Hydrogeological Assessment Report

Grimsby Anaerobic Digestion Site

Escarpment Renewables

January 24, 2022

→ The Power of Commitment

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Executive summary

This Hydrogeological Assessment Report has been prepared in accordance with Table 1 of Ontario Regulation 359/09. A summary of where information is contained in this report as it relates to these requirements is provided below.

Table E.1 Ontario Regulation 359/09 Compliance Summary

Requirements	Location in Report
Set out the following information in respect of the renewable energy project:	
i. Plans, specifications and descriptions of the geological and hydrogeological conditions of the land within 300 metres of any biomass storage areas, source separated organics storage areas, farm material storage areas, storage tanks and digester tanks.	Section 2
ii. An assessment of the suitability of the project location for the handling, storage and processing of biomass, taking into account,	
A. the design of the facility, including existing features and features that are proposed to be implemented to control the expected production of leachate,	Section 3.2
B. the ability to identify, through monitoring, any environmental effects that may result on ground water from leachate production, and	Section 4
C. the feasibility of contingency plans that could be implemented to control leachate produced in a quantity greater than expected or with a quality worse than expected.	Section 4

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1. Introduction

1.1 Purpose

This Hydrogeological Assessment Report has been prepared as a partial fulfillment of the Renewable Energy Approval (REA) requirements as set out in Ontario Regulation (O.Reg.) 359/09 and 521/10. The Site is an anaerobic digestion (AD) facility that currently operates under REA No. 8541-9HSGG3, as amended. The project has received a Feed-In Tarrif (FIT) Contract No. F-000610-BIG-130-302.

1.2 Project Location

The project construction will occur on lands owned by Escarpment Renewables at 424 Sobie Road in the Town of Grimsby, Ontario (Site). The project will be located on the northwestern 5.4 hectares (ha) of a 10.5-ha property located on the south side of Sobie Road approximately 300 metres (m) east of Park Road South. The legal description of the property is part of Lots 1 and 2, Concession 6, Former Township of North Grimsby being Part 1 on Plan 30R-13677.

The Site location is shown on Figure 1.

1.3 The Project

The project will include expansion to the existing Site. The AD facility processes source-separated organics (SSO) and industrial, commercial, institutional (ICI) organic materials. The AD facility is currently operating at a maximum of 23,000 tonnes per year of incoming organic waste and will be upgraded to accommodate a capacity of 159,000 tonnes per year. A new organics pre-processing building will be constructed with the necessary equipment to receive, temporarily store, and process solid organic material for digestion by removing inert contaminants such as plastic packaging. New digesters will be added to the existing AD facility and thereby a significant increase of biogas production is anticipated. Escarpment Renewables is proposing to build a new renewable natural as (RNG) upgrading system on Site to produce RNG from the additional biogas generated. The RNG will be compressed and temporarily stored in tube trailers adjacent to the RNG upgrading system for off-Site transportation. The proposed Site expansion is shown on Figures 2 and 3.

1.4 Hydrogeological Assessment

In order to proceed with the Site expansion, the REA requires a hydrogeological assessment be completed for the Site. As per Section 7 of Table 1 in O.Reg. 359/09, the hydrogeological assessment must be prepared to set out the following information with respect to the renewable energy project:

1. Plans, specifications, and description of geological and hydrogeological conditions of the land within 300 m of any biomass storage areas, source separated organics storage areas, farm material storage areas, storage tanks, and digester tanks
2. An assessment of the suitability of the project location for the handling, storage and processing of biomass, taking into account:
    a. the design of the facility, including existing features and features that are proposed to be implemented to control the expected production of leachate
    b. the ability to identify, through monitoring, any negative environmental effects that may result on ground water from leachate production
    c. the feasibility of contingency plans that could be implemented to control leachate produced in a quantity greater than expected or with a quality worse than expected

The purpose of this Hydrogeological Assessment Report is to provide information for the items above. It is intended to develop a clear conceptual model of the hydrogeology and the potential for risks to human health or ecological receptors from the proposed Site expansion and related future operations.

The following sections provide a detailed review of the Site conditions, both on a regional and site-specific context. The project location suitability will be evaluated to assess the location's suitability for the handling, storage, and processing of biomass. This Hydrogeological Assessment Report will be structured as follows:

– Section 2: Region and Site Setting
  - Providing information on the site location, regional and site-specific physiography, topography, Site drainage, nearby surface water features, regional and Site-specific geology, regional and Site-specific hydrogeology, existing monitoring infrastructure, and nearby groundwater use
– Section 3: Project Location Suitability
  - Providing information on the site conditions, facility design, and suitability for the facility expansion from a hydrogeological perspective
– Section 4: Potential Environmental Effects and Mitigation
  - Providing an evaluation of any potential negative environmental effects that may result on groundwater from leachate production, as a result of the facility expansion
  - Providing a monitoring plan and potential contingency plans to mitigate environmental effects
– Section 5: Conclusions

2. Regional and Site Setting

This report was prepared following a review of historical environmental studies completed on the Site by others. Additionally, public resources were reviewed, such as Ontario Geological Survey (OGS) and Ontario Ministry of the Environment, Conservation, and Parks (MECP) mapping, reports and databases, which provide descriptions of the regional geologic/hydrogeologic setting.

The regional and Site setting is described in the following sections.

2.1 Site Location

The Site is located in a rural area, with vacant land to the north, agricultural properties to the east, woodlot to the south, and a closed landfill to the west (referred to as the Park Road Landfill Site). There are residential properties approximately 300 m to the west, along Park Road South. Additionally, there are other residential properties more than 500 m away from the Site to the east and south.

The Park Road Landfill Site, neighbouring the Site to the west, accepted non-hazardous municipal solid waste (MSW) between 1956 and 1995. The Park Road Landfill Site has a leachate collection system. The landfill has the potential to contaminate groundwater in the area. This is further discussed in Section 2.5.

2.2 Physiography and Topography

The Site is located within the Till Plains and Haldimand Clay Plains physiographic regions (Chapman and Putnam, 1984[1]). The Site is approximately 3 kilometers (km) south of the Niagara Escarpment, located on the upper portion of the Niagara Escarpment.

[1] The Physiography of Southern Ontario, L.J. Chapman and D.F. Putnam, Ontario Geological Survey,1984

The regional topography in the area of the Site is relatively flat, with the exception of the Niagara Escarpment. Topography on the upper portion of the Niagara Escarpment around the Site ranges between approximately 190 mAMSL to 200 mAMSL. The Park Road Landfill Site represents a local topographic high, with an elevation approximately 8 m above the direct surrounding lands.

2.3 Site Drainage and Surface Water Features

The Site is located within the Jordan Harbour – Twenty Mile Creek watershed (Ontario Ministry of Natural Resources and Forestry, 2020[2]). An unnamed drainage swale is located along the western property boundary. This unnamed drainage swale drains south towards Spring Creek, approximately 500 m south of the Site. Spring Creek flows easterly and eventually joins with Twenty Mile Creek, which drains to Lake Ontario through Jordan Harbour.

There are no natural surface water features on Site and the Site is not located within a flood plain.

Site drainage and stormwater runoff is controlled via perimeter swales along the perimeter access road. The AD equipment is contained within the interior of the perimeter access road. The perimeter swales convey runoff from the access road to the existing stormwater ponds along the south of the Site. Discharge from the stormwater ponds is conveyed west to the existing unnamed drainage swale and then south toward Spring Creek approximately 500 m south.

2.4 Geology

The surficial geology in the regional area is comprised of fine-textured glaciolacustrine deposits, consisting of silt and clay and minor sand and gravel (Ontario Geologic Survey, 2003[3]). Bedrock of the Lockport Formation underlies the Site, consisting of shale, dolomitic limestone, and limestone. Drift thickness in the regional area is generally less than 8 m (Ontario Geological Survey, 2006[4]).

Boreholes drilled on the Site (by others) indicated the overburden material consisted of varved silty clay (Landtek, 2014[5]; Story Environmental, 2019[6]). The silty clay was reported to become fractured and fissured with depth. A thin layer of till was encountered at the overburden-bedrock interface. A cross section from a previous study showing the geology at the Site is provided in Appendix A (Landtek, 2014). Note that the wells shown on the cross section in Appendix A have since been decommissioned.

Bedrock underlying the Site consists of dolomitic limestone. Drilling activities completed for previous studies encountered the top of bedrock at approximately 8.5 to 11.5 m below ground surface (mbgs), or at an elevation of approximately 179.7 to 181.9 m above mean sea level (AMSL). According to previous studies, there is a bedrock ridge located approximately 850 m to the south of Site, where bedrock was encountered at approximately 3 mbgs (Landtek, 2010[7]).

2.5 Hydrogeology

The regional and local hydrostratigraphy and groundwater quality is described in the following sections.

2.5.1 Hydrostratigraphy and Groundwater Flow

The hydrostratigraphy on the Site consists of an overburden aquitard and a confined bedrock aquifer.

[2] Ontario Watershed Boundaries Map, Ontario Ministry of Natural Resources and Forestry, March 31, 2020
[3] Surficial Geology of Southern Ontario, Ontario Geological Survey, 2003
[4] Drift Thickness Map, Ontario Geological Survey, 2006
[5] Hydrogeologic Investigation, 442 Sobie Road, Grimsby, Ontario, prepared for Grimsby Energy Inc, prepared by Landtek Limited, dated July 7, 2014
[6] Groundwater Site Investigation – Grimsby Anaerobic Digester, prepared for Miller Waste Systems Inc., prepared by Story Environmental Inc., dated October 2019
[7] Geotechnical Investigation, Proposed 1 MW Bioreactor Project, 442 Sobie Road, Town of Grimsby, prepared by Landtek Limited, dated November 24, 2010

The silty clay of the Haldimand Clay Plains underlying the Site acts as an aquitard overlying bedrock. An unconfined water table is found in the overburden aquitard, at approximately 2 to 3 mbgs on Site (Landtek, 2014). Hydraulic testing conducted on Site indicated the hydraulic conductivities of the silty clay ranged from $1.6x10^{-5}$ cm/s to $7.2x10^{-8}$ cm/s, that is indicative of an aquitard. Groundwater movement within the overburden aquitard is expected to be slow due to the low permeability of the silty clay. It is interpreted that surface water infiltration on Site will be limited due to the presence of the overburden aquitard below ground surface.

Note that leachate mounding within the neighbouring Park Road Landfill Site may potentially influence groundwater flow within the overburden aquitard. However, due to the low permeability of the silty clay and the operation of a leachate collection system at the Park Road Landfill Site, it is expected that leachate and/or groundwater movement from the Park Road Landfill to the Site would be minimal. This would have to be evaluated with a more expansive monitoring well network.

The dolomitic limestone underlying the Site is part of a confined bedrock aquifer, which is a regionally extensive aquifer. The limestone bedrock aquifer is reported to be approximately 10 to 20 m thick and is commonly used for potable water supply in the area. The Site was identified as an area of high aquifer vulnerability as per the Niagara Peninsula Conservation Authority Source Protection and Aquifer Vulnerability mapping (Landtek, 2014). This was reported by Landtek to be potentially due to the shallow depth of bedrock acting as a recharge for the bedrock aquifer to the south of the Site. On Site, the bedrock aquifer is protected from surficial sources of impact due to the presence of the overburden aquitard.

Generally, regional flow within the bedrock aquifer is towards the Niagara Escarpment to the north - northeast of the Site. During the Groundwater Site Investigation completed by Story Environmental (Story Environmental, 2019), the potentiometric surface within the bedrock aquifer on Site ranged from approximately 189.22 to 189.23 mAMSL. However, note that water levels may not have completely stabilized during this study. During this investigation, the hydraulic gradient within the bedrock aquifer was relatively flat on Site, although appeared to flow towards the northeast. Groundwater elevations measured during previous studies indicated the bedrock aquifer was confined (Story Environmental, 2019; Landtek, 2014). An upward gradient between bedrock and overburden was measured at nested wells on Site by Landtek.

2.5.2 Groundwater Quality

Wells on Site were sampled as part of previous studies completed by others. Groundwater samples were collected for inorganic parameters and select metals during the Environmental Investigation completed by Associated Brownfields Services Ltd. (Associated Brownfields Services Ltd., 2011[8]). The investigation by Associated Brownfields was completed prior to Site development as an AD Facility. Additionally, groundwater samples were collected from different wells for inorganic parameters, dissolved metals, petroleum hydrocarbons, and volatile organic compounds (VOCs) during the Groundwater Site Investigation completed by Story Environmental (Story Environmental, 2019). The investigation by Story Environmental was completed while the Site was operating as an AD facility.

Based on a review of the analytical results from these previous studies, groundwater chemistry on Site appears to have elevated concentrations of sulphates, total dissolved solids (TDS), strontium, chloride, and sodium. Additionally, low concentrations of VOCs were detected, including methylene chloride and toluene. Elevated concentrations of chloride, sulphates, and TDS, and low concentrations of VOCs may be indicative of impact from typical MSW landfill leachate, although note there is no recent leachate data available for review from the Park Road Landfill Site. The operational performance of the leachate collection system at the Park Road Landfill is unknown. There is the potential that leachate impacted groundwater may be migrating on Site, although this would not impact Site operations or the suitability for the facility expansion.

Concentrations of nitrates, biological oxygen demand (BOD), ammonia, and alkalinity were low. Elevated concentrations of nutrients would be expected if there was impact to groundwater from digestate or AD operations. It is not suspected that AD operations at the Site are impacting the groundwater quality, based on the historical

[8] Environmental Investigation, 442 Sobie Road, Grimsby, Ontario, prepared for Grimsby Energy Inc., prepared by Associated Brownfields Services Ltd., dated June 6, 2011.

groundwater quality results reviewed. However, there is not an unimpacted background well in the area to use to compare concentrations. Generally, groundwater quality showed comparable concentrations before and after Site development as an AD Facility, which supports the interpretation that AD operations do not appear to be impacting the groundwater.

2.5.3 Existing Groundwater Monitoring Infrastructure

As described above, wells were installed on Site as part of previous studies. Wells installed by Associated Brownfields in 2011 and Landtek Limited in 2014 have been decommissioned with Site development. Note that the wells shown on the cross section in Appendix A have been decommissioned.

Wells installed as part of the groundwater site investigation completed by Story Environmental in 2019 are reported to remain on Site. As part of this investigation, wells were installed to investigate the potential for groundwater contamination from the nearby Park Road Landfill Site and the digesters on Site. Eleven wells were installed at seven locations, with four locations being installed as nest wells. Figure 2 shows the locations of existing wells on Site. The table below describes the location and screen bottom depth of the existing wells on Site (Story Environmental, 2019).

Table 2.1 Details of Existing Monitoring Wells

Well ID	Relative Location on Site	Geological Unit	Screen Depth (mbgs)
MW1D	Northern portion of Site, east of Site entrance	Bedrock	15.29
MW1S		Overburden	8.39
MW2	Northwest corner	Overburden	7.47
MW3D	Western portion of Site, west of existing solid storage bunkers	Bedrock	13.23
MW3S		Overburden	7.47
MW4	Southern portion of Site, near the stormwater management ponds	Overburden	5.34
MW5D	Southeastern portion of Site, near the stormwater management ponds	Bedrock	12.21
MW5S		Overburden	5.34
MW6	Eastern portion of Site	Overburden	8.31
MW7D	Central area of Site, near existing storage tanks	Overburden	7.98
MW7S		Fill	4.88

The current monitoring well network was distributed around the current Site operations, with wells installed along the Site boundary and near specific infrastructure, such as the solids storage bunkers, the storage tanks, and the stormwater management ponds. Note that there is no background or upgradient well within the well network. Additionally, there are no off-Site wells within the well network to provide a more comprehensive understanding of hydrogeology on and around the Site.

Three wells (MW1D, MW3D, and MW5D) were installed in bedrock to evaluate groundwater quality within the confined aquifer. As described in Section 2.5.1, the horizontal hydraulic gradient within the bedrock aquifer was relatively flat but appeared to flow towards the northeast. Given this, well MW1D could be considered to be cross-gradient or downgradient of the Site.

2.5.4 Groundwater Use

Based on a review of the MECP well record database, there are potential domestic groundwater users near the Site. The confined bedrock aquifer is used as a source of potable water in the area (Story Environmental, 2019). There are no known municipal supply wells within 300 m of the Site.

Domestic groundwater wells exist at the residential properties near the intersection of Park Road South and Sobie Road to the west of Site, and near the intersection of Park Road South and Mud Street to the south of Site.

A door-to-door survey of groundwater users was completed by Landtek in 2014 to confirm the water well locations near the Site (Landtek, 2014). Four properties were identified to be within 300 m of the Site and these properties were included in the survey. The survey indicated that one property used groundwater for agricultural purposes, although the groundwater was reported to be cloudy. One property no longer used their well. Two of the four properties did not respond and therefore they could potentially use groundwater as their primary potable water source. For the purposes of this report, it has been assumed that the groundwater is being used as potable water as a conservative approach.

3. Project Location Suitability

An assessment of the suitability of the proposed facility design for handling, storage, and processing of organic waste is provided in the following sections.

3.1 Facility Design

Figure 2 shows the existing site layout. The Proposed Site Layout for the project is depicted on Figure 3. The conceptual Organics Pre-Processing Building layout is shown in Figure 4.

The Site consists of an organics processing facility, which will be capable of receiving and processing up to 159,000 tonnes of organic waste per year by AD. The existing solids storage bunkers will be decommissioned. A new organics pre-processing building will be constructed with all the necessary equipment to receive, temporarily store, and process solid organic material for digestion. Liquid receiving tanks are located near the existing pump and pasteurization building and will continue to receive liquid organic material for processing. The AD facility, which is currently operational, will be expanded with additional digester tanks and additional pre-processing equipment. Digestate management currently consists of two storage tanks which will remain. Two additional digestate storage tanks will be constructed. The new above grade tanks will be located in a new secondary containment system designed in accordance with the Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities. The secondary containment system provides capacity to collect and contain spills from the digestate storage tanks to prevent discharge to the environment.

The existing biogas management area consists of a combined heat and power (CHP) engine, flare, and biogas storage area. The Site will continue to utilize biogas in the existing CHP. The existing temporary biogas storage will be decommissioned in favour of storing biogas in double membrane roof systems on the new digestate storage tanks.

Biogas will also be upgraded to RNG for temporary storage on Site in tube trailers prior to transportation off Site. The existing administration buildings, which consist of an office and staff building will remain but be relocated. Air treatment will be managed by a new air treatment system, managing potentially odour-impacted air generated within the organics pre-processing building. There are also two stormwater management ponds located at the south end of the Site, which will be unchanged. The Site access consists of a gravel road which will be realigned to make space for additional tanks and equipment.

The REA requires stormwater management in the form of a sediment basin with a total capacity of 675 cubic metres (m^3). The two existing ponds, includes a west pond and an east pond that are interconnected by a series of culverts between them. The east pond drains into the west pond. The estimated total volume of the two ponds is approximately 3,000 m^3.

The ponds currently receive runoff from the perimeter ditch and the central area around the existing digesters, servicing the currently developed portion of the property (approximately 4.8 ha). The discharge from the west pond is directed along a swale running to the southwest corner of the Site and discharging to existing drainage features consistent with the historical use of the property as an agricultural field.

A secondary containment system will be constructed for the new above-grade tanks, with a total area of approximately 0.8 ha. This area will contain stormwater, which will either be used in the anaerobic digestion process, or manually pumped to the head of the east stormwater management pond if not needed and deemed to not be impacted by Site operations. This pumping will be done during periods where the stormwater ponds have capacity to manage the volume of water to be pumped. Therefore, the total area that the stormwater ponds will be servicing post-expansion is approximately 4.6 ha, which is less than the current conditions (approximately 4.8 ha). Given the reduction in direct-flow service area and the fact that the existing ponds are larger than that required by the current REA, no changes are proposed to the stormwater management ponds.

Silt fencing is installed and will be maintained along the western property line a minimum 3 m from the edge of an existing drainage area to prevent migration of sediment during construction of the Site. The existing drainage is vegetated, and any vegetation removed as part of the construction will be restored following construction and prior to any silt fence being removed. The stormwater management ponds collect runoff from the Site and provide sedimentation. A silt sock exists in the effluent ditch from the existing stormwater management ponds to further protect the downstream receiving environment from potential sediment migration from the stormwater management ponds.

3.2 Suitability

The following evaluates the suitability of the Site for the proposed expanded operations, considering the proposed expanded facility design from the perspective of its potential to impact groundwater quality.

Site Setting

The Site is located in a rural area of the Town of Grimsby. The Park Road Landfill Site is a neighbouring property to the Site. The Site topography is relatively flat and there are no major hills or valleys present on Site. No major surface water bodies exist on the Site. The Site setting is considered suitable for an expansion to Site operations.

Geological and Hydrogeological Setting

The Site is underlain with a low permeability silty clay, which acts as an overburden aquitard. It is interpreted that surface water infiltration on Site will be limited due to the presence of the overburden aquitard below ground surface. The silty clay aquitard will provide a suitable hydraulic barrier from the Site activities at surface by restricting downward and lateral migration of potential contaminants. In addition, horizontal and vertical groundwater movement within the overburden aquitard is expected to be very slow. The presence of the overburden aquitard is advantageous for Site operations as not only will it provide a suitable barrier against downward migration, but it will also provide the opportunity for substantial advance warning of impact to groundwater prior to reaching the underlying bedrock aquifer.

The bedrock aquifer is located under the overburden aquitard, encountered at approximately 8.5 to 11.5 mbgs on Site. This aquifer is used as a potable groundwater source in the area. The bedrock aquifer is confined by the overlying overburden aquitard, and an upward gradient is present between the overburden and bedrock aquifer. This indicates that the bedrock aquifer is not likely recharged by the overburden aquitard on the Site. These conditions are favourable to protect the potable groundwater resource from Site operations.

The geological and hydrogeological setting is considered suitable for an expansion to Site operations.

Waste Management Practices and Facility Design

Incoming waste will be received in the form of bulk solid, non-hazardous organic waste and liquid organic waste. Liquid organic waste will be directly unloaded into the existing liquid receiving tanks and solid organic waste will be received within the new organics pre-processing building. All digestate will be stored in digestate storage tanks. For the expansion, it has been proposed that no waste is stored outside or exposed to the atmosphere. The storage of waste indoors will reduce the potential for leachate generation. Of the minimal leachate that is generated, leachate from digestate and liquid waste will be contained within the tanks. Leachate from solid waste will be contained within the organics pre-processing building.

Additionally, the facility has been designed with the storage tanks located within a secondary containment system constructed of compacted clay. As shown on Figure 3, the proposed secondary containment system will be constructed around above-grade digesters and digestate/biogas storage tanks. It will contain any potential spills from the digesters and storage tanks and stormwater generated in the area.

Minimizing the generation of leachate and the containment of leachate within engineered controls reduces the potential for exposure of surface water and groundwater to leachate. The design of the proposed facility considers contingency measures to contain leachate in the event of a spill through the implementation of a secondary containment system. Therefore, the waste management practices and facility design proposed for the Site are suitable for the protection of groundwater.

4. Potential Environmental Effects and Mitigation

Existing groundwater monitoring requirements as per Item 58 of existing REA No. 8541-9HSGG3 specify that groundwater level monitoring program be implemented at the Site, as outlined in Hydrogeological Report prepared by Landtek Limited Consulting Engineers dated July 7, 2014. The recommendation from Landtek refers to completing groundwater level monitoring in the spring and summer, with the intention to confirm groundwater levels and potential seasonal groundwater level fluctuations. This condition will continue to be complied with during the expansion. Note that the wells installed by Landtek in 2014 have since been decommissioned. However, groundwater levels can be collected from the existing wells on Site (as detailed in Section 2.5.3).

Leachate generation will be minimized at the Site since no waste is stored in an area where it can contact precipitation. The potential negative environmental effects on groundwater are limited to surface water infiltration from contaminated runoff or a spill. The secondary containment system will be constructed around above-grade digesters and storage tanks, which. This secondary containment system is considered a contingency measure that will be implemented at the facility to minimize the potential impact to groundwater resources from a spill. Additionally, waste will be stored indoors, which overall reduces leachate generation and the potential for infiltration from contaminated runoff.

It is expected that the facility design, environmental control systems, and Site setting will reduce potential negative environmental effects to groundwater resources. However, in order to confirm no adverse effect are occurring due to Site operations, it is recommended that the existing groundwater wells are sampled semi-annually concurrent with the groundwater level monitoring events. Groundwater samples should be analyzed for pH, TDS, nitrate, nitrite, BOD, ammonia, phosphorus, chloride, sodium, iron, manganese, and sulphate. It is recommended groundwater sampling be conducted for four years, followed by a reevaluation of whether sampling should continue. The sampling results should be interpreted considering the Site's proximity to the Park Road Landfill Site.

Note that with the facility expansion some of the existing monitoring wells may be required to be decommissioned. The monitoring well network should be re-evaluated in context of the expansion to determine if wells need to be decommissioned and replaced, or if supplementary wells should be added to the monitoring well network.

5. Summary and Recommendations

5.1 Summary

The following summarizes the results of the hydrogeological assessment:

1. The Site geology is comprised of silty clay overburden underlain by dolomitic limestone bedrock.
2. The silty clay overburden acts as an aquitard. Groundwater movement is slow within the overburden aquitard due to the low permeability of the silty clay.
3. The dolomitic limestone is part of a confined bedrock aquifer, which is approximately 10 to 20 m thick and is a source of potable water in the area, including within 300 m of the Site. Regional groundwater flow within the bedrock aquifer is to the north – northeast towards the Niagara Escarpment.
4. The available groundwater quality data for the Site shows comparable concentrations before and after Site development as an AD facility. The adjacent Park Road Landfill Site has the potential to impact groundwater quality on Site. The available historical groundwater quality data does not indicate that the Site operations had impacted groundwater quality on Site at the time of monitoring.
5. The expansion of the facility has been designed with considerations for mitigating potential impacts to groundwater, including by processing waste indoors to minimize leachate generation and by constructing secondary containment areas surrounding the new above-grade storage tanks. The proposed waste management practices and facility design are considered suitable for Site operations.
6. The site setting is considered suitable for Site operations due to its setting in a rural area with flat topography and away from major surface water bodies.
7. The geological and hydrogeological setting is considered suitable for Site operations due to the low permeability overburden aquitard acting as a hydraulic barrier to restrict downward and lateral migration of potential contamination.

5.2 Recommendations

1. It is recommended the condition in existing REA No. 8541-9KSGG3 to collect groundwater levels from wells is continued throughout the expansion. Groundwater levels are to be collected in spring and summer.
2. To confirm no adverse effects are occurring due to Site conditions, it is recommended the existing groundwater wells are sampled semi-annually during the collection of groundwater levels. Groundwater samples should be analyzed for pH, TDS, nitrate, nitrite, BOD, ammonia, phosphorus, chloride, sodium, iron, manganese, and sulphate. It is recommended groundwater sampling be conducted for four years, followed by a reevaluation of whether sampling should continue.
3. The monitoring well network should be re-evaluated in context of the expansion to determine if wells need to be decommissioned and replaced, or if supplementary wells should be added to the monitoring well network.

6. References

Associated Brownfields Services Ltd., Environmental Investigation, 442 Sobie Road, Grimsby, Ontario, prepared for Grimsby Energy Inc., dated June 6, 2011.

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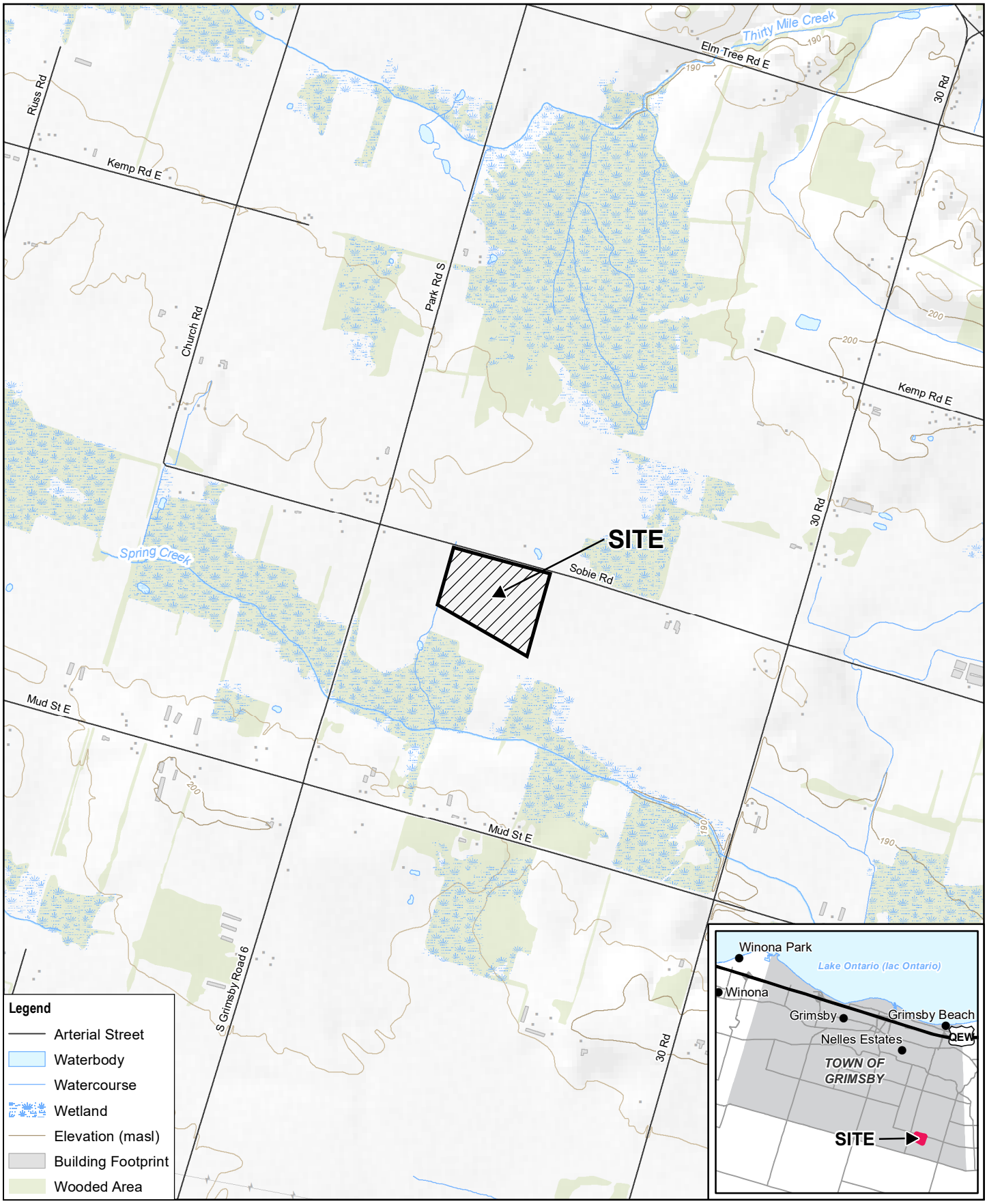
Landtek Limited, Hydrogeologic Investigation, 442 Sobie Road, Grimsby, Ontario, prepared for Grimsby Energy Inc, dated July 7, 2014

Ontario Geological Survey, Surficial Geology of Southern Ontario, 2003

Ontario Geological Survey, Drift Thickness Map, 2006

Ontario Ministry of Natural Resources and Forestry, Ontario Watershed Boundaries Map, March 31, 2020

Story Environmental Inc., Groundwater Site Investigation – Grimsby Anaerobic Digester, prepared for Miller Waste Systems Inc., dated October 201



Paper Size ANSI B

0 200 400 600 800

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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ESCARPMENT RENEWABLES
442 SOBIE ROAD, TOWN OF GRIMSBY, ONTARIO

Project No. **11226032**
Date **Jun 9, 2021**

SITE LOCATION MAP

FIGURE 1

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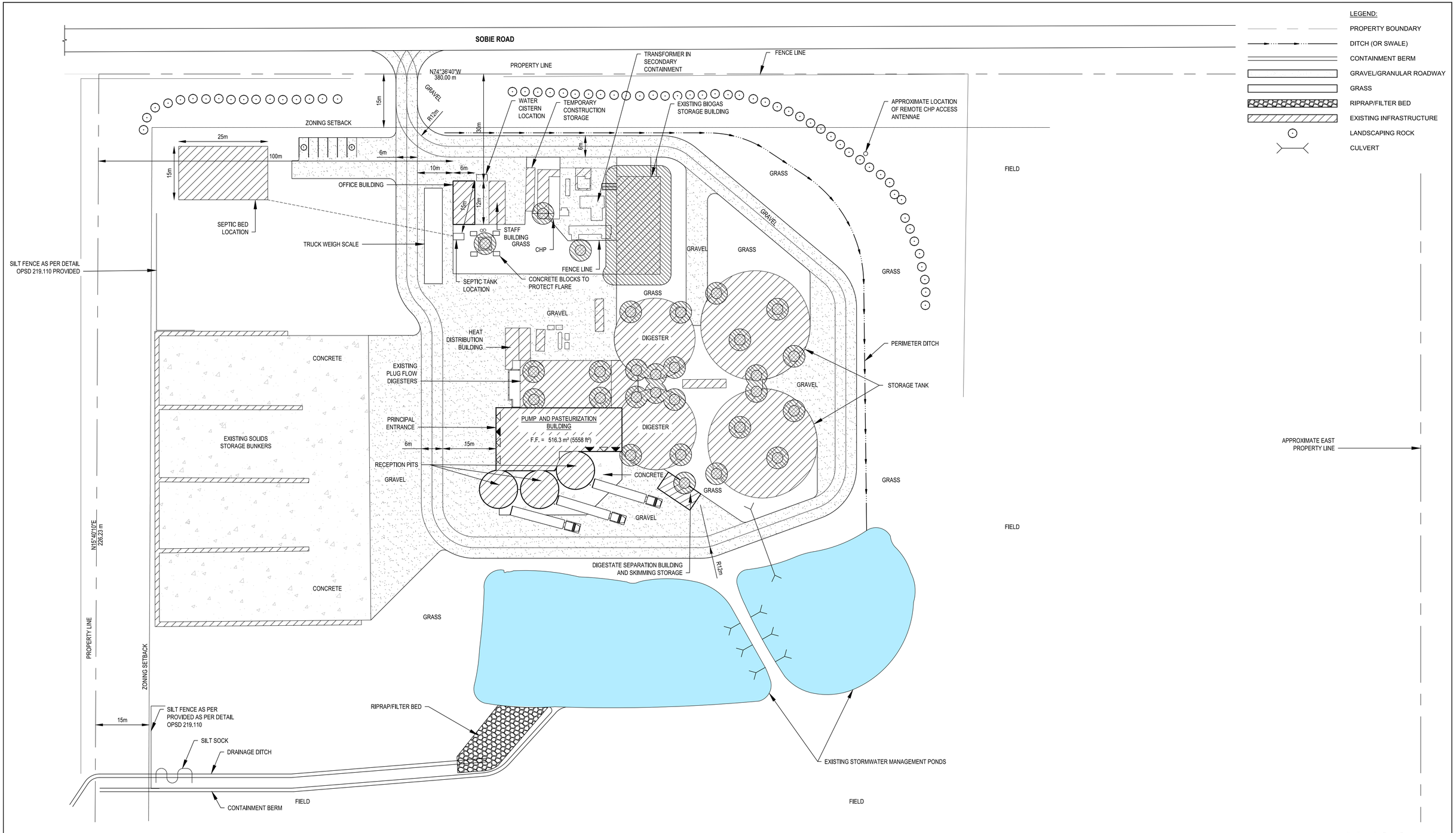

PRELIMINARY

No.	Issue	Checked	Approved	Date
				2022-01-17

Author	**SPENCER H**	Drafting Check	**KALJINDER D**	Project Manager	**JASON W**
Designer	**JASON W**	Design Check	**RYAN L**	Project Director	**VICTORIA S**

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Client **ESCARPMENT RENEWABLES**

Project **ESCARPMENT RENEWABLE ENERGY APPROVAL AMENDMENT**

Title **EXISTING CONDITIONS**

Size **ANSI D**

Project No.	Date	Scale
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Sheet No. **FIGURE 2**

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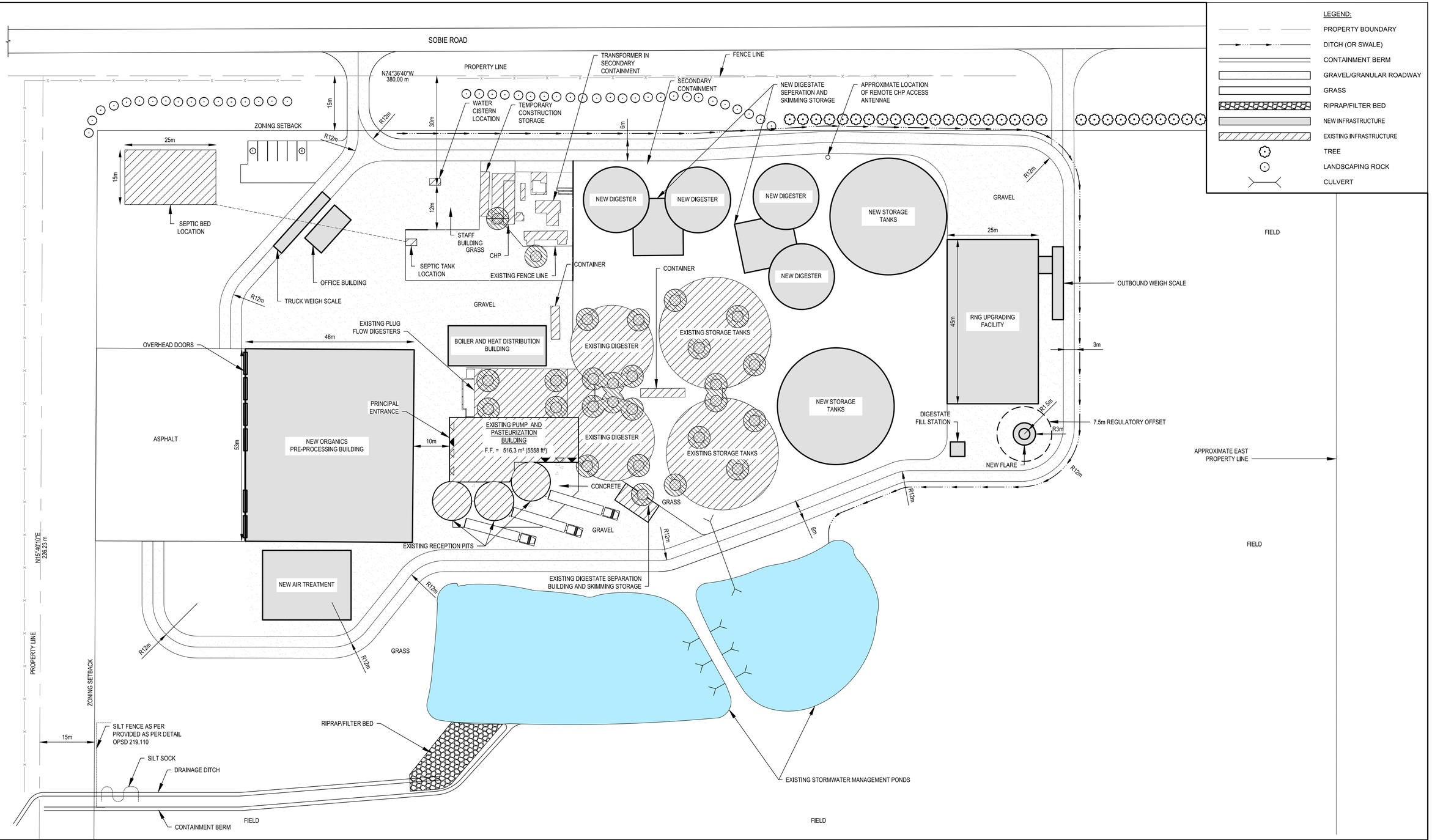

PRELIMINARY

No.	Issue	Checked	Approved	Date
				2022-01-17

Author	SPENCER H	Drafting Check	KALJINDER D	Project Manager	JASON W
Designer	JASON W	Design Check	RYAN L	Project Director	VICTORIA S

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Client: ESCARPMENT RENEWABLES

Project: ESCARPMENT RENEWABLE ENERGY APPROVAL AMENDMENT

Title: PROPOSED SITE LAYOUT

Size: ANSI D

Project No.	Date	Scale
11226032	2022-01-17	1:500

Sheet No.: FIGURE 3

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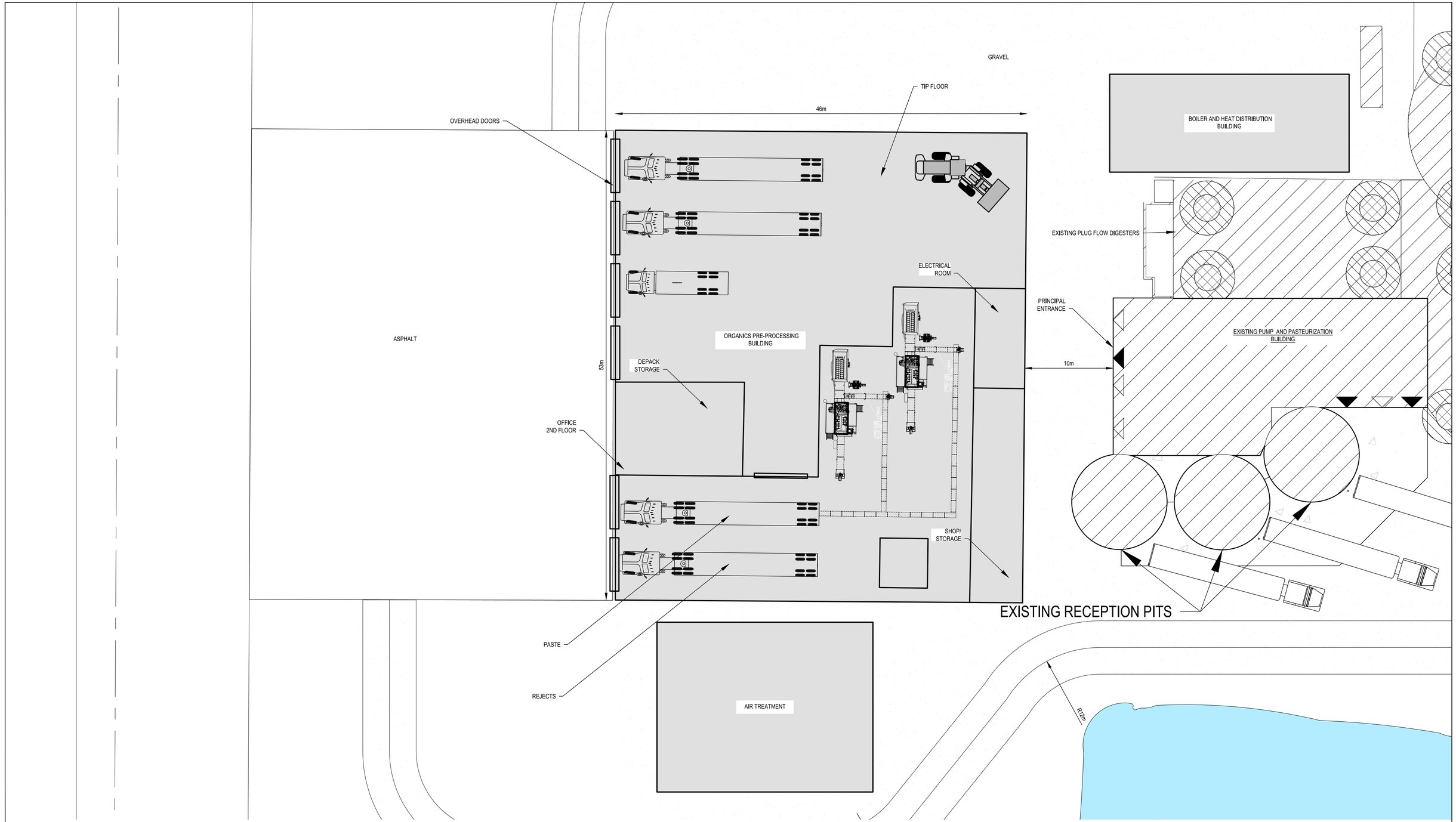

PRELIMINARY

No.	Issue		Checked	Approved	Date
					2022-01-17

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Designer	JASON W	Design Check	RYAN L	Project Director	VICTORIA S

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Client: **ESCARPMENT RENEWABLES**

Project: **ESCARPMENT RENEWABLE ENERGY APPROVAL AMENDMENT**

Title: **ORGANIC PRE-PROCESSING BUILDING LAYOUT**

Size: **ANSI D**

Project No.	Date	Scale
11226032	**2022-01-17**	**1:500**

Sheet No.: **FIGURE 4**

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Appendices

Appendix A

Reference Geological Cross Section

Key Plan - NTS

LEGEND

- Approximate Location of monitoring wells installed by Landtek Limited on June 9, 2014.
- Approximate location of boreholes drilled by Landtek Limited on Nov. 8, 2010.
- Cross Section
- TBM: Nail in hydro pole # 3021

NOTES

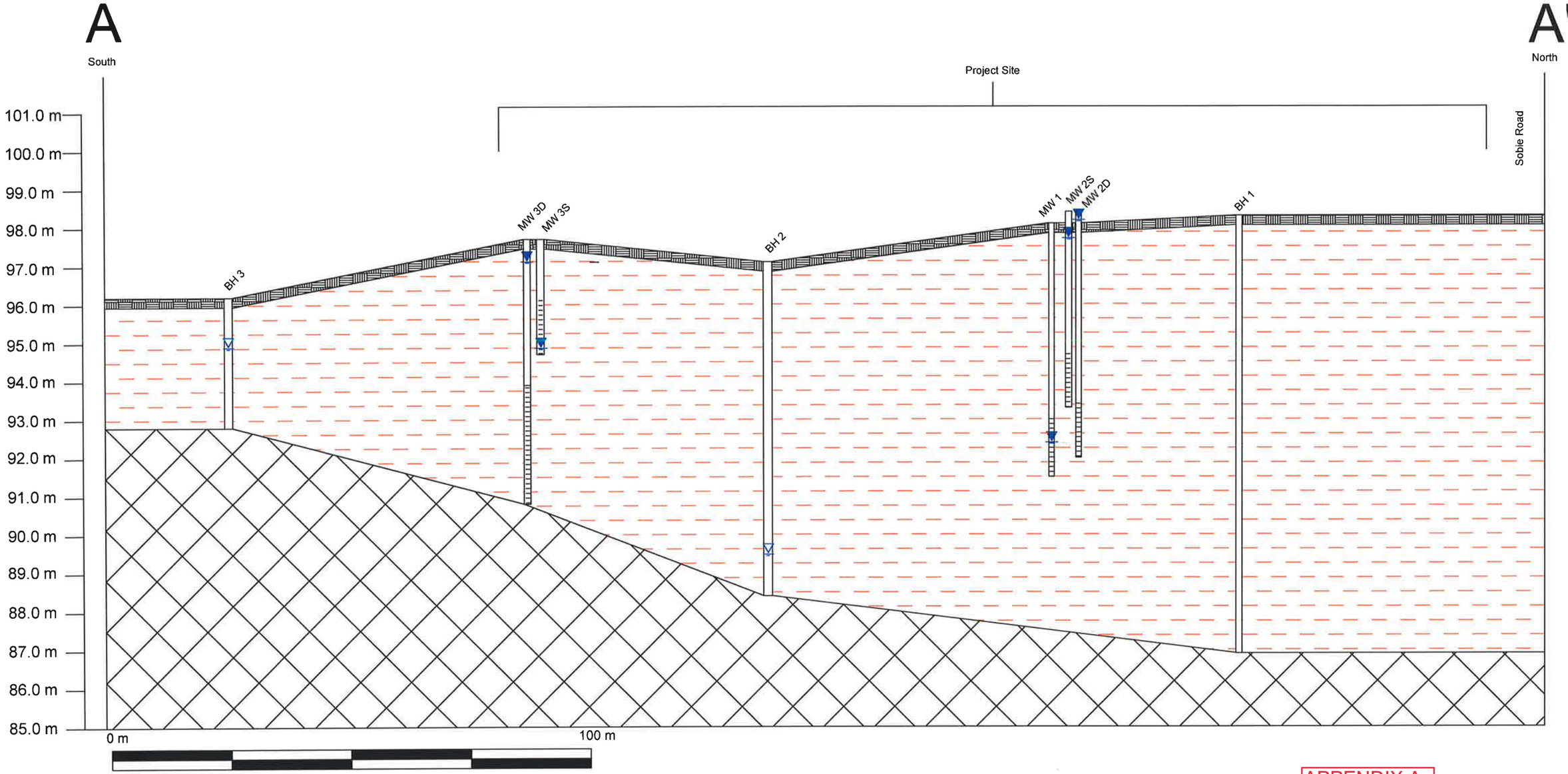
Reference: The Regional Muncipality of Niagara Interactive Mapping accessed June, 2014.

Note - Monitoring wells shown on figure were decommissioned

APPENDIX A

LANDTEK LIMITED
CONSULTING ENGINEERS
205 NEBO ROAD, HAMILTON, ONTARIO, L8W 2E1

DRAWING:	Monitoring Well Location Plan		
PROJECT:	Hydrogeological Investigation, Grimsby Energy Inc., 442 Sobie Road, Grimsby, Ontario		
SCALE:	NTS	**PROJECT NO.**	14152
DATE:	June, 2014	**FIGURE NO.**	2



APPENDIX A

LEGEND

- TOPSOIL
- SILTY CLAY
- BEDROCK
- Water Levels measured on June 23, 2014
- Water Levels measured on Nov. 18, 2010

NOTES

1. Water Levels measured by Landtek Limited on June 23, 2014
2. Stratigraphy between and beyond boreholes is inferred.
3. See Figure 2 for location of section A-A'

LANDTEK LIMITED
CONSULTING ENGINEERS
205 NEBO ROAD, HAMILTON, ONTARIO, L8W 2E1

DRAWING:	Cross Section A - A'		
PROJECT:	Hydrogeological Investigation, Grimsby Energy Inc., 442 Sobie Road, Grimsby, Ontario		
SCALE:	See DWG	**PROJECT NO.**	14152
DATE:	June, 2014	**FIGURE NO.**	3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