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**Proposal for an Environment Act Licence for an Expanded Domestic Wastewater
Lagoon for Glenway Holding Co. Ltd. at E ½ 2-2-3E in the Rural Municipality of
Franklin**

Submitted to:

Director
Environment Assessment and Licensing Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
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Proponent:
Glenway Holding Co. Ltd. (Glenway Colony)
As Represented by
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January 29, 2013



Table of Contents

1.0 INTRODUCTION.....	2
2.0 LAND OWNERSHIP AND MUNICIPAL LAND-USE DESIGNATION.....	3
3.0 SITE CONDITIONS.....	5
3.1 Location.....	5
3.2 Groundwater and Surface Water Resources.....	5
3.3 Soil Conditions.....	7
4.0 DESIGN CRITERIA FOR PROPOSED WASTEWATER LAGOON	8
4.1 Hydraulic Loading.....	8
4.2 Organic Loading	9
4.3 Other Factors Influencing Effluent Quality.....	10
4.4 General Design Parameters	10
5.0 DESIGN CAPACITY	12
5.1 Primary Cell.....	12
5.2 Secondary Cell.....	12
6.0 EFFLUENT DISCHARGE	13
6.1 Method of Discharge.....	13
6.2 Discharge Procedure	15
7.0 ENVIRONMENTAL IMPACT	16
7.1 Odour Production	16
7.2 Impact of Discharge to Waterways	17
7.3 Impact on Groundwater.....	18
7.4 Impacts on Wildlife, Forestry and Heritage Resources.....	19
7.5 Gasoline and Associated Product Storage	20
7.6 Socio-economic Implication.....	21
8.0 MAINTENANCE AND INSPECTION	21
8.1 General Maintenance	21
8.2 Monitoring Requirements.....	21
9.0 CONSTRUCTION SCHEDULE.....	22
10.0 FUNDING	22
APPENDIX A – CERTIFICATE OF TITLE.....	23
APPENDIX B – GEO-TECHNICAL INFORMATION	24
APPENDIX C – DESIGN DRAWINGS.....	25

1.0 Introduction

In response to Warning No. W11763 and concerns expressed by Manitoba Conservation and Water Stewardship over the original construction and operation of a domestic wastewater lagoon under the control of Glenway Colony situated on E½ 2-3-3E in the RM of Franklin, South-Man Engineering was asked by the colony to undertake the task of evaluating the current facility and preparing the required Environment Act Proposal which would facilitate the licensing and operation of the facility.

A site investigation and assessment of the existing facility was conducted in order to determine any remedial actions necessary to ensure protection of the environment and establish a long term operating procedure. The investigation included test drilling to confirm soil and groundwater conditions and verification of the construction practices used to construct the original facility. The results of this investigation have revealed the presence of high plastic clay to the depth of investigation, 9.15m (see sample test results Appendix A). Similarly, the test holes conducted on the berms of the existing structure revealed that this same high plastic clay was used to construct the existing berms. Based on the quality of the material on site and the absence of ground water in the test holes, it has been concluded that this site is suitable for such a structure and poses no threat to groundwater resources in the region.

Inspection of the existing facility did reveal that there was some erosion of the interior slopes present. An attempt to correct the erosion in the primary cell had been undertaken in the fall of 2011 however, a degree of deterioration was again evident. The level of erosion has not been significant enough to compromise the integrity of the berm, however for long term performance and maintenance it is recommended that the improvements be implemented. Limited vegetation growth was present in the primary cell, but was more prominent in the secondary cell and is in need of removal in order to facilitate the treatment process.

The historical operation of the treatment facility was reviewed with the proponent while on site. Based on this discussion it was determined that the retention capacity and treatment capacity is insufficient to provide effective treatment and afford the necessary storage capacity to facilitate only emptying twice per year. Current practices have consisted of discharging typically 3 times per year, one discharge of which has typically occurred early in the spring due to shortages in storage capacity following the winter period. As a result, the proposed EAP will include the addition of a third cell which will both address the current retention capacity and treatment needs of the colony.

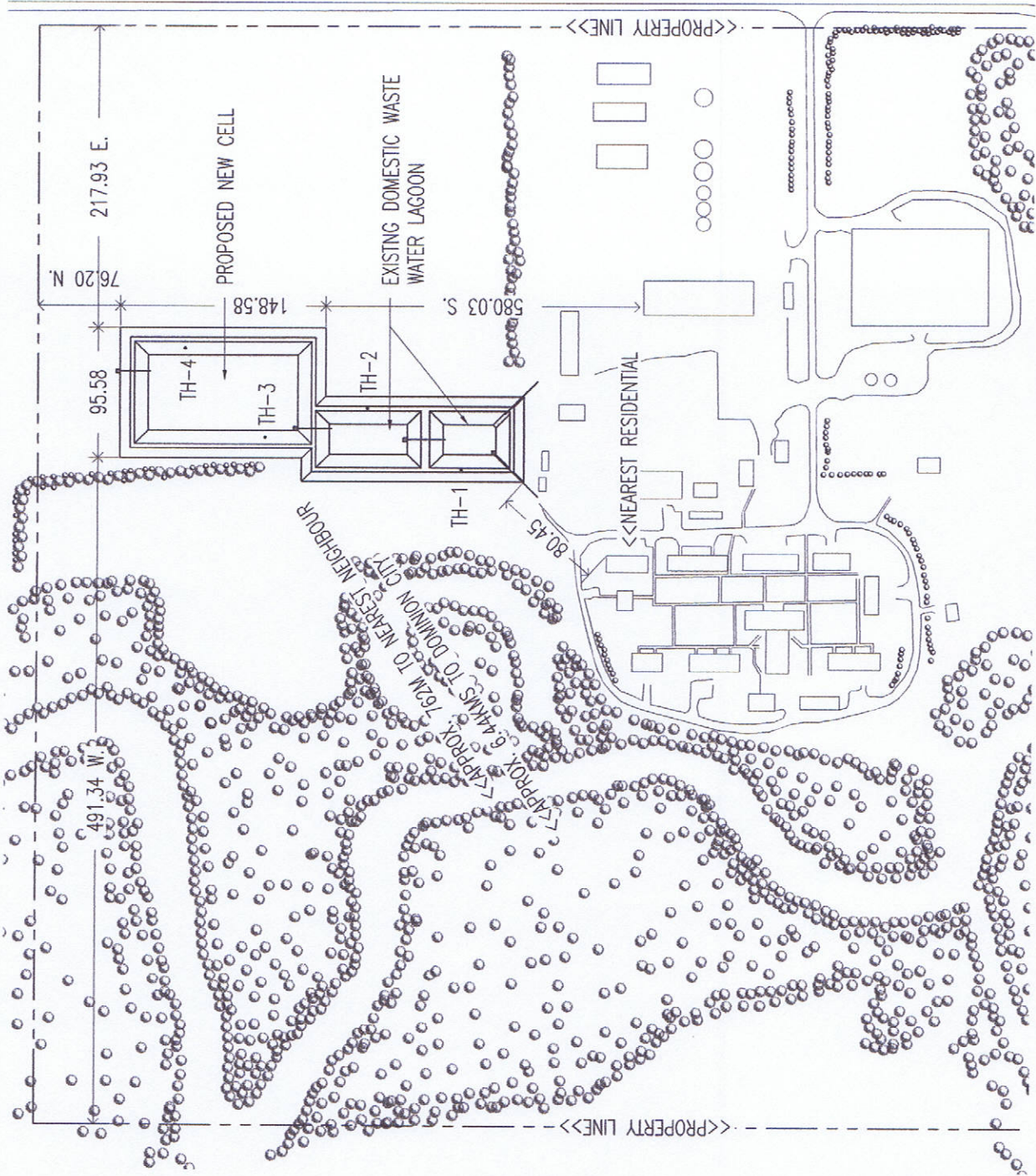
South-Man Engineering has been retained to provide the design services for the proposed stabilization pond and to prepare the Environment Act Proposal. This report has been compiled to address the information requested in the Environment Act Proposal Form.

2.0 Land Ownership and Municipal Land-Use Designation

Glenway Holding Co. Ltd owns the proposed site. A copy of the Certificate of Title for the land is included in Appendix A. The existing wastewater stabilization pond is situated on E½ 2-3-3E along with the existing commercial and residential development as illustrated in Figure 1.

The land where the existing and proposed development is to take place, and the immediate surrounding land, is currently used for agricultural production and is used primarily for the production of cereal and oilseed crops. The R.M. of Franklin has adopted Zoning By-Law 1411 which regulates the location and construction of lagoons for the storage and treatment of domestic sewage. In discussion with municipal staff, it has been indicated that although there is an existing facility in place, the proposed additional cell will warrant a Conditional Use Hearing. Siting requirements stipulated within the Zoning By-Law requires a minimum site area of 20 acres, minimum site width of 400 feet, minimum front yard of 125 feet and minimum side and rear yards of 100 feet. The existing and proposed development, exceed all of these requirements.

There have been no previous studies or activities relating to the proposed site development that have been found, however the colony does remember the involvement of a Government agency when the original wastewater cells were constructed approximately 45 years ago.



PROJECT NAME	GLENWAY COLONY EZ 2-03-3E	BUILDING AREA	N/A
SHEET TITLE	SITE PLAN	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	OCTOBER 2012	DRAWING SCALE	SCALED TO FIT
		SHEET NUMBER	FIGURE-1

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3.0 Site Conditions

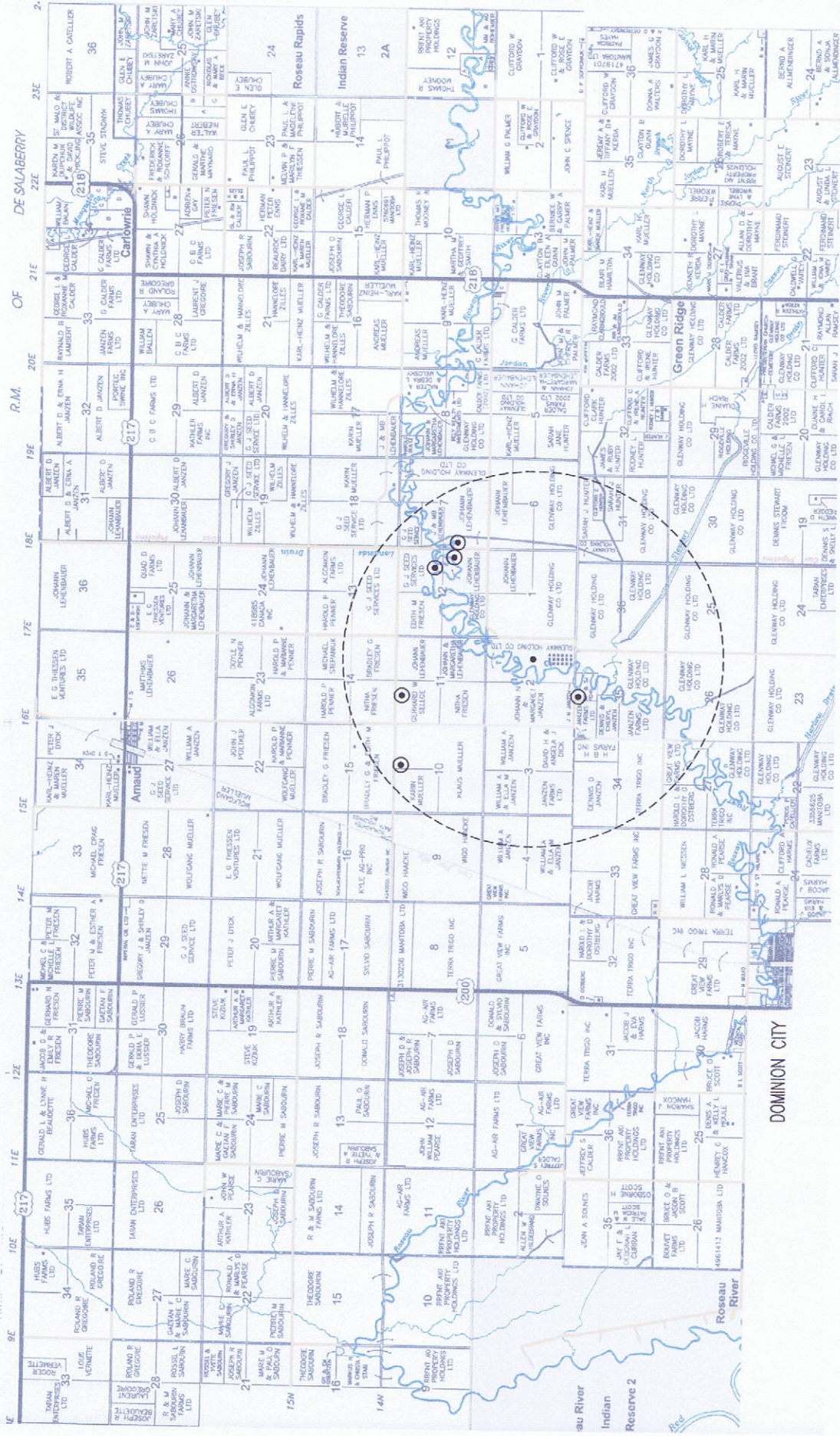
3.1 Location

The wastewater treatment lagoon is located approximately 762m from the nearest neighbouring residence and is approximately 95m from the nearest colony residence. The nearest residential development is Dominion City located approximately 6.44 km southwest, Figure 2.

The location where the lagoon is situated is such that prevailing winds from the north to northwest and south-southwest to south-southeast will not affect a significant number of people. The nearest residence to the southeast is approximately 5.0 km away, while the nearest to the north and northwest is 2.7 km, affording significant separation for mitigating any odour concerns. The nearest neighbor 904m to the southwest, is not within the prevailing wind directions and is not anticipated to be affected by the development. Currently there are natural treed areas near the lagoon separating the nearest neighbour from the development further reducing the possibility of unobstructed wind sweeps across the lagoon surface from having a significant effect.

3.2 Groundwater and Surface Water Resources

A review of groundwater resources in the area has revealed the presence of a thick mantel of clay overlying gravel and sand layers inter-dispersed within the clay. From test wells drilled on site, these sand and gravel layers are not encountered until 16.5m below the surface. Although these sand and gravel layers have been identified, they have not been developed as a water source due to the limited quantity of water available. In general, the heavy clay overburden overlying the sand and gravel layers are considered to provide a significant amount of protection against leaching. There are no users of surface water along the proposed discharge path for domestic or livestock use. Activities on the surface in this region are generally not considered a significant threat to groundwater quality due to the low permeability of the soil, thereby resulting in a low pollution hazard potential.



PROJECT NAME	GLENWAY COLONY E/S 2-03-3E
BUILDING AREA	N/A
SHEET TITLE	MUNICIPAL SITE MAP
DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAIN	OCTOBER 2012
DRAWING SCALE	SCALED TO FIT
SHEET NUMBER	FIGURE-2

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⊙ — RESIDENCES WITHIN 3.2KM RADIUS

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A review of topography in the area indicates that natural drainage patterns from the proposed site are to the north and west away from potentially impacted sites to the south and east. A review of the development area with the Water Resources Branch has revealed no record of surface flooding. Although the Roseau River is near the proposed development site, there are no records of flood damage or requests for flood protection assistance following the 1997 flood. Flooding has occurred further west along the Roseau River as well as the Red River, but due to the distance to these waterways the hazard potential is extremely low. To prevent isolated surface accumulations from causing property damage it is recommended that any structures built, be slightly elevated and graded to enhance drainage. Structures such as the wastewater treatment lagoon, has been constructed with inherent flood protection by way of berms which currently extend approximately 1.5 meters above surrounding grade. Any natural drainage impeded by the proposed facility will be re-established by the construction of drainage swales with a minimum 0.1% slope to ensure ponding does not occur adjacent to the structure.

3.3 Soil Conditions

A geo-technical investigation was conducted by South-Man Engineering on May 3, 2012 in order to assess the soil characteristics to facilitate evaluation of the existing structure and construction of the proposed wastewater lagoon addition. Four test holes were drilled in the vicinity of the lagoon to a maximum depth of 9.15 meters. 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 highly plastic clay. Intermittent silt inclusions were encountered in several of the test holes. The depth of topsoil from the surface as determined from the on-site soil investigation varied from 0.15 to 0.20 m. Beneath the topsoil layer the clay thickness extended to the depth of exploration, 9.15m below grade. Details of the test-hole logs and soil test results are included in Appendix B.

Based on the particle size analysis and Atterberg Limit results determined on several samples of the clay from which the existing lagoon is constructed and the proposed addition is to be constructed, and

immediately underlying the facility, the clay soil is classified as CH, high plastic clay, with a liquid limit between 53% and 105%, and a plasticity Index between 32 and 73. 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.

4.0 Design Criteria for Proposed Wastewater Lagoon

4.1 Hydraulic Loading

Hydraulic loading refers to the volume of raw sewage that will flow to 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 water infiltration into the infrastructure. Traditionally Hutterite Colonies range in size from 120 to 150 persons before an additional colony is developed. In discussion with Glenway Colony it is their intent to maintain a population less than 150 persons at the proposed development.

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 consumption. Based on a population of 150 people the total flow will be 37,500 liters per day ($37.5 \text{ m}^3/\text{day}$). The contribution from water infiltration into the sewer system is considered negligible due to the absence of a high water table and installation of the sewage collection system in high plastic clays and the exclusion of external sources such as weeping tile collection.

In addition to domestic wastewater production, there will also be contribution from a slaughter house used strictly for butchering and packaging meat products for their own consumption. In total it is estimated that 53,200 kg live weight of poultry and pork will be processed on an annual basis. Based on discussions with members of the Colony, all blood-letting will take place outside of the slaughter facility and the paunches will be disposed of by means of rendering or composting. Based on the low range of wastewater production from simple commercial slaughter houses and low-processing packing houses it is estimated that 760 litres of wash water will be produced per 455 kg of live weight killed.

On an annual basis this represents a total hydraulic load of 88,862 litres (88.9 m³). Although it is likely that slaughtering will not occur on a daily basis, for the purpose of determining the daily hydraulic loading the annual production has been divided evenly into each day. The resulting daily hydraulic loading from the slaughter house is 243.5 litres/day (0.244 m³/day).

Total hydraulic loading from domestic wastewater and slaughter house waste is 37,744 litres per day (37.74 m³/day).

4.2 Organic Loading

Based on accepted practice the daily BOD₅ (5 day Biochemical Oxygen Demand) production has been estimated to be 0.077 kg per person. The total daily BOD₅ contribution to the stabilization pond will be 11.55 kg based on a population of 150 people.

The average daily BOD₅ contribution from the slaughter house is estimated to be 1.9 kg based on 13 kg BOD₅ per tonne of live weight.

$$\frac{13 \text{ kg/tonne} \times 53.2 \text{ tonne/yr}}{365 \text{ days/yr}} = 1.9 \text{ kg/day}$$

Traditionally the BOD₅ of wastewater from a red meat slaughter house is estimated at 26 kg/tonne of live weight, with blood being the single largest contributor. As the blood will not be disposed of through the sewer and the paunch will be disposed of through rendering or composting, these contributors have been deducted resulting in an estimated 13 kg/tonne live weight.

The total daily BOD₅ contribution to the stabilization pond will be 11.91 kg based on a population of 150 people and the additional organic loading from the slaughter house.

4.3 Other Factors Influencing Effluent Quality

The current practice is that domestic water will be softened using a sodium based ion exchange treatment system. To minimize the salinity as referenced to SAR, only water used for laundry and food preparation services is softened. Wastewater produced as a result of the softening process will empty into the lagoon thereby affecting the SAR of the treated effluent. Based on analysis of wastewater samples collected from the secondary cell of the existing lagoon, SAR levels between 12.28 and 14.87 were recorded. These levels are above the recommended levels for irrigation, particularly on fine texture and low permeability soils. As it is anticipated that repeated application of treated effluent to irrigated land will have a negative impact on the productivity of the agricultural land, it was decided to utilize discharge to a waterway as the preferred method of disposal.

It is proposed to mitigate any potential impacts with regards to discharging the treated effluent in a waterway by means of trickle discharge which will significantly dilute the effluent and achieve an effective SAR level well below levels considered to be deleterious to waterways. In addition to limiting the quantity of softened water to essential needs, Glenway Colony has also agreed to investigate alternative water softening methods that will reduce the SAR of the treated effluent, and participate in any regional programs focusing on improving treated wastewater quality and nutrient reduction initiatives.

4.4 General Design Parameters

The design liquid depth in the storage is 1.5 metres. A one meter freeboard is provided to protect against catastrophic levels of precipitation and to shelter the liquid surface to minimize the effects of 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 metres to permit access of maintenance equipment.

Due to the presence of slight silt inclusions encountered within 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. With the exception of topsoil any deleterious soil containing silt or sand shall only be used in constructing the outer embankments.

The first phase of construction will consist of constructing the additional cell. All topsoil and organic matter will be removed from the entire foot print of the facility, 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 0.3m deep key is to be constructed beneath the embankments to provide additional lateral support. Prior to starting placement of clay material to construct the embankments the material in the key is to be scarified and compacted to 95% of maximum dry density (MDD).

During construction of the embankments, the material is to be placed in maximum 150mm thick lifts and compacted using a sheepsfoot packer to achieve a minimum of 95% of MDD. To achieve the desired compaction rate, the moisture content of the clay material should be within plus or minus two percent of the optimum moisture content as determined from the Standard Proctor moisture versus density relationship curve. The amount of compaction effort required to achieve the minimum 95% will be dependant on the moisture content of the material. In general, a minimum of 5 to 10 passes over each lift will be required.

Construction of the bottom of the storage will consist of removing the clay material to 1.0m below the design elevation of the facility and replacing and compacting this high plastic clay material in 0.15m 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 1.0×10^{-7} cm/s is attained for a full metre thickness over the entire interior surface of the structure.

For safety reasons it is recommended that fencing and warning signs be installed around the facility to discourage the entry of livestock, wildlife and trespassers. Gates sufficient to permit the entry of mowing and maintenance equipment shall be provided and be locked when access is not required.

5.0 Design Capacity

5.1 Primary Treatment Cells

It is proposed to utilize the existing two cells in combination as the primary treatment cell. At the design depth of 0.75m the water surface area in the existing two cells has been determined to be 0.30 hectares. Based on the BOD₅ contribution of 11.91 kg per day and the available treatment cell area, a maximum BOD₅ loading of 39.7 kg/ha/day is anticipated. A BOD₅ loading this low is expected to minimize the potential for odour production during spring thaw and to limit the potential for offensive odour production throughout the year. Given the configuration of these cells and the distance between the influent line and discharge point into the third cell, the potential for short circuiting of effluent between cells is unlikely. Construction drawings for the lagoon are included in Appendix C.

5.2 Secondary Treatment Cell

Given the soil conditions encountered on site and the design criteria to be implemented, it is reasonable to assume that seepage losses from the storage will be negligible. Based on resources from Environment Canada, annual precipitation for this area is 535.7mm while annual evaporation values are as high as 820mm. Therefore, it is assumed that evaporation will at a minimum meet or exceed precipitation levels, as is generally the case in southern Manitoba. Additional storage capacity beyond the freeboard has not been provided to facilitate excess precipitation.

Operation of the lagoon is based on twice per year discharge, thereby requiring that the total storage capacity of the wastewater lagoon be equivalent to the estimated hydraulic flow, multiplied by the retention time. To eliminate the need for discharging treated effluent more than twice per year, or discharging in the period between November 1st and June 15th of the following year, the third cell addition has been sized to accommodate a minimum of 227 days of retention time, not taking into consideration any contribution in allowable storage capacity of the primary treatment cells. The storage capacity of the third cell at a maximum design depth of 1.5m is 8573.2 m³ excluding 0.3 m of dead storage below the discharge pipe and excluding any allowance for evaporation or seepage. In addition, a 1.0m freeboard is provided to facilitate a significant rainfall event and to

shelter the liquid surface from wind thereby reducing wave action. The retention capacity of the third cell alone is 227 days and when combined with 50% of the capacity of the primary treatment cell will achieve a total retention time of 259 days at the maximum design hydraulic loading.

6.0 Effluent Discharge

6.1 Method of Discharge

It is proposed that treated effluent from the wastewater lagoon will be discharged into a swale constructed in the adjacent agricultural land, Figure 3. The depth of this swale will be adjusted to enable discharge of the proposed cell by means of gravity. The effluent will flow in this swale to the north and approximately 436m before it reaches the Roseau River. Installation of rip rap at the discharge of the effluent pipe and the point of entry into the Roseau River will be required to prevent erosion of the embankments and disturbance of particulate matter in the water stream.

Trickle discharge will be implemented in order to limit the release of liquids into the waterway as a means of trying to minimize the amount of liquids that actually enter into the Roseau River. Over its entire length between the proposed construction site and the Roseau River, the swale will be established with grasses which will be harvested annually in order to remove nutrients taken up the foliage. In this manner it will be possible to recapture any nutrients within the treated effluent as well as any sediment within the water stream. Trickle discharge will allow the opportunity for maximum infiltration to occur and under low flow conditions will provide additional opportunity for further treatment to occur. Under normal conditions where field soil conditions are not saturated it is anticipated that a significant amount of the discharge will infiltrate into the surface soils.



PROJECT NAME	GLENWAY COLONY E½ 2-03-3E	BUILDING AREA	N/A
SHEET TITLE	PROPOSED DISCHARGE ROUTE	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	OCTOBER 2012	DRAWING SCALE	SCALED TO FIT
		SHEET NUMBER	FIGURE-3

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6.2 Discharge Procedure

In order to facilitate emptying the final treatment cell, it must first be proven that the treated effluent meets the minimum effluent standards. Consideration must be given to the time required for the final treatment in this 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 in excess of four weeks.

Following is the general discharge procedure to be implemented:

- 1) Close the valve in the connecting piping between the primary cells and the final treatment cell a minimum of two weeks before collecting the effluent samples for laboratory analysis. This valve is to remain closed until discharge of the cell is complete.
- 2) Collect sample from the final treatment 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 final treatment cell can proceed. If the results are not favorable, additional treatment will be required. In the event that the BOD₅ level exceeds the limit, additional time will be required to allow the contents of the 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 cell at a rate of 100 kg/ha. Re-testing to verify that the minimum standards are met will be required. Discharge the final cell when all requirements are met.
- 4) With discharge of the final treatment cell complete, the discharge valve is closed and the valve between the primary cells and final treatment cell is opened to allow the liquid levels in all cells to equalize. These valves will remain open until the next discharge procedure is initiated. Sizing of the final treatment cell is such that two discharges will be required when the population of the colony exceeds approximately 90 persons.
- 5) If additional discharges are required, repeat the entire procedure.

7.0 Environmental Impact

7.1 Odor Production

Sizing of the primary cell has been based on an organic loading rate 39.7 kg BOD₅/ha/day. This level, which is considerably less than the maximum allowable 56 kg BOD₅/ha/day as prescribed in Province of Manitoba document "Design Objectives for Standard Sewage Lagoons" will ensure that the facility operates relatively odour free for the majority of the year.

Potential does exist for odour to be present during the spring thaw when gases such as hydrogen sulfide, which have been trapped under the ice, are released. Production of these gases are 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 odours 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. With the removal of the ice cover the lagoon will quickly return to an aerobic state and odour production will be minimal.

The large separation distance between the lagoon and the nearest residences within the prevailing wind directions will serve to further reduce any potential impacts of odour production. Wind data available for the area indicates that the predominant wind directions are from the north to northwest and south-southeast to south-southwest. Of the six residences within a 3.2 km radius that are not associated with Glenway Colony, three are located northeast of the proposed site from 2.2 to 2.5 km away, two are located north-northwest from 2.5 to 3.1 km away, and one is located to the southwest, 762m away. The nearest neighbour 762m from the development is not within the prevailing wind directions as winds from the northeast are relatively rare. The large separation distances to the other neighbours are anticipated to provide a sufficient buffer to minimize any odour related impacts. Many of these residences are also surrounded by treed shelters and bush, further mitigating any potential impacts. No complaints have been expressed to the colony in regards to odours related to the existing municipal lagoon.

In summary, odor reduction has been taken into consideration in the design of the treatment lagoon and separation distances from

neighbouring residences are significantly greater than the required minimums. For these reasons it is not anticipated that odour will have any significant environmental impacts.

7.2 Impact of Discharge to Waterways

The treated effluent from the final treatment cell of the lagoon will be discharged twice per year during the period prescribed in the Environment license when the population of the colony exceeds 90 persons. 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

Stream flow statistics available for the Roseau River from a monitoring station located at Dominion City were available at this station from 1913 to 2009. Over this period, minimum daily flow rates of 0.000 m³/s were recorded during the months of July through October during years which corresponded to drought conditions. For a more realistic representation of the minimum flow rates to be anticipated the lower quartile of mean monthly discharges are considered between the months of July through October. The lowest discharge rate based on these conditions is 0.570 m³/s. Under trickle discharge conditions which are anticipated to be approximately 6-7 L/s, the dilution rate would be in excess of 80:1, even if all of the treated effluent discharged from the facility were to reach the Roseau River. When minimal flow rates are experienced in the Roseau

River, it would also be anticipated that the soils conditions along the discharge path would be extremely dry and much of the treated effluent would be absorbed in the soil or utilized by the vegetation within the drainage swale.

Efforts will be made by the colony to decrease the SAR level within the treated effluent by reducing the amount of water that is softened and by exploring alternative methods of iron removal that will reduce the impact on SAR levels currently experienced.

Moderate levels of SAR in treated wastewater in the range of 6 to 8 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. 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. In the event that discharge is necessary during a period of low flow in the waterway, it is anticipated that any precipitated salts will be re-suspended and diluted by the next significant rainfall and corresponding flow event.

7.3 Impact on Groundwater

Soil types and construction methods utilized in constructing the lagoon will limit potential seepage losses to a minimum. The clay mantle and reconstructed clay liner within the proposed lagoon will adequately protect the sub-surface groundwater resources beneath the facility. The presence of high plasticity surface clay within the discharge path will also afford protection to groundwater resources determined to be approximately 18m below grade based on well logs for the area. For these reasons the impact on groundwater is considered negligible.

7.4 Impacts on Wildlife, Forestry and Heritage Resources

Currently the land at the proposed construction site is utilized for agricultural purposes. This area currently does not represent a significant source of wildlife or forestry habitat, or heritage resource. Consequently is not anticipated that the proposed lagoon addition will have an impact on them.

It has been determined that the Roseau River is habitat for numerous species of fish the most common of which are, Black Crappie, Blacknose Dace, Black-sided Darter, Carp, Central Mudminnow, Channel Catfish, Common Shiner, Fathead Minnow, Freshwater Drum, Johnny Darter, Northern Pike, River Shiner, Rock Bass, Sand Shiner, Shorthead Redhorse, Silver Chub, Spottin Shiner, Walleye, White Sucker and Lake Sturgeon. On rare occasion the following species have also been found, Bigmouth Shiner, Burbot, Chesnut Lamprey, Longnose Dace and Stonecat. As this habitat and the tributaries that flow into the Roseau River represent potential spawning grounds, discharge of treated wastewater during the spawning period is not recommended. It is generally accepted that discharge after June 15th will mitigate any negative effects on fish spawning.

The Roseau River and its tributaries represent a source of recreational fishing. To protect water quality and minimize any effects on fish habitat, strict adherence to maximum nutrient levels in the treated wastewater as specified in the Licence must be ensured. Participation in nutrient reduction programs is also recommended to further reduce nutrient loading.

Manitoba Conservation Wildlife and Ecosystem Branch Data Center database has confirmed that the *Veronicastrum virginicum*, more commonly known as the Culver's-root, is found in this region. As this plant has become rare in Manitoba, it has been placed on the Data Center database. Culver's root is found most commonly at edges of woodlands, thickets, savannas, and swampy meadows along rivers and ditches. The plant is rare among highly disturbed habitats such as cultivated agricultural land. As the proposed lagoon is to be placed on cultivated farmland, no further damage to plant population or habitat within the development area is anticipated.

Based on information from the Wildlife and Ecosystem Protection Branch, no wildlife habitat areas exist in the immediate vicinity of the proposed development. Two Red River Region Wildlife Management Areas do exist in the region, however are a considerable distance away. These areas are the Rat River (southeast of St. Malo) and St. Malo region (8 km south of St. Malo). Due to the separation distance from both the drainage path and construction site no impacts are anticipated.

Historic Resources have indicated that the nearest historic sites are situated in Arnaud and Dominion City. Arnaud is situated 7.5 km north-northeast and Dominion City is situated 6.4 km southwest of the proposed development. The R.M. of Franklin has indicated that there currently are no municipal requirements to setbacks from historical site, however, the current setback would be anticipated to exceed any such requirement in the future. The construction of the proposed addition and continued operation of the existing lagoon is not anticipated to have any impact on these sites. Any odour issues will be mitigated by the facility design and large separation distance.

Also of notable interest is the Cottonwood Tree situated along the banks of the Roseau River on 12-3-3E. The Cottonwood Tree is a notable landmark and tourist attraction in the R.M. of Franklin boasted to be the largest tree in Manitoba and is estimated to be over 300 years old. This site is situated such that the development will have no impact either during construction or during operation of the lagoon in the future. Discharge from the lagoon flows away from this site and the separation and prevailing winds will mitigate any potential odour concerns. No complaints or concerns have been expressed based on the operation of the existing facility in this respect.

7.5 Gasoline and Associated Product Storage

No storage of gasoline or associated petroleum products are expected on site due to the proposed development. Refueling and storage of petroleum products will be done within the developed yard site to the south of the construction site, well removed from the Roseau River.

7.6 Socio-economic Implication

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

8.0 Maintenance and Inspection

8.1 General Maintenance

Several aspects require regular attention throughout the year, particularly during the growing season. Regular mowing of the grass on the embankments is required to minimize and discourage habitation by burrowing rodents which may impair the water holding capacity. 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 which would otherwise be used in the breakdown of organic compounds. Significant populations will also prevent sunlight from penetrating the surface of the wastewater further reducing the efficiency of the natural treatment process.

8.2 Monitoring Requirements

Operation of the lagoon is relatively self sufficient, however regular inspections are required to ensure operation and water flows are occurring as designed.

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 second cell. Odour levels are to be assessed and if excessive, the cause of the odours determined and rectified. General condition of the embankments and any rip-rap should also be assessed for damage from wind and wave action and repaired as necessary.

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

9.0 Construction Schedule

It is proposed that construction of the cell addition would begin as soon as the Environmental Licence has been granted and weather conditions are favorable. For practical purposes construction would occur between May 1st and October 31st to avoid contending with frozen soil and freezing conditions.

10.0 Funding

Construction of the domestic lagoon will be funded primarily by Glenway Holding Co. Ltd., however a grant has been requested from the Canada/Manitoba Infrastructure Program to potentially recover some of these costs.

Appendix A – Certificate of Title

DATE: 2013/01/28
TIME: 15:45

MANITOBA
STATUS OF TITLE

TITLE NO: 2411160/1

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	P GRIEGER
ORIGINATING OFFICE...	WINNIPEG	ADDRESS.....	UNIT 15-1559 DUGALD RD
REGISTERING OFFICE...	WINNIPEG		WPG MB R2J 0H3
REGISTRATION DATE....	2010/09/17		
COMPLETION DATE.....	2010/12/10	CLIENT FILE...	NA
		PRODUCED BY...	M.DERKSEN

LEGAL DESCRIPTION:

GLENWAY HOLDING CO. LTD.

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

FIRSTLY: THE NE 1/4 OF SECTION 2-3-3 EPM
EXC ALL THAT PORTION DESCRIBED AS FOLLOWS: COMMENCING AT THE
SW CORNER OF SAID NE 1/4 THENCE NLY ALONG THE WESTERN LIMIT THEREOF
A DISTANCE OF 30 FEET THENCE ELY AT RIGHT ANGLES TO THE SAID WESTERN
LIMIT A DISTANCE OF 30 FEET THENCE SLY PARALLEL WITH THE SAID WESTERN
LIMIT TO THE SOUTHERN LIMIT OF SAID NE 1/4
THENCE WLY ALONG SAID SOUTHERN LIMIT TO THE POINT OF COMMENCEMENT
SECONDLY: ALL THAT PORTION OF THE SE 1/4 OF SAID SECTION 2
WHICH LIES EAST OF THE ROSSEAU RIVER ACCORDING TO PLAN 2549 WLTO

ACTIVE TITLE CHARGE(S):

1753228/1	ACCEPTED DESCRIPTION: FROM/BY: TO: CONSIDERATION:	CAVEAT LEASE SAM KLEINSASSER, ZACHARIUS HOFER AND HARRY HOFER	REG'D: 1993/12/24 NOTES: AFF: SECONDLY
2353508/1	ACCEPTED DESCRIPTION: FROM/BY: TO: CONSIDERATION:	CAVEAT EASEMENT MTS COMMUNICATIONS INC. WILLIAM F. JOHNSTONE AS AGENT	REG'D: 1999/02/25 NOTES: AFF: SECONDLY
2394791/1	ACCEPTED DESCRIPTION: FROM/BY: TO: CONSIDERATION:	CAVEAT RIGHT-OF-WAY AGREEMENT MTS COMMUNICATIONS INC. WILLIAM F. JOHNSTONE, AS AGENT	REG'D: 1999/07/09 NOTES:

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2013/01/28 OF TITLE NUMBER 2411160/1

***** STATUS OF TITLE 2411160/1 CONTINUED ON NEXT PAGE *****

DATE: 2013/01/28
TIME: 15:45

MANITOBA

TITLE NO: 2411160/1

STATUS OF TITLE

PAGE: 2

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	P GRIEGER
ORIGINATING OFFICE...	WINNIPEG	ADDRESS.....	UNIT 15-1559 DUGALD RD
REGISTERING OFFICE...	WINNIPEG		WPG MB R2J OH3
REGISTRATION DATE....	2010/09/17		
COMPLETION DATE.....	2010/12/10		
		CLIENT FILE...	NA
		PRODUCED BY...	M.DERKSEN

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	GLENWAY HOLDING CO. LTD.	
	X	

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
3981436/1	ITREQ	2010/09/17	\$0.00	\$0.00
PRESENTED BY:	CONV/INTERNAL - NO AUTO PRINT			
FROM:	WLTO INTERNAL - CONVERSIONS			
TO:				

FROM TITLE NUMBER(S):

A66992/1 ALL

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	NE	2	3	3E
NOTE:	EX PT			
	SE	2	3	3E
NOTE:	PART EAST OF ROSEAU RIVER			

DUPLICATE PRODUCED FOR.. HOLD FOR PROD OF DUPL CT NO(S) 2010/12/13
 ADDRESS..... A66992

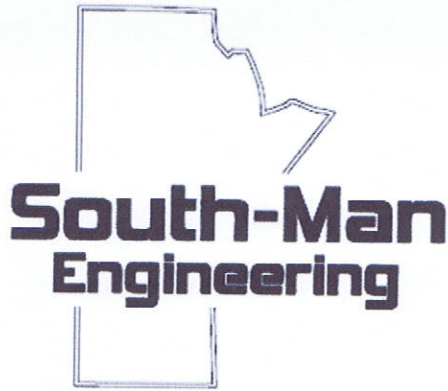
POSTAL CODE.....

ACCEPTED THIS 17TH DAY OF SEPTEMBER, 2010
 BY J.SCOTT FOR THE DISTRICT REGISTRAR OF
 THE LAND TITLES DISTRICT OF WINNIPEG.

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
 STORAGE SYSTEM ON 2013/01/28 OF TITLE NUMBER 2411160/1.

***** END OF STATUS OF TITLE 2411160/1 *****

Appendix B – Geo-Technical Information



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: Glenway Holding Co. Ltd.

Operation: Domestic Lagoon

Location: E ½ 2-3-3E

RM: Franklin

City/Town, Prov.: Dominion City, MB

Test Hole Logs by: Peter Grieger, P. Eng.

Drilling Performed by: Kletke Enviro Drilling

Date: May 3, 2012

Test Hole #1 (top of west berm, primary cell)

0 – 2"	topsoil
2" – 4.5'	clay fill, firm. medium/high plasticity
4.5' – 6'	black clay, med/high plasticity, appears to be transition material beneath topsoil
6' – 19'	brown/grey clay, high plasticity, firm becoming softer below 12'
19' – 24'	brown clay, high plasticity, sticky, soft, visible salts
24' – 27'	brown silty clay w/ thin silts inclusions, low/medium plasticity, soft
27' – 30'	grey/blue clay, high plasticity, sticky, soft

No water encountered in test hole after 2 hours.

Test Hole #2 (top of east berm, secondary cell)

0 – 6'	clay fill, stiff, med/high plasticity
6' – 8'	brown clay, stiff, medium/high plasticity, visible salts
8' – 20'	brown clay, firm, high plasticity, slight visible salts 13'-16'
20' – 30'	brown/grey clay, high plasticity, soft, sticky

No seepage or sloughing after drilling.

Test Hole #3 (west side of cell addition)

0 – 8"	topsoil
8" – 2.5'	grey clay, firm, med/high plastic, visible salts
2.5' – 13.5'	brown clay, firm, high plastic, slight silt inclusions @ 9', slight oxidized flecks
13.5' – 30'	grey clay, soft, sticky, high plastic

No seepage or sloughing after completion.

Test Hole #4 (east side of cell addition)

0 – 6"	topsoil
6" – 1.5'	grey clay, firm, slight silt inclusions, med-high plastic
1.5' – 15'	brown clay, firm, high plastic, slight visible salts
15' – 30'	grey clay, soft, high plastic

No seepage or sloughing after completion.



Unit 6 - 854 Marion Street, Winnipeg, Manitoba, R2J 0K4
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May 18, 2012

File No.: 11-408-21

South-Man Engineering
37084 Hazelridge Road
Box 18, Grp 30, RR#1
Anola, Manitoba
R0E 0A0

ATTENTION: Peter Grieger, P.Eng

RE: GLENWAY COLONY – DOMESTIC LAGOON

Dear Mr. Grieger

ENG-TECH Consulting Limited (ENG-TECH) has completed the requested analyses of six (6) soil samples from the above project. The laboratory soil analyses consisted of the following:

- Particle Size Analysis (6)
- Atterberg Limits (6)
- Moisture Content (6)


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. 11-408-21-13,14,15,16,17,18).

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

Email: peter@southmaneng.com

Attachments: Table 1
Particle Size Analysis Reports (Ref. No. 11-408-21-13,14,15,16,17,18)

TABLE 1
 SOIL SAMPLE ANALYSIS
 GLENWAY COLONY – DOMESTIC LAGOON

Test Hole	Sample No.	Ref. No.	Depth (ft.)	Classification	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
TH1	-	11-408-21-13	10	CH, clay, high plastic, dark grey, trace silt, trace sand.	41.0	105	32	73
TH1	-	11-408-21-14	20	CH, clay, high plastic, dark grey, with silt, trace gypsum.	51.9	104	32	72
TH3	-	11-408-21-15	5	CH, clay, high plastic, dark grey, some silt.	40.2	99	30	66
TH3	-	11-408-21-16	15	CH, clay, high plastic, dark grey, some silt.	52.0	90	29	61
TH3	-	11-408-21-17	25	CH, clay, high plastic, dark grey, and silt.	30.3	53	21	32
TH4	-	11-408-21-18	10	CH, clay, high plastic, brown, some silt.	53.3	101	31	70



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**PARTICLE SIZE
 ANALYSIS REPORT**

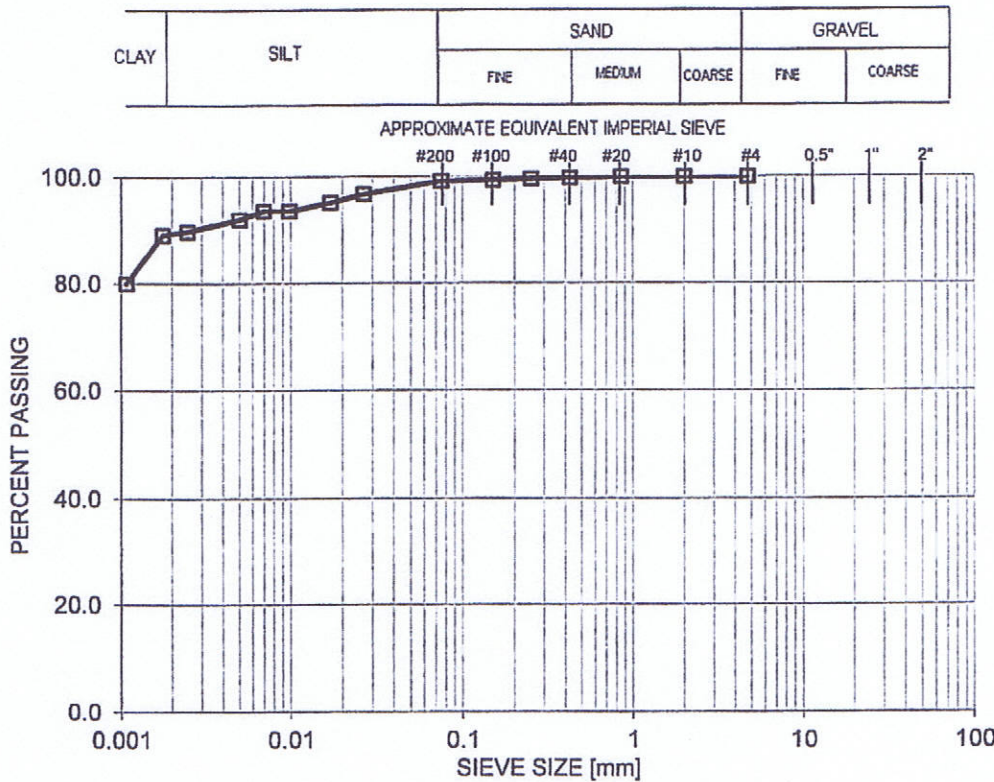
South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 R0E 0A0

File No.: 11-408-21
 Ref. No.: 11-408-21-13

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH1 Sample No. - Depth: 10'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	99.7
0.250	99.5
0.150	99.3
0.075	99.1
0.027	96.8
0.017	95.1
0.010	93.5
0.0069	93.5
0.0050	91.9
0.0025	89.7
0.0018	89.0
0.0011	80.0

Percent of: GRAVEL (0.0 %), SAND (0.9 %), SILT (9.8 %), CLAY (89.3 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 41.0%.

Email: peter@southmaneng.com

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**

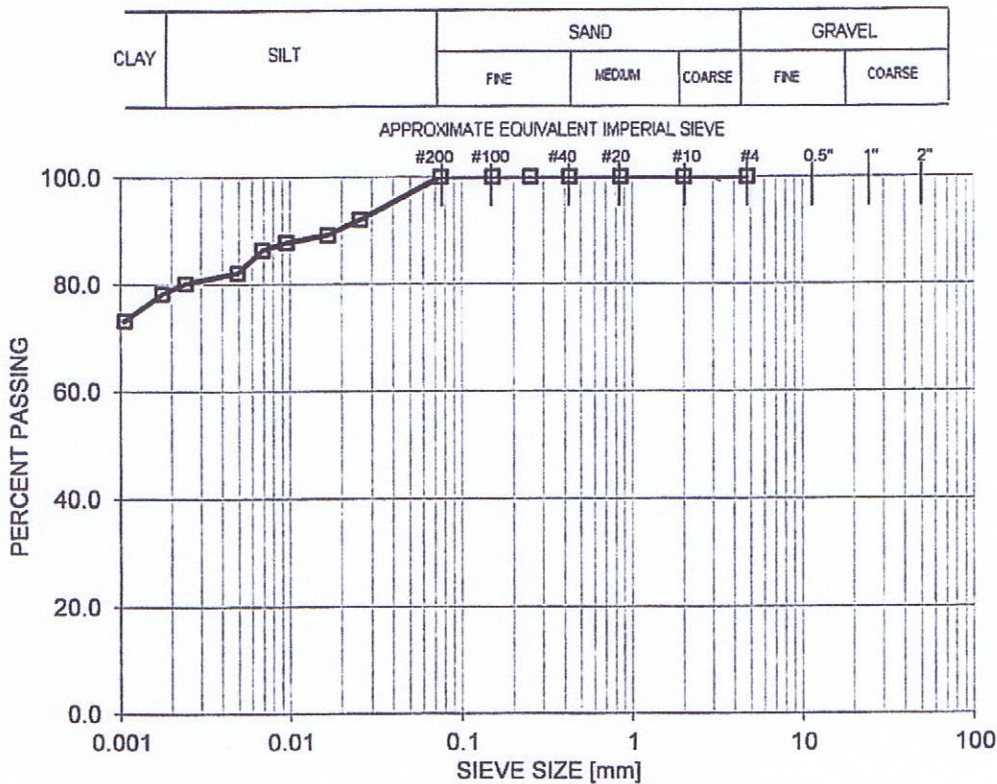
South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 R0E 0A0

File No.: 11-408-21
 Ref. No.: 11-408-21-14

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH1 Sample No. - Depth: 20'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12




SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.150	100.0
0.075	100.0
0.026	92.1
0.017	89.3
0.010	87.9
0.0069	86.5
0.0049	82.2
0.0024	80.2
0.0018	78.3
0.0011	73.2

Percent of: GRAVEL (0.0 %), SAND (0.0 %), SILT (20.9 %), CLAY (79.1 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 51.9%.

Email: peter@southmaneng.com

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per 
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**PARTICLE SIZE
 ANALYSIS REPORT**

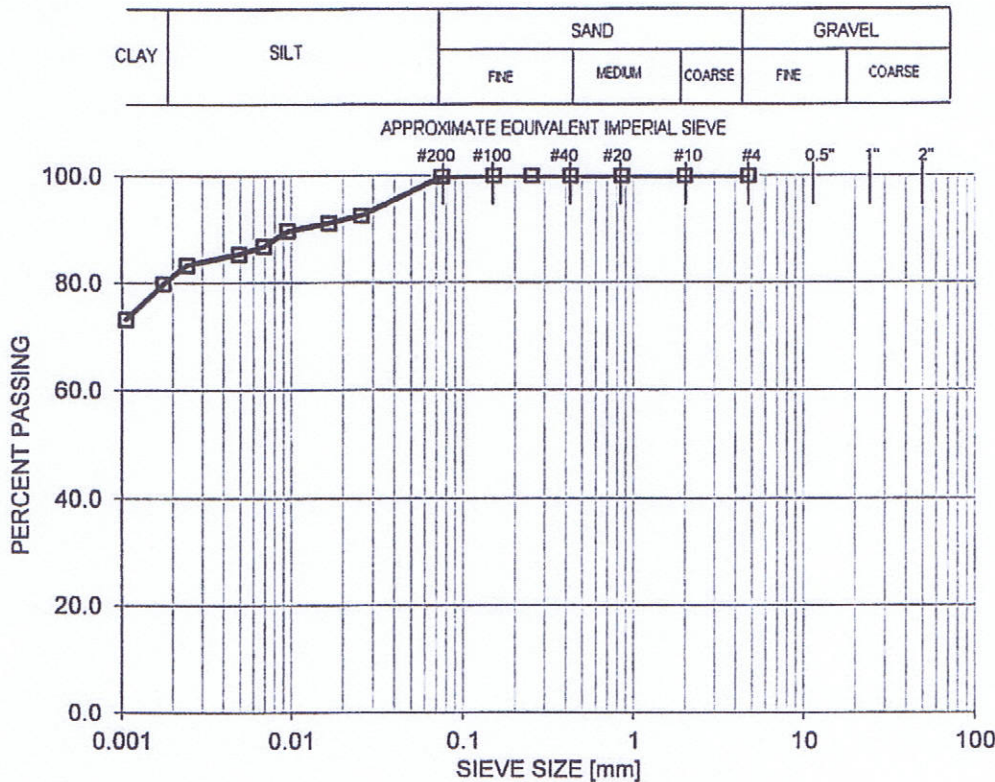
South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 R0E 0A0

File No.: 11-408-21
 Ref. No.: 11-408-21-15

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH3 Sample No. - Depth: 5'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12




SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.150	100.0
0.075	99.8
0.026	92.5
0.017	91.1
0.010	89.7
0.0069	86.8
0.0049	85.3
0.0024	83.3
0.0018	79.9
0.0011	73.2

Percent of: GRAVEL (0.0 %), SAND (0.2 %), SILT (18.5 %), CLAY (81.3 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 40.2%.

Email: peter@southmaneng.com

ENG-TECH Consulting Limited

per 
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**PARTICLE SIZE
 ANALYSIS REPORT**

South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 ROE 0A0

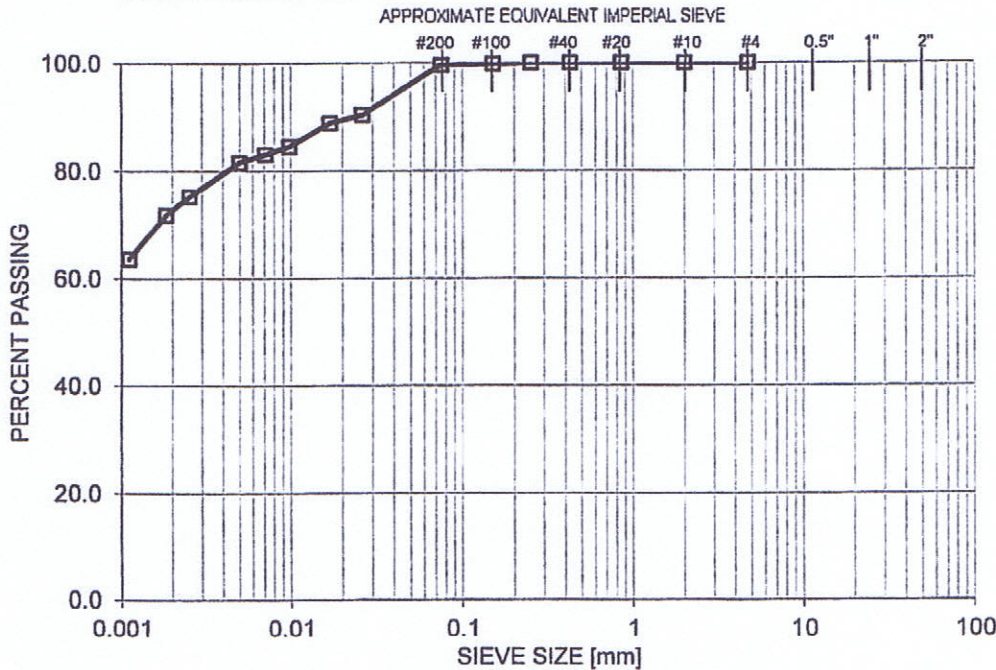
File No.: 11-408-21
 Ref. No.: 11-408-21-16

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH3 Sample No. - Depth: 15'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



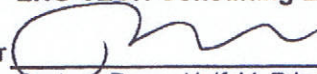
SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.150	99.8
0.075	99.6
0.026	90.4
0.017	88.9
0.010	84.6
0.0071	83.1
0.0050	81.7
0.0025	75.3
0.0018	71.8
0.0011	63.7

Percent of: GRAVEL (0.0 %), SAND (0.4 %), SILT (26.8 %), CLAY (72.8 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 52.0%.

Email: peter@southmaneng.com

ENG-TECH Consulting Limited

per 
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**PARTICLE SIZE
 ANALYSIS REPORT**

South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 R0E 0A0

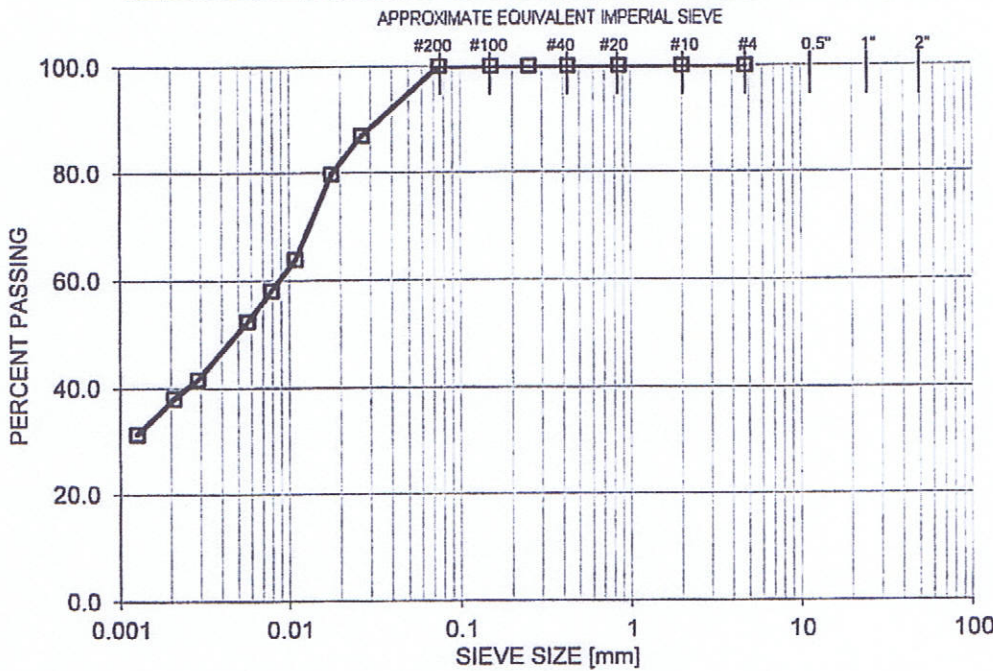
File No.: 11-408-21
 Ref. No.: 11-408-21-17

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH3 Sample No. - Depth: 25'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.150	100.0
0.075	100.0
0.027	87.0
0.018	79.8
0.011	63.9
0.0079	58.1
0.0057	52.3
0.0029	41.6
0.0021	38.2
0.0013	31.5

Percent of: GRAVEL (0.0 %), SAND (0.0 %), SILT (62.3 %), CLAY (37.7 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 30.3%.

Email: peter@southmaneng.com

ENG-TECH Consulting Limited

per
 Contact: Danny Holfeld, Principal
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**PARTICLE SIZE
 ANALYSIS REPORT**

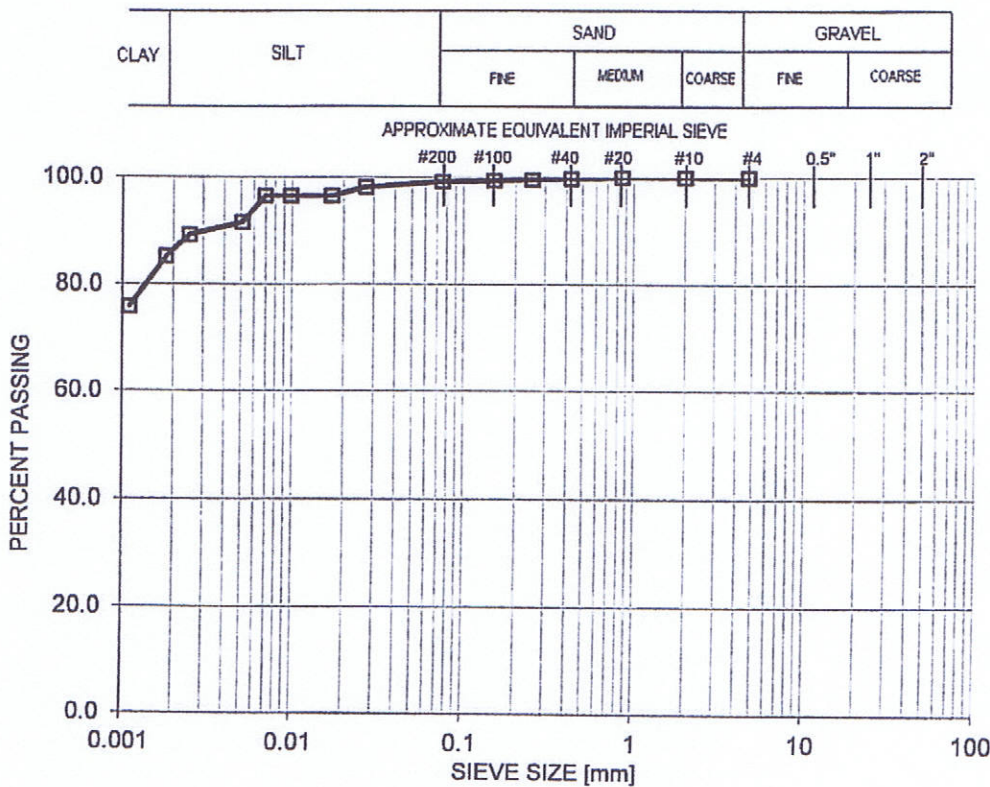
South-Man Engineering
 37084 Hazelridge Rd, Box 18, Grp 30, RR #1
 Anola, MB
 R0E 0A0

File No.: 11-408-21
 Ref. No.: 11-408-21-18

ATTENTION: Peter Grieger, P.Eng.

PROJECT: GLENWAY COLONY - DOMESTIC LAGOON

Test Hole No. TH4 Sample No. - Depth: 10'
 Sampled By: Client Type of Sample: Grab Source: Project Site
 Date Sampled: May 4/12 Date Received: May 7/12 Date Tested: May 9/12



SIEVE SIZE (mm)	PERCENT PASSING
4.750	100.0
2.000	100.0
0.850	100.0
0.425	99.8
0.250	99.6
0.150	99.4
0.075	99.2
0.027	98.1
0.017	96.5
0.010	96.5
0.0069	96.5
0.0051	91.5
0.0025	89.2
0.0018	85.2
0.0011	75.9

Percent of: GRAVEL (0.0 %), SAND (0.8 %), SILT (12.7 %), CLAY (86.5 %)
 Sample Description:

COMMENTS: Insitu Moisture content is 53.3%.

Email: peter@southmaneng.com

ENG-TECH Consulting Limited

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

Appendix C – Design Drawings

PROJECT NAME:

GLENWAY COLONY

E¹/₂ 2-03-3E (RM of FRANKLIN, MB) DOMESTIC WASTE WATER LAGOON



South-Man Engineering



UNIT 15-1599 DUGALD ROAD | WINNIPEG, MANITOBA | R2J 0H3
PH: 204.668.9652 | FAX: 204.668.9204
sme@southmaneng.com

SHT NO.	COVER SHEET	SHEET SCHEDULE
CS	COVER SHEET	
GN	GENERAL NOTES	
SP-1	SITE PLAN	
S-1	FLOOR PLAN	
S-2	CROSS-SECTION	
S-3	ACCESS RAMP DETAILS	
S-4	INLET PIPING, SPLASH PAD & REBAR SPLICE DETAILS	
S-5	GATE VALVE DETAIL	
S-6	TRENCH DETAIL	
S-7	PERIMETER FENCE & GATE DETAILS	
PROJECT NAME GLENWAY COLONY E ¹ / ₂ 2-03-3E		BUILDING AREA N/A
SHEET TITLE COVER PAGE		DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN OCTOBER 2012		DRAWING SCALE N/A
		SHEET NUMBER CS

THIS DRAWING IS THE PROPERTY OF SOUTH-MAN ENGINEERING, WINNIPEG, MANITOBA, CANADA.

GENERAL NOTES:

- THIS WASTE WATER STORAGE 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.

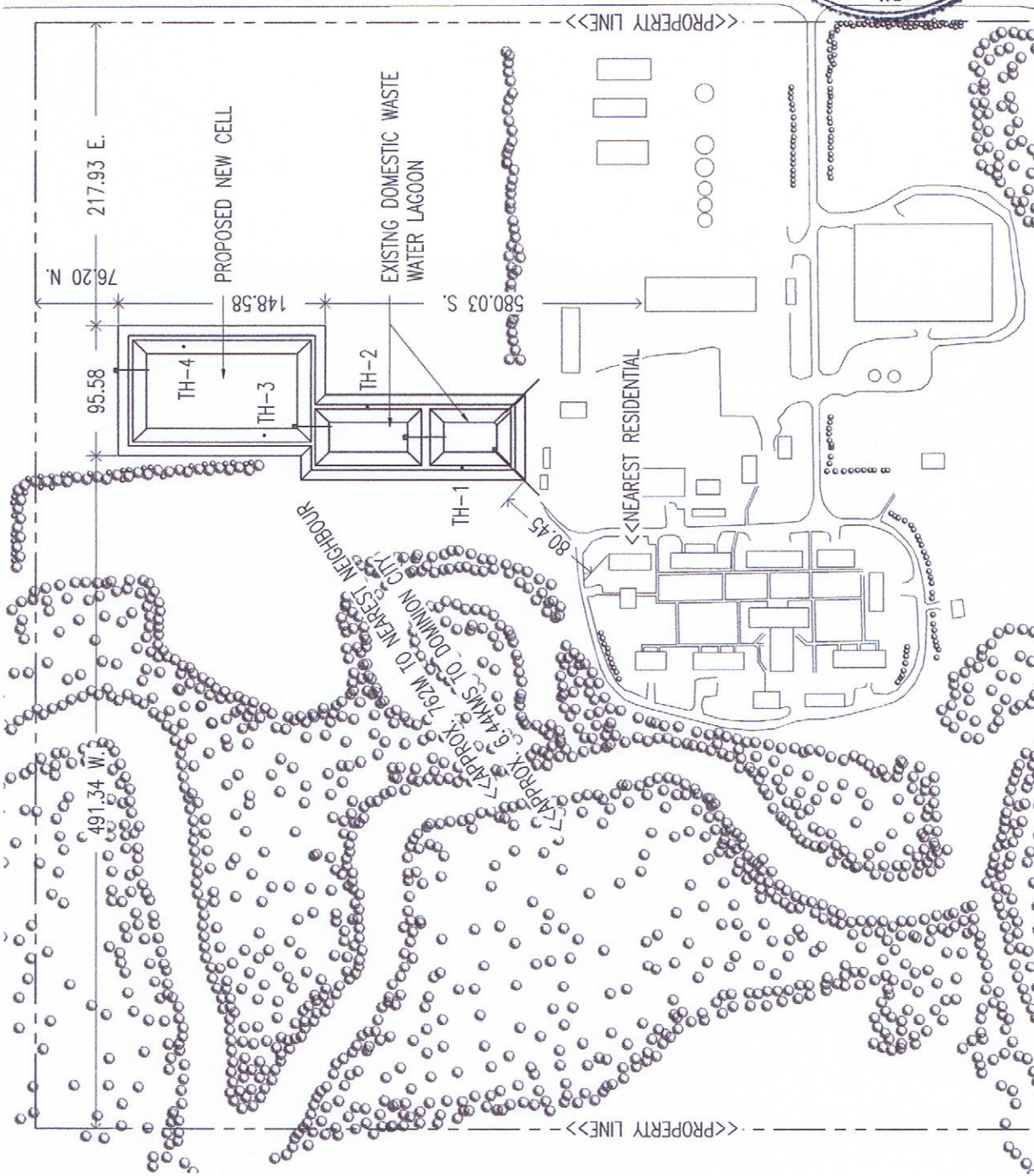


PROJECT NAME	GLENWAY COLONY E/2 2-03-3E	BUILDING AREA	N/A
SHEET TITLE	GENERAL NOTES	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	OCTOBER 2012	DRAWING SCALE	N/A
		SHEET NUMBER	GN

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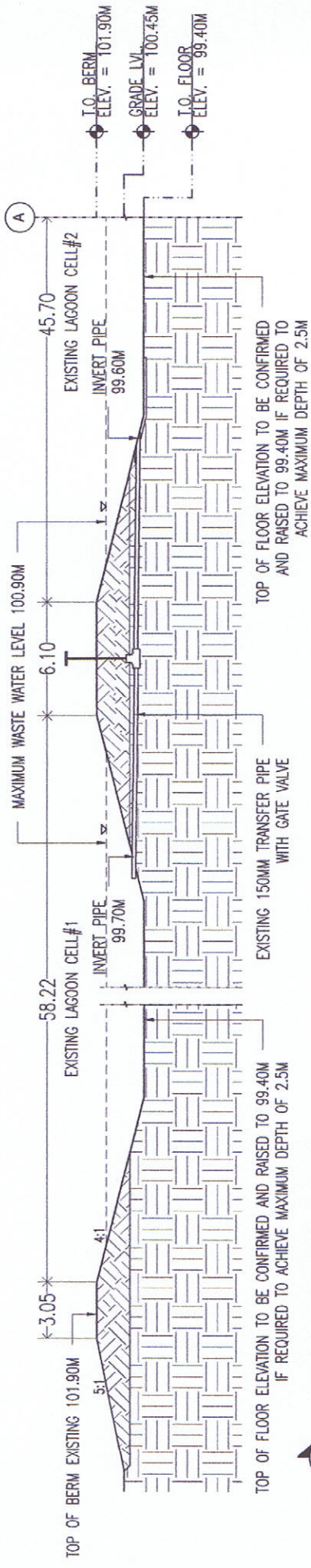


PROJECT NAME	GLENWAY COLONY E/2 2-03-3E	BUILDING AREA	N/A
SHEET TITLE	SITE PLAN	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	OCTOBER 2012	DRAWING SCALE	SCALED TO FIT
		SHEET NUMBER	SP-1

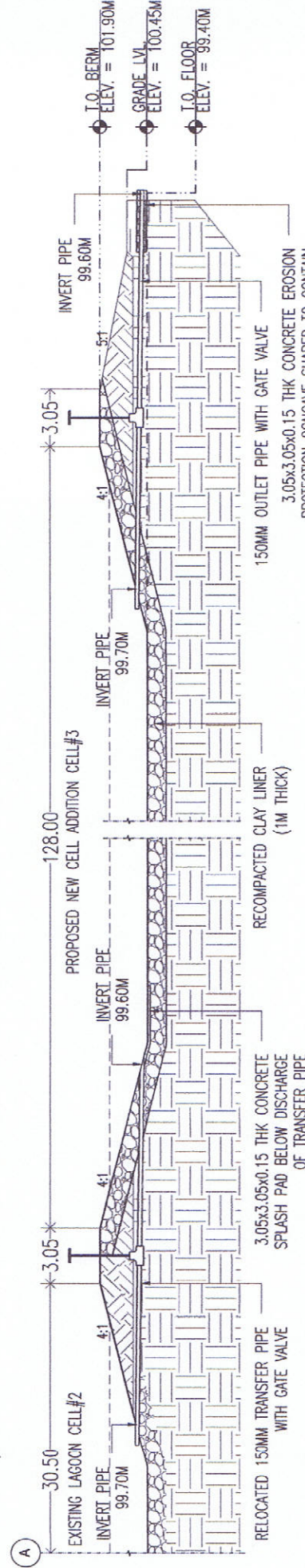
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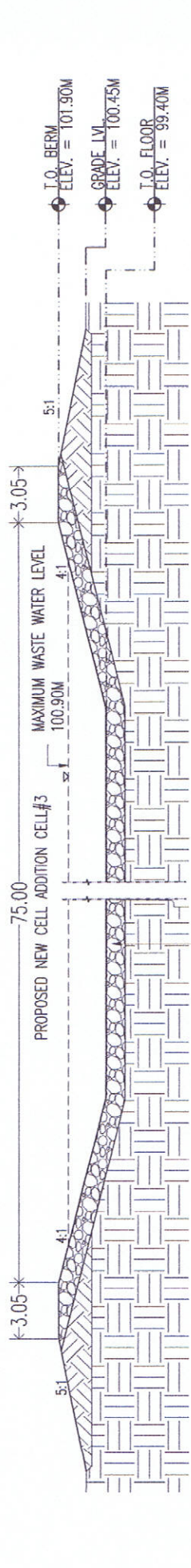
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CROSS-SECTION DETAIL
1 S-2



CROSS-SECTION DETAIL
1 S-2



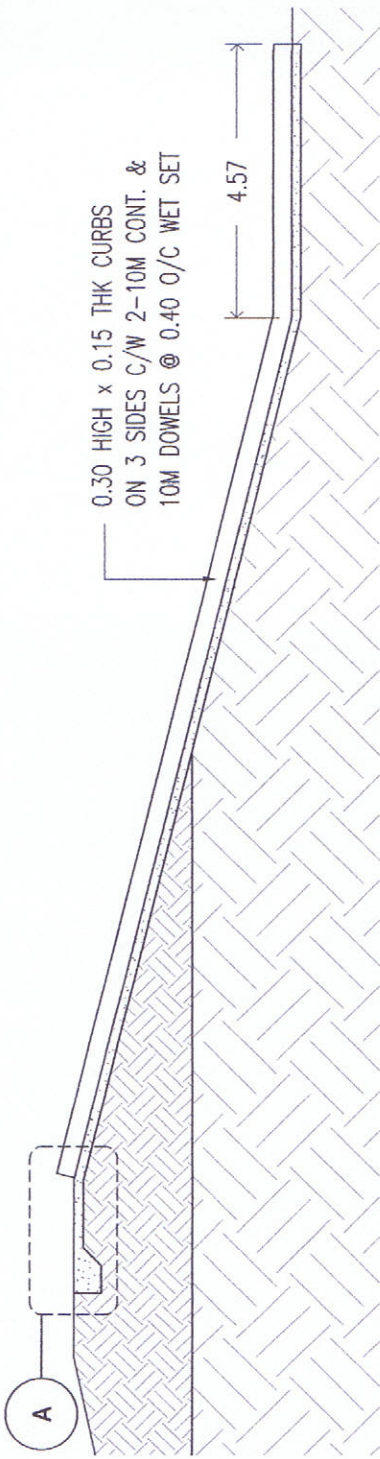
CROSS-SECTION DETAIL
2 S-2

PROJECT NAME GLENWAY COLONY E2 2-03-3E	BUILDING AREA N/A
SHEET TITLE CROSS SECTIONS	DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN OCTOBER 2012	DRAWING SCALE NOT TO SCALE
SHEET NUMBER S-2	

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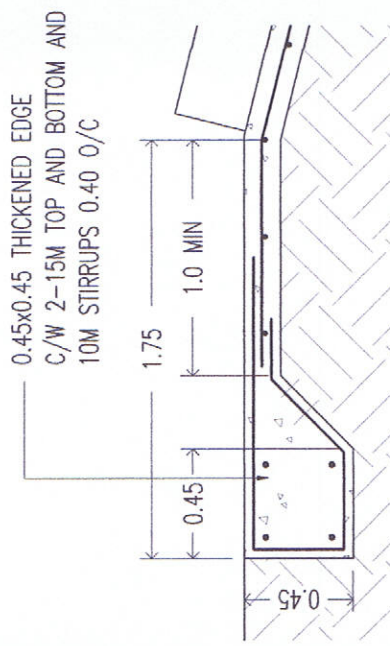
REGISTERED PROFESSIONAL ENGINEER
 P. GRIEGER
 Jan 29/13

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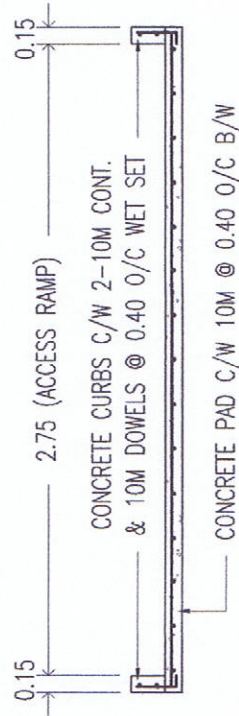


ACCESS RAMP: SIDE VIEW

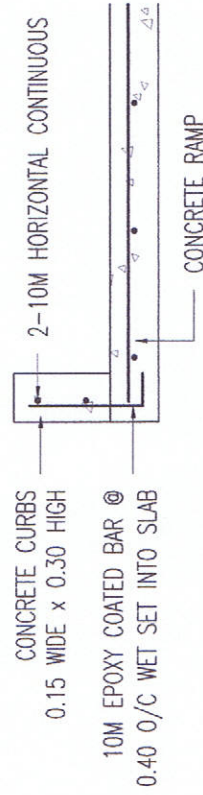
CONCRETE PAD C/W 10M @ 400mm O/C B/W
 CONCRETE CURBS 0.30 HIGH x 0.15 THK C/W
 2-10M CONT. AND 10M DOWELS @ 0.40 O/C WET SET



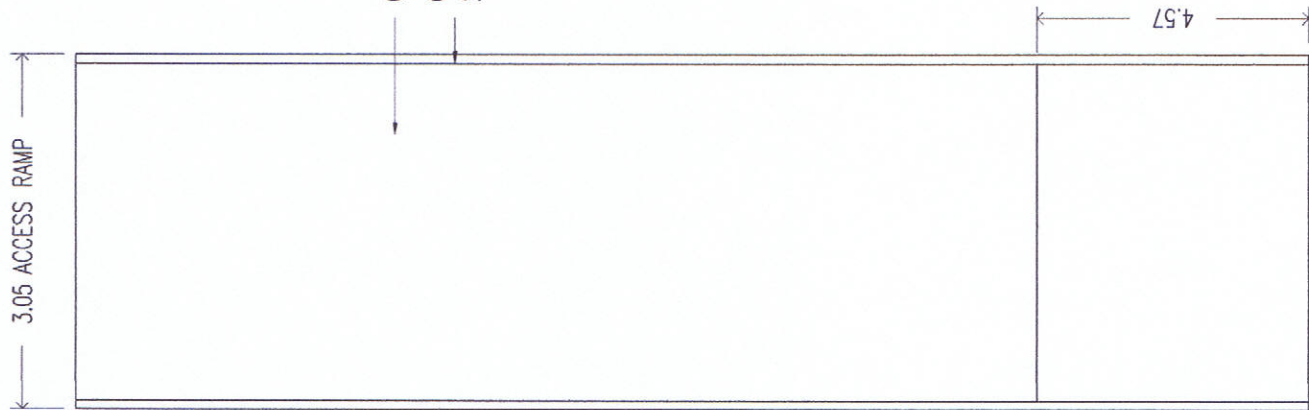
ACCESS RAMP: ANCHORAGE DETAIL



ACCESS RAMP: CROSS-SECTION DETAIL



ACCESS RAMP: CROSS-SECTION DETAIL



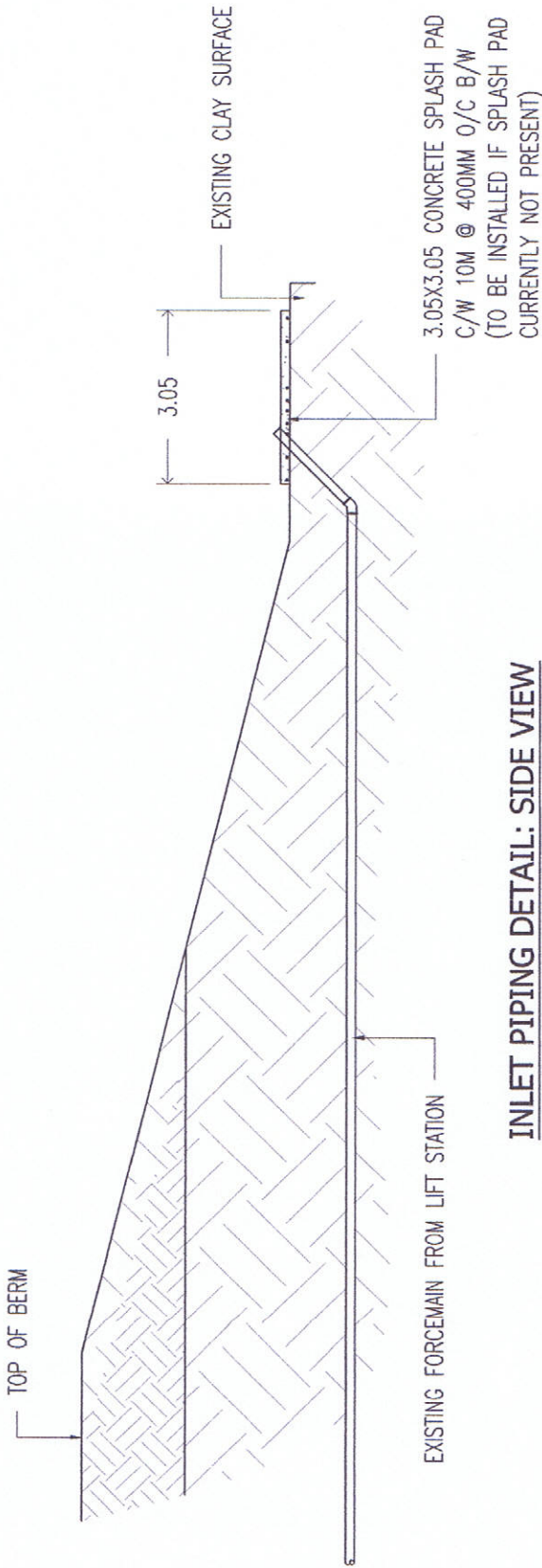
ACCESS RAMP: TOP VIEW

PROJECT NAME GLENWAY COLONY E/L 2-03-3E	BUILDING AREA N/A
SHEET TITLE ACCESS RAMP DETAILS	DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN OCTOBER 2012	DRAWING SCALE SCALED TO FIT
SHEET NUMBER S-3	

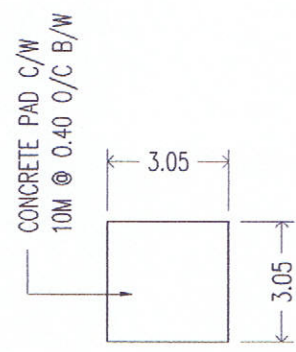
South-Man Engineering
 15-1599 Dugald Road | Winnipeg, Manitoba | R2J 0A3
 PH. (204) 668-8652 | FAX (204) 668-9294



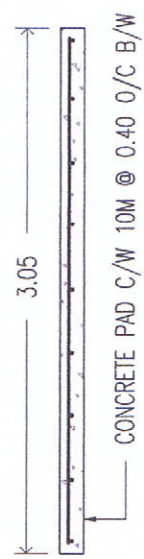
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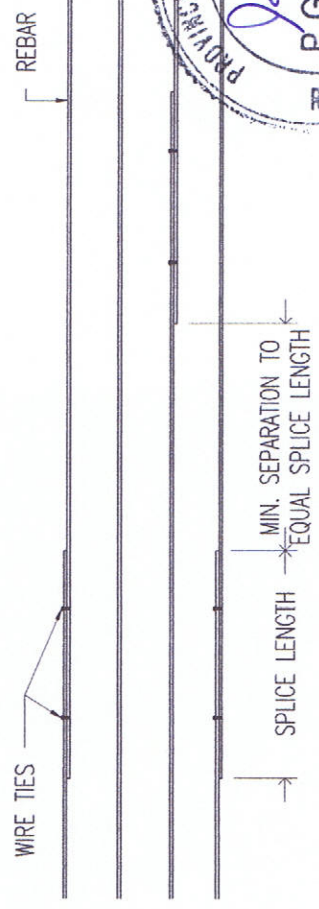
INLET PIPING DETAIL: SIDE VIEW



SPLASH PAD: TOP VIEW



SPLASH PAD: CROSS-SECTION DETAIL



REBAR SPLICE DETAIL



PROJECT NAME GLENWAY COLONY E/z 2-03-3E	BUILDING AREA N/A
SHEET TITLE INLET PIPING, SPLASH PAD & REBAR SPLICE DETAILS	DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN OCTOBER 2012	DRAWING SCALE SCALED TO FIT
SHEET NUMBER S-4	



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TOP COVER MIN. 0.3 ABOVE OUTER BERM HEIGHT

DUCTILE IRON UPPER SECTION

50mm SQ. OPERATING NUT

STONE DISK

ADJUSTABLE VALVE BOX

PVC LOVER SECTION

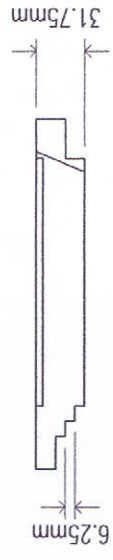
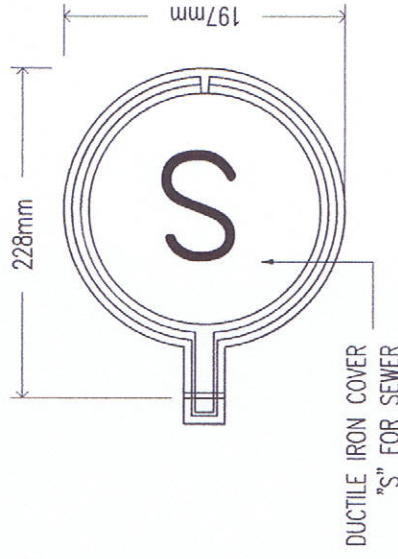
25mm SQ. EXTENSION SPINDLE

PROTECT VALVE BOX AGAINST LATERAL MOVEMENT AND MISALIGNMENT DURING THE PROCESS OF BACKFILL

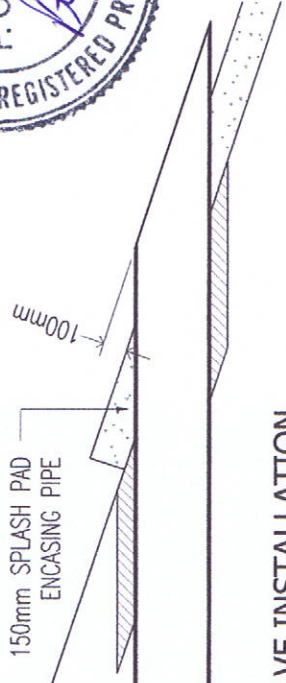
AWWA C509 GATE VALVE (LEFT-HAND OPENING) WITH CONNECTIONS COMPATIBLE TO PIPE USED

TRANSFER PIPE C/W GASKETS OR BOLTED FLANGE

MIN. .3X.3X.05 PRECAST CONCRETE BLOCK TO SUPPORT VALVE ON TRENCH BED



GATE VALVE COVER



GATE VALVE INSTALLATION

PROJECT NAME GLENWAY COLONY E/2 2-03-3E	BUILDING AREA N/A
SHEET TITLE GATE VALVE DETAILS	DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN OCTOBER 2012	DRAWING SCALE SCALED TO FIT
SHEET NUMBER S-5	

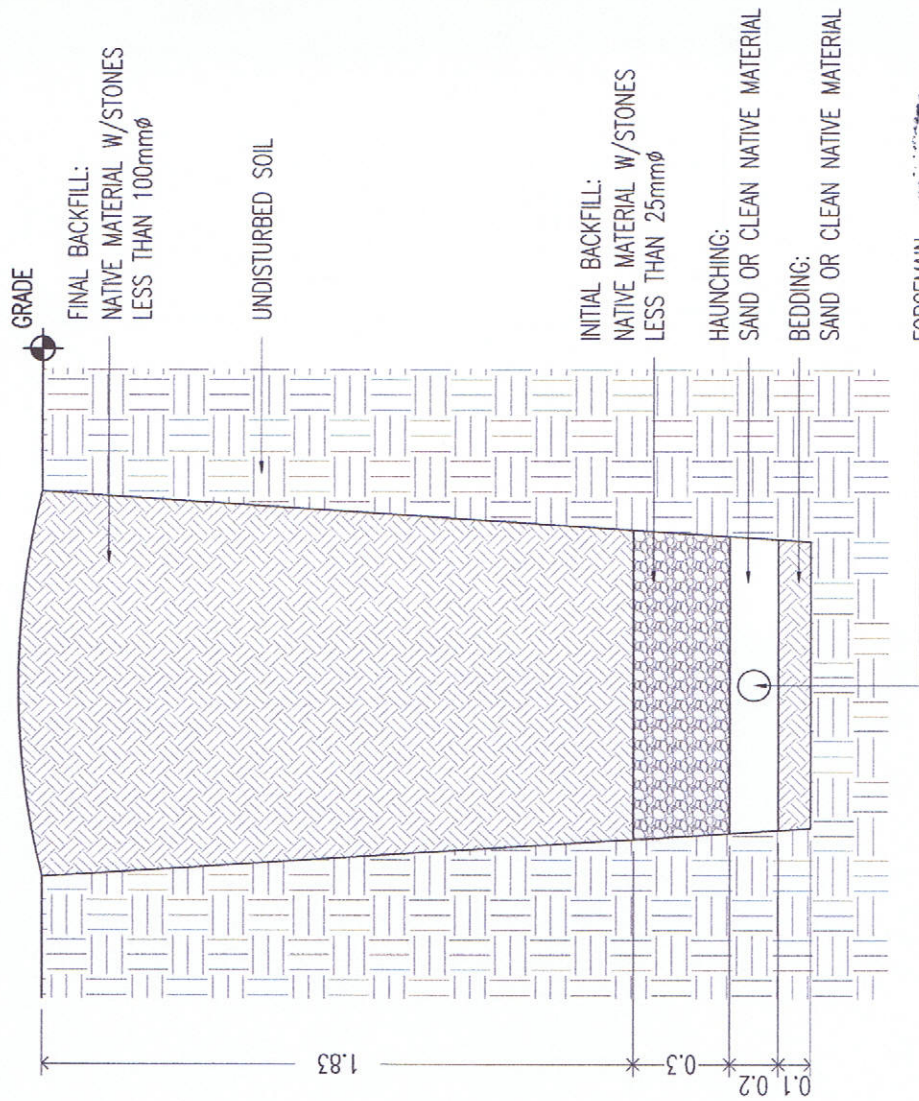
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PIPING GENERAL NOTES:

1. ALL PIPELINE CONSTRUCTION AND PRESSURE TESTING SHALL CONFORM WITH THE TECHNICAL REFERENCE DOCUMENTS FOR PIPELINES, APPURTENANCES, AND TREATMENT STATIONS.
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 0.56 m². 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, 100mm THROUGH - 300mm FOR WATER
AWWA C907 PVC PRESSURE FITTINGS FOR WATER - 100mm THROUGH 300mm
ASTM D2241 PVC PRESSURE RATED PIPE (SDR SERIES) OR DR17 HDPE PIPE
PIPING: SCHEDULE 40 PVC GLUED CONNECTIONS SDR26 SERIES 160 OR DR17 HDPE



FORCEMAIN

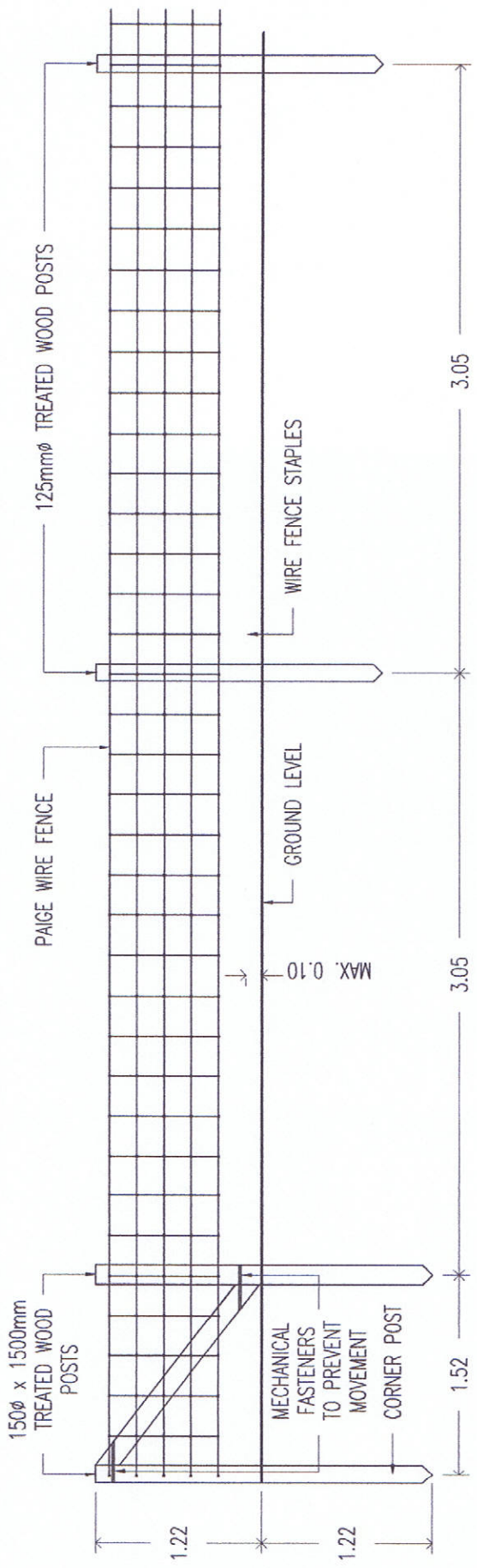


PROJECT NAME	GLENWAY COLONY E½ 2-03-3E
BUILDING AREA	N/A
SHEET TITLE	TRENCH DETAIL
DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	OCTOBER 2012
DRAWING SCALE	SCALED TO FIT
SHEET NUMBER	S-6

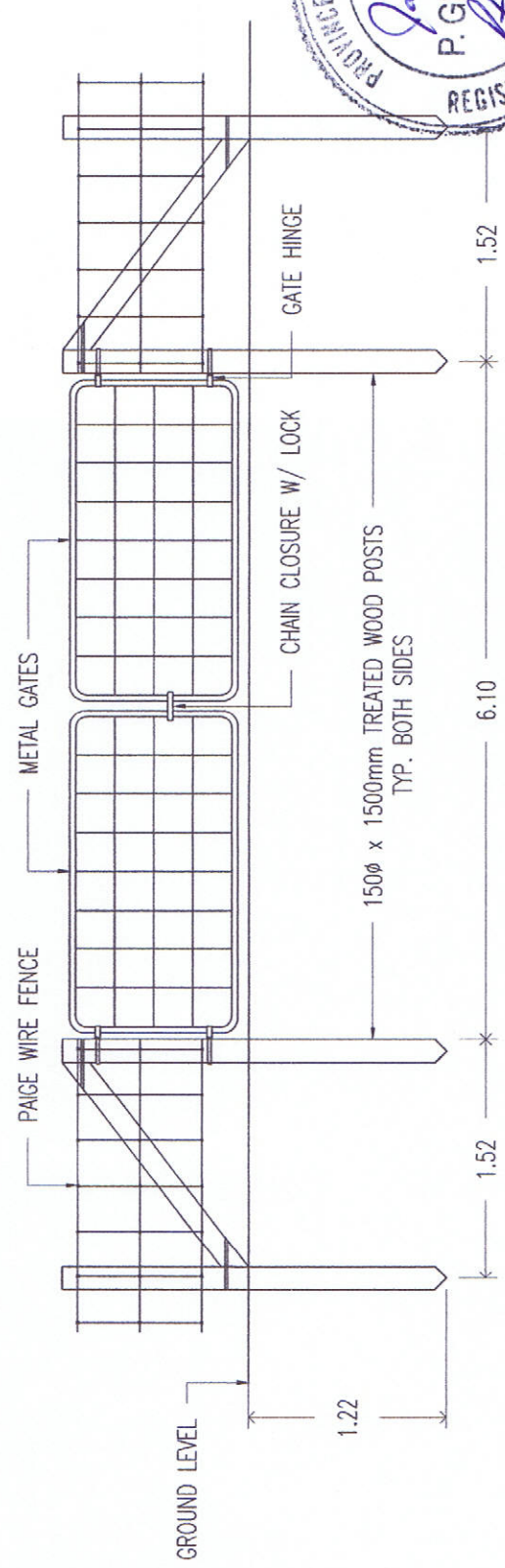
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FENCING CORNER DETAIL



GATE DETAIL



PROJECT NAME	GLENWAY COLONY E/2 2-03-3E	BUILDING AREA	N/A
SHEET TITLE	PERIMETER FENCE & GATE DETAILS	DRAWN BY	R. FLORES
DATE DRAWN	OCTOBER 2012	DRAWING SCALE	SCALED TO FIT
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