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Environment Act Proposal for Lakeside Colony New Domestic Wastewater Lagoon Situated at Lot 53 to 57 in the Rural Municipality of Cartier

Submitted to:

Director
Environment Approvals
Manitoba Conservation & Water Stewardship
Suite 160, 123 Main Street
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Executive Summary

The existing wastewater facility at Lakeside Colony dates back to 1945. Owing to current practices of use in those days, the facility was erected as a single cell storage/treatment facility for waste water. No engineering information is available for this facility. The Lakeside Colony recognizes the environmental risks associated with this facility, which was affected by recent floods. Soil investigations also revealed that the facility may not adequately protect groundwater resources.

The Lakeside Colony is currently home to 110 persons. As customary for Hutterite Brethren Colonies, the Colony is set to slowly expand in population up to approximately 150 peoples, at which point the Colony will undertake plans to establish a daughter colony to develop. Lakeside Colony is also operating a seasonal poultry slaughter and packing facility, which contributes to the wastewater treatment volume and load.

As typical for Colonies, Lakeside Colony owns vast stretches of land and holds agricultural land adjacent to the existing facility, where construction of a new wastewater treatment lagoon is ideal. Geotechnical investigations revealed that the soil at a location south and east of the Colony's premises is suited for the construction of a wastewater treatment lagoon comprising a compacted clay liner.

Owing to its location, the proposed site is ideal to mitigate any nuisance concerns to neighbours, and visitors of municipal Heritage Sites. No impacts to wildlife or fish are anticipated as a result of the proposed development. The site also affords protection against flooding. The new wastewater treatment lagoon will significantly improve Lakeside Colony's environmental performance.

Following issuance of an Environment Act Licence for construction and operation of the proposed wastewater treatment facility, Lakeside Colony will take steps to ensure that a certified operator will be available to operate the new wastewater treatment facility. Finally, the existing facility will be decommissioned.

1. Introduction

A review of the Manitoba Conservation records indicates that there is presently no licensed domestic wastewater disposal facility at Lakeside Holding Co. Ltd; this situation arose from the historical development of the Lakeside Holding Co. Ltd Colony, dating back to 1945. Under *The Environment Act, Classes of Development Regulation* MR164/88, all wastewater facilities fall under Class 2 developments, and can only be erected in compliance with the environment act licensing process as prescribed by the *Licensing Procedures Regulation* MR163/88, and be operated under the license requirements defined by Manitoba Conservation. Lakeside Holding Co. Ltd is anxious to rectify the historical issues regarding their wastewater treatment process and facilities, and submit a proposal under the aforementioned legislations to better serve the Colony and reduce its environmental impacts.

Traditionally, Hutterite Colonies range in size from 120 to 150 persons before a daughter colony is developed and the population decreases momentarily. At the present time, 110 persons are currently residing in Lakeside colony. The Colony also operates on a seasonal basis a small poultry slaughterhouse and packing facility primarily for the colony's own poultry consumption. Liquid waste from this facility is routed to the existing wastewater treatment facility, while segregated and screened solids are treated separately.

To assess the environmental performance of the existing facility, a borehole was sampled on the man-made banks of the facility revealing noticeable amounts of low plasticity soil (Appendix C). Soil similar to that encountered in borehole # 1 at 3.81 m from the top of its banks, which is representative of the clay till underlying the clay, would not be expected to achieve the minimum hydraulic conductivity of 1 $x10^{-7}$ cm/s. As the facility is a single cell storage pond, it does not provide adequate treatment capacity to properly stabilize the wastewater from the Colony. Moreover, the facility is somewhat undersized, and has been the object of overflow spills during the most recent flood events in the region. Given that the existing facility had not been properly designed nor engineered, and owing to deterioration of the facility over the years, Manitoba Conservation officials have determined that the construction of a new wastewater treatment lagoon was required. To facilitate the implementation of a new wastewater treatment lagoon, we propose that the existing facility will remain in operation, as this Environment Act Proposal is reviewed and up to the completion and commissioning of the anticipated new construction.

South-man Engineering has been retained to provide the design services for the proposed stabilization pond. The following information has been compiled to address the information requested by the *Licensing Procedures Regulation* MR163/88.

2. Land Ownership and Municipal Land-Use Designation

The proposed site of this domestic wastewater treatment lagoon is located approximately on River Lots 56 and 57 in St-François-Xavier Parish of the rural municipality of Cartier; this land is owned by Lakeside Holding Co. Ltd and it is situated in the immediate vicinity of the Colony's premises. A copy of the Certificate of Title for the land is included in Appendix A. The surrounding land area is currently designated as "Rural General Policy Area" as defined by the White Horse Plains Planning District Development Plan By-Law #1-2008 (Appendix B). To date, the Lakeside Holding Co. Ltd has used this land mainly for agricultural use, primarily for

the cultivation of cereal, grain and oilseeds crops. Policy 2.3.1 (9), in part 4 "Rural Policies Areas" of zoning By-Law #1-2008 of the Rural Municipality of Cartier, allows the development of wastewater treatment lagoons in the area, and lists the following conditions for development:

(9) New solid waste disposal sites and sewage lagoons shall comply with the following development criteria:
  (a) Sites shall comply with provincial environmental site and design standards.
  (b) Sites shall not adversely affect the recreational amenities of the area.
  (c) Sites shall not be located in close proximity to residential areas and other non-compatible uses.
  (d) Sites shall be designed and operated in such manner so as to ensure that waste is not scattered onto adjacent properties.
  (e) Development in the vicinity of sewage lagoons and solid waste disposal sites shall be restricted in order to minimize the potential adverse affects of such uses, subject to the White Horse Plains Planning District Zoning By-law.

This proposal was designed to meet each of these conditions.

There have been no previous studies or activities relating to this potential site development. As the surrounding property is primarily agricultural land mostly under the ownership of the Lakeside Holding Co. Ltd, there is little expectation that any significant residential development will occur in the area.

3. Site Conditions

Given the proposed location for the new domestic wastewater treatment lagoon, the historical experience with the undersized wastewater facility at the site, and characteristic at the site, little or no additional environmental impacts are foreseen with the new development. In our discussions with municipal officials, there was mention of odor complaints from neighbours located north of the Assiniboine River; however, we concluded that the origin of such occasional nuisance odours was the 580 animal units livestock operation located at the Lakeside Holding Co. Ltd, and perhaps emissions from other livestock operations near-by.

Sewage collection at the site consists of a pressure rated gravity system draining into a lift station; sewage will be pumped from the lift station to the proposed stabilization lagoon. The present proposal will make use of the existing collection system, by simply re-routing its end piping to a force main servicing the proposed wastewater treatment lagoon.

3.1 Location and Impacts to Neighbours and the Public

The siting of the proposed domestic stabilization lagoon (Appendix B) would provide a separation distance of approximately 460 m from the nearest neighboring

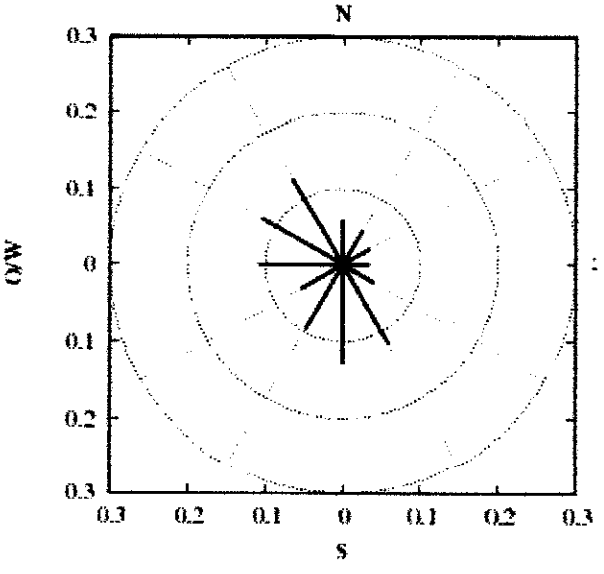


Figure 1. Frequency of prevalent winds near St-François Xavier, Mb. (source: Canadian Wind Energy Atlas -

residence, located south-east from the site, and about 230 m north-west of the nearest colony residence. This location would be most suitable as only about 10% of the prevailing winds in the area would blow over the proposed site for the domestic wastewater treatment lagoon and in the direction to the nearest neighbour. In general, winds originating from other cardinal points blow over farm fields, wetlands, and forested habitat, which will help absorb odor and airborne microbes. Consequently, the proposed site affords adequate separation for mitigating most if not all nuisance odour concerns for nearly all neighbors not associated with the Lakeside Holding Co. Ltd Colony. No municipal underground cable or pipes were detected in the vicinity of the chosen site during test hole drilling. The Colony sources their domestic water directly from a deep artesian well, which is far removed from any surface or base flow contamination.

Access to the proposed development site is possible via Trans-Canada highway (HWY #1,) westwards from Winnipeg, where it intersects PR (424), and 2.8 km northwards to the lagoon site. Little to no odour nuisance impacts to passerby's is expected.

Other sites were considered for the construction and operation of the domestic wastewater treatment lagoon. Among these, another potential site exists north of the colony. The soil properties in this site are very similar to the other site south of the colony. At this site, the separation distance to the Assiniboine River is approximately 130 m and 460 m to the nearest neighboring residence, and the site is generally much closer to the town of St-François-Xavier.

3.2 Groundwater and Surface Water Resources

The rural municipality of Cartier is geographically situated in the Red River Valley subsection of the Manitoba Plain (Agriculture and Agri-Food Canada, 1999). The area generally presents a natural drainage pattern towards the south and west away from the proposed site, although the topography at the site is rather flat (slopes of 2% or less). Surface soils are predominantly alluvial deposits and are dominantly comprised of clayey soils.

According to Manitoba Water Stewardship (2002), networks of man-made drains have been constructed to enhance and reduce the duration of surface ponding in the municipality. The low surface gradient (less than 0,01%) results in very slow surface drainage. Historical data collected between 2000 and 2013 for the area (The Weather Network, 2014) suggests that the area receives a mean annual precipitation of approximately 540 mm per year.

A municipal official provided information on a very rare flooding incident at the site, attributed to the constructed drain network. In addition, and according to colony residents, the 2011 flooding totally inundated the old lagoon site. The impact is still visible as indicated by lagoon contents washed away onto adjacent land by the flood. This event will be considered in the current design plan to avert a potential flood situation. Luckily the new site is situated on higher terrain, which was reportedly not affected by the 2011 flood. If necessary, the construction of drainage swales with a minimum 0.1% slope will suffice to prevent flooding adjacent to the structure.

It should be noted that Manitoba Water Stewardship (2002) indicates that the town of Portage La Prairie utilize the Assiniboine River surface water source for domestic purposes.

3.3 Soil Conditions

A geo-technical investigation was conducted by South-Man Engineering on March 26, 2012 to assess the soil characteristics for the proposed lagoon. Eight (8) test holes were drilled in the vicinity of the sites under consideration, to depths of up to 10 m (30 ft) to identify soil hydrogeological characteristics and to determine the most suitable lagoon location. Soil conditions were visually identified and representative samples were collected for laboratory analysis.

Soil conditions in the area consist of topsoil/organic material over medium-high plasticity clay underlain by clay till with silt and sand fractions. The depth of topsoil from the surface as determined from the on-site soil investigation varied from 0.15 to 0.2 m. Beneath the topsoil layer, lighter colored clay extended between 0.2 to 5 m of the soil profile. The darker clay till extended from the 5 m depth to at least 8 m, beyond which sand, gravel and groundwater table may be encountered. Details of all test-hole logs and soil test results are included in Appendix C.

Based on the particle size analysis and Atterberg Limits results determined on several samples of the clay from which the lagoon is to be constructed and underlying the proposed facility (Appendix C), the clay soil is classified as CH, high plastic clay, with a liquid limit between 67% and 85%, and a plasticity Index between 45% and 59%. Typically soils exhibiting these characteristics will yield a hydraulic conductivity less than of 1.0×10^{-7} cm/s when remolded and compacted to 95% of maximum dry density at plus or minus two percent of optimum moisture content.

Our findings are consistent with the report from Agriculture and Agri-Food Canada (1999), describing the soils in the RM of Cartier as "Black Chernozems and Humic Gleysols". Agricultural soil management considerations are primarily related to heavy clay texture and wetness.

4. Design Criteria for Proposed Wastewater Lagoon

The domestic wastewater treatment lagoon will service the waste water from the residential and meeting facilities at the Lakeside Holding Co. Ltd premises, as well as the waste water from a small scale poultry slaughter facility. For the purpose of estimating maximum required facility dimensions, calculations will account for a maximum population of 150 persons at the Colony. In addition, the wastewater from the poultry slaughter and packing facility will be accounted for; the Colony processes approximately 5100 broiler chicken, 4500 capon (egg laying hens) and 700 ducks annually.

4.1 Hydraulic Loading

Hydraulic Loading refers to the volume of raw sewage that will flow into the treatment lagoon per day. This volume is impacted by the number of residents the system is servicing, the amount of water use by each resident and the amount of subsurface infiltration into the

infrastructure. Based on historical data, and industry adopted production rates for this type of application, an estimated 250 liters per day is used as the "per capita" daily water consumption/waste water generation. Based on a population of 150 people the total flow will be 37,500 liters per day (37.5 m^3/day). The contribution from groundwater infiltration into the sewer system is considered negligible due to the absence of a high water table (over 8 m deep).

The existing slaughter house is used strictly for butchering and packaging whole poultry or ducks. The annual poultry processing is estimated at approximately 20 000 kg of live weight bird killed (LWK). The Colony slaughter facility management indicated that current practices include segregation of most of the blood and entrails, which are collected for treatment by windrow composting. Wastewaters are generated mainly for the plucking and washing of the carcasses, and cleaning the slaughterhouse after each kill batch. Colony officials estimated their water use to 1600 litres of wash water per tonne of live weight killed. This compares with 8 litres per bird, or approximately 3800 litres per tonne LWK (Verheijen, 1996) and 7560 litres per tonne LWK (USEPA 2004) for large commercial poultry processing plants. The difference likely arises from the fact that large commercial facilities include full processing of birds (into several consumer products) and their access to ample supply of water. This is in contrast with processing limited to only slaughter and packing of birds at the Colony, and the operation of a small facility supplied with well water, and a situation where most processes are mostly manual. The wastewater treatment lagoon design will therefore be based on a wastewater volume of 1.6 m^3/t LWK, amounting to 32 m^3/yr of wastewater from this facility.

It should be noted that the slaughtering facility is operated only on a seasonal basis, coinciding with the live poultry reaching target weights. Typically, the maximum number of birds processed per day is approximately 1700 birds. For the purpose of determining the daily hydraulic loading for the treatment facility, the annual production has been divided evenly into a daily value. The resulting daily hydraulic loading from the slaughter house is 88 litres/day (0.088 m^3/day):

$$20\ t\ LWK\ \times \frac{1.6\ m^3}{tonne\ LWK} = 32\ m^3/yr,$$

$$32\ m^3\ \div 365\ days = 0.088\ \frac{m^3}{day}$$

The total combined Hydraulic Loading for the domestic wastewater and the poultry slaughter facility is

Total Daily Hydraulic Load = 37.5 + 0.088 = 37.59 m^3/day

4.2 Organic Matter Loading

Design values for daily BOD_5 (5-day Biochemical Oxygen Demand) production are assumed to be 0.077 kg per capita per day. The total BOD_5 contribution to the stabilization pond will be 11.55 kg/day for a design population of 150 people.

BOD_5 from the poultry slaughter/packing facilities highly depends on the solids segregation strategies and can range from as little as 1.8 to 6.4 kg/ton LWK (Verheijen 1996) to 8.4 to 12.1 kg/ton LWK (USEPA 2004). Based on previous experience, the annual BOD_5 produced

during processing is estimated at 13 kg BOD_5 per tonne of live poultry weight. Reporting this organic load to a daily basis, the design daily BOD_5 from poultry processing becomes.

$$\frac{13\ {}^{kg\ BOD}/_{t} \times 20\ {}^{t}/_{yr}}{365\ {}^{days}/_{yr}} = 0.71\ {}^{kg\ BOD}/_{day}$$

Consequently, the average daily design value for the wastewater treatment lagoon becomes:

Combined organic (BOD_5) loading = 0.71 + 11.55 = **12.26 kg/day**

4.3 Other Factors Influencing Treated Effluent Quality

This wastewater treatment lagoon is also designed to mitigate any potential impacts with regards to seasonal discharge of the treated effluent into the Assiniboine River. Discharge will be synchronized with times of high flow rate of the River, and in accounting of seasonal wastewater treatment facility discharges from other sources in the rural municipality of Cartier; these operational measures will significantly dilute the effluent and achieve effective SAR levels in the river well below levels considered to be deleterious to waterways.

4.4 General Design Parameters

The effective design liquid depth for the wastewater treatment lagoon is 1.5 metres. A one meter (1 m) freeboard will also be provided to protect against catastrophic levels of precipitation and wave action. The interior slopes of the embankments will be constructed at 4:1. The exterior slopes of the embankments will be constructed at 5:1 in order to facilitate proper maintenance and grooming. The embankment top width will be 3.05 meters to permit access of maintenance equipment.

Due to the low hydraulic conductivity afforded by the high quality, high plastic clays encountered on site, it is recommended that the lagoon be constructed with a reconstructed 1.0m thick clay liner utilizing the in-situ material. The reconstructed clay liner is proposed as a means of ensuring that any potential preferential flow paths are eliminated, thereby minimizing seepage losses. Topsoil and any soil containing notable amounts of silt or sand shall only be used in constructing the outer embankments.

The first phase of construction will consist of removing all topsoil and organic matter from the entire foot print of the pond, including beneath the embankments. This material is to be stockpiled for future use in landscaping and final dressing of the embankments in order to promote the growth of grass. In addition to the removal of the topsoil a 0.3 m deep key is to be constructed beneath the embankments to provide additional lateral support. An average cut depth of approximately one meter will be carried out; owing to the natural slope of the site, the floor level on the east side of the secondary cell will be nearly at grade level. Prior to starting placement of material to construct the embankments the material in the key is to be scarified and compacted to 95% of maximum dry bulk density (MDD).

During construction of the embankments, the material is to be placed in 0.15-m lifts or less, and compacted using a sheepsfoot packer to achieve a minimum of 95% of the soil's MDD. To achieve the desired compaction rate, the moisture content of the clay material should be between 90 and 120 percent of optimum moisture as determined from the Standard Proctor moisture versus density relationship curve (Appendix C). The amount of compaction effort required to achieve the minimum 95% will be dependent on the moisture content of the material. In general, a minimum of 5 to 10 passes with a sheepsfoot packer over each lift will be required.

Construction of the bottom of the storage will consist of removing the clay material to 1.0 m below the design elevation of the facility and replacing and compacting this clay material in 0.15-m lifts to achieve a reconstructed clay liner. The purpose of this design element is to eliminate any potential fissures and preferential flow paths within the in-situ clay which in turn will ensure an effective hydraulic conductivity of $1 \cdot 10^{-7}$ cm/s is attained for a full 1-m thickness over the entire interior surface of the structure.

As a safety precaution, it is recommended that fencing and warning signs be installed around the pond to discourage the entry of livestock, wildlife and unaware trespassers. Gates sufficiently wide enough to permit the entry of mowing and maintenance equipment shall be provided and be locked when access is not required. Lift stations, valve access holes, pump out access ports shall be securely capped with a lock.

5. Wastewater Treatment Lagoon Sizing

The wastewater treatment lagoon is designed as a two-cell facultative anaerobic treatment lagoon. The design relies on seasonal discharge of the lagoon into the nearby Assiniboine River, usually in the spring and mid-fall.

5.1 Primary Cell

A conservative BOD_5 loading is proposed to minimize the potential for odour production during spring thaw and to limit the potential for offensive odour production throughout the year. Moreover, the proposed wastewater treatment lagoon will be relatively small, to the point of hindering the use of large earthmoving equipment during construction for the primary cell, and therefore unnecessarily increasing costs. A larger primary cell will also be more likely to minimize the occurrence of short circuited wastewater flow to the second cell. While design BOD_5 loadings of 56 kg/day/ha are commonly used to size the primary treatment cell, we have designed the primary cell with 42.25 kg BOD_5/day/ha to overcome construction issues and provide additional mitigation of odours as well as increasing treatment efficiency. Calculations for the primary cell treatment area are made for a depth of 0.75 m from the bottom of the primary cell, in other words at the liquid level coinciding with the middle of the treatment depth.

Primary cell design treatment area:

$$Treatment\ Area\ (ha) = \frac{Average\ Daily\ BOD_5\ Load}{Design\ Daily\ BOD_5\ Load/_{ha}} = \frac{12.26\ kg\ BOD_5/_{day}}{42.25\ kg\ BOD_5/_{day \cdot ha}} = \mathbf{0.2902\ ha}$$

The treatment volume is calculated to provide for this treatment area at a depth of 0.75 m, while the final volume of the primary cell also accounts for an additional 1.0 m of freeboard. While average annual precipitation for this area amounts to approximately 540 mm (The Weather Network, 2014), the annual evaporation values are as high as 820 mm in Southern Manitoba. Therefore, it is assumed that evaporation will at some point meet or exceed precipitation levels, thereby eliminating the need to provide additional storage capacity to manage excess precipitation; wetter than average years will be accommodated via the 1.0 m freeboard. The design volume for the primary cell amounts to **4385 m³**; construction drawings are shown in Appendix D.

5.2 Secondary Cell

Operation of the lagoon is based on discharging treated wastewater twice per year once the Colony reaches its maximum population, typically after mid-June and before November 1st of each year. It is customary to include 50% of the retention capacity of the primary cell into the total volume required for managing year round retention time of the wastewater, as typically only half of the treatment layer in the first cell is biologically active. Another criteria is to ensure that the secondary cell will be effectively sized to eliminate the unforeseen need of discharging treated effluent more than twice per year, or discharging in the period between November 1st and June 15th of the following year, thus the cell must afford at least 255 days of storage.

Given a volume for the primary cell of 4385 m³, the available retention time relative to the primary cell, for the purpose of a single discharge per year, is

$$Retention_{50\%\ Primay\ Cell} = \frac{50\ \%\ Volume\ of\ Primary\ Cell}{Daily\ Hydraulic\ Load} = \frac{0.5 \times 4385\ m^3}{37.59\ m^3/_{day}} = \mathbf{58\ days}$$

Secondary cell sizing for 255 days is therefore:

$$Volume_{2nd\ Cell} = Retention\ Time \times Hydraulic\ Loading$$

$$= 255\ days \times 37.59\ \frac{m^3}{day} = \mathbf{9585\ m^3}$$

After adjusting the dimensions of the secondary cell to facilitate earthwork, the secondary cell volume proposed amounted to **9521 m³**. The above retention volume for the secondary cell excludes 0.3 m "dead storage" below the discharge pipe. The footprint of the storage is such that the design storage capacity is achieved at a maximum liquid depth of 1.5 m. An additional 1.0 m freeboard is provided to avoid overtopping as a result of above average yearly precipitations as well as potential delays for discharge.

It should be noted that, currently, the Lakeside Colony population is 110 people. The intention of the Colony is to continue growing up to a maximum of 150 people, which is accounted for in the lagoon design. Once the Colony reaches this population level, the wastewater treatment facility will afford 311 days of storage retention. Up until such time that the Colony reaches 150 people and prepares to found a daughter Colony, the facility will provide enough storage capacity to allow a single discharge per year.

Design, construction and operation work of the facilities shall conform and be carried out in accordance with the Manitoba Workplace Safety and Health Regulation 217/2006. Hydrostatic test shall also be carried out on the influent piping.

6. Effluent Discharge

Shortly after obtaining the Environment Act Licence for the construction and operation of the proposed facility, one of the Colony staff will enroll into a wastewater facility operator certification program, with the objective of obtaining certification before or shortly after commissioning of the facility.

6.1 Method of Discharge

It is planned that treated effluent from the wastewater lagoon be discharged into the Assiniboine River via a new grassed swale. Since the secondary cell of wastewater treatment lagoon will be constructed partly above grade, the cleanout will be enabled by gravity flow from a conduit installed at 0.3 m from the second cell's floor. The effluent will flow in this drain to the east approximately 135 m before it reaches the Assiniboine River. The discharge will be full flow into the Assiniboine River, since there will be enough oxygenated water flow during the spring and again in mid-fall to significantly dilute the effluent and achieve an effective SAR level well below levels considered to be harmful to aquatic organisms. Installation of rip rap at the discharge of the swale will be required to prevent erosion of the embankments and disturbance of particulate matter or fish in the Assiniboine River.

According to municipal staff there are 11 Hutterite Brethren Colonies within the rural municipality of Cartier and potentially other premises that utilize connected municipal drains and the Assiniboine River as wastewater discharge ends. As a precautionary measure, it is proposed that discharge shall not be carried out simultaneously with that of neighboring facilities' to reduce net wastewater flow into the Assiniboine River at any one time.

To minimize the potential impact on the environment, Lakeside Colony is willing to participate in any watershed or nutrient reduction strategies symposia organized by Manitoba Conservation.

6.2 Discharge Procedure

As a prerequisite to the emptying of the secondary cell, the treated effluent must meet the minimum effluent standards. Consideration must be given to the time required for the final treatment in the secondary cell and the time required to perform the necessary testing in order

to meet a specific discharge period as may be specified in the Licence. Realistically, the final treatment and testing phase may take four weeks or more.

The following are general discharge procedure to be implemented:

1) Close the valve in the connecting piping between the primary and secondary cell a minimum of two weeks before collecting the effluent samples for laboratory analysis. This valve is to remain closed until discharge of the secondary cell is complete.

2) Collect sample from the secondary cell only and submit for analysis. Laboratory results can usually be expected in approximately two weeks.

3) If the results of the laboratory analysis meet the minimum effluent quality requirements, discharge of the secondary cell can proceed. If the results are not favorable, additional treatment will be required. In the event that the BOD_5 level exceeds the limit, additional time will be required to allow the contents of the secondary cell to further stabilize. Alternately, mechanical aeration can be provided to speed up the treatment process. If the coliform MPN exceeds the limit, dry chlorine may be spread over the surface of the secondary cell at a rate of 100 kg/ha to eradicate further remaining pathogens. Should phosphorus levels exceed regulated limits, alum will be added to secondary cell. Re-testing to verify that the minimum standards are met will be required. Discharge the secondary cell when all requirements are met.

4) With discharge of the secondary cell complete, the discharge valve is closed and the valve between the primary and secondary cells is opened to allow the liquid levels of both cells to equalize. This valve will remain open until the next discharge procedure is initiated.

5) If additional discharges are required, repeat the entire procedure.

7. Environmental Impact

The construction of the wastewater treatment lagoon will go a long way to improve the environmental performance of Lakeside Colony, which does not currently have a properly designed wastewater treatment facility. The design proposed accounts for all known environmental issues at the site.

7.1 Odor Production

Sizing of the primary cell has been based on an organic loading rate 42.25 kg BOD_5/ha/day. This level, which is considerably less than the maximum allowable 56 kg BOD_5/ day prescribed

in Province of Manitoba document "Design Objectives for Standard Sewage Lagoons", will ensure that the pond operates relatively odor free for the majority of the year.

If at all, odors may become noticeable during spring thaw, when gases such as hydrogen sulfide, which have been trapped under the ice, are released with the melting of the lagoon's ice cap. Production of this gas is the result of anaerobic decomposition of organic compounds which occurs when the ice cover prevents the introduction of oxygen into the wastewater. The duration of these odors is not anticipated to last any longer than two to three weeks depending on the time it takes for the ice cover to completely melt. As the ice cover recedes in early spring, the surface layers of the wastewater lagoon cells will quickly return to an aerobic state and odor production will subside. This process is also known as "spring turnover", triggered by the cooler low density of the upper effluent medium causing it to submerge when the winter ice retreats or outside temperature warms up.

The separation distance between the lagoon and the nearest residence not associated with the wastewater treatment lagoon (460 m) will further serve to reduce any potential impacts of odor production. Wind data available for the area indicates that the predominant wind direction in the spring is from the North West and South East (Figure 2) with an average annual velocity of 5.96 m/s (Environment Canada, 2011); on average, only 10% of these winds would blow from the facility in the direction of the closest residence. The larger separation distances to other neighbouring residences anticipated to provide adequate buffer to minimize any odour related impacts. Many of these other residences are also separated by shrubs and wooded habitats, that absorb any potential odor impacts.

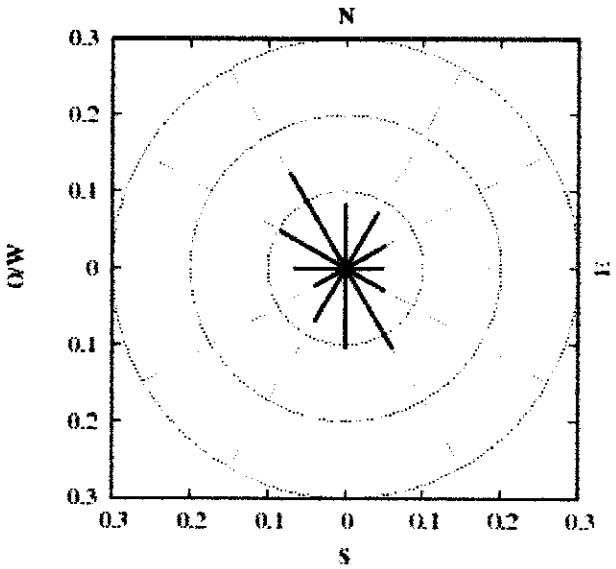


Figure 2. Frequency of prevalent winds in spring time near St-François Xavier, Mb. (source: Environment Canada, 2011: Canadian Wind Energy Atlas - www.windatlas.ca)

In summary, odor reduction has been taken into consideration in the design of the treatment lagoon and dispersion distances from neighboring residences are greater than the required minimums. For these reasons it is not anticipated that odor will have any significant environmental impacts to neighbours of Lakeside Colony.

7.2 Impact of Discharge to Waterways

The treated effluent from the secondary cell of the lagoon will be discharged either once or twice per year during the period prescribed in the Environment license. In order to discharge treated domestic effluent into a waterway, specific treatment levels must be achieved before any release is permitted. Laboratory analysis of the treated effluent will

be used to verify that the minimum requirements as specified in the Environmental Licence are met. Discharge will not be permitted unless the minimum requirements are met. Table 1, summarizes published information for the minimum accepted standards of specific constituents.

Table 1. Minimum Standards for Effluent Quality

CONSTITUENT	TREATED WASTERWATER
BOD_5 (mg/L)	Less than 30
NH_3 (mg/L)	Less than 15
Total Coliform (MPN/100mL)	Less than 1500
Fecal Coliform (MPN/100mL)	Less than 200
Total Suspended Sediments (mg/L) (excluding growing algae)	Less than 30
Total Phosphorus (mg/L)	1
Total Nitrogen (mg/L)	30

It is anticipated that the level of SAR of the effluent will be between 6 and 8 based our experience with wastewater treatment lagoons at other Hutterite Brethren Colonies. To reduce the level of SAR it is proposed that the Colony's households limit the quantity of softened water that is used for laundry and food preparation services. If it were determined that the SAR level remained excessive in the treated wastewater as a result of the softening process, alternative methods of water softening methods would be explored.

Moderate levels of SAR in treated wastewater are not anticipated to affect the quality of water significantly in waterways. The proportion of treated wastewater to the volume of water flowing through the body of water is relatively small, resulting in a highly diluted solution, moreover the first annual discharge is recommended to occur towards the end of spring to circumvent flooding, and still allow for enough flowing water to dilute discharged effluent (SWA, 2005). The cumulative effect of numerous sources within the watershed region should be considered in coordinating the discharge periods in order to lessen the impact on water quality.

The minimum standards for effluent quality, requires that the maximum phosphorus level in the treated effluent be less than 1.0 mg/L. The colony has been made aware of this requirement and have committed to reducing the use of phosphate based soaps in order to achieve this goal. Testing of the treated effluent for phosphorus levels prior to discharge is suggested as a means of monitoring levels. In the event that levels exceed the allowable minimum, alum may be applied to the lagoon as a means of reducing the phosphorus level in the discharge effluent stream.

Periodic removal of vegetative growth within the discharge route is also recommended for removing the nutrient stores within the plant material in order to minimize the long term potential for nutrient movement into the watercourse. Removal of this material, however, should be done in a manner that does not disturb the soil surface in order to avoid the potential for introducing sediments into the water stream. Removed material can be utilized as animal feed if the discharge route is seeded to forage crops, or alternately will be used a source of fertilizer and carbon for either composting or else direct land application.

7.3 Impact on Groundwater

Soil types and construction methods utilized in constructing the lagoon will limit potential seepage losses to a minimum. The high clay content in surface and subgrade soil at the site will adequately protect the sub-surface groundwater resources beneath the facility. Moreover, the proposed design limits the cut depth to approximately 1 m, therefore providing a known separation distance of about 7 m to groundwater. The minimum required hydraulic conductivity of the material used to construct this liner is 1.0×10^{-7} cm/s. Also the presence of these same clay textures soils within the discharge path will also afford protection to groundwater resources. For these reasons the impact on groundwater is considered negligible.

The environmental performance of the proposed facility relative to groundwater protection will be considerably better than that of the existing facility. Recalling the soil log for borehole #1, it is clear that the existing facility did not meet impermeability requirements needed to protect groundwater resources.

7.4 Impacts on Wildlife and Forest Habitat

Presently the land at the proposed construction site is utilized for agricultural purposes. As a result, this wastewater treatment facility does not represent a significant threat to source of wildlife habitat or forest, therefore it is not anticipated that the proposed lagoon will have an impact on them. The Assiniboine River is habitat to about 40 species of fish; the most common includes walleye, white sucker, northern pike, and perch (MWS, 2002), and its shore supports numerous plants and animal species. It is evident that over enrichment of the river with nutrient could become a limiting factor to biodiversity along the Assiniboine. It is generally accepted that discharge of treated wastewater during spawning is not recommended, so discharge is preferably time to occur after June 15th of each year. To protect water quality and minimize any effects on fish, strict adherence to maximum nutrient levels in the treated wastewater as specified in the Licence will be ensured. Participation in nutrient reduction programs by stakeholders is also recommended to further manage nutrient loading.

Based on information from Manitoba Conservation's Wildlife Branch (http://www.manitoba.ca/conservation/wildlife/index.html), no wildlife habitat reserves of areas exist in the immediate vicinity of the proposed development, since the development will be on farmland owned by the Lakeside Colony.

7.5 Heritage Resources

The Manitoba Historical Society (2014) lists three designated historic sites in the RM of Cartier, the Grey Nun's Convent (1066 PTH 26, St-François Xavier, Mb), the St Paul's Anglican Church (4813 PTH 26, St-François Xavier, Mb) and the Warkentin's Blacksmith Shop (2172 PTH 26, St-François Xavier, Mb).

The Grey Nun's Convent (49°54'45"N 97°32'21"W) is located approximately 1.7 km north east of the proposed site for the wastewater treatment facility. The separation distance and location away from predominant winds in spring time should virtually guard visitors against most

occurrences of odour nuisances from the facility. Whereas both of the Warkentin's Blacksmith Shop (49°57'50"N 97°37'42"W) and St Paul's Anglican Church (50°02'59"N 97°50'13"W) are situated North West of the facility, separation distances of 7.8 and 25 km should be more than sufficient to eliminate any odour concerns from the proposed facility.

7.6 Gasoline and Associated Product Storage

No storage of gasoline or associated products is expected on site due to the proposed development. Refueling station and storage of petroleum products are located within the Colony main facilities to the North of the proposed lagoon, well removed from the Assiniboine River

7.7 Socio-economic Implication

As no significant environmental impacts are anticipated, no socio-economic implications are likely.

8. Maintenance, Inspection and Monitoring

Several aspects require regular attention throughout the year, particularly during the growing season, among which are grooming of the berms, and maintenance of the lagoon's cells. The Lakeside Colony will either assign a staff to be trained and certified as a wastewater facility operator, or else contract the operation of the facility to an outside certified operator.

8.1 General Maintenance

While the outside berms will be grassed as part of the construction of the facility, it is advised that the internal berm slope should be grassed to the depth of the freeboard in both cells to prevent erosion during and after commissioning. Regular mowing of the grass on the outside embankments is required to minimize and discourage use by burrowing rodents which may impair the facility's berm integrity.

The berms should be inspected during the growing season for signs of erosion and presence of rodent's burrows. Any erosion damage should be repaired as soon as possible by filling with and compacting in clayey material. Any rodents should be eliminated from the berms and the rodent burrows filled in.

Manual or mechanical removal of aquatic vegetation from the bottom and interior slopes of the embankments is required to prevent over population by these species. Significant populations of aquatic plants remove considerable amount of oxygen from the wastewater during its decay or prevent it from wind aeration, which would otherwise be used in the breakdown of organic compounds. Significant aquatic populations will also prevent sunlight from penetrating the surface of the wastewater further reducing the efficiency of the natural treatment process.

8.2 Operation Monitoring Requirements

Operation of the lagoon will be relatively self-sufficient, however regular inspections are required to ensure operation and water flows are occurring as designed, and do not become clogged with debris or ice.

During moderate temperature when the lagoon surface is free of ice, it should be noted whether the wastewater introduced into the primary cell is dispersed evenly or whether it is short-circuiting to the cross-over into the secondary cell. Odour levels are to be assessed and if excessive, the cause of the odours determined and rectified. General condition of the embankments and each rip-rap feature protecting the berms and discharge route should be assessed for damage from wind and wave action, or discharge flow and repaired as necessary.

Winter monitoring is limited to checking for frozen piping and verifying that the cross-over piping between the two cells is not frozen. This can be accomplished by comparing that the water levels in the primary and secondary cells are the same.

9. Construction Schedule

It is proposed that construction would begin as soon as the Environmental Licence has been granted and weather conditions are favorable. For practical purposes, construction would be best to be undertaken between May 1st and October 31st to avoid challenges associated with earthmoving with frozen soil and freezing conditions.

10. Decommissioning of Existing Facilities

The existing facility will be decommissioned either as soon as the proposed facility is commissioned, or else the next growing season following completion of the new facilities, whichever comes first. Decommission will be accomplished in three (3) phases.

Emptying of the facility. Upon severing the wastewater pipeline to the existing facility and re-routing the pipeline to the new facility, the facility will be sampled to assess whether the effluent quality parameter meet the requirements shown at Table 1. If so, discharge to the Assiniboine River will be carried out in accordance with the terms and conditions for discharge set out in the Environment Act Licence issued for the proposed facility. If not, the effluent will be sampled again either in early October, or early May of the following year. In the event that the effluent quality parameters are not met in terms of BOD_5, coliforms or phosphorus, remedial action consisting of aeration, chlorination and/or addition of alum will be implemented to accelerate stabilization and allow for emptying within two years of commissioning of the proposed facility. The facility will be emptied by pumping out the effluent, without agitation, to within 1 m of its bottom.

Disposal of sludge by land application. The contents of the last 1 m of the facility will be sampled for nitrogen and phosphorus content. Prior and during application the facility's sludges will be agitated to re-suspend all contents with equipment commonly available for livestock manure storage facilities. The facility's sludge will be land applied in accordance with the

practices used by Lakeside Colony for livestock liquid manure, at rates based on crop removal for nitrogen or phosphorus, whichever dictates the lowest application rate.

Final decommission of the facility. It is proposed that the facility will be filled with clean surface water, and used as a permanent water pond for wildlife.

11. Funding

Construction of the domestic lagoon will be funded primarily by Lakeside Holding Co Ltd. Some funds may be available indirectly through Agriculture and Agri-Food Canada.

12. References

Agriculture and Agri-Food Canada. 1999. Soils and Terrain, An introduction to the land resource Rural Municipality of Cartier – Information Bulletin 99-1
http://sis.agr.gc.ca/cansis/publications/surveys/mb/mbrm492/mbrm492_report.pdf

Environment Canada. 2011. Canadian Wind Energy Atlas. http://www.windatlas.ca/en/index.php

Manitoba Water Stewardship. 2002. Assiniboine River: Across the Watershed http://www.gov.mb.ca/waterstewardship/water_quality/quality/assiniboine_river-across_the_watershed.pdf

Saskatchewan Watershed Authority 2005. Background Report Assiniboine River Watershed http://www.swa.ca/Publications/Documents/Background%20Report.pdf

The Manitoba Historical Society. 2014. MHS Resources: Historic Sites of Manitoba. http://www.mhs.mb.ca/docs/municipalities/stfrancoisxavier.shtml#sites

The Weather Network. 2014. Farmzone - Historical Search for the Portage - Carman - Holland, Manitoba. http://www.farmzone.com/

US EPA. 2004. Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category (40 CFR 432). Report EPA-821-R-04-011. http://water.epa.gov/scitech/wastetech/guide/mpp/index.cfm

Verheijen L.A.H.M., D. Wiersema, L.W. Hulshoff Pol, J. De Wit. 1996. Management of Waste from Animal Product Processing. FAO Corporate Document Repository.
http://www.fao.org/wairdocs/lead/x6114e/x6114e00.htm.

Appendix A
Certificate of Title

DATE: 2012/04/04
TIME: 12:01

MANITOBA

STATUS OF TITLE

TITLE NO: 1739486/1

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	X
ORIGINATING OFFICE...	WINNIPEG	ADDRESS.....	
REGISTERING OFFICE...	WINNIPEG		
REGISTRATION DATE....	2000/08/01		
COMPLETION DATE.....	2000/08/08		
		CLIENT FILE...	NA
		PRODUCED BY...	J.JOYAL

LEGAL DESCRIPTION:

LAKESIDE HOLDING CO. LTD.

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON, IN THE FOLLOWING DESCRIBED LAND:

PARCEL 1: W 1/2 OF RL 53 AND
ALL OF RL 54 TO 57 PARISH OF ST FRANCOIS XAVIER
EXC FIRSTLY: DRAIN PLAN 1380 WLTO
SECONDLY: ROAD PLANS 4137, 5066, 5815, 8750 WLTO AND 38665 WLTO
EXC OUT OF SAID RL 57 ROAD PLAN 4623 WLTO AND
EXC OUT OF SAID RL 53 ALL THAT PORTION CONTAINED WITHIN THE FOLLOWING LIMITS:
COMMENCING AT THE INTERSECTION OF THE NORTHERN LIMIT OF MAIN HIGHWAY PLAN 552 WLTO WITH THE EASTERN LIMIT OF THE W 1/2 OF SAID RL 53
THENCE WLY ALONG THE SAID NORTHERN LIMIT 384.35 FEET
THENCE NELY ON A COURSE WHICH FORMS AN ANGLE ON ITS EASTERN SIDE WITH THE SAID NORTHERN LIMIT OF 85 DEGREES 30 MINUTES 129.05 FEET
THENCE ELY ON A COURSE WHICH FORMS AN ANGLE ON ITS SOUTHERN SIDE WITH THE LAST DESCRIBED COURSE OF 128 DEGREES 7 MINUTES TO THE SAID EASTERN LIMIT OF THE W 1/2 OF RL 53
THENCE SLY ALONG THE SAID EASTERN LIMIT TO THE POINT OF COMMENCEMENT

PARCEL 2: W 1/2 OF OTM LOT 53 AND ALL OTM LOTS 54 TO 57 OF PARISH OF ST FRANCOIS XAVIER
EXC OUT OF SAID PARCEL 2
FIRSTLY: RAILWAY PLANS 5111 AND 5112 WLTO
SECONDLY: DRAIN PLAN 1380 WLTO
THIRDLY: ROAD PLAN 5815 WLTO
FOURTHLY: WATER CONTROL WORK PLAN 9321 WLTO AND
EXC OUT OF SAID LOTS 53 TO 55 ROAD PLAN 4037 WLTO AND
EXC OUT OF SAID LOT 57 ROAD PLAN 4623 WLTO

PARCEL 3: PARCEL A PLAN 38489 WLTO
IN RL 58 PARISH OF ST FRANCOIS XAVIER.

ACTIVE TITLE CHARGE(S):

165002/1	ACCEPTED	CAVEAT	REG'D: 1956/04/03
	FROM/BY:	MAN POWER COMMISSION	
	TO:		
	CONSIDERATION:	NOTES:	RL 53 PLAN 5673

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2012/04/04 OF TITLE NUMBER 1739486/1

********** STATUS OF TITLE 1739486/1 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... WINNIPEG
REGISTERING OFFICE... WINNIPEG
REGISTRATION DATE.... 2000/08/01
COMPLETION DATE..... 2000/08/08

PRODUCED FOR.. X
ADDRESS.....

CLIENT FILE... NA
PRODUCED BY... J.JOYAL

ACTIVE TITLE CHARGE(S):

D66522/1 ACCEPTED MISCELLANEOUS REG'D: 1959/07/14
DESCRIPTION: O/C 1880/58 & AMEND CLOSE DR PL 1380 IN OTM PL7060
FROM/BY:
TO:
CONSIDERATION: NOTES: PARCEL 2 PLAN 7060

H9488/1 ACCEPTED MISCELLANEOUS REG'D: 1966/09/29
DESCRIPTION: O/C 1122/66 CLOSES DR PL1380 AFFECTS LOT 57 PCL 2
FROM/BY:
TO:
CONSIDERATION: NOTES: PARCEL 2 PLAN 8321

85-96298/1 ACCEPTED CAVEAT REG'D: 1985/10/11
FROM/BY: MAN. TELEPHONE SYSTEM
TO:
CONSIDERATION: NOTES: PART RL 53 TO 55

86-93924/1 ACCEPTED CAVEAT REG'D: 1986/09/10
FROM/BY: MANITOBA HYDRO
TO:
CONSIDERATION: NOTES: AFF: PARCEL 3

87-1428/1 ACCEPTED CAVEAT REG'D: 1987/01/07
FROM/BY: MAN. HYDRO ELECTRIC BOARD/MAN. TELEPHONE SYSTEM
TO:
CONSIDERATION: NOTES: PART RL 57

2326508/1 ACCEPTED CAVEAT REG'D: 1998/11/23
DESCRIPTION: EASEMENT
FROM/BY: MTS COMMUNICATIONS INC.
TO:
CONSIDERATION: NOTES: AFF: PART PARCEL 1

2326509/1 ACCEPTED CAVEAT REG'D: 1998/11/23
DESCRIPTION: EASEMENT
FROM/BY: MTS COMMUNICATIONS INC.
TO:
CONSIDERATION: NOTES: AFF: PART PARCEL 1

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2012/04/04 OF TITLE NUMBER 1739486/1

********** STATUS OF TITLE 1739486/1 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... WINNIPEG
REGISTERING OFFICE... WINNIPEG
REGISTRATION DATE.... 2000/08/01
COMPLETION DATE..... 2000/08/08

PRODUCED FOR.. X
ADDRESS.....

CLIENT FILE... NA
PRODUCED BY... J.JOYAL

ACTIVE TITLE CHARGE(S):

2326510/1 ACCEPTED CAVEAT REG'D: 1998/11/23
DESCRIPTION: EASEMENT
FROM/BY: MTS COMMUNICATIONS INC.
TO:
CONSIDERATION: NOTES: AFF: PART PARCEL 3

2493693/1 ACCEPTED MORTGAGE REG'D: 2000/06/05
FROM/BY: LAKESIDE HOLDING CO. LTD.
TO: CANADIAN IMPERIAL BANK OF COMMERCE
CONSIDERATION: $4,000,000.00 NOTES:

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	LAKESIDE HOLDING CO. LTD. 5600 PR. 241 NORTH CARTIER MB	R4K 1B1

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
2512301/1	TREQ	2000/08/01	$0.00	$0.00

PRESENTED BY: LAND MANAGEMENT SERVICES
FROM: LAKESIDE HOLDING CO. LTD.
TO:

FROM TITLE NUMBER(S):

1727060/1 BAL

LAND INDEX:

LOT	TYPE	PARISH
53	OUTER TWO MILE LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
54	OUTER TWO MILE LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
55	OUTER TWO MILE LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
56	OUTER TWO MILE LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2012/04/04 OF TITLE NUMBER 1739486/1

********** STATUS OF TITLE 1739486/1 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... WINNIPEG
REGISTERING OFFICE... WINNIPEG
REGISTRATION DATE.... 2000/08/01
COMPLETION DATE..... 2000/08/08

PRODUCED FOR.. X
ADDRESS.....

CLIENT FILE... NA
PRODUCED BY... J.JOYAL

LAND INDEX:

LOT	TYPE	PARISH
57	OUTER TWO MILE LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
53	RIVER LOT	ST FRANCOIS XAVIER
NOTE:	EXC PART AND PLANS	
54	RIVER LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
55	RIVER LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
56	RIVER LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	
57	RIVER LOT	ST FRANCOIS XAVIER
NOTE:	EXC PLANS	

LAND INDEX:

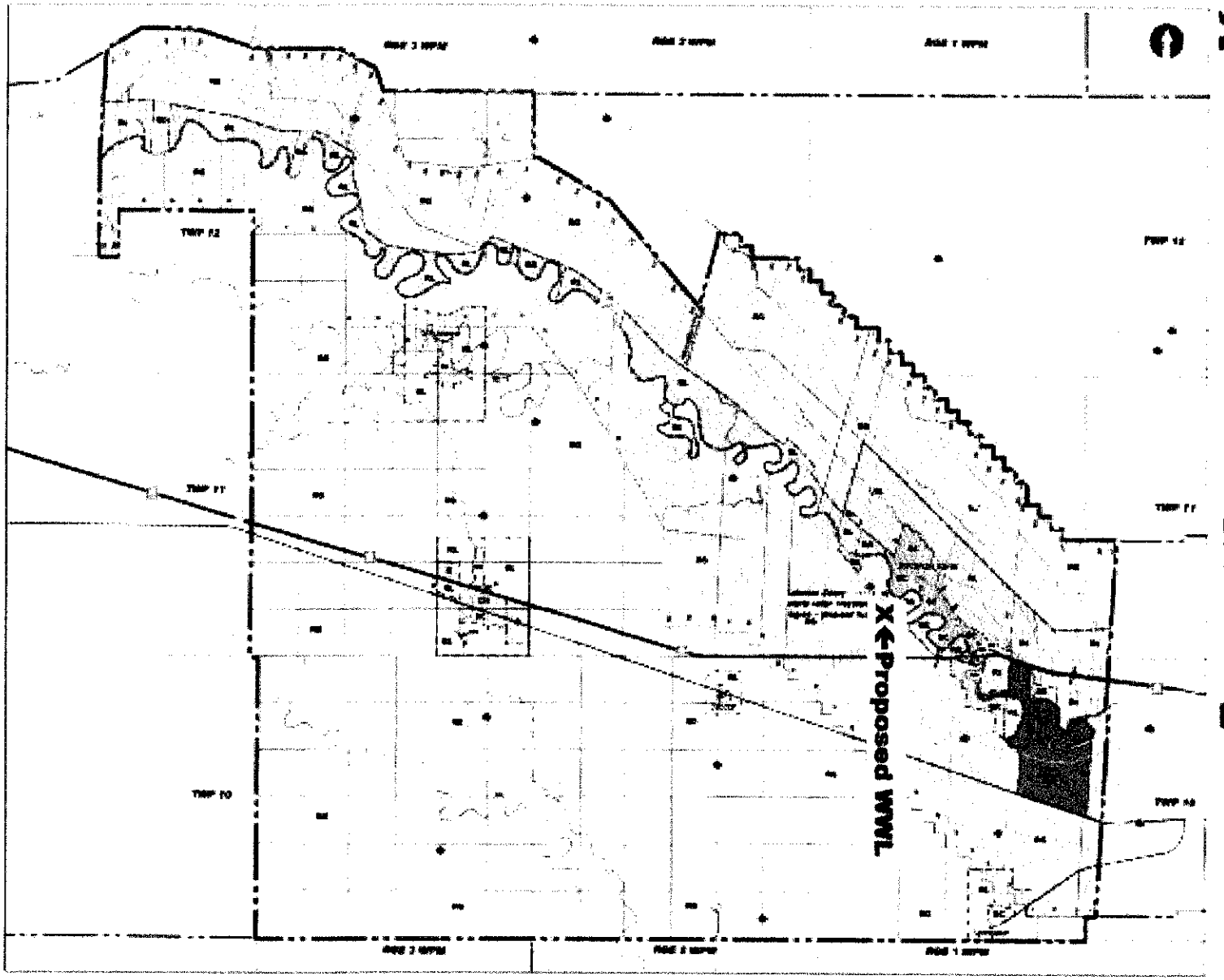
LOT	BLOCK	SURVEY PLAN
A		38489
NOTE:		

**ACCEPTED THIS 1ST DAY OF AUGUST, 2000
BY J.MOFFAT FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF WINNIPEG.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2012/04/04 OF TITLE NUMBER 1739486/1.

********** END OF STATUS OF TITLE 1739486/1 **********

Appendix B
Site Location in
Whitehorse Plains Planning District


WHITE HORSE PLAINS
PLANNING DISTRICT
DEVELOPMENT PLAN
BY-LAW No. 1-2008
MAP 1
Overall
Land Use Plan
LEGEND
RG Rural General Policy Area
RI Rural Limited Policy Area
RR Rural Residential Policy Area
SC Settlement Centre Policy Area
B Business Policy Area
Municipal Boundary
Provincial Trunk Highway
Future Development
X Proposed WWL
Manitoba
Department of Land Government
Community Planning Services

Appendix C
Geo-Technical Information

South-Man Engineering

15-1599 Dugald Road
Winnipeg, MB R2J 0H3

Phone: 204.668.9652
Fax: 204.668.9204
E-mail: sme@southmaneng.com

TEST HOLE LOGS

For: Lakeside Holding Co. Ltd.
Operation: Domestic Lagoon
Location: Lot 56+57
RM: Cartier
City/Town, Prov.: Elie MB.

Test Hole Logs by: Peter Grieger, P. Eng.
Drilling Performed by: Kletke Enviro Drilling
Date: March 26, 2012
Land Location: NW 28-2-4E

TEST Hole #1 **(existing EMS site)**

0 – 1	Topsoil
1' – 5'	Clay fill material
5' – 10.5'	Sandy clay mixture, wet, low plasticity
10.5' – 15'	Grey Clay with impurities 10.5'-12.5', moist, high plasticity

Test Hole #2

0'- 5'	Medium, sand frozen, wet below 3'
5' – 10'	Sandy bearing silty at 9.5', moist
10 – 13.5'	Sand, wet, medium grain
13.5' – 15'	Grey sand with organic deposits

Test Hole #3 Test holes #3 to #5 were spaced linearly at 300' intervals

0 – 2.5	Mottled clay + topsoil
2.5' – 6'	Brown silty clay, medium plasticity with slight silt inclusion
6' – 10'	Brown silty soft clay, oxidation flecks below 7', med-high plasticity
10'- 15'	Consistent brown silty clay, oxidation flecks below 7', med-high plasticity
15' – 20'	Brown silty clay with slight silt inclusion, soft, sticky, high plasticity
20' – 26'	Brown silty clay with grey clay, soft, sticky and moist
26' –27.5'	Grey clay with flecks
27.5' – 30'	Gravelly clay with sand fraction, wet, light grey

Water level 11' below grade

Test Hole #4

0 – 2.5'	Mottled organic content with silty clay
2.5' – 6'	Brown clay, with silty inclusions, slight oxidation, medium plasticity
6' – 10'	Brown silty clay, medium plasticity, slight oxidation
10' – 15'	Consistent greyish brown color, silt inclusion, soft
15' - 20'	Greyish, clayey, slight silt inclusion, with pebbles, med-high plasticity, color transitioning to brown around 17'
20' – 25'	Transition to very greyish color, with some pebble inclusions, high plasticity and soft
25' – 30'	Color changing to darker grey at 27' with silt inclusions, big particles (cobbles) visible, highly plastic and soft.

Water level at 27'.

Test Hole #5

0' – 2.5'	Darker grey, silt and organic inclusions, sediment and roots visible, low to med plasticity,
2.5' – 6'	Lighter grey coloration and medium plasticity, plant root pieces visible
6' – 10'	Color transitioning to lighter grey, silt and pebbles inclusions, slight oxidation, hard feel and medium plasticity
10' – 15'	Consistent grey color, silt and pebble inclusions, medium plasticity, dry/hard
15' – 20'	More greyish toward 17', pebbles very inclusive between 17' and 20', silt visible, medium plasticity
20' – 25'	Color consistent, pebbles inclusions all the way, silt visible ,hard, medium plasticity
25' – 30'	Color darkened from 26', silt inclusions, light pebble visible, higher plasticity all through, gravel particles inclusions just from 28' depth, softer in feel.

Water level at 28'.

Test Hole #6 Test Hole from #6 to #8 are linearly and evenly spaced by 350'

0 – 2.5'	6" top soil, dark grey in coloration
2.5' – 6'	
6' – 10'	Pebbles visible, light grey color, silt and pebbled inclusion, slight oxidation towards the 10' depth low plasticity
10' – 15'	Consistent light grey color at first, changing near 15', slight silt inclusion, slight oxidation, medium plasticity
15' – 20'	Slight oxidation and pebbles inclusions, color darkened towards the 18' depth, still light grey in color above 18'. high plasticity
20' – 25'	Color darkening towards the end from 21.5', darker from 23.5' onward, slight oxidation, slight pebble inclusions, high plasticity
25' – 30'	Sandy and gravel material from 26.5', hit a boulder at 27.5', dark at the top and very light after 27'.

Test Hole #7

0 – 2.5′	6″ top soil, dry and hard in feel, silt inclusion, low plasticity, dark in color
2.5′ – 6′	Pebbles inclusions
6′ – 10′	Color lightening toward 10′, silt inclusions, oxidation starts around 6′, down to 10′, medium plasticity
10′ – 15′	Consistent color (lightening), dry pebbles and slight oxidation present, slight silt inclusions, medium plasticity
15′ – 20′	Color from light grey at the top to dark grey at 16 ½′, very slight silt inclusion, slight oxidation at the top, high plasticity
20′ – 25′	Color darkened, very slight silt inclusions, very high plasticity
25′ – 30′	Dark clayey color at the very top before 26′, but changes to light grey through the strata. Pebbles inclusions, till material from 28′, sandy and gravel material quite visible, silt inclusions, soft feel, and high plasticity

Test Hole #8

0 – 6′	Around 6″ top soil, very hard feel, dark grey in color, silt inclusion at the top, organic layer at 2.5′,medium plasticity
6′ – 10′	Color lightening after 6.5′ and very consistent throughout, slight oxidation throughout, dry and hard in feel, slight silt inclusions at the top, medium plasticity
10′ – 15′	Consistent light grey color up to 13.5′ and changing below that depth, slight oxidation throughout, slight silt inclusions, medium to high plasticity
15′ – 20′	Slight oxidation and pebbles inclusions, color darkening toward 18′, still light grey in color above 18′, high plasticity
20′ – 25′	Color darkening from 21.5′ to further down, slight oxidation, slight pebble inclusions, color darker from 23.5′, high plasticity
25′ – 30′	Sandy and gravel material from 26.5′, dark at the top and very light after 27″, high silt inclusions after 26.5′, high plasticity

Water level at 27′

ENG-TECH
CONSULTING LIMITED

Unit 6 - 854 Marion Street, Winnipeg, Manitoba, R2J 0K4
Phone: (204) 233-1694 Fax: (204) 235-1579
E-mail: eng_tech@mts.net
www.eng-tech.ca

September 16, 2014 File No.: 14-408-16

South-Man Engineering
37084 Hazelridge Road, Box 18, Group 30, RR1
Anola, MB
R0E 0A0

ATTENTION: Peter Grieger, P. Eng.

RE: LAKESIDE COLONY DOMESTIC LAGOON

Dear Mr. Grieger

ENG-TECH Consulting Limited (ENG-TECH) has completed the requested analyses of 7 soil samples from the above project. The laboratory soil analyses consisted of the following:

- Particle Size Analysis (7)
- Atterberg Limits (7)
- Moisture Content (7)

The above tests were conducted in accordance with the current ASTM Standard Test Methods D 422, D 4318 method B and D 2216.

The results of the Atterberg Limits and insitu moisture contents are shown on Table 1. Also attached are the grain size distribution results shown on the Particle Size Analysis Reports (Ref. No's. 14-408-16-1,2,3,4,5,6,7).

Soils with index properties such as the samples submitted, would be expected to achieve a hydraulic conductivity value in the order of 1×10^{-7} cm/sec when remoulded and compacted to 95 percent of maximum dry density at plus or minus two percent of optimum moisture content.

ENG-TECH trusts this is all the information you require. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited

Danny Holfeld, Principal
Manager of Operations

DH/cah

Attachments: Table 1
Particle Size Analysis Reports (Ref. No's. 14-408-16-1,2,3,4,5,6,7)

TABLE 1
SOIL SAMPLE ANALYSIS
LAKESIDE COLONY DOMESTIC LAGOON

Test Hole	Sample No.	Ref. No.	Depth (ft.)	Classification	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
TH 6	-	14-408-16-1	7.5'	CH, clay, high plastic, dark brown, silt sizes, trace sand	28.8	80	21	59
TH 6	-	14-408-16-2	15'	CH, clay, high plastic, dark brown, silt sizes	33.0	69	19	50
TH 7	-	14-408-16-3	5'	CH, clay, high plastic, dark brown, silt sizes, trace sand	30.1	85	26	59
TH 7	-	14-408-16-4	25'	CH, clay, high plastic, dark brown, silt sizes, trace gravel, trace sand	38.7	74	22	52
TH 8	-	14-408-16-5	5'	CH, clay, high plastic, dark brown, silt sizes, trace sand	27.8	82	25	57
TH 8	-	14-408-16-6	10'	CH, clay, high plastic, dark brown, silt sizes, trace sand	36.6	67	22	45
TH 8	-	14-408-16-7	20'	CH, clay, high plastic, dark brown, silt sizes, trace sand	35.4	74	21	53

ENG-TECH Consulting Limited
Unit 6 - 854 Marion Street
Winnipeg, Manitoba
R2J 0K4
eng_tech@mts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS REPORT

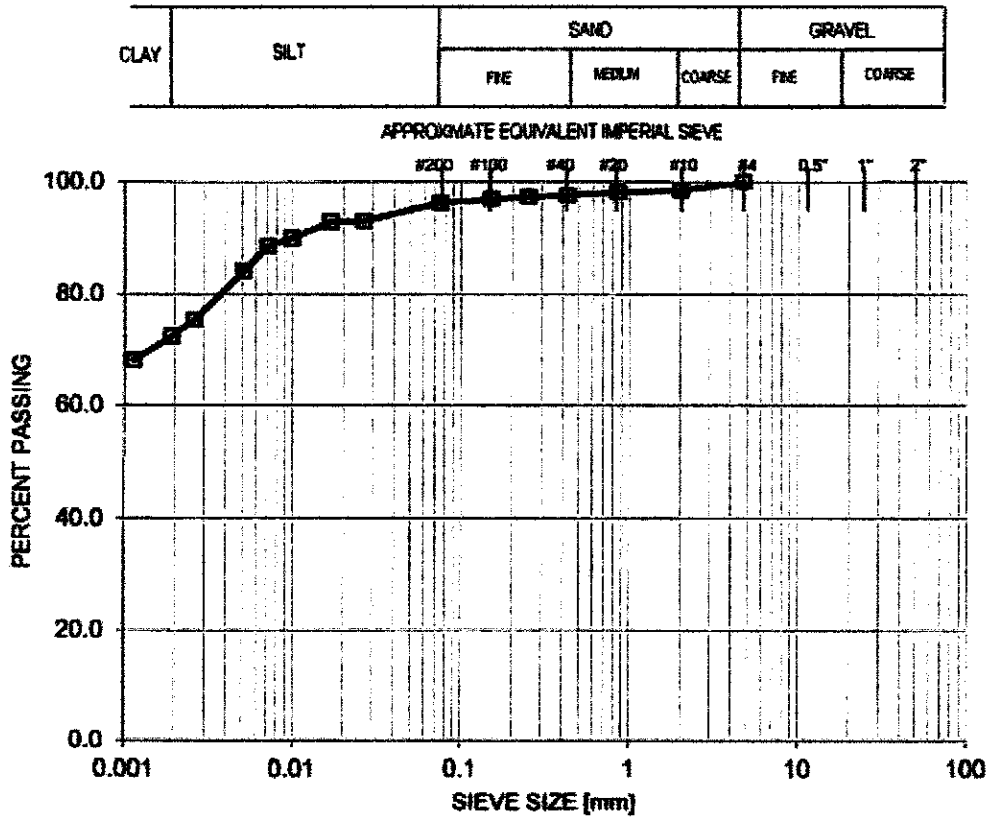
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-1

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 6	**Sample No.**	-	**Depth:**	7.5'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 5/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	98.5
0.850	98.1
0.425	97.6
0.250	97.2
0.150	96.8
0.075	96.1
0.027	92.9
0.017	92.7
0.010	89.8
0.0071	88.5
0.0051	84.0
0.0026	75.4
0.0019	72.5
0.0011	68.1

Percent of: GRAVEL (0.0 %), SAND (3.9 %), SILT (23.2 %), CLAY (72.9 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\HYD\14-408-16-1hyd

ENG-TECH Consulting Limited
Unit 6 - 854 Marion Street
Winnipeg, Manitoba
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eng_tech@mts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS REPORT

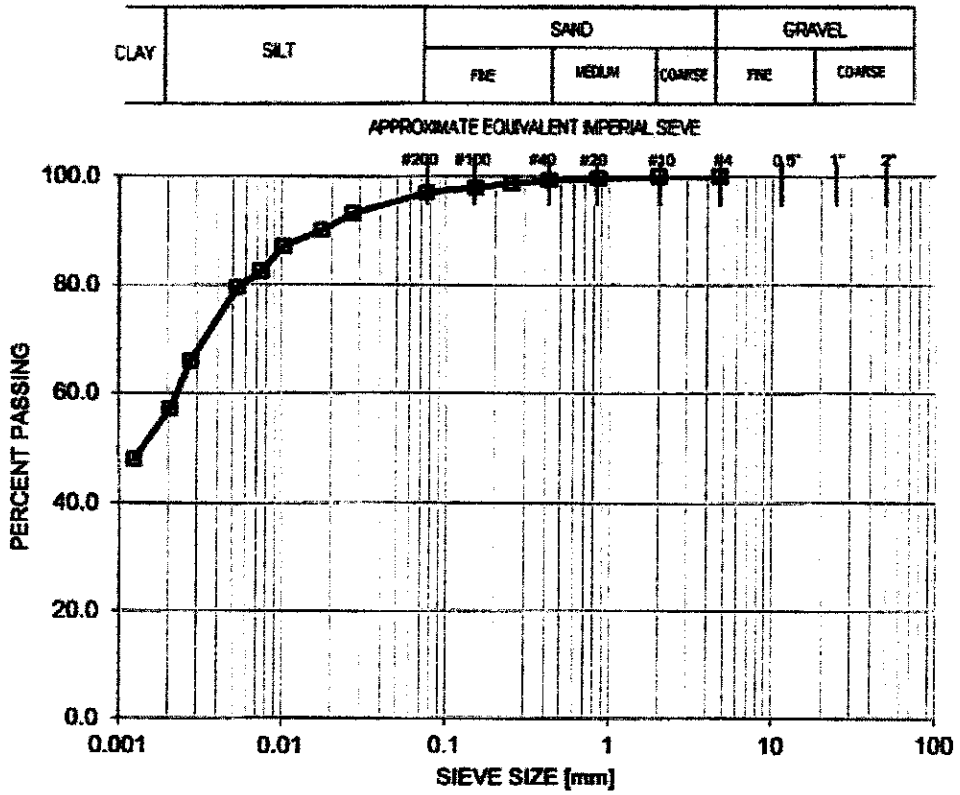
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-2

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 6	**Sample No.**	-	**Depth:**	15'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 5/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	99.6
0.425	99.2
0.250	98.7
0.150	97.9
0.075	97.0
0.027	93.0
0.017	90.0
0.010	87.0
0.0074	82.5
0.0053	79.5
0.0028	66.0
0.0021	57.1
0.0012	48.0

Percent of: GRAVEL (0.0 %), SAND (3.0 %), SILT (40.4 %), CLAY (56.6 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\H-PYD\14-408-16-2hyd

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PARTICLE SIZE ANALYSIS REPORT

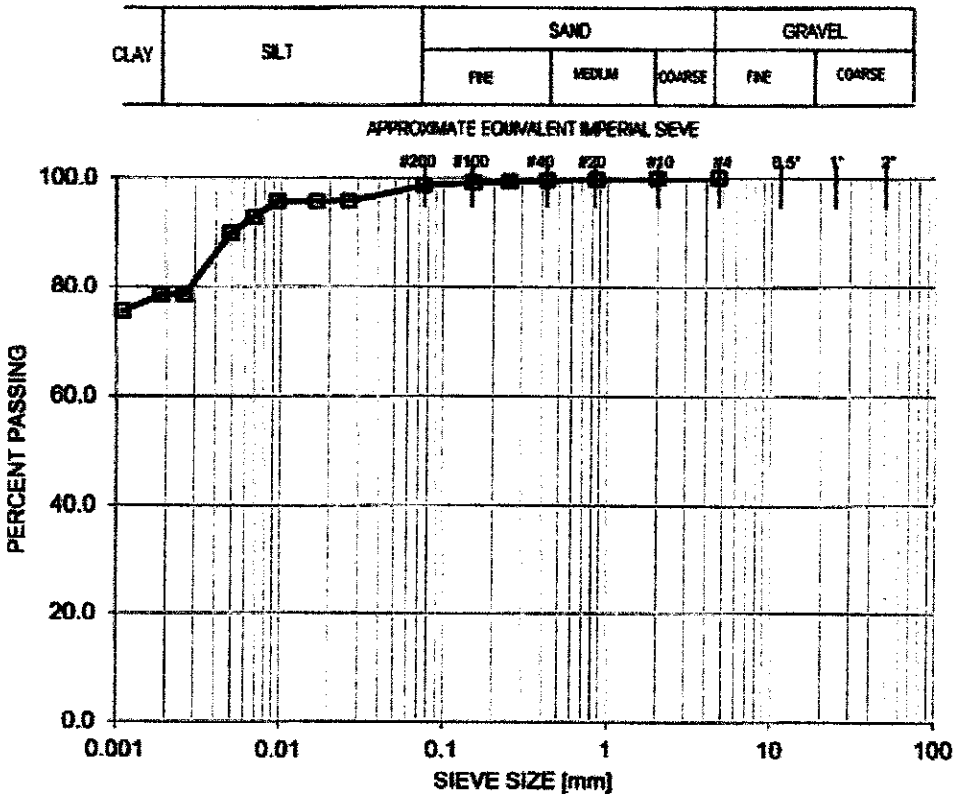
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-3

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 7	**Sample No.**	-	**Depth:**	5'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 5/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	99.9
0.850	99.8
0.425	99.6
0.250	99.4
0.150	99.2
0.075	98.7
0.026	95.8
0.017	95.8
0.010	95.8
0.0069	92.9
0.0049	90.0
0.0026	78.5
0.0019	78.5
0.0011	75.5

Percent of: GRAVEL (0.0 %), SAND (1.3 %), SILT (20.2 %), CLAY (78.5 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\HYD\14-408-16-3hyd

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PARTICLE SIZE ANALYSIS REPORT

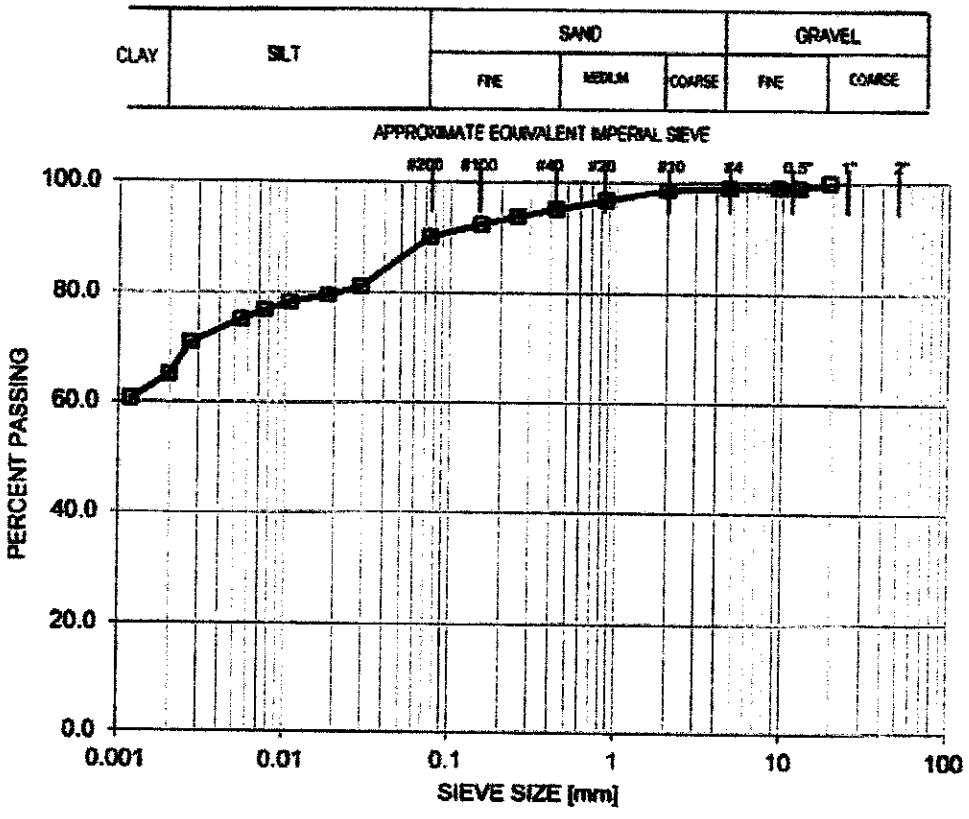
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-4

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 7	**Sample No.**	-	**Depth:**	25'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 8/14



SIEVE SIZE (mm)	PERCENT PASSING
19.000	100.0
12.500	99.0
9.500	99.0
4.750	99.0
2.000	98.7
0.850	96.8
0.425	95.2
0.250	93.9
0.150	92.4
0.075	90.2
0.0288	81.2
0.0182	79.6
0.0106	78.2
0.0075	76.7
0.0054	75.0
0.0027	70.7
0.0020	65.0
0.0012	60.6

Percent of: GRAVEL (1.0 %), SAND (8.9 %), SILT (25.1 %), CLAY (65.1 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\HYDA\14-408-16-4hyd

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PARTICLE SIZE ANALYSIS REPORT

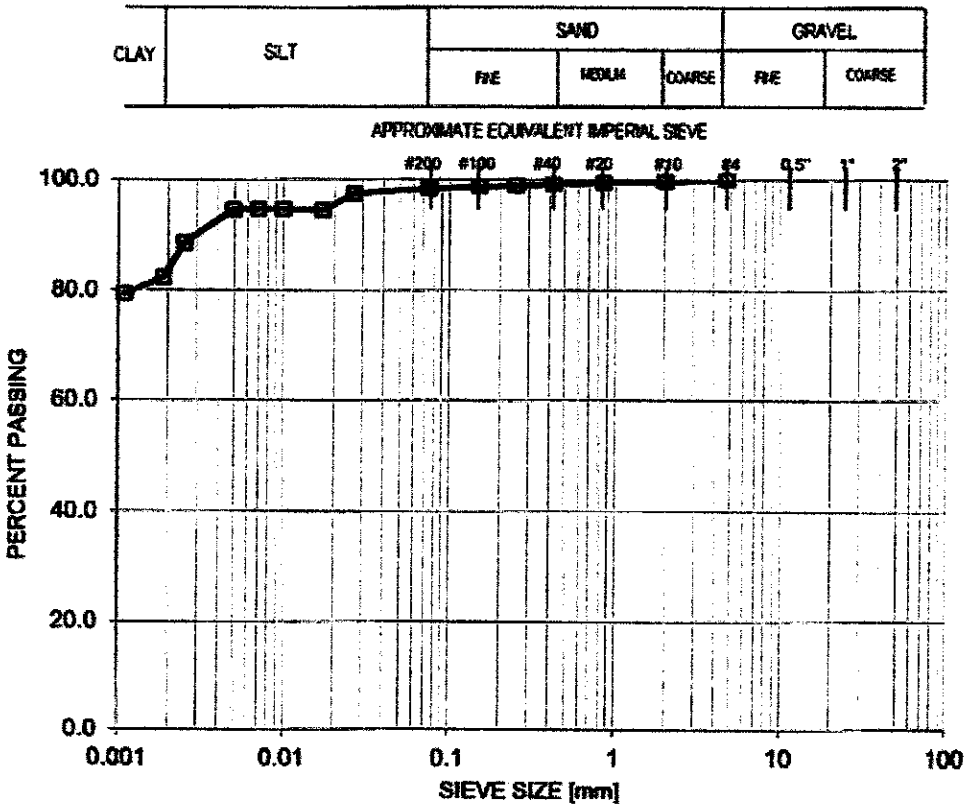
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-5

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 8	**Sample No.**	-	**Depth:**	5'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 8/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	99.7
0.850	99.5
0.425	99.1
0.250	98.9
0.150	98.7
0.075	98.3
0.027	97.4
0.017	94.4
0.010	94.6
0.0070	94.6
0.0049	94.5
0.0025	88.5
0.0019	82.4
0.0011	79.4

Percent of: GRAVEL (0.0 %), SAND (1.7 %), SILT (14.4 %), CLAY (83.9 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\HYD\14-408-16-5hyd

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PARTICLE SIZE ANALYSIS REPORT

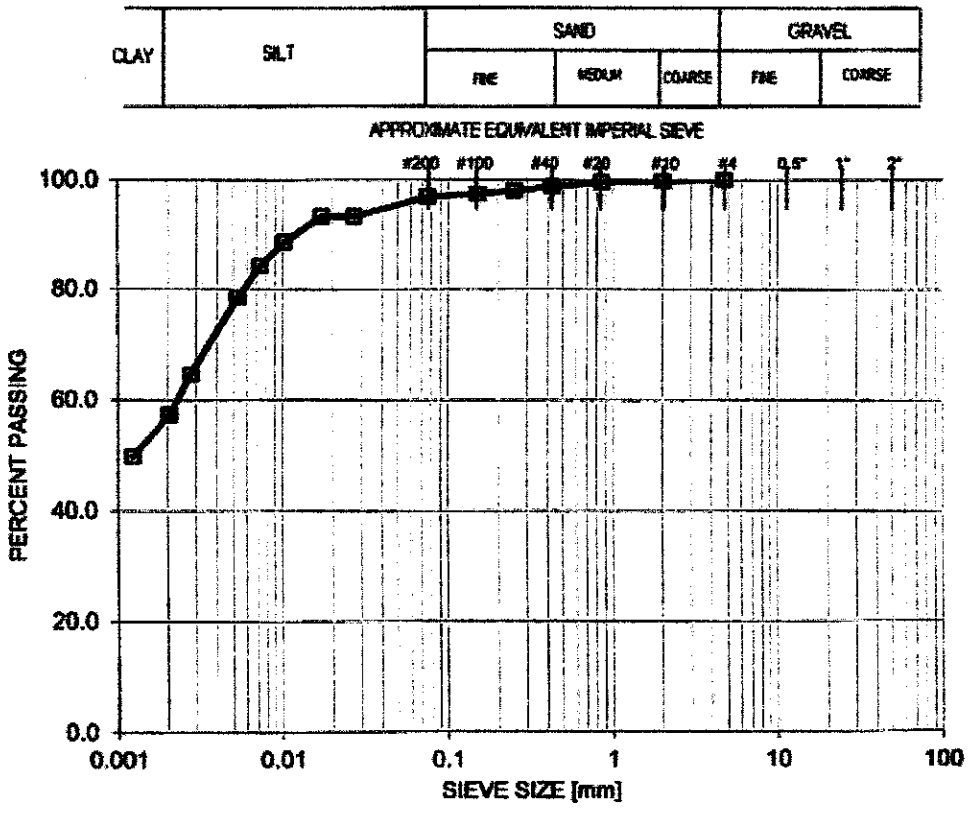
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-6

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 8	**Sample No.**	-	**Depth:**	10'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 8/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	99.8
0.850	99.6
0.425	98.8
0.250	98.1
0.150	97.5
0.075	96.9
0.027	93.4
0.017	93.4
0.010	88.7
0.0073	84.3
0.0053	78.5
0.0028	64.7
0.0021	57.4
0.0012	49.8

Percent of: GRAVEL (0.0 %), SAND (3.1 %), SILT (40.0 %), CLAY (56.9 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

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PARTICLE SIZE ANALYSIS REPORT

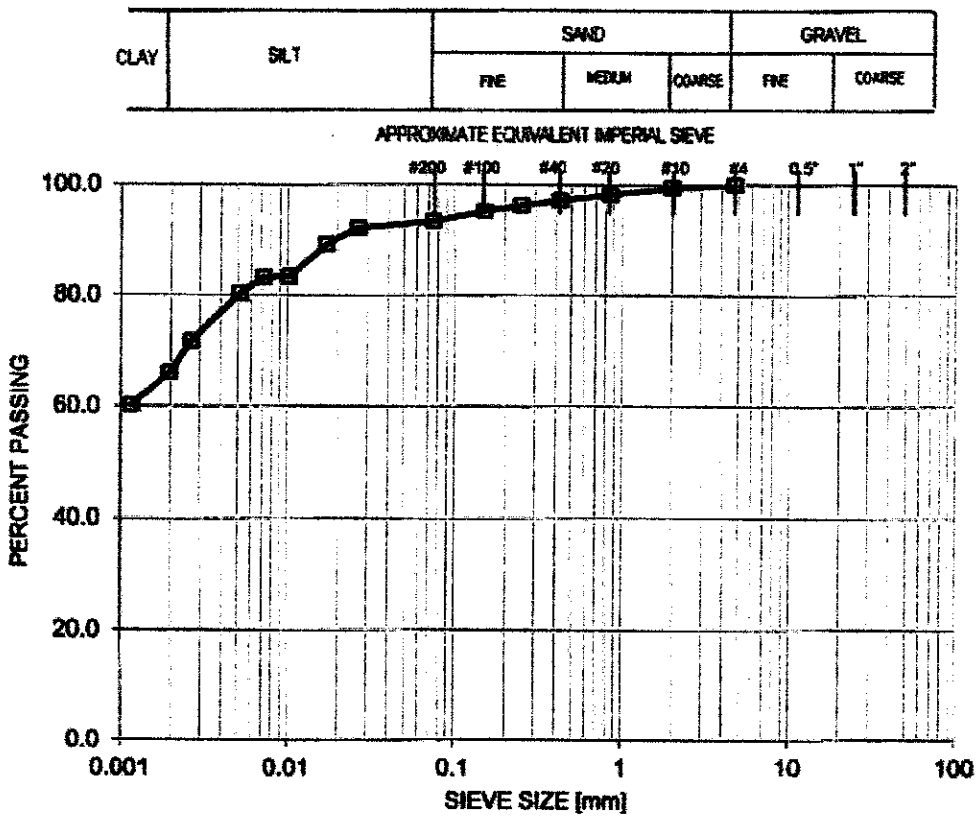
South-Man Engineering
37084 Hazelridge Road, Box 18, Grp 30, RR1
Anola, MB
R0E 0A0

File No.: 14-408-16
Ref. No.: 14-408-16-7

ATTENTION: Peter Grieger, P.Eng.

PROJECT: LAKESIDE COLONY DOMESTIC LAGOON

Test Hole No.	TH 8	**Sample No.**	-	**Depth:**	20'
Sampled By:	Client	**Type of Sample:**	Grab	**Source:**	Project Site
Date Sampled:	April 2014	**Date Received:**	Sept 2/14	**Date Tested:**	Sept 8/14



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	99.5
0.850	98.2
0.425	97.1
0.250	96.2
0.150	95.1
0.075	93.3
0.027	92.1
0.017	89.1
0.010	83.3
0.0072	83.2
0.0052	80.3
0.0026	71.9
0.0020	66.1
0.0012	60.3

Percent of: GRAVEL (0.0 %), SAND (6.7 %), SILT (26.8 %), CLAY (66.5 %)
Sample Description:

COMMENTS:

ENG-TECH Consulting Limited

per _____
Contact: Danny Holfeld, Principal
Ph: (204) 233-1694 Fax: (204) 235-1579

P:\2014\Projects\408(South-Man_Engineering)\16(Lakeside Colony Domestic Lagoon)\HYD\14-408-16-7hyd

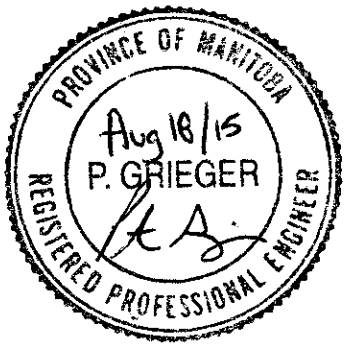
Appendix D

Construction Drawings For The Proposed Wastewater Treatment Lagoon

To Service Lakeside Colony

PROJECT NAME:

LAKESIDE HOLDING CO. LTD
LOT 56-57, RM OF CARTIER, MB.
DOMESTIC WASTEWATER LAGOON



South-Man Engineering

15-1599 Dugald Road | Winnipeg, Manitoba | R2J 0H3
PH. (204) 668-9652 | FAX (204) 668-9204

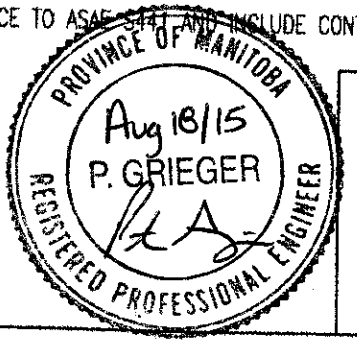
SHT NO.	SHEET SCHEDULE
CS	COVER SHEET
GN	GENERAL NOTES
SP	SITE PLAN
S-1	FLOOR PLAN
S-2	CROSS-SECTION DETAILS
S-3	INLET PIPING, GATE VALVE & THRUST BLOCK DETAIL
S-4	TRENCH DETAIL
S-5	RAMP & SPLASH PAD DETAILS
S-6	FENCE & GATE DETAILS

PROJECT NAME: LAKESIDE COLONY DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: COVER SHEET	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
SHEET NUMBER: CS	

GENERAL NOTES:

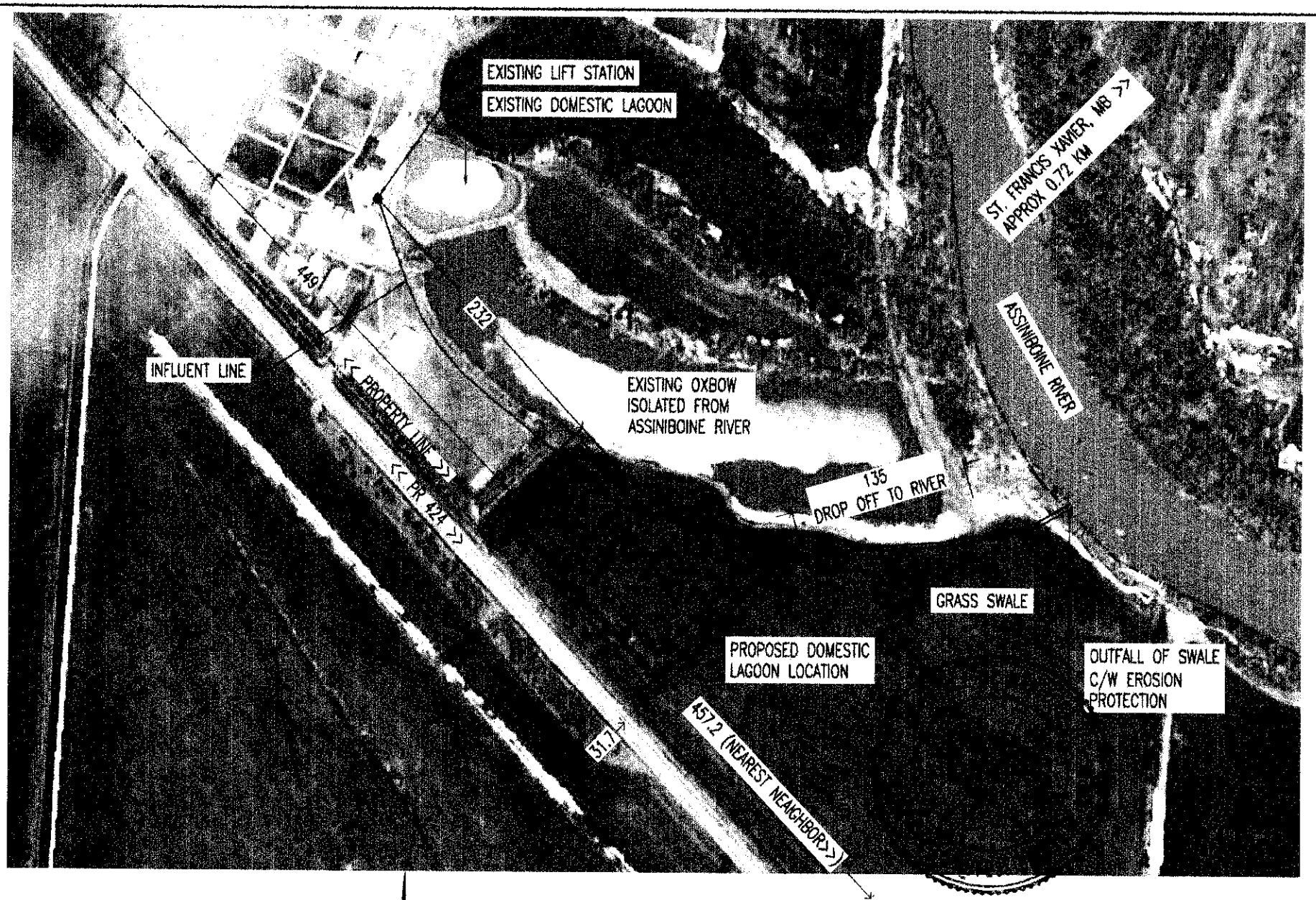
THIS WASTE WATER LAGOON SHALL CONFORM TO ASTM AND AWWA STD. SPECIFICATIONS.
ALL CONSTRUCTION SHALL CONFORM TO SPECIFICATIONS.

- STRIP ALL ORGANIC MATERIAL AND TOPSOIL FROM STORAGE SITE TO OUTSIDE TOE OF BERM. REMOVE MATERIAL TO STOCK PILE FOR USE IN LANDSCAPING IN THE FUTURE.
- PROVIDE A .3 DEEP X 2.44 WIDE KEYWAY BENEATH BERMS PRIOR TO STARTING CONSTRUCTION OF BERMS. REMOVE ALL TOP SOIL AND ORGANIC MATERIAL BENEATH NEW BERM CONSTRUCTION.
- INTERIOR SURFACE OF FACILITY TO CONSIST OF A 1m THICK RECONSTRUCTED CLAY LINER UTILIZING THE IN-SITU HIGH PLASTIC CLAY PRESENT ON SITE.
- CONSTRUCT BERMS AND LINER IN MAXIMUM 150mm LIFTS. COMPACT EACH LIFT USING A FULLY BALLASTED SHEEPSFOOT PACKER (2400kPa OF COMPACTION PRESSURE) TO ACHIEVE 95% OF STANDARD PROCTOR DENSITY. PRIOR APPROVAL REQUIRED FOR OTHER TYPES OF PACKING EQUIPMENT.
- UNACCEPTABLE MATERIAL CONSISTING OF ORGANIC MATERIAL, HIGH PERCENTAGE SILT AND SAND, FROZEN SOIL OR STONES GREATER THAN 75mm SHALL NOT BE USED IN CONSTRUCTION OF THE BERMS. CONSULT ENGINEER IF QUALITY OF MATERIAL IS QUESTIONABLE.
- ANY UNSUITABLE MATERIAL ENCOUNTERED IS TO BE REMOVED AND UTILIZED IN CONSTRUCTION OF EXTERIOR SLOPE OF BERM.
- THE MOISTURE CONTENT OF THE FILL MATERIAL SHALL BE SUCH THAT PROPER PACKING CAN BE ACHIEVED (0.9-1.2 OPTIMUM). MATERIAL SHOULD BE STIFF TO THE TOUCH BUT NOT CRUMBLE WHEN HANDLED. ALLOW DRYING OR PROVIDE WETTING BETWEEN CONSECUTIVE LIFTS AS REQUIRED.
- DISC AND RECOMPACT INTERIOR SURFACE OF FACILITY TO 95% OF STANDARD PROCTOR DENSITY UPON COMPLETION.
- SEED BERMS WITH GRASS TO PREVENT LONG TERM EROSION.
- ACCESS RAMPS AND SPLASH PADS TO BE CONSTRUCTED USING .15 REINFORCED CONCRETE, C/W 10M @ .40 O/C BOTH WAYS. ACCESS RAMPS TO HAVE .15 WIDE BY .3 HIGH RAISED CURB ALONG EDGES.
- ALL CONCRETE TO BE 25MPa TYPE 10 W/5-7% AIR ENTRAINMENT.
- CONCRETE PLACED IN COLD WEATHER (BELOW 0°C AIR TEMP. AND WINDCHILL) SHALL BE PROTECTED WITH INSULATED TARPS. BELOW -3°C CONCRETE IS TO BE HEATED TO MAINTAIN 10° CELSIUS FOR A MINIMUM OF TWO DAYS AFTER PLACEMENT. REMOVE INSULATION AND HEATING GRADUALLY TO AVOID THERMAL SHOCK.
- INSTALL FENCE AROUND ENTIRE PERIMETER OF WASTE WATER STORAGE AS PER DETAIL ATTACHED.
- SIGNAGE SHALL BE PROVIDED INDICATING THAT POTENTIAL FOR DANGER EXISTS.
- SIGNAGE SHALL BE POSTED IN ACCORDANCE TO ASAE S441 AND INCLUDE CONTACT NUMBERS IN CASE OF EMERGENCY.



South-Man Engineering
19-1599 Dugald Road | Winnipeg, Manitoba | R2J 0R3
PH. (204) 660-9653 | FAX (204) 668-9204

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: GENERAL NOTES	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: GN

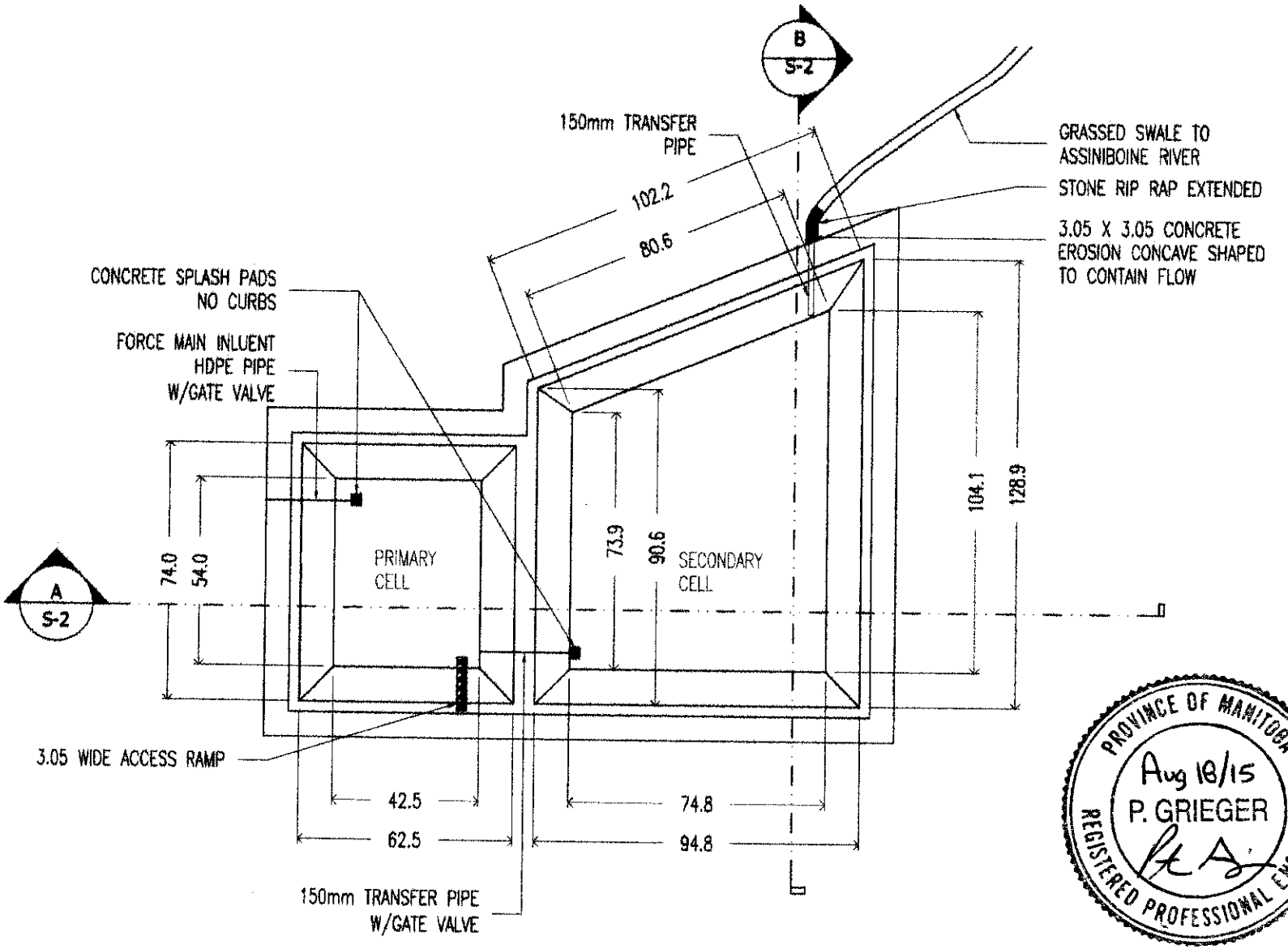


LAKESIDE COLONY
LOT 56-57
R.M. OF CARTIER

N

South-Man Engineering
35-1999 Dugald Road | Winnipeg, Manitoba | R2J 0H1
PH. (204) 668-9853 | FAX (204) 668-9204

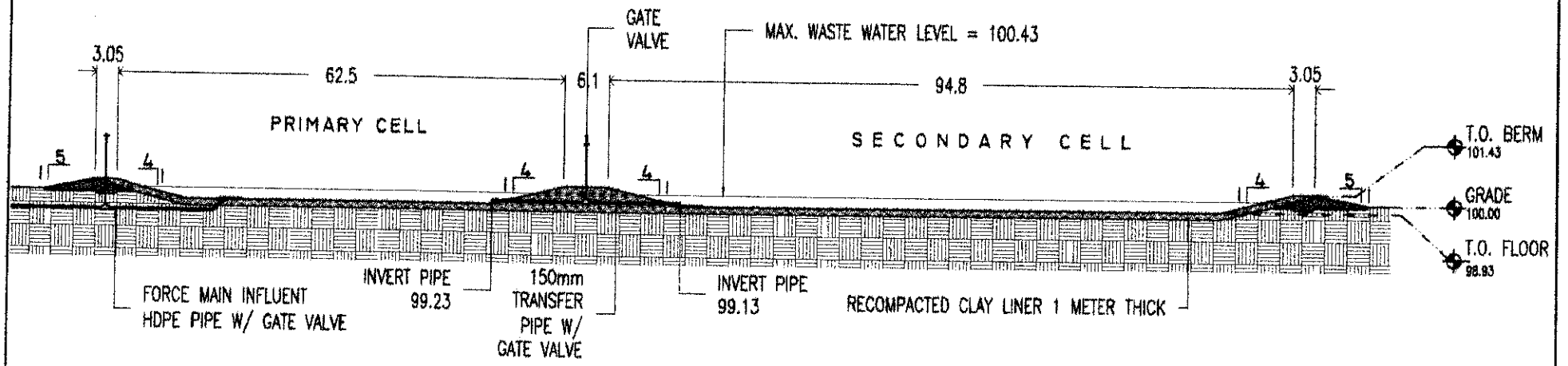
PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: SITE PLAN	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S-P



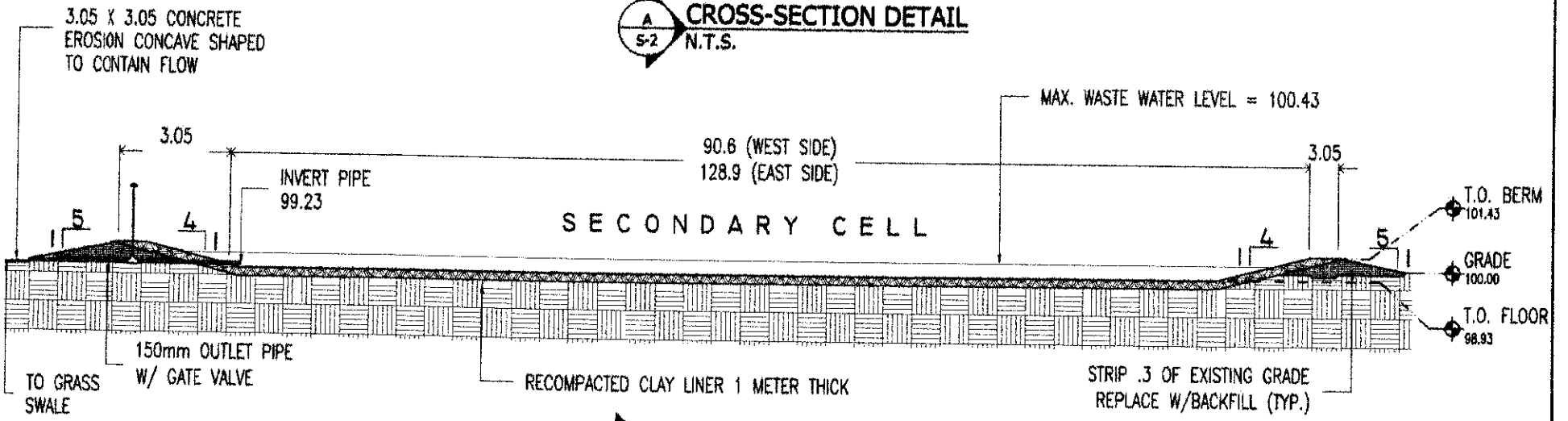
PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

South-Man Engineering
15-1599 Dugald Road | Winnipeg, Manitoba | R2J 0H2
PH: (204) 668-6852 | FAX: (204) 668-9304

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: FLOOR PLAN	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
SHEET NUMBER: S-1	



A S-2 **CROSS-SECTION DETAIL** N.T.S.

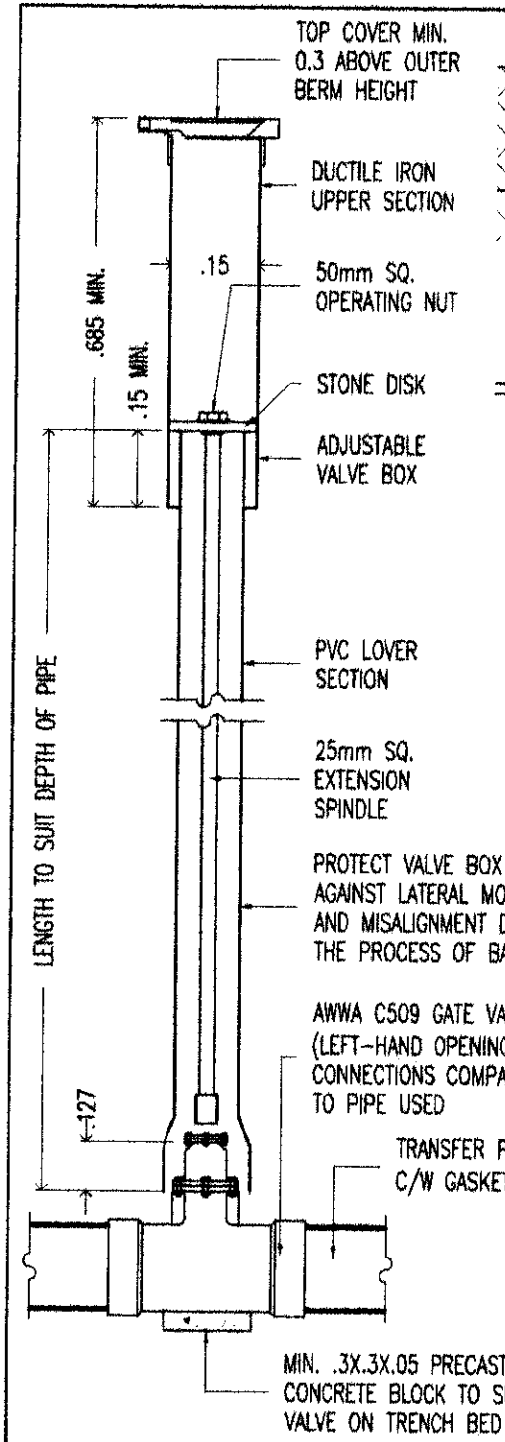


B S-2 **CROSS-SECTION DETAIL** N.T.S.

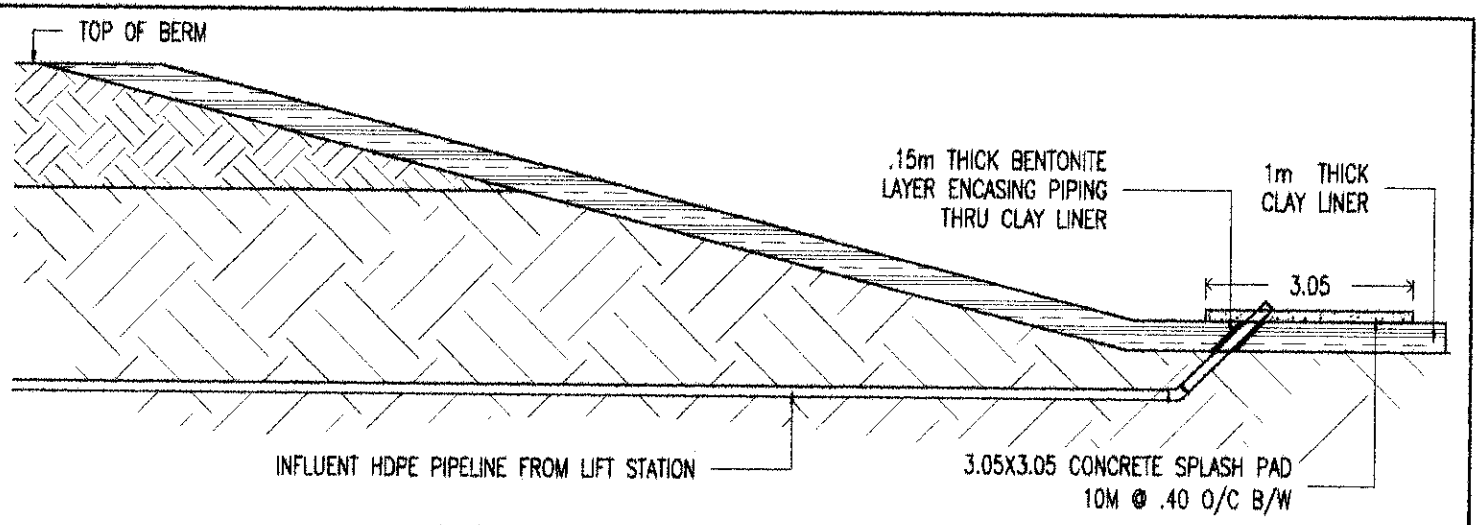
PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

South-Man Engineering
15-1899 Dugald Road | Winnipeg, Manitoba | R2J 0H5
PH. (204) 668-9652 | FAX (204) 668-9204

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: CROSS SECTION DETAILS	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S-2

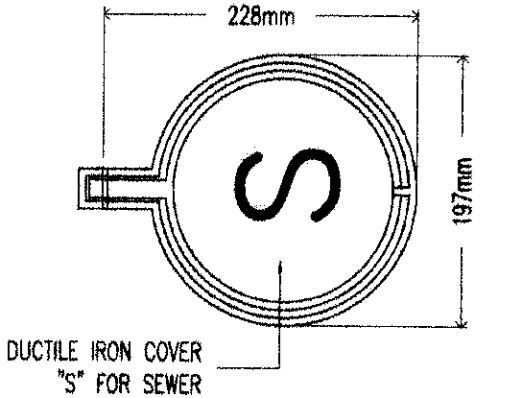


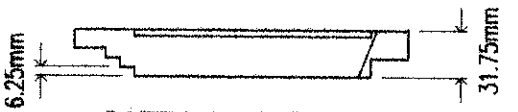
GATE VALVE INSTALLATION



INLET PIPING DETAIL: SIDE VIEW

N.T.S.





GATE VALVE COVER

PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

South-Man Engineering

(5-1599 Dugald Road | Winnipeg, Manitoba | R2J 0H3)
PH: (204) 668-9852 | FAX: (204) 668-8204

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: INLET PIPING & GATE VALVE DETAIL	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S-3

PIPING GENERAL NOTES:

1. ALL PIPELINE CONSTRUCTION AND PRODUCTS INCORPORATED INTO PROJECT SHALL CONFORM TO ASTM AND AWWA STANDARD SPECIFICATIONS.

2. INSTALLATION TO CONFORM WITH PIPE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

3. FROZEN MATERIAL SHOULD NOT BE USED TO SUPPORT OR BED THE PIPE.

4. AT LEAST 100mm OF BEDDING MATERIAL SHOULD BE PLACED UNDER THE PIPE IF ROCKY CONDITIONS EXIST. PROJECTING BELLS OF THE PIPE SHOULD BE PROPERLY RELIEVED IN THE TRENCH BOTTOM SO THAT THE ENTIRE PIPE IS EVENLY SUPPORTED BY THE BEDDING.

5. DO NOT THROW THE PIPE & FITTINGS INTO THE TRENCH, OR ALLOW ANY PART OF THE PIPE TO TAKE AN UNRESTRAINED FALL ON TO THE TRENCH BOTTOM.

6. PIPE MACHINING & CHAMFERING:
CUT PIPE SHOULD BE CUT AS SQUARE AS POSSIBLE AND CHAMFERED SIMILAR TO THE PIPE SUPPLIED FROM THE FACTORY.

7. WHERE THE PIPE LINE EXPERIENCES CHANGES IN DIRECTION, THRUST BLOCKS CONSISTING OF CONCRETE ARE TO BE INSTALLED. MINIMUM THRUST BLOCK AREA IS 1.8msq. CONCRETE USED FOR THRUST BLOCKS ARE TO HAVE A MIN. 28 DAY COMPRESSIVE STRENGTH OF 15MPA. CONCRETE SHALL BE SULPHATE RESISTANT (TYPE GU/TYPE 10 CEMENT), AND FOLLOW THE CURRENT CSA STANDARD A23.1. WATER USED FOR CONCRETE SHALL BE CLEAN AND EQUAL TO POTABLE (DRINKABLE) WATER IN PHYSICAL AND CHEMICAL PROPERTIES.

8. PRESSURE PIPE & FITTINGS TO MEET THE FOLLOWING STANDARDS

CANADIAN STANDARDS ASSOCIATION

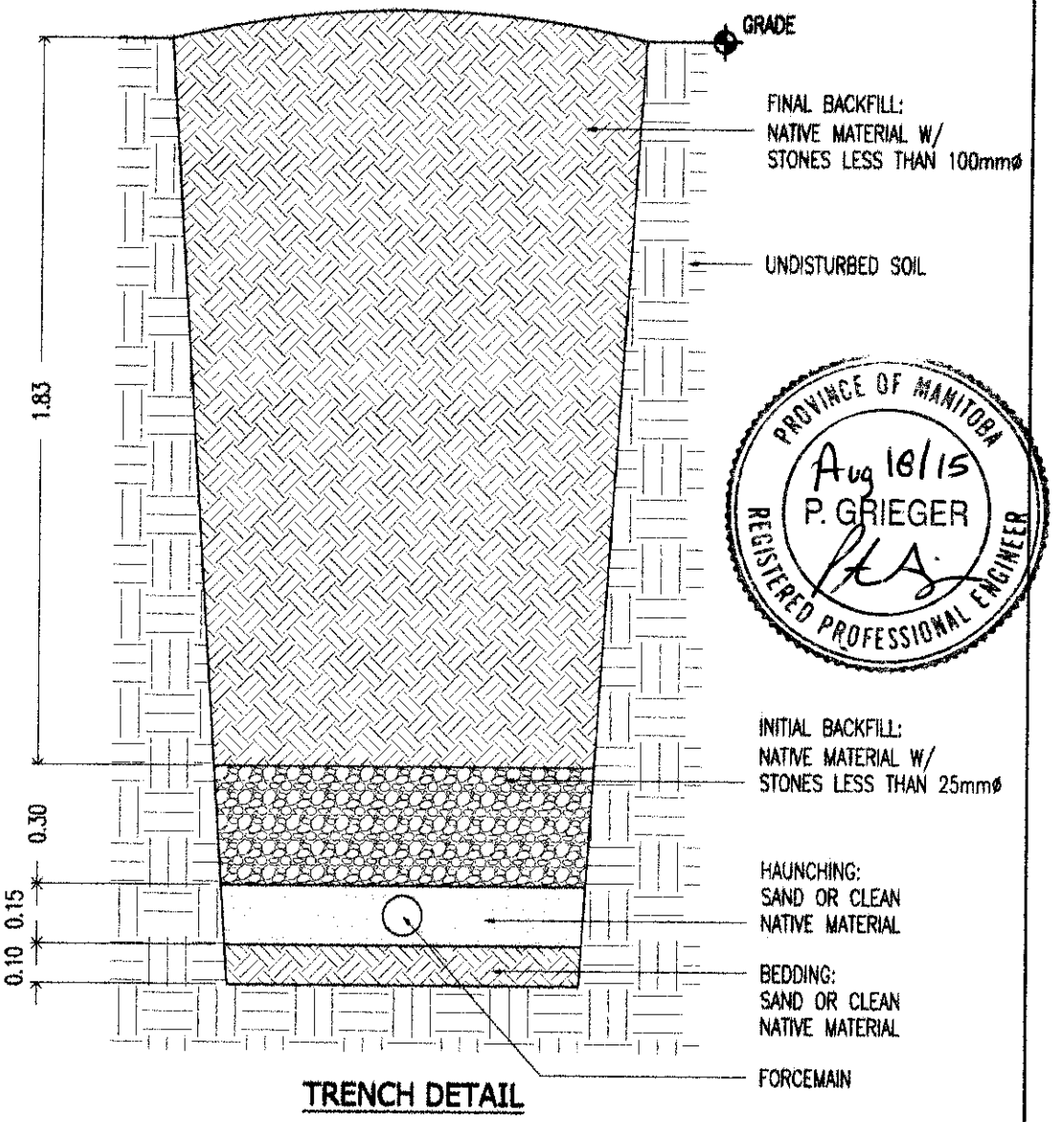
B137.2	RIGID PVC PIPE FOR PRESSURE APPLICATIONS
B137.3	LARGE DIAMETER FABRICATED FITTINGS

AMERICAN WATER WORKS ASSOCIATION

AWWA C900	PVC PRESSURE PIPE, 1.2m THROUGH – 3.7mFOR WATER
AWWA C907	PVC PRESSURE FITTINGS FOR WATER – 1.2m THROUGH 3.7m
ASTM D2241	PVC PRESSURE RATED PIPE (SDR SERIES) OR DR17 HDPE PIPE
PIPING:	SCHEDULE 40 PVC GLUED CONNECTIONS, SDR26 SERIES 160 PVC OR DR17 HDPE

9. ALL UNDERGROUND PIPING IS TO BE PRESSURE TESTED TO ENSURE THE INTEGRITY OF THE PIPE AND CONNECTIONS. THE PRESSURE TEST SHALL BE CARRIED OUT AT 700 kPa PRESSURE WITH PRESSURE DROP OVER 1 HR PERIOD NOT TO EXCEED 1.5%.

10. CLEANOUTS TO BE PROVIDED ON PIPELINE AT MAXIMUM 300m (1000 ft) INTERVALS.

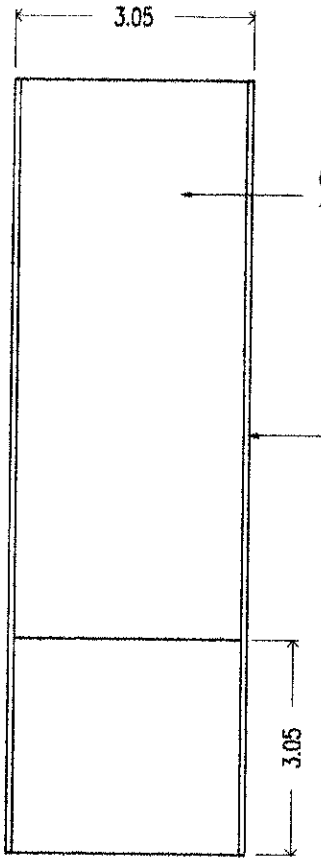


TRENCH DETAIL

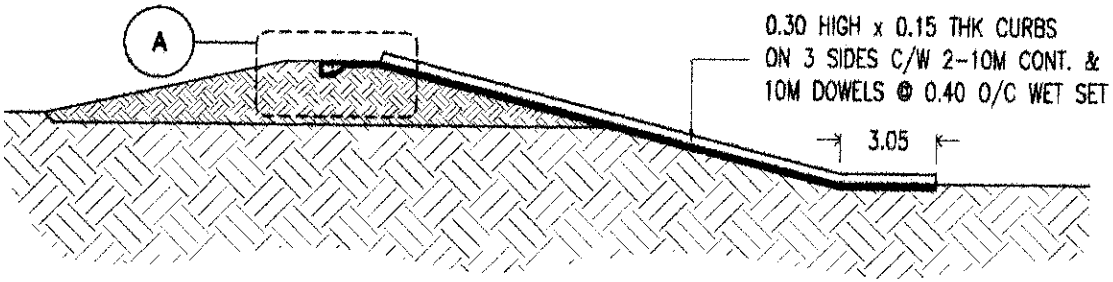
PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

South-Man Engineering
18-1599 Dugald Road | Winnipeg, Manitoba | R2J 0H3
PH: (204) 668-6662 | FAX: (204) 668-6704

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: TRENCH DETAIL	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S4



ACCESS RAMP: TOP VIEW



ACCESS RAMP: SIDE VIEW

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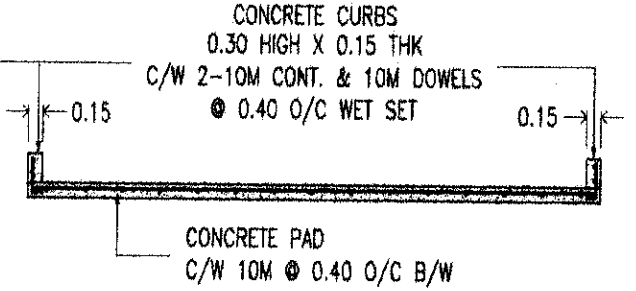

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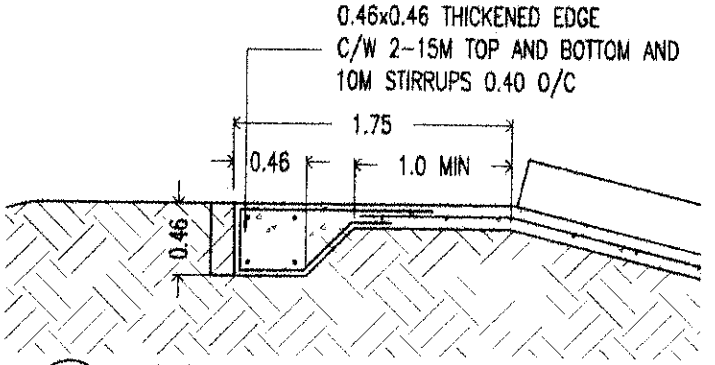

A ACCESS RAMP: ANCHORAGE DETAIL

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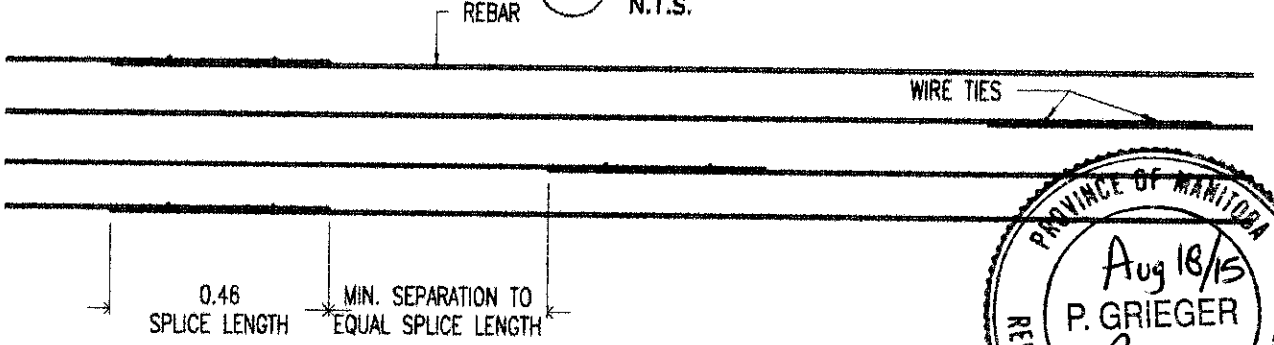

REBAR SPLICE DETAIL

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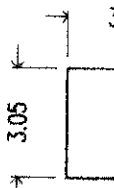
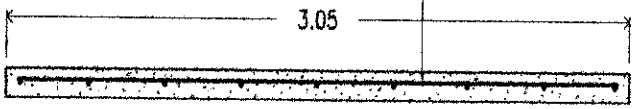


SPLASH PAD: TOP VIEW



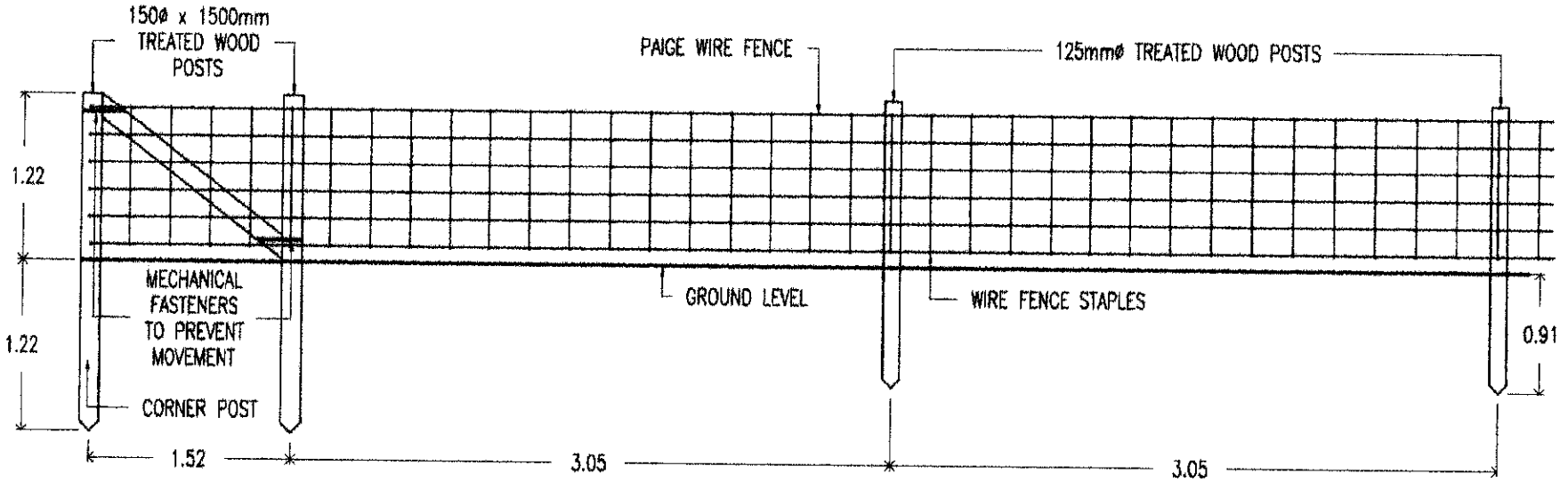
SPLASH PAD: CROSS-SECTION DETAIL

PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

South-Man Engineering

25-1999 Dugald Road | Winnipeg, Manitoba | R2J 0H3
PH. (204) 668-9852 | FAX (204) 668-9109

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: RAMP & SPLASH PAD DETAILS & REBAR SPLICE DETAIL	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S-5



FENCING CORNER DETAIL

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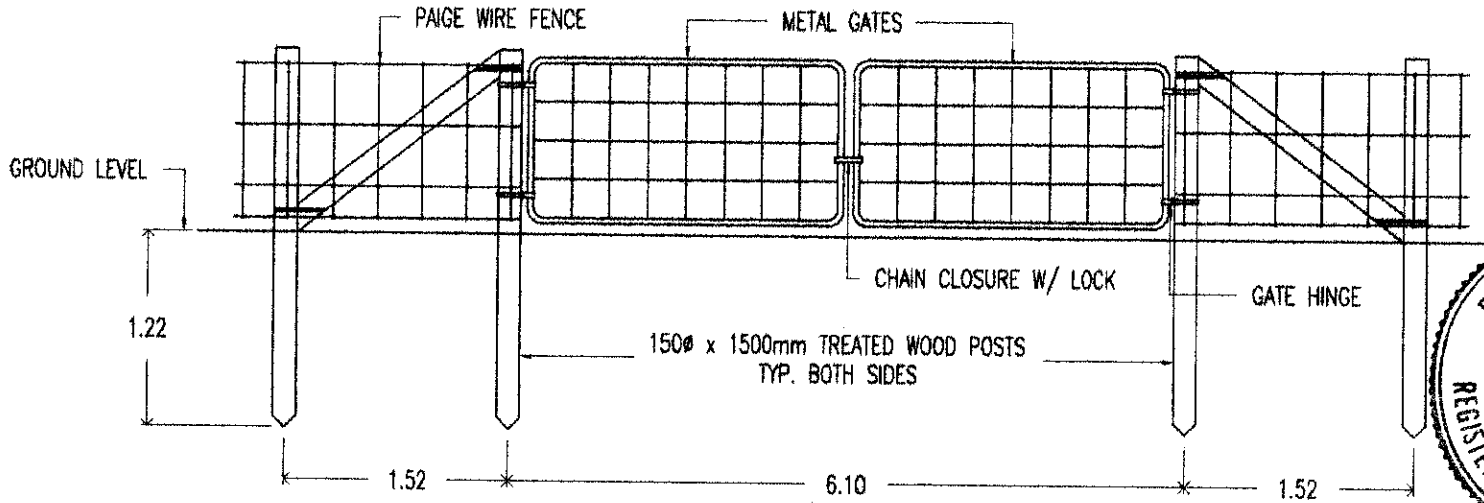


PROVINCE OF MANITOBA
Aug 18/15
P. GRIEGER
REGISTERED PROFESSIONAL ENGINEER

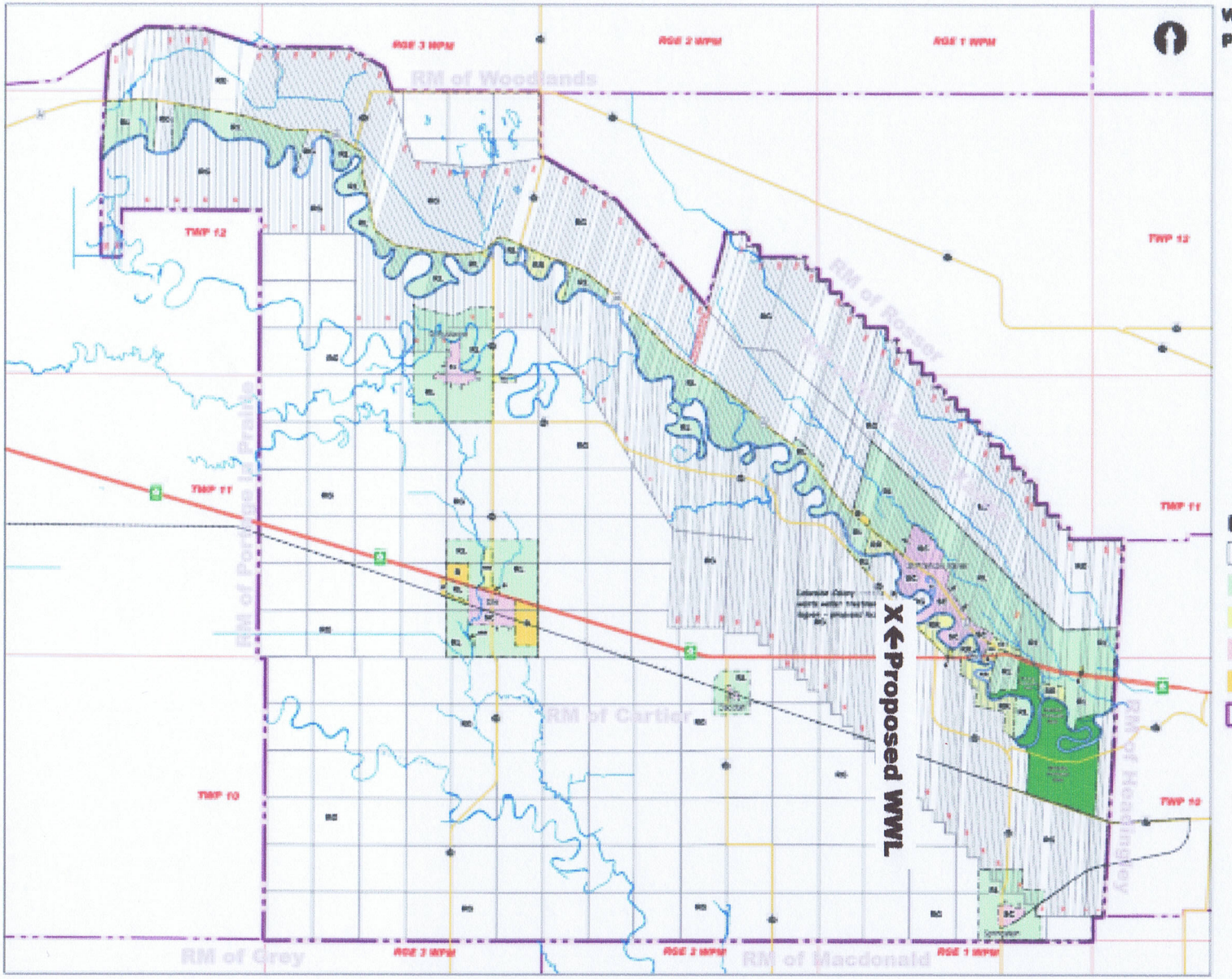
GATE DETAIL

N.T.S.

South-Man Engineering

15-1508 Dugald Road | Winnipeg, Manitoba | R2J 0H3
PH. (204) 668-9683 | FAX (204) 668-9284

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: FENCE & GATE	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
SHEET NUMBER: S-6	



WHITE HORSE PLAINS PLANNING DISTRICT

DEVELOPMENT PLAN BY-LAW No. 1-2008

MAP 1

Overall Land Use Plan

LEGEND

- RG - Rural General Policy Area
- RL - Rural Limited Policy Area
- RR - Rural Residential Policy Area
- SC - Settlement Centre Policy Area
- B - Business Policy Area
- Municipal Boundary
- Direction of Future Development

Manitoba
Department of Local Government
Community Planning Services

LAKESIDE COLONY
LOT 56-57
R.M. OF CARTIER

N

South-Man Engineering

15-1999 Dugald Road | Winnipeg, Manitoba | R2J 0H3
PH. (204) 668-9852 | FAX (204) 668-9204

PROJECT NAME: LAKESIDE HOLDING CO. LTD. DOMESTIC WASTE WATER LAGOON	BUILDING AREA: N/A
SHEET TITLE: SITE PLAN	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER
DATE DRAWN: OCTOBER 2014	DRAWING SCALE: METRIC
	SHEET NUMBER: S-P