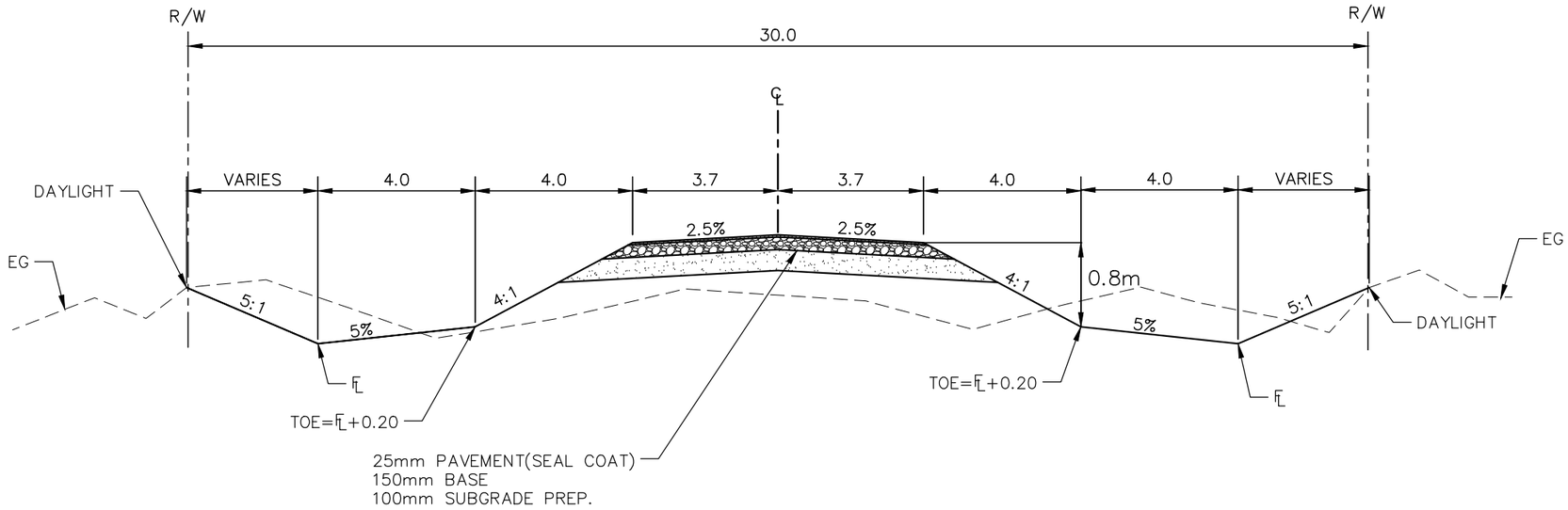
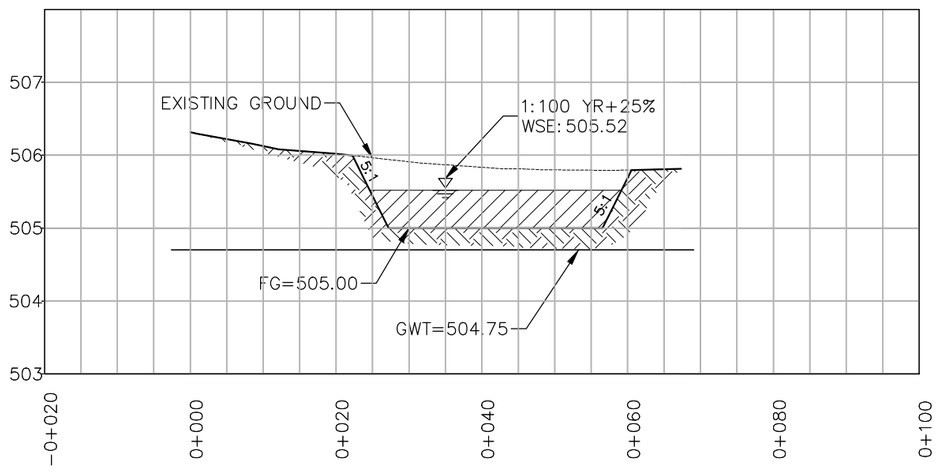


A TYPICAL ROAD CROSS SECTION (CUT)

NTS



B TYPICAL POND CROSS SECTION

NTS

NOTES:
1. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04-36-05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

PRELIMINARY NOT FOR CONSTRUCTION

ENGINEER
Clifton Associates

CLIENT
KEN & WENDY BERNHARD

PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
IMPROVEMENT PLANS
DETAIL SHEET

DESIGNED: CF	SCALE: NTS	DATE: 2014-06-10
DRAWN: RMcL / RMM	PROJECT NO.: S2033	DWG NO.: 14
CHECKED: CF / JAO	FILE NO.: S2033-IMPROV-02	SHEET NO.: 14 OF 16

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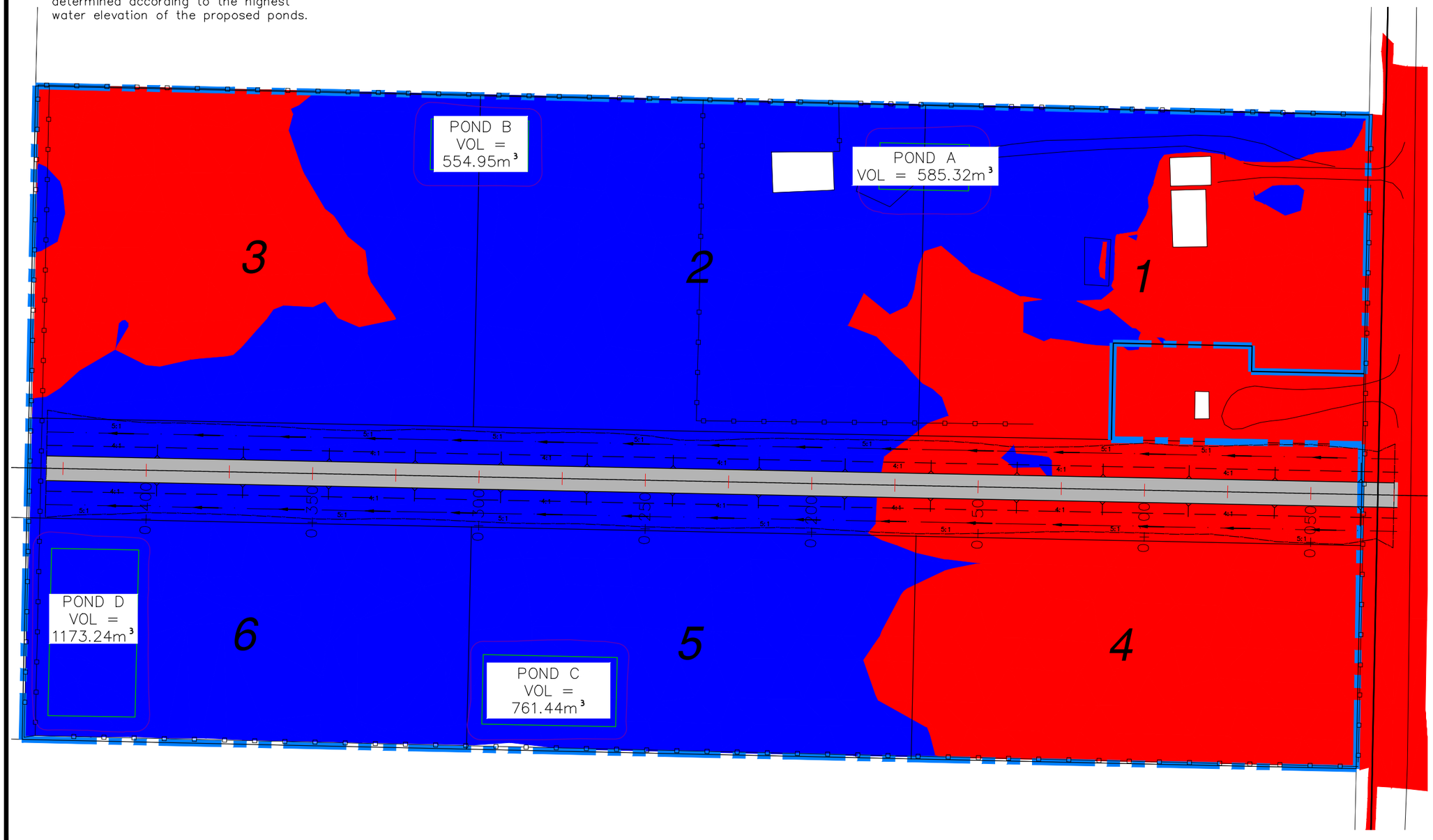
ELEVATIONS TABLE			
COLOR	MINIMUM ELEVATION	MAXIMUM ELEVATION	AREA (m^2)
	505.530	506.680	49,117.960
	506.680	508.670	33,283.180

Note: Minimum building elevations were determined according to the highest water elevation of the proposed ponds.

MINIMUM BUILDING ELEVATION – RECOMMENDATION				
CRITICAL DESIGN LEVELS	POND A	POND B	POND C	POND D
MAXIMUM WATER LEVEL (m.a.s.l.)	505.680	505.520	505.420	505.430
MINIMUM WATER LEVEL (m.a.s.l.)	506.680	506.520	506.420	506.430



LEGEND

- SITE BOUNDARY
- LEGAL FABRIC
- EXISTING DIRT ROADS
- EXISTING BUILDING
- EXISTING FENCE
- PROPOSED LOT LINE
- LOT NUMBER 5
- DITCH FLOW LINE
- ROAD

- FILL OR BUILDING PAD PREQUIRED
- MEETS MBE REQUIREMENT

NOTES:
1. LEGAL DESCRIPTION: LSD 9&10, SE 04–36–05 W3M, 4470 CLARENCE AVE S CORMAN PARK NO.344, SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

ENGINEER

Clifton Associates

CLIENT

KEN & WENDY BERNHARD

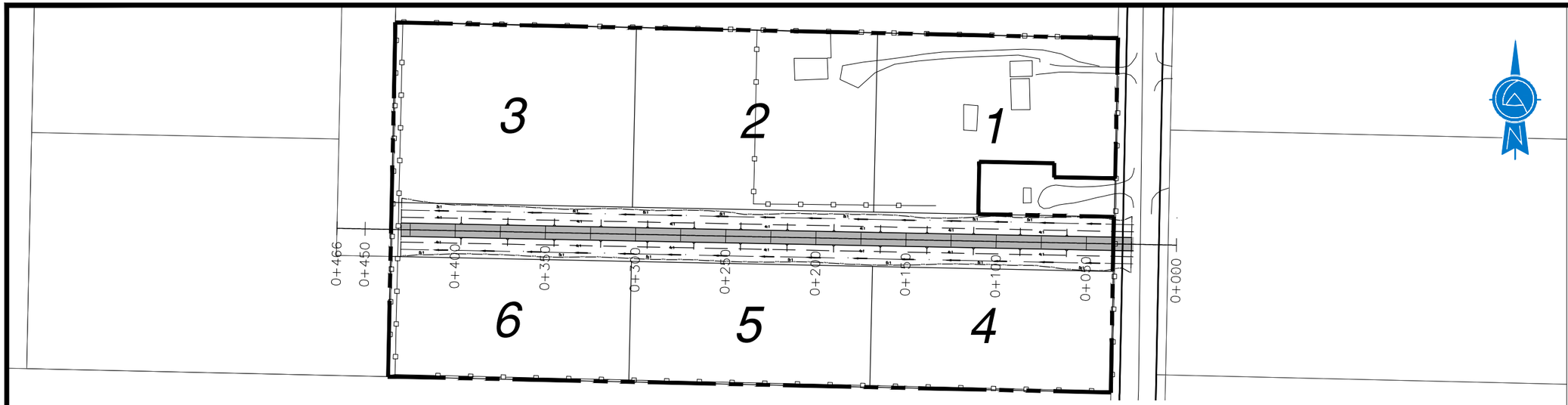
PROJECT

BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE

IMPROVEMENT PLANS
MBE

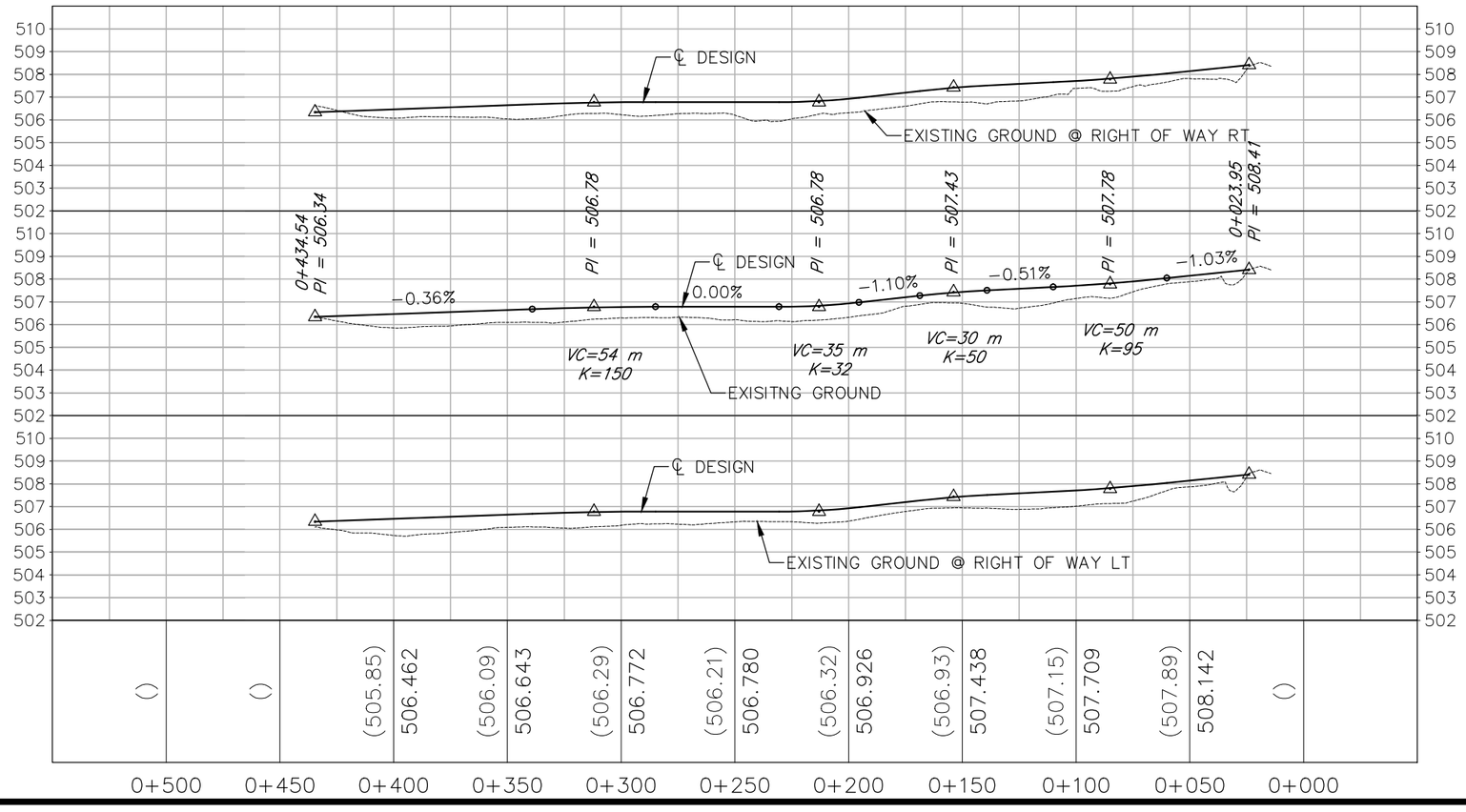
DESIGNED	SCALE	DATE
CF	1:1250	2014-06-10
DRAWN: RMcL / RMM	PROJECT NO.: S2033	DWG NO.: 15
CHECKED: CF / JAO	FILE NO.: S2033-MBE-01	SHEET NO.: 15 OF 16



6 LOT SUBDIVISION CONSTRUCTION

50 0 50 100 150

METRES 1:2000



LEGEND

- SITE BOUNDARY
- LEGAL FABRIC
- EXISTING DIRT ROADS
- EXISTING BUILDING
- EXISTING FENCE
- PROPOSED LOT LINE
- LOT NUMBER 5
- DITCH FLOW LINE
- ROAD

NOTES:
1. LEGAL DESCRIPTION:
   LSD 9&10,
   SE 04-36-05 W3M,
   4470 CLARENCE AVE S
   CORMAN PARK NO.344,
   SASKATCHEWAN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE

PRELIMINARY NOT FOR CONSTRUCTION

ENGINEER
Clifton Associates

CLIENT
KEN & WENDY BERNHARD

PROJECT
BERNHARD SUBDIVISION INVESTIGATION
RESIDENTIAL SUBDIVISION

TITLE
IMPROVEMENT PLANS
ROADWAY PLAN

DESIGNED CF	SCALE 1:2000	DATE 2014-06-10
DRAWN RMcL / RMM	PROJECT NO. S2033	DWG NO. 16
CHECKED CF / JAO	FILE NO. S2033-IMPROV-01	SHEET NO. 16 OF 16

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Appendix "D"
Ministry of Environment Correspondence

Maggie Schwab

From: Doell, Vern ENV <Vern.Doell@gov.sk.ca>
Sent: Wednesday, April 30, 2014 12:34 PM
To: Maggie Schwab
Subject: RE: Proposed Subdivision - RM of Corman Park

Good afternoon Maggie,

I've had a look at the species information and given that the CDC has rated this species as S3, there are presently no setback distances designated for this species and the development would have negligible impact, we would not have a concern with the sub-division and development at this location.

If you require anything further, please let me know.

Thanks.

Vern

Vern Doell
Ecological Protection Specialist
Saskatchewan Ministry of Environment
(306) 933-6532 Office (306) 933-8442 Fax

From: Maggie Schwab [mailto:mschwab@crosbyhanna.ca]
Sent: Wednesday, April 30, 2014 10:27 AM
To: Doell, Vern ENV
Subject: Proposed Subdivision - RM of Corman Park

Good Morning Vern,

I originally sent this e-mail to Steve, but I see he has retired!

Please see below regarding a proposed subdivision in the R.M. of Corman Park. We wish to know how to proceed going forward.

From: Maggie Schwab
Sent: Wednesday, April 30, 2014 10:23 AM
To: 'Steve.Hyde@gov.sk.ca'
Subject: Proposed Subdivision - RM of Corman Park

Good Morning Steve,

We have been contracted by Ken and Wendy Bernhard to undertake a Comprehensive Development Review with the intention of re-zoning land in the SE-36-5 W3M from D-Agriculture 1 District to C-Country Residential 4 District. As a part of the CDR, the R.M. requires that any environmental issues are addressed prior to re-zoning and subsequent subdivision.

Please find attached the following:

- Map of proposed residential development location at the SE-36-5 W3M;
- Result map from the CDC screening database undertaken in August, 2013; and,
- Photo of the proposed development location.

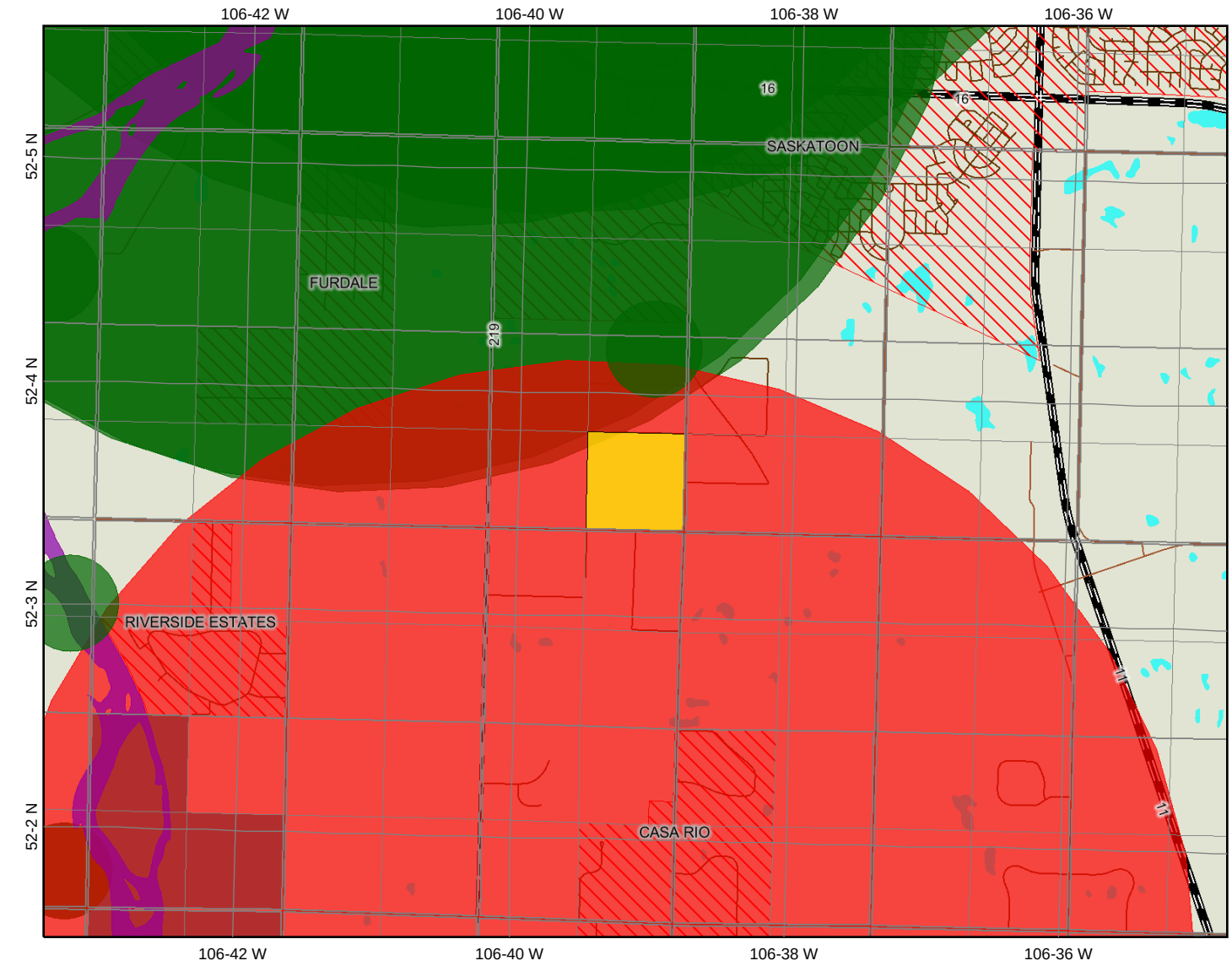
This development is listed in a potential area of critical wildlife habitat (according to the CDC mapping database). As such, the Developer was wondering what actions need to be undertaken (if any), as a part of his plan to subdivide the land into 6 residential lots. The parcel is characterized by flat land, and vegetation consists of hayland with a small cluster of trees towards the southwest corner.

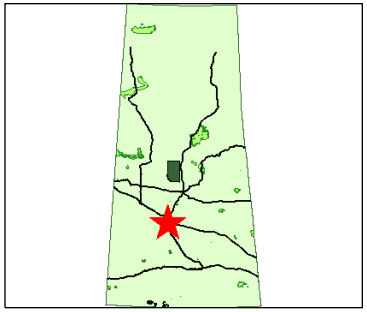
If you could let me know how to proceed, going forward, it would be appreciated.

Kindest regards,

Maggie Schwab, M.A.
CROSBY HANNA & ASSOCIATES
407 1st Avenue North
Saskatoon, SK S7K 1X5
T (306) 665-3441
F (306) 652-9613
E mschwab@crosbyhanna.ca
www.crosbyhanna.ca

SE-4-36-5-W3 CDC Wildlife Sensitivity





Legend

- Sask Outline
- Sask Mask
- Sections
- Quarter Sections

Rare and Endangered Species

- Animal
- Community
- Invertebrate
- Other
- Plant
- Fish and Wildlife Development Fund Lands
- Wildlife Habitat Protection
- Agricultural Crown Land

SURN Roads

- Local / Street
- Resource / Recreation
- Collector
- Urban Municipalities
- SURN Highways

Lakes 50k

- Intermittent Water
- Permanent Water
- Flooded Area
- Irrigation Canal

Rivers 50k

- PFRA Community Pastures
- Ramsar Wetland
- Provincial Community Pastures
- Protected Areas

N

Scale: 1:53,056

Map center: 52° 3' 36" N, 106° 39' 9" W

Appendix “E"
Correspondence from the R.M. of Corman Park

Maggie Schwab

From: Bill Delainey <bdelainey@rmcormanpark.ca>
Sent: Monday, June 25, 2012 12:56 PM
To: Jim Walters
Subject: Re: Country Residential Development - Ken Bernhard - SE 1/4 Section 4-36-5-W3M

Sounds good Jim but Ken's property is in the District and is appropriately designated on the FLUM already - so he may proceed under the existing bylaws now that Council has communicated that they will no longer be maintaining a three year lot inventory. This was the only thing hindering his development.

Regards,

Bill

From: "Jim Walters" <jwalters@crosbyhanna.ca>
To: "Bill Delainey (bdelainey@rmcormanpark.ca)" <bdelainey@rmcormanpark.ca>
Sent: Monday, June 25, 2012 11:50:18 AM
Subject: Country Residential Development - Ken Bernhard - SE 1/4 Section 4-36-5-W3M

Hi Bill, I had a meeting with Ken this morning and we will be assisting him with a CDR for a proposed 7 lot country residential development on the above noted land. I just wanted to let the planning department know. Actual work on the CDR will not start until later this summer, once we have had a chance to look at the draft bylaws. Our intent would be to submit under the new bylaws, subsequent to them being adopted.

Jim Walters, P.P.S., M.C.I.P.
Crosby Hanna & Associates
Phone: 306.665.3441
Fax: 306.652.9613
Email: jwalters@crosbyhanna.ca

--
Bill Delainey, MCIP
Director of Planning
RM of Corman Park No. 344
phone: (306) 975-1653
email: bdelainey@rmcormanpark.ca

Appendix "F"
Correspondence from Utilities

Customer Service
PO Box 8670
408-36th Street East
Saskatoon, SK S7K 6K8
Phone: (306) 975-8573
Fax: (306) 975-8558
Email: kcameron@saskenergy.com

November 21, 2014 WR# 225543

Ken Bernhard
4770 Clarence Ave South
Saskatoon, SK S7T 1A7
CITY, PROVINCE PC

Dear Ken:

RE: Natural Gas Service For 6 lot Subdivision located at SE 04 - 36 - 05 W3

SaskEnergy has completed the design to provide natural gas service to the above location. It is our goal to provide cost effective customer solutions while meeting SaskEnergy's business criteria.

Please review this offer carefully and in particular the General Servicing Conditions and Rates section in this letter, which outlines potential additional costs.

Servicing Plan

Under SaskEnergy's Terms and Conditions of Service Schedule (the "Terms and Conditions of Service"), an applicant or customer who authorizes construction for a new service installation will be responsible for all SaskEnergy construction costs and service fees associated with that new service unless otherwise agreed to by SaskEnergy in a written service agreement.

This design includes a main extension only and is designed to provide a maximum load of 6.0 m3/hr per lot with one point of delivery per lot and 1.75 kpa delivery pressure to each lot.

Your Contribution - Summer 2015

Your required contribution is $23,334.53, plus 1,166.73 GST for a total customer contribution of $24,501.26. SaskEnergy's GST number is 119 429 751.

Full SaskEnergy investment on all proposed lots has been deferred until such time as a request to install service lines is received by SaskEnergy. The cost of the service line and meter has not been included in the overall costs below, and will be charged at the time of installation request.

The customer contribution quoted above includes ONE crew mobilization. If SaskEnergy has to dispatch the construction crew several times due to delays in your ability to have the property ready for servicing (i.e. survey pins, obstacles in the natural gas route, other utilities needing to go in first etc.) you will be charged for the additional crew mobilization(s). You may also be responsible for any increased construction costs related to any changes you make in the original design, or as a result of the re-mobilization(s).

If SaskEnergy cannot complete this project prior to winter construction coming into effect, due to the property not being ready for servicing at the time requested, we will contact you with two servicing options:

1. SaskEnergy will re-estimate the cost of this job with winter construction and re-quote you this amount, or
2. Defer construction of this project to next spring.

Methods of Payment

Payment of the required customer contribution may be provided as follows:

- An immediate single payment, cash or cheque, for the total amount of $24,501.26.
- The total amount $24,501.26 to be invoiced up project completion,
- The total amount of $24,501.26 paid through SaskEnergy financing, and included on your monthly SaskEnergy bill.

If you are interested in SaskEnergy financing, please check off Option 3 on the customer confirmation sheet attached, and provide the required information. If your loan is approved, you will be contacted and advised of the monthly payment and terms.)

General Servicing Conditions and Rates

This customer offer is based on the following conditions:

1. SaskEnergy is able to obtain all required easements and approvals.
2. Route is to final grade, clear of obstruction, and ready for service prior to construction.
3. Native material can (in SaskEnergy's opinion) be used for backfill of all excavations.
4. The work can be performed under summer working conditions
5. SaskEnergy will prepare and forward the required easement agreement(s) for the right-of-way plan, which Ken Bernhard will execute and return. SaskEnergy will advise Ken Bernhard when the easement(s) has been registered. Ken Bernhard will not sell or transfer the parcel or individual lots in SE 04 – 36 – 05 W3 before the easement(s) has been registered. Ken Bernhard will be responsible for any and all costs incurred by SaskEnergy to acquire the easement(s) in the event that Ken Bernhard fails to comply with said obligation.

The offer is open for acceptance for thirty (30) days from the date of this letter. A deposit or payment in full is required on acceptance, as outlined in this offer. Where financing is requested, this letter agreement shall be subject to financing approval and the provision by you of an executed financing agreement, where applicable.

These conditions are for the sole benefit of SaskEnergy and may be waived by SaskEnergy. In the event these conditions are not met (or waived in writing), or an accepted offer is not received by the date provided, no binding contract shall exist.

All Services are subject to SaskEnergy's Terms and Conditions of Service. SaskEnergy's Terms and Conditions of Service are available at www.saskenergy.com or at your local SaskEnergy office.

What Happens Next?

In order to better secure a place in the current year construction season's schedule, please execute and return the attached Customer Confirmation as indicated. Your commitment is needed as soon as possible. If SaskEnergy receives your commitment for this offer by December 19, 2014, we will target installation for Spring 2015. This is a target installation date only. Within this time period, SaskEnergy will forward you a routing approval drawing indicating SaskEnergy's easement requirements, for your approval.

By accepting this offer below, you agree to execute and deliver such further documents and consents and do such further acts and things as SaskEnergy may reasonably request to evidence, carry out and give full effect to the terms, conditions, intent and meaning of this letter.

Sincerely,

SASKENERGY INCORPORATED

Kelly Cameron
Business Supervisor, Saskatoon Area

KC*

Enclosure (4)

cc: Saskatoon East/West Rural Operations, Project File

November 21, 2014 WR#**225543**

Customer Confirmation – Summer 2015

To confirm your acceptance, please choose and option and sign and return this page

SaskEnergy's GST number is 119 429 751.

[Option 1] ☐ Cheque for the total of $24,501.26

[Option 2] ☐ Invoice the total of $24,501.26 upon installation of the system, or

[Option 3] ☐ On approved SaskEnergy Customer Financing, the balance of $24,501.26 will appear in instalments on your SaskEnergy bill. Please read the following statement.

By checking Option 3 above, and by my signature below, I hereby authorize SaskEnergy to complete a credit check for SaskEnergy Customer Financing. Credit check(s) shall include, without limitation, the acquisition, retention and review of a credit report from a credit reporting agency, which report will contain credit information, personal information or both. I acknowledge that SaskEnergy requires consent pursuant to The Credit Reporting Act, and I hereby consent to SaskEnergy obtaining and utilizing a credit report in connection with the extension of credit to myself and/or the collection of any resulting debt. Provision of loan security for gas line financing shall be in a form and amount satisfactory to SaskEnergy. The Cost of Credit Disclosure Act, 2002 disclosure, where required, will be provided by letter with your financing agreement.

Driver's license # _____ Date of Birth (mm/dd/yy) _____/_____/_____

Signed _____ Date _____

Name (print) _____ For _____

Address _____

Community _____ Postal Code _____

Service to be installed at above address or _____

By my signature above I declare I am authorized to sign on behalf of _____

Please return to:

SaskEnergy
Attention: Kelly Cameron
PO Box 8670
408 – 36th Street East
Saskatoon, SK S7K 6K8

SaskEnergy

ROUTE & GRADE APPROVAL

November 21, 2014 WR# 225543

Service Location: SE 041 – 36 – 05 W3

Project Contact: Kelly Cameron
Customer Service
408-36th Street East
Saskatoon, SK S7K 6K8

Phone: (306) 975-8573

Fax: (306) 975-8558

Email: kcameron@saskenergy.com

Two copies of the proposed gas main extension sketch for the above location are attached. We appreciate your assistance in supplying us with the following:

a) Plans indicating existing and proposed sewer and water mains (if applicable).
b) Location of facilities affecting our construction; i.e. – power, telephone, cables, etc.
c) Normal cover is 1.0 meters in easements and lanes, 1.2 meters in streets and intersections a plan or description showing these final grades would be appreciated.

Please sign and return one original main extension sketch along with any comments as soon as "final grade" of the service area is determined.

Your service request cannot be scheduled for construction until the route and grade approval is received.

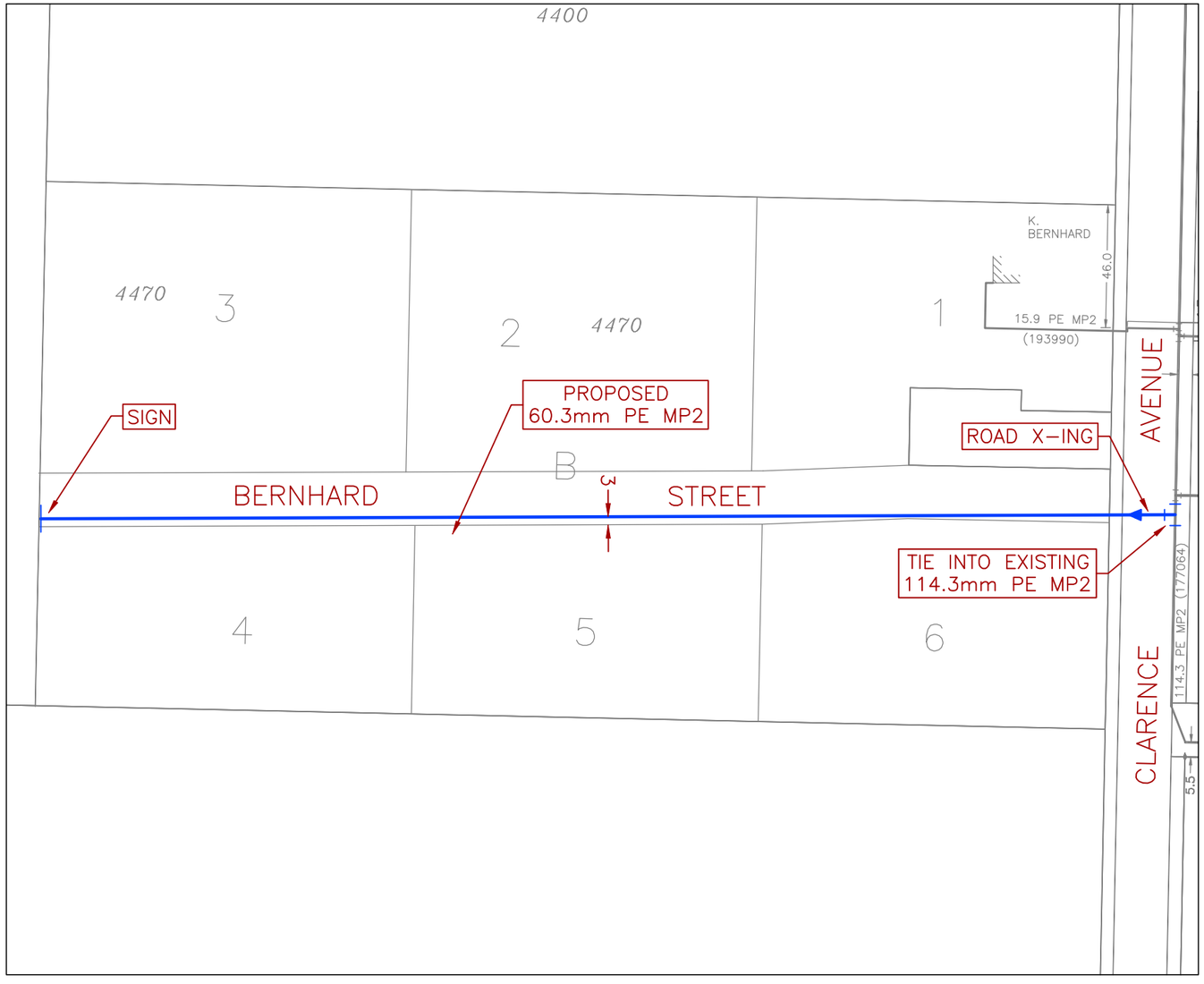
Thank you for your assistance in this matter.

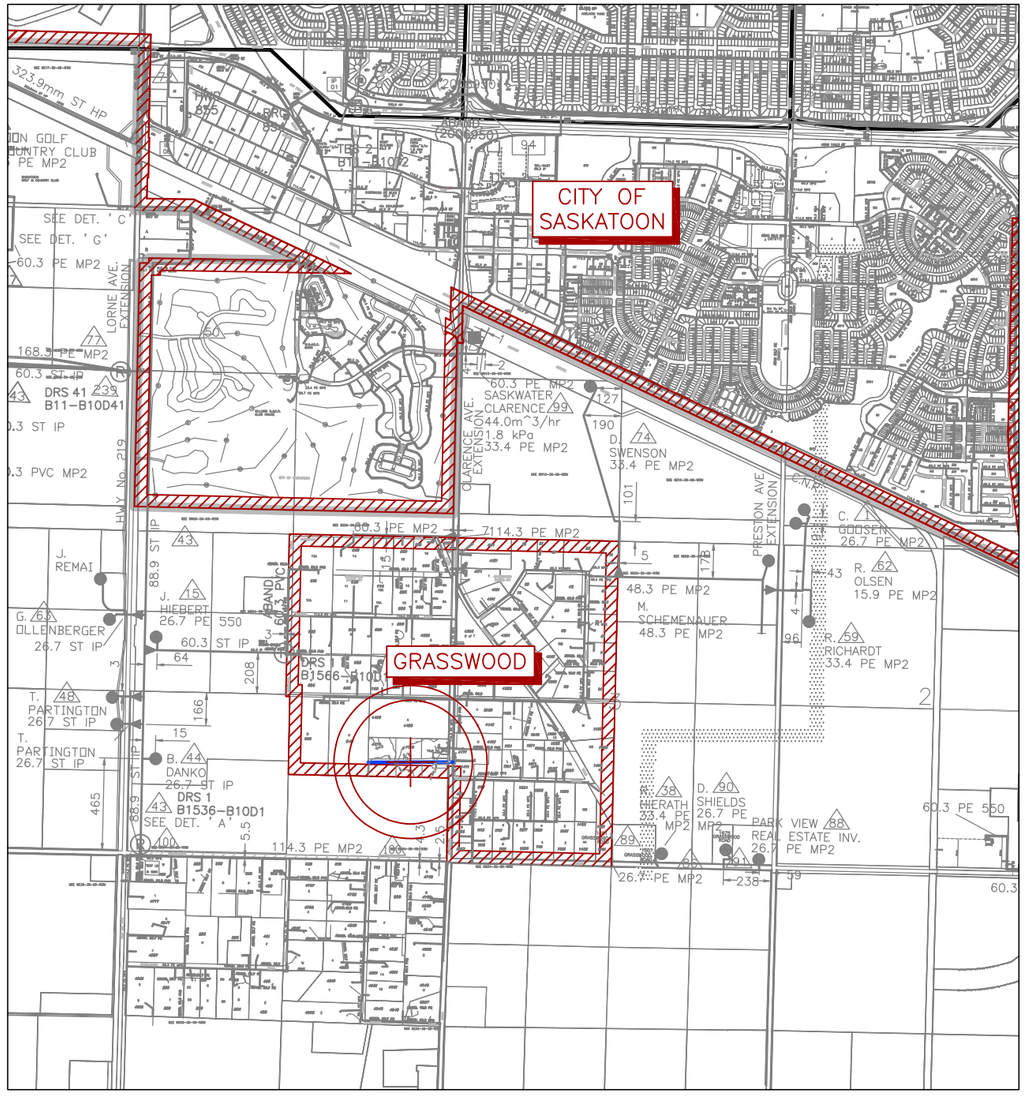
Sincerely,

SASKENERGY INCORPORATED

Kelly Cameron
Business Supervisor, Saskatoon Area

KC:
cc: Saskatoon East/West Rural Operations, Project File





N

WATER
ROADS
BUSH
PROPOSED
EXISTING
NOTES

PRESSURE TESTING REQUIREMENTS

1. Test Pressure Requirements:
   a.) Rural Plastic Distribution systems shall be tested with air or nitrogen and comply with SaskEnergy SPI D-08-02.1
   b.) Urban Distribution Systems shall be tested with air or nitrogen and comply with SaskEnergy SPI D-08-02.2
2. Test Records and Reports to be completed in accordance with SaskEnergy SPI D-08-03.1, D-08-03.2 and forwarded to Distribution Engineering.
3. Modifications to above only with WRITTEN authorization of Distribution Engineering.

DISTRIBUTION ENGINEERING

APPROVED FOR CONSTRUCTION

Signature _____

Date _____

PROPOSED

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SaskEnergy DISTRIBUTION ENGINEERING NORTH

CONSTRUCTION DRAWING

PROJECT: GRASSWOOD – PARCEL B SE 4-36-05-W3M

LOCATION : GRASSWOOD – SE 4-36-05-W3M

ACCT# : 2014-33-3000 W.R.# 225543 SCALE : 1:2000

DATE : 2014/09/25 LOCAL DISTRICT #: 3302 – SASKATOON E/W

REVISION
A
B
C

PIPE REQUIREMENTS	REFERENCE	APPROVALS
~435m OF 60.3mm PE (MP2)	PG: 18-N	DRAFTING: Z.BENSON
	380 kPa	ENGINEERING: S. DAVIDOVIC
	PROPOSED PLAN OF SURVEY	PHONE: 8585

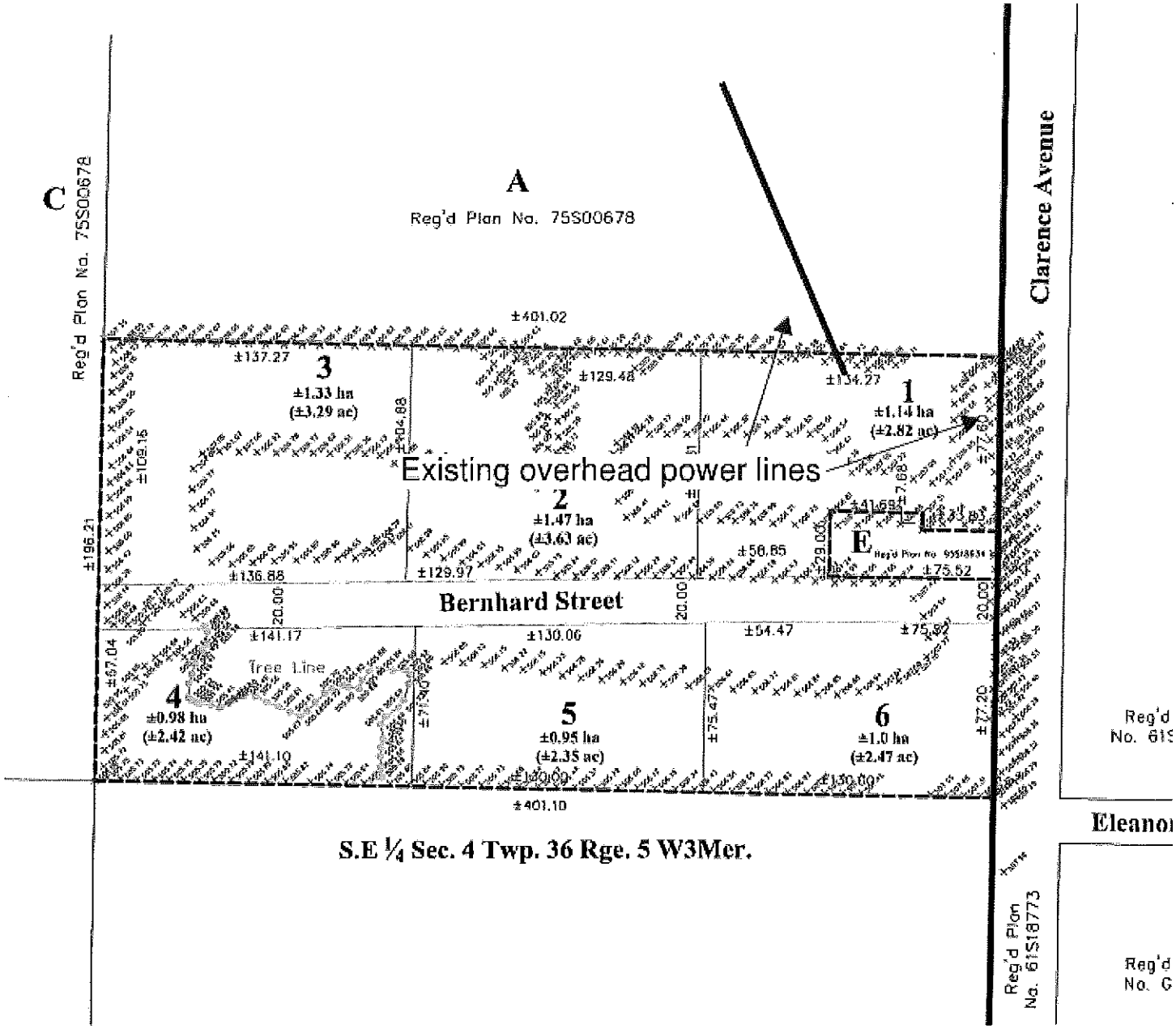
Maggie Schwab

From: Ian Waldner <iwaldner@saskpower.com>
Sent: Wednesday, September 10, 2014 2:37 PM
To: Maggie Schwab
Cc: BERNHARDKEN@HOTMAIL.COM
Subject: 301630756 subdivision 5 lots

Hello Maggie,

Please view the map below. There is an existing overhead power line along the west side of Clearance Ave. that will supply electricity to the subdivision. A distribution line and transformers will have to be constructed to service each lot at the developer's expense.

Thanks
Ian Waldner
SaskPower
306-934-7760



Maggie Schwab

From: Dwayne Keir <tech.services@rmcormanpark.ca>
Sent: Thursday, September 04, 2014 10:54 AM
To: Maggie Schwab
Subject: Re: Development in Corman Park
Attachments: image.jpeg

No problem. Also here is a picture of a waterline connection excavation across the road in Hill Street from August. The water level is extremely high so basement development in the region may not be a good idea.

Dwayne Keir
RM of Corman Park No. 344
tech.services@rmcormanpark.ca
306-975-1665 office
306-361-9792 cell
306-242-6965 fax

On Sep 4, 2014, at 10:44 AM, "Maggie Schwab" <mschwab@crosbyhanna.ca> wrote:

> Perfect. Thanks Dwayne.
>
> ---
>
> **From:** Dwayne Keir [mailto:tech.services@rmcormanpark.ca]
> **Sent:** Thursday, September 04, 2014 10:43 AM
> **To:** Maggie Schwab
> **Subject:** RE: Development in Corman Park
>
> Thanks Maggie,
>
> I did a quick calculation of the waterline distance and we would be looking at around 300 meters of water main, and I forgot to include an isolation valve for the line as well.
>
> I'll be reviewing the CDR with Teresa in the next week or so, so we should be able to get back to you with any comments shortly.
>
> Thanks,
> Dwayne
>
> **From:** Maggie Schwab [mailto:mschwab@crosbyhanna.ca]
> **Sent:** September-04-14 10:39 AM
> **To:** Dwayne Keir
> **Subject:** RE: Development in Corman Park
>
> Thanks Dwayne for the quick response.
>
> I have forwarded the information to the Developer.

I've attached the plan of proposed survey, for your information. At this point, I believe the next step is for Corman Park to review the CDR and either approve it, or request revisions. From that point the Developer will determine how he wants to deal with the water.

Thanks again,
Maggie

From: Dwayne Keir [mailto:tech.services@rmcormanpark.ca]
Sent: Thursday, September 04, 2014 9:55 AM
To: Maggie Schwab
Subject: RE: Development in Corman Park

Thanks Maggie,

The RM of Corman Park operates a water system for the region surrounding Grasswood around Clarence Avenue and Grasswood Road. The water system was constructed in 1994 when Grasswood was an organized Hamlet. The Hamlet and it's board have since disbanded.

I have attached the 2011 Water System Assessment we had completed for our Grasswood and Casa Rio water systems by AECOM. This report indicates that the water system's existing reservoir, waterlines, and pump has a remaining capacity for approximately 60 more pressurized household water system connections before upgrades or replacements would be required.

For the proposed development to connect to this system shouldn't be a problem. The costs are $12,000 per connection or cost plus 13%. This is stipulated within the RM's Water Utility Bylaw.

Without seeing the lot design I can't really estimate the distance of water main that would need to be constructed. However, at any terminal (dead end) points of the line a flushout of appropriate size would additionally need to be constructed. Both the Grasswood Road and Clarence Avenue frontages of the property have 150 mm watermains within the municipal right of way. Any watermain constructed would need to be 50 mm at a minimum. I've also attached the waterline drawing fronting the property on the south and east sides.

So basically the costs would either be

6 * $12,000 = $72,000

Or

Cost of water main construction + Cost of 6 curbstop connections + Cost of Flushout(s) + 13%.

On the south end of the property the municipal right-of-way is loaded with infrastructure. Apart from the Grasswood Water System connection, the Dundurn Rural Water Utility, and I believe other utilities are also located within the south ditch.

Another option for residential water connection would be the Dundurn Rural Water Utility. However, their system is a low pressure or "drip" system. The difference between this system and Grasswoods is that every residence would require a holding tank and the ability to pressurize water within each household.

Either way feel free to give me a shout at 306-361-9792 anytime if you want to chat about the options or require more information or details.

Thanks,
Dwayne

From: Maggie Schwab [mailto:mschwab@crosbyhanna.ca]
Sent: September-03-14 2:24 PM
To: Dwayne Keir
Subject: Development in Corman Park

Hi Dwayne,

We are working for a Developer who is looking to subdivide his parcel into six residential lots. He is located in the SE-4-36-5 W3M (Parcel B, Plan 75S00678). We just submitted a Comprehensive Development Review for review by Administration and Council.

We were under the impression that residential development outside of the City of Saskatoon would not be able to get water from the City. And when we contacted SaskWater (on behalf of the Developer), they indicated that the Developer could apply for water through SaskWater or the DRWU. However, when the Developer contacted SaskWater to fill out the application form, he was told that he was to contact Corman Park as the pump station (which provides City of Saskatoon water to the existing residence on the parcel) is located immediately adjacent to his property.

Can you clarify for me what utility we should be contacting on the Developer's behalf regarding potable water?

Kindest regards,
Maggie

Maggie Schwab, M.A.
CROSBY HANNA & ASSOCIATES
407 1st Avenue North
Saskatoon, SK S7K 1X5
T (306) 665-3441
F (306) 652-9613
E mschwab@crosbyhanna.ca
www.crosbyhanna.ca

Maggie Schwab

From: ken bernhard <bernhardken@hotmail.com>
Sent: Friday, August 29, 2014 11:24 AM
To: Maggie Schwab
Subject: SaskWater

Hi Maggie
You ask us to fill out an application form for SaskWater, We spoke to Bob Lys from SaskWater And he stated that because we are already getting City Water from the Corman Park pump station located on our property , that we deal with Corman Park for water on the future five Lots. Therefore do we need to apply to them or will it automatically be dealt with in our Subdivision request.
Thanks
Ken

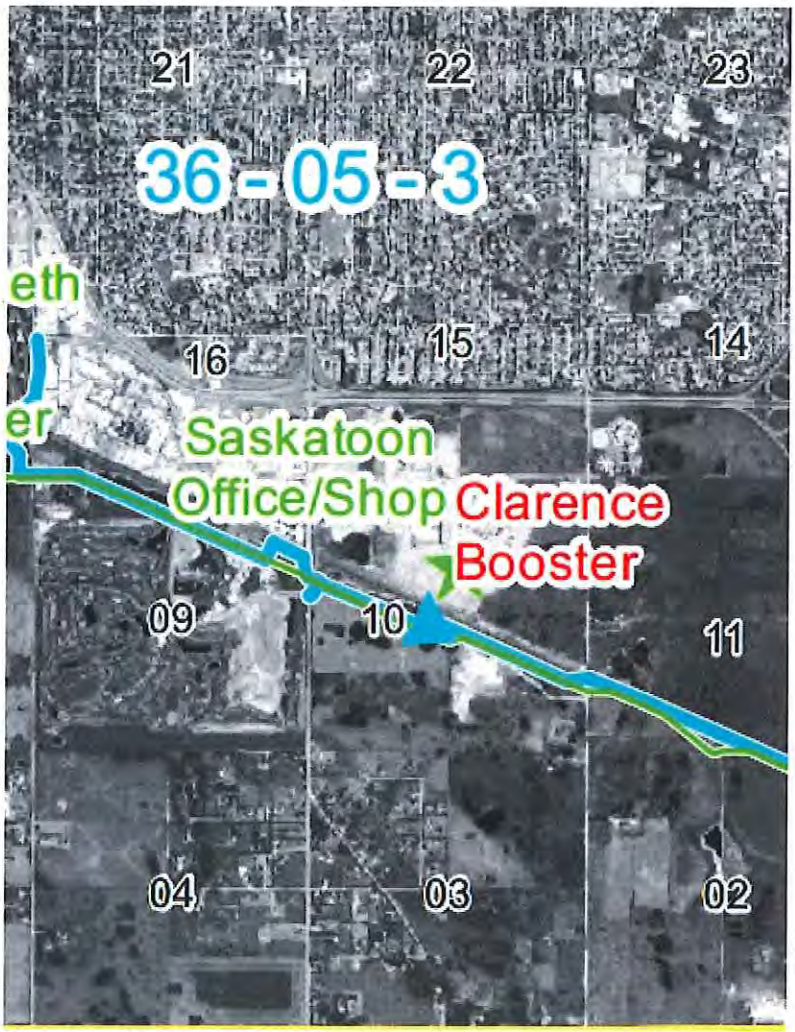
Sent from my iPad

Maggie Schwab

From: Shauna McClinton <Shauna.McClinton@saskwater.com>
Sent: Wednesday, August 27, 2014 3:21 PM
To: Maggie Schwab
Subject: Request for Service Information
Attachments: Request for Service Form- 2013.pdf; Connecting to a SaskWater System-Info Sheets-May 1, 2014.pdf

Good afternoon Ms. Schwab,

As follow-up to our conversation regarding developer, Mr. Ken Bernhard, looking to confirm water for 6 lots in the SE 4-36-5 W3M, please request that the attached Request for Service for be completed, signed and return for review and validation for capacity available to supply from our water line. The following is snapshot of where SaskWater's line is. Please also refer to the attached information sheets regarding information on a Standard Connection to SaskWater's line.



The blue is our potable line and green is non potable.

Another option for water service in that area is through the Dundurn Rural Water Utility, who we provide water to. I believe they have waterlines in this area; they can be reached at 306- 492-2566.

If you have any questions, please let me know.

Sincerely,

Shauna McClinton
Customer Service Representative
SaskWater
200 111 Fairford St E
Moose Jaw SK S6H 1C8
1-888-230-1111, Ext. 2-Customer Services
Phone: 306-694-3588
Fax: 306-694-3207

Appendix "G"
Prairie Spirit School Division Correspondence

Maggie Schwab

From: Kerry Donst <kerry.donst@spiritsd.ca>
Sent: Monday, July 21, 2014 7:35 AM
To: Maggie Schwab
Cc: Karen McKee
Subject: RE: School Capacity for Corman Park Residential Subdivision

Maggie,

Please be advised that our Grasswood area schools have sufficient enrollment capacity for the proposed development of 6 residential lots.

Please contact me if you have any questions or comments.

Kerry Donst
Facilities Planner
Prairie Spirit School Division
Tel 306-683-2917

From: Karen McKee
Sent: Sunday, July 20, 2014 1:46 PM
To: Maggie Schwab
Cc: Kerry Donst
Subject: Re: School Capacity for Corman Park Residential Subdivision

Hi Maggie,
I am forwarding your request to our Facilities supervisor who will be able to provide you with the information that you need.

Karen

Sent from my iPad

On Jul 17, 2014, at 8:59 AM, "Maggie Schwab" <mschwab@crosbyhanna.ca> wrote:

> Hi Karen,
>
> I am just following up on my earlier email concerning the proposed residential development in the R.M. of Corman Park.
>
> Is there a good time I could call to discuss this development?
>
> Thanks,
> Maggie
>
> Maggie Schwab, M.A.
> **CROSBY HANNA & ASSOCIATES**
> 407 1st Avenue North
> Saskatoon, SK S7K 1X5
> T (306) 665-3441
> F (306) 652-9613

E mschwab@crosbyhanna.ca
www.crosbyhanna.ca

From: Maggie Schwab
Sent: Wednesday, April 30, 2014 3:36 PM
To: 'karen.lapointe@spiritsd.ca'
Subject: School Capacity for Corman Park Residential Subdivision

Hi Karen,

We (Crosby Hanna & Associates) have been contracted by a Developer in the R.M. of Corman Park to help him with re-zoning and subdivision of land for future acreage development. As a part of the re-zoning process, the R.M. of Corman Park requires that the Developer ensure that there is capacity in the school division for future families and their children of school age.

The proposed development is only comprised of six (6) residential lots. It is located in the Grasswood area.

Could you please indicate whether the school(s) in the vicinity would be able to handle the potential increase in enrolment generated by this small development? The Developer wishes to have the re-zoning and subsequent subdivision approved in September, 2014. I would suspect development would proceed quite quickly thereafter.

Please call if you have any questions regarding this development.

Kindest regards,

Maggie Schwab, M.A.
CROSBY HANNA & ASSOCIATES
407 1st Avenue North
Saskatoon, SK S7K 1X5
T (306) 665-3441
F (306) 652-9613
E mschwab@crosbyhanna.ca
www.crosbyhanna.ca

Appendix "H"
Heritage Conservation Branch Screening Results

PARKS, CULTURE AND SPORT

ABOUT PARKS, CULTURE AND SPORT

Inquiry was made on August 27, 2014 at 3:02 PM
You are inquiring about the heritage sensitivity of the following land location:

Quarter-section:
SE

Section:
4

Township:
36

Range:
5

Meridian:
3

This quarter-section is NOT heritage sensitive.

It is not necessary to submit the project to the Heritage Conservation Branch for screening. These results can be printed for submission to other regulatory bodies (e.g. Saskatchewan Environment, Saskatchewan Industry and Resources). Please email **arms@gov.sk.ca** if you have any questions.

Inquiry was made on August 27, 2014 at 3:02 PM

Appendix "I"
Public Consultation

October 1, 2012

Dear Sir or Madam,

Ken and Wendy Bernhard are proposing a residential subdivision on the following land in the RM of Corman Park:

SE-4-36-5-W3, Parcel B, Plan #75S00678 Ext 0 (west of and adjacent to Clarence Avenue).

Please see the reverse of this letter for a map showing the location of the proposed development.

The proposed development would consist of seven (7) residential lots.

The open house is scheduled for:

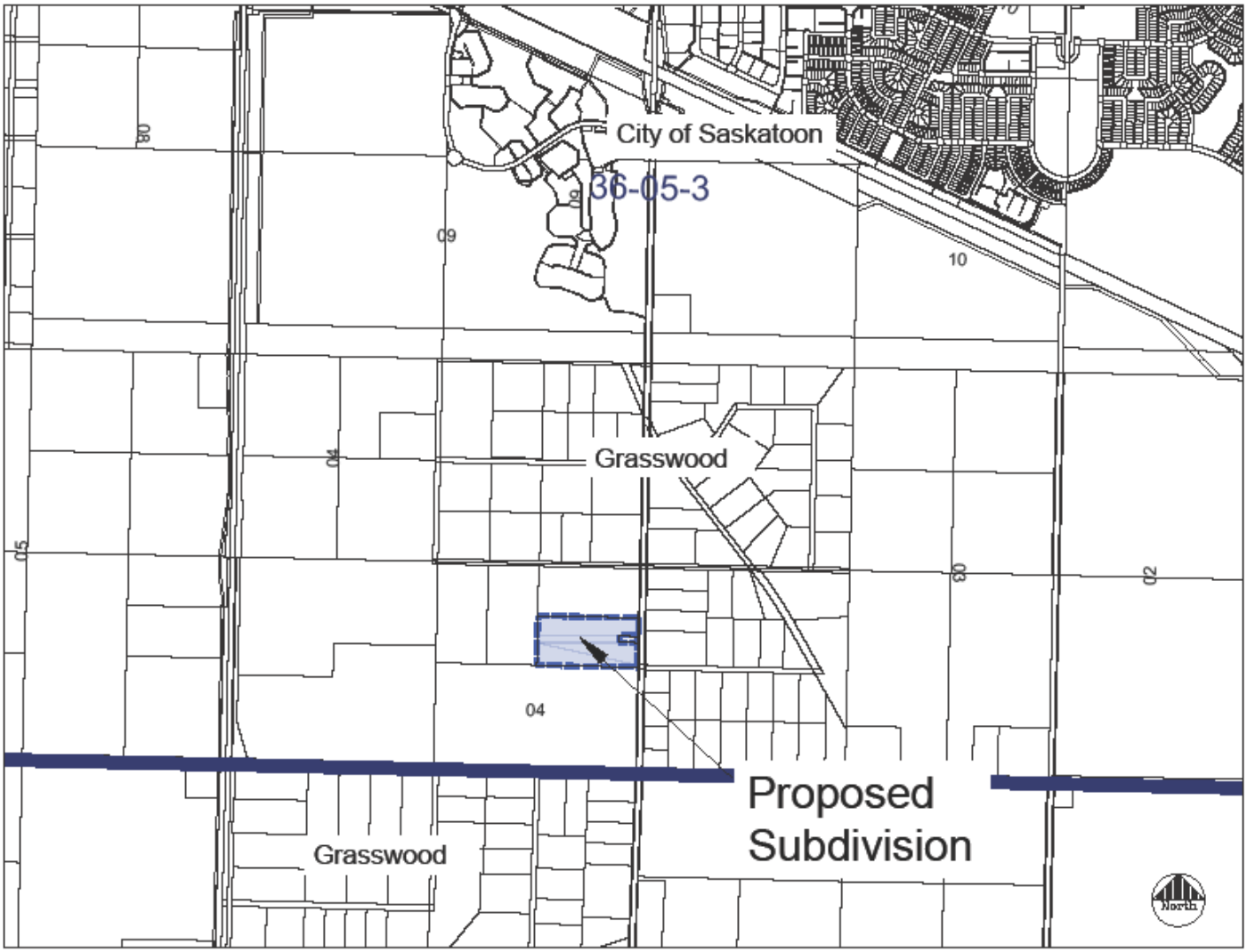
Wednesday October 17, 2012, 6:00 p.m. to 7:30 p.m.
SCPCA Log Cabin at the South Corman Park School
Corner of Preston Avenue at Baker Road
Rural Municipality of Corman Park No. 344

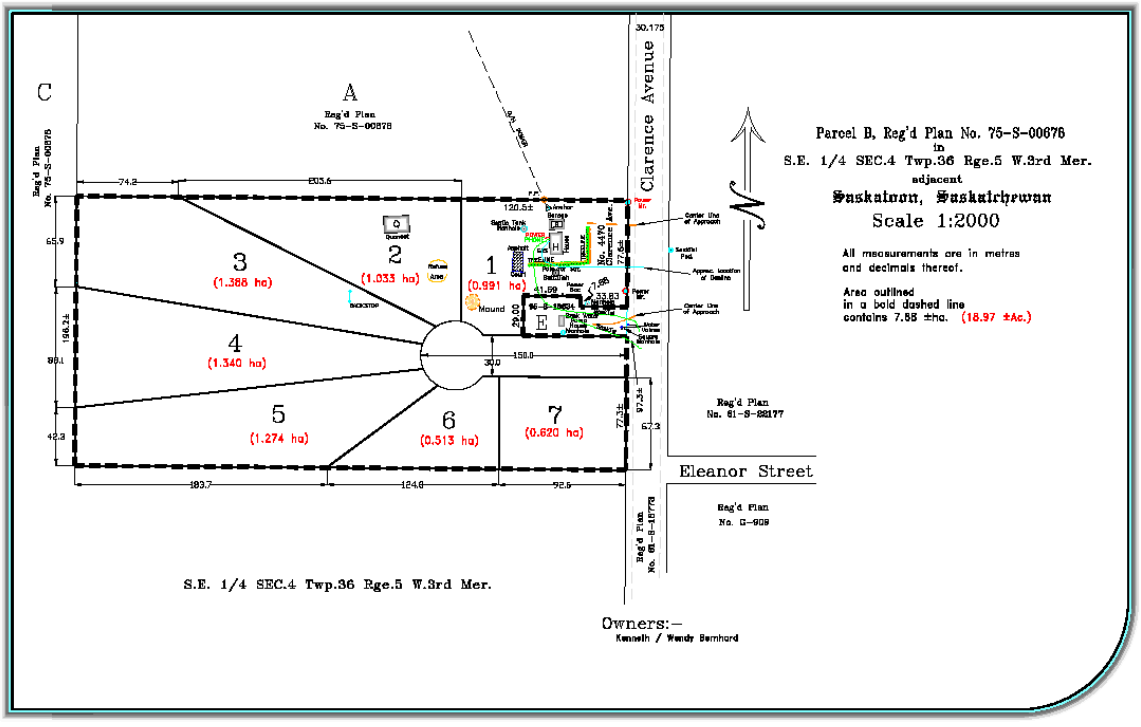
This is a come and go event, intended to provide an opportunity for neighbours to discuss potential issues, possible solutions to those issues and to ask general questions. The Developers and members of the design team will be present at the open house.

If you are unable to attend the open house, please provide any comments or concerns to Jim Walters at jwalters@crosbyhanna.ca.

We look forward to seeing or hearing from you.

Ken and Wendy Bernhard


City of Saskatoon
36-05-3
Grasswood
Grasswood
Proposed
Subdivision
North


Clarence Avenue
Eleanor Street
Parcel B, Reg'd Plan No. 75-S-00676
in
S.E. 1/4 SEC.4 Twp.36 Rge.5 W.3rd Mer.
adjacent
Saskatoon, Saskatchewan
Scale 1:2000
All measurements are in metres and decimals thereof.
Area outlined in a bold dashed line contains 7.65 ±ha. (18.97 ±Ac.)
S.E. 1/4 SEC.4 Twp.36 Rge.5 W.3rd Mer.
Owners:-
Kenneth / Wendy Bernhard

ATTENDEES AT MEETING
OCT 17/12

KEN & WENDY BERNHARD — PROPOSED RESIDENTIAL SUBDIVISION
SEVEN LOTS — SE-4-36-5-W3, PARCEL B
OPEN HOUSE RESPONSE FORM

Please use this form to record your reactions to the proposed Residential Subdivision by Ken and Wendy Bernhard and to provide any comments you may have. When completed, please leave the form with us before leaving. Thank you for your input.

Alternatively, you may send comments to Jim Walters at: jwalters@crosbyhanna.ca

Joan Mitchell
Diana Wilson
Joanne Walker
Ingrid Benning
Jerry Partington
Jane Krawlik
Douglas Hay
Laurence Mitchell
Janey Rodl
Stuart + Dorothy Middleton
Greg Nelson
Jerry Lambalge
Lindsay Blackwell
Michelle Hough
Donna + Keith Fitzgerald

CROSBY HANNA & ASSOCIATES
LANDSCAPE ARCHITECTURE
COMMUNITY PLANNING

407 1st Avenue North
Saskatoon, SK S7K 1X5
www.crosbyhanna.ca

T (306) 665-3441
F (306) 652-9613

October 29, 2013

Dear Sir or Madam,

Ken and Wendy Bernhard are proposing a residential subdivision consisting of seven (7) residential lots on the following land in the R.M. of Corman Park:

SE-4-36-5-W3, Parcel B, Plan #75S00678 Ext 0 (west of and adjacent to Clarence Avenue).

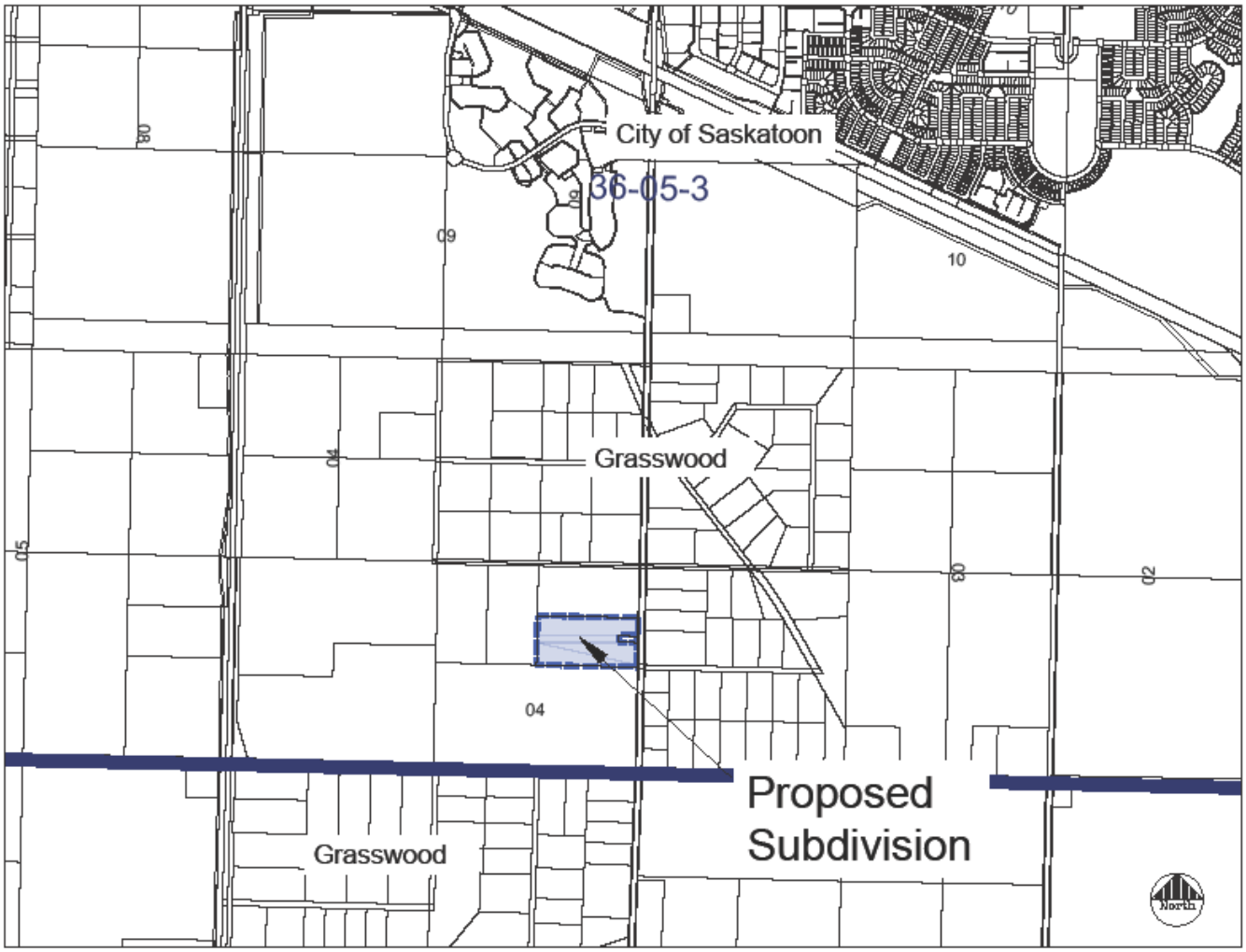
Please see the reverse of this letter for a map showing the location and concept plan of the proposed residential development.

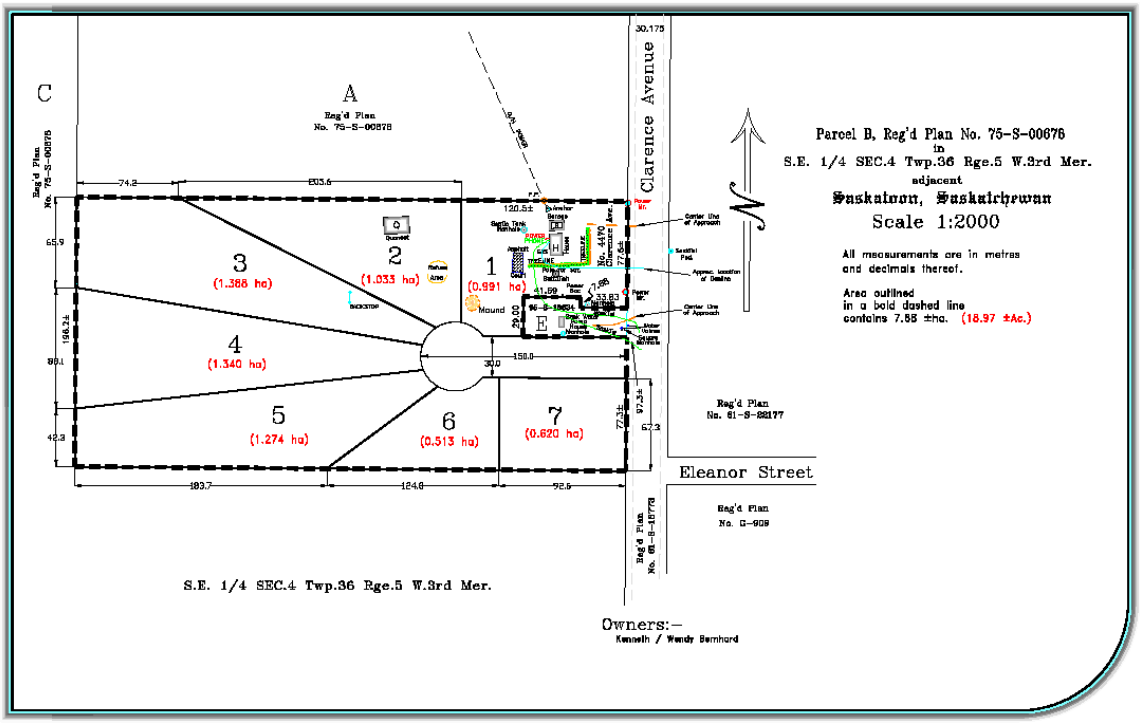
This proposed subdivision was selected to move to the public consultation stage of the R.M.'s 2013 call for applications for new multi-parcel country residential development. A Public Open House, previously held on Wednesday October 17th, 2012 provided surrounding residents with the opportunity to discuss potential issues, possible solutions to those issues and to ask general questions to the Developers and design team about the proposed subdivision.

If you have any questions, concerns or comments surrounding this proposed development, you may do so by contacting Jim Walters by November 15th, 2013 by telephone at 306-665-3441, fax at 306-652-9613 or by e-mail at jwalters@crosbyhanna.ca.

We look forward to hearing from you.

Ken and Wendy Bernhard


City of Saskatoon
36-05-3
Grasswood
Grasswood
Proposed
Subdivision
North


Clarence Avenue
Eleanor Street
A
Reg'd Plan No. 75-S-00676
C
Reg'd Plan No. 75-S-00675
1 (0.991 ha)
2 (1.033 ha)
3 (1.388 ha)
4 (1.340 ha)
5 (1.274 ha)
6 (0.513 ha)
7 (0.620 ha)
Reg'd Plan No. 61-S-22177
Reg'd Plan No. G-909
Reg'd Plan No. 61-S-18778
S.E. 1/4 SEC.4 Twp.36 Rge.5 W.3rd Mer.
Parcel B, Reg'd Plan No. 75-S-00676
in
S.E. 1/4 SEC.4 Twp.36 Rge.5 W.3rd Mer.
adjacent
Saskatoon, Saskatchewan
Scale 1:2000
All measurements are in metres and decimals thereof.
Area outlined in a bold dashed line contains 7.55 ±ha. (18.97 ±Ac.)
Owners:–
Kenneth / Wendy Bernhard

Maggie Schwab

From: Jim Walters
Sent: Wednesday, October 24, 2012 2:20 PM
To: 'Jason Brockman'
Cc: Rebecca Row (rrow@rmcormanpark.ca); bernhardken@hotmail.com
Subject: RE: Clarence Avenue - Subdivision Comments

Hi Jason, thank you for providing me with your concerns. The project engineer (Clifton Associates) will be examining soil conditions and ground water to determine the best way to treat sewage. I do not anticipate a mound system being proposed. Clifton's transportation engineers will also be looking at traffic conditions and will make any necessary recommendations to address safety issues or general road conditions.

I have copied this message to Rebecca Row, Manger of Policy at the RM and to Ken Bernhard, the developer. Please don't hesitate to contact me if you have any questions.

Jim Walters, P.P.S., M.C.I.P.
Crosby Hanna & Associates
Phone: 306.665.3441
Fax: 306.652.9613
Email: jwalters@crosbyhanna.ca

From: Jason Brockman [mailto:jb.miners@shaw.ca]
Sent: October-24-12 1:51 PM
To: Jim Walters
Subject: Clarence Avenue - Subdivision Comments

Jim,

My name is Jason Brockman and I reside at 630 Gabriel Road in Grasswood. My wife and I had an opportunity to review the Crosby Hanna design for the proposed acreage sub-division with access off Clarence Avenue South. In summary, we are opposed to the design.

One of the key reasons we purchased in this area is the restricted population density which promoted a rural family lifestyle. The recent closure of Lorne Ave promoted a significant increase in traffic on Clarence which impacted the safety and even pleasure (noise) when participating in leisure activities like cycling, walking, horseback riding, etc. As well, the recently approved by-law now provides the opportunity for acreages to subdivide to 4.6 acres parcels. We also have concerns regarding how the gray and black water will be dealt with... septic mounds with this density are in question of contaminating local wells when considering our soil stratigraphy and concerns raised in the Casa Rio area.

Bottom line, is that we would be open to a property size of 2.3 acres or larger. Anything smaller would be challenged aggressively.

Regards,

Jason Brockman, P.Eng.
630 Gabriel Road
Grasswood, SK S7T 1A8

Maggie Schwab

From: Jim Walters
Sent: Monday, November 11, 2013 9:10 PM
To: Jan Burmeister
Subject: RE: Questions regarding Berrnhard proposed subdivision

Hi Jan, thank you for the questions. My answers are below:

1. The RM of Corman Park put out a proposal call for multi-parcel residential projects. The Bernhard's responded with this proposal – if it were ultimately successful (subject to all technical requirements being fulfilled and Council approval), it would be rezoned by the RM. Rezoning allows for a greater density than 4 per quarter.
2. City water
3. The sewage treatment and disposal method will be determined by hydrogeological testing of existing ground water conditions. If Council allows the project to move further in the process, this would be decided during the next few months. The sewage treatment and disposal method is subject to provincial approval. I would guess that one possible option would be package treatment plants that discharge treated wastewater into the ground. They have multi-compartment tanks that treat the wastewater. Solids would be pumped out of the tanks once or twice a year.

Please let me know if you have any other questions.

Jim Walters, R.P.P., M.C.I.P.
Crosby Hanna & Associates
Phone: 306.665.3441
Fax: 306.652.9613
Email: jwalters@crosbyhanna.ca

From: Jan Burmeister [mailto:jan.burmeister@sasktel.net]
Sent: November-11-13 1:29 PM
To: Jim Walters
Subject: Questions regarding Berrnhard proposed subdivision

Good Morning:

I have received your write up in regards to the proposed Bernhard subdivision and have some questions.

1. With Corman Park allowing four homes per quarter, how are the Bernhards allowed 8 homes in what looks to be 10 acres.
2. Will these lots have wells, or strictly city water.
3. Will these lots have just sewage tanks, or will disposal fields be involved.

Thanks so much,

Mr. Jan Burmeister
Middleton Road
Grasswood, SK

City of
Saskatoon
Community Services
Department

222 3rd Avenue North Saskatoon Saskatchewan S7K 0J5
Phone (306) 975-3340 Fax (306) 975-3185

November 19, 2013

Jim Walters
Crosby Hanna & Associates
407 – 1st Avenue North
Saskatoon SK S7K 1X5

Dear Mr. Walters:

Re: SE 4-36-5 W3, Parcel B, Plan No. 75S00678 Ext. 0 (west of and adjacent to Clarence Avenue)
Proposed Multi-Parcel Country Residential Subdivision
Our File No.: PL 4240-22

Thank you for referring this multi-parcel country residential subdivision proposal to us for comments.

We do not have concerns with the subdivision proposal at this time. The proposed development is not within a future growth area of the City of Saskatoon, and the land is designated as "Future Residential" on the Future Land Use Map that is part of the Official Community Plan for the Corman Park-Saskatoon Planning District. We would like to review and comment on the details of the subdivision proposal, if it proceeds to the next review stage.

We note that the proposed development is located within the Study Area for the Saskatoon Region Growth and Development Plan (Plan). This Plan will address long-term urban and rural growth needs. The City of Saskatoon and its regional partners have begun discussions on this Plan, with the goal of completing it in the next 18 to 24 months.

If you have any questions, please feel free to contact me.

Yours truly,

Laura Hartney, MCIP, RPP, Future Growth Manager
Planning and Development Division (306-975-2288)

LH:ks

cc: Rebecca Row, Manager of Policy, Rural Municipality of Corman Park

Appendix "J"
Correspondence from Loraas Disposal

Maggie Schwab

From: Jan Magnuson <jan.magnuson@loraas.ca>
Sent: Thursday, July 17, 2014 11:13 AM
To: Maggie Schwab
Subject: SE 4 36 5 W3 Waste & Recycle Service
Attachments: Rural Acreage Service - Corman Park.docx

Good Afternoon,

Thank you for your interest in Loraas waste and recycle service.
We would be more than happy to service the area with both waste and recycle once the acreages and roads are finished.
Please find attached information on the services that are provided.

Any further questions please feel free in contacting us.

Thank you,

Jan Magnuson | Customer Care| Loraas Disposal
805 - 47th Street East | Saskatoon, SK | S7K 8G7 | P (306)242-2300 | F (306)242-4994

Disposal Recycle Loraas Organics Landfill

Loraas Disposal Services Ltd.

95 gallon Waste Cart

$ 21.00 per month plus Corman Park road levy, fuel surcharge & GST prepaid annual subscription, 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 includes service of one level full container of household recyclables on a bi-weekly basis, initial cart is provided by Loraas.

In 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. Please call with any questions you may have.

Sincerely,

Inside Sales Representative
insidesales@loraas.ca
Phone: 242-2300