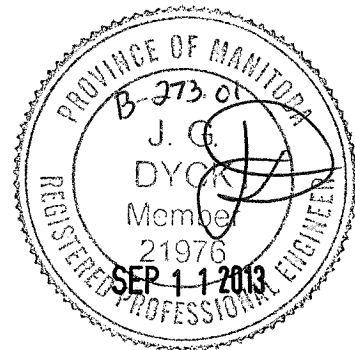
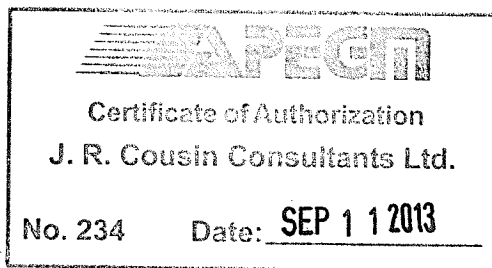


BLUE CLAY FARMS 98 LTD.
Environment Act Proposal
for
Wastewater Treatment Lagoon
Upgrade



September 2013

Prepared by: J. R. Cousin Consultants Ltd.
91 A Scurfield Blvd.
Winnipeg, Manitoba
R3Y 1G4 Ph. (204) 489-0474

ACKNOWLEDGMENTS

To prepare this report various sources of information were investigated and researched. J. R. Cousin Consultants Ltd. (JRCC) wishes to thank Blue Clay Farms and Manitoba Conservation who contributed to the data and content of this study. In addition, we wish to commend Blue Clay Farms for their fortitude in addressing the need for a long-term solution to wastewater treatment for the Blue Clay Hutterite Colony.

REMARKS

J. R. Cousin Consultants Ltd. has conducted this environment act proposal in accordance with generally accepted professional engineering principles and practices for the purpose of identifying conditions that may have an environmental impact on the site. The findings and recommendations reached in this report are based on information made available to JRCC during the investigation and conditions at the time of the site investigation. Conclusions derived in this report are intended to reduce, but not wholly eliminate the uncertainty regarding potential environmental concerns on the site, and recognizes reasonable limitations with regards to time, accuracy, work scope and cost. It is possible that environmental conditions may change from the date of this report. If conditions appear different from those encountered and expressed in this report, JRCC should be informed so that mitigation recommendations can be reviewed and adjusted as required. Historical data and information obtained from personal communication used in this report, are assumed to be correct, however JRCC has not conducted further investigations into the accuracy of this data. JRCC has produced this report for the use of the client, and takes no responsibility for any third party decisions or actions based on information contained in this report.

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Appendix A

Land Title (Number 1159542/1)

Land Title (Number 1159541/1)

Crown Lands & Property Agency - Lands Branch, July 9, 2013 Email Correspondence

Appendix B

Table 1: Blue Clay Farms Population, Hydraulic, and Organic Loading Projections

Manitoba Conservation and Water Stewardship Fisheries Branch, July 11, 2013 Email Correspondence

Manitoba Conservation Wildlife and Ecosystem Protection Branch, July 15, 2013 Email Correspondence

Manitoba Historic Resources Branch, July 10, 2013 Email Correspondence

Appendix C

Test Hole Logs

Hardy BBT Ltd. Soil Analysis Results

HBT AGRA Ltd. Letter Report of Soils Permeability Analysis Results, August 5, 1992

Appendix D

Title Page

Plan L1: Proposed Lagoon Expansion Location Plan with Setbacks

Plan L2: Proposed Discharge Plan

Plan L3: Lagoon Expansion Layout

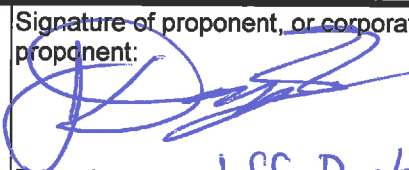
Plan L4: Proposed Drainage Route

Plan L5: Lagoon Dike Details

Plan L6: Valve, Valve Marker, Sign, Rip Rap, Ditch and Silt Fence Details

Plan L7: Fence and Gate Details

Environment Act Proposal Form

Name of the development: Blue Clay Farms Wastewater Treatment Lagoon Upgrade	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Wastewater Treatment Lagoon - Class 2 Development	
Legal name of the proponent of the development: Blue Clay Farms 98 Ltd.	Mailing address: Box 23 Arnaud, MB, R0A 0B0
Location (street address, city, town, municipality, legal description) of the development: SE 9-4-3 EPM	
Name of proponent contact person for purposes of the environmental assessment: Mr. Jeff Dyck	
Phone: (204) 489-0474 Fax: (204) 489-0487	Mailing address: J.R. Cousin Consultants Ltd. 91 A Scurfield Blvd. Winnipeg, MB, R3Y 1G4
Email address: jdyck@jrcc.ca	
Webpage address: www.jrcc.ca	
Date: 2013/09/11	Signature of proponent, or corporate principal of corporate proponent:  Printed name: Jeff Dyck

A complete **Environment Act Proposal (EAP)** consists of the following components:

- **Cover letter**
- **Environment Act Proposal Form**
- **Reports/plans supporting the EAP** (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information and number of copies)
- **Application fee** (Cheque, payable to Minister of Finance, for the appropriate fee)

Submit the complete EAP to:

Director
 Environmental Assessment and Licensing Branch
 Manitoba Conservation
 Suite 160, 123 Main Street
 Winnipeg, Manitoba R3C 1A5

For more information:

Phone: (204) 945-7100
 Fax: (204) 945-5229
 Toll Free: 1-800-282-8069, ext. 7100
<http://www.gov.mb.ca/conservation/ea/>

Per Environment Act Fees Regulation (Manitoba Regulation 168/96):	
Class 1 Developments	\$500
Class 2 Developments	\$5,000
Class 3 Developments:	
Transportation and Transmission Lines.....	\$5,000
Water Developments	\$50,000
Energy and Mining.....	\$100,000

1.0 INTRODUCTION AND BACKGROUND

The development described herein is for upgrading the existing Blue Clay Farms Wastewater Treatment Lagoon in the RM of De Salaberry, Manitoba.

1.1 Introduction

Blue Clay Farms is proposing to upgrade the existing wastewater treatment lagoon for the Blue Clay Hutterite Colony through expansion and alteration of the lagoon discharge process. A lagoon expansion is required to accommodate the future proposed growth in the colony. It is also proposed that the lagoon discharge be altered from effluent irrigation to a surface discharge route. An Environment Act Licence is required from Manitoba Conservation for the construction and operation of the upgraded lagoon and discharge route. J. R. Cousin Consultants Ltd. (JRCC) was retained for the related engineering services.

1.2 Contact Information

Mr. Jeff Dyck, P.Eng.
J. R. Cousin Consultants Ltd.
91A Scurfield Blvd.
Winnipeg, Manitoba
R3Y 1G4
Phone: (204) 489-0474, Fax (204) 489-0487

Mr. Phillip Tschetter
Blue Clay Farms 98 Ltd.
Box 23
Arnaud, Manitoba
R0A 0B0
Phone: (204) 746-5097

1.3 Background Information

Blue Clay Farms is located approximately 60 km south of Winnipeg, Manitoba, in the RM of De Salaberry. The existing lagoon is located to the east of the Hutterite colony in SE 9-4-3 EPM. The colony consists of 11 residential buildings, a laundry facility, a school, a kitchen facility and several farming buildings. The colony residents are the only contributors to the lagoon loading, via a piped wastewater collection system.

The Blue Clay Farms wastewater treatment lagoon was constructed in 1992, with the construction of a primary cell and a storage cell of compacted clay soils. The lagoon is currently being operated under Environmental Licence No. 1542, issued in 1992. Based on an expected expansion within the Blue Clay Farms Hutterite Colony, and a desired alteration of the existing

lagoon discharge method, the wastewater treatment lagoon is in need of upgrading, therefore a new Environment Act Licence would be required.

1.4 Description of Previous Studies and Documentation

Various sources of information for the Blue Clay Farms lagoon were reviewed to obtain background information on the site including: the original Environment Act Proposal, submitted by JRCC in 1991; results of geotechnical testing conducted by JRCC in 1992; the Environment Act Licence issued in 1992; and the construction specifications and plans produced by JRCC in 1991.

The Blue Clay Farms lagoon EAP prepared by JRCC in 1991 was reviewed to determine environmental conditions and concerns at the time of the original lagoon construction. This EAP identified the lagoon as having a 20 year design life, with a design population of 150 people and a hydraulic storage capacity for 200 days. No significant environmental or health and safety concerns were anticipated at the time of the lagoon construction.

Geotechnical testing of the constructed lagoon dikes completed by JRCC in 1992 indicated that the three soil samples submitted all had permeability results that exceeded the environmental requirements for a lagoon liner and ranged between 1.6×10^{-9} cm/sec and 9.0×10^{-9} cm/sec.

The existing Environment Act Licence (No. 1542) for the Blue Clay lagoon was reviewed to determine the required conditions of construction and operation for the existing lagoon. The lagoon was licenced for a storage period of 230 days (October 1 to May 15), and effluent was intended for spray irrigation on surrounding farmland.

The construction specifications and design plans produced by JRCC in 1991 were reviewed to determine the methodology of the existing lagoon construction.

2.0 DESCRIPTION OF THE DEVELOPMENT

For each heading there is an information request from the Environment Act Proposal Form. These requests are repeated herein in italics followed by the pertaining response.

2.1 Land Title/Location

Certificate of Title showing the owner(s) and legal description of the land upon which the development will be constructed; or, in the case of highways, rail lines, electrical transmission lines, or pipelines, a map or maps at a scale no less than 1:50,000 showing the location of the proposed development:

The existing lagoon is located in SE 9-4-3 EPM. The proposed lagoon expansion will be to the east of the existing lagoon, still within SE 9-4-3 EPM. A copy of the Certificate of Title (No. 1159542/1) for the land on which the lagoon expansion is proposed is attached in Appendix A.

2.2 Owner of Land and Mineral Rights

Owner of land upon which the development is intended to be constructed, and of mineral rights beneath the land, if different from surface owner:

The Crown Lands & Property Agency was contacted regarding the proposed development location. According to the Crown Lands & Property Agency, the mines & minerals and sand & gravel at the existing and proposed lagoon site are privately owned with the surface titles and the Crown has no interests (see email correspondence from the Crown Lands & Property Agency, dated July 9, 2013 in Appendix A).

2.3 Existing Land Use

Existing land use on the site and on land adjoining it, as well as changes that will be made in such land use for the purposes of the development:

The proposed lagoon expansion site is the land directly east of the existing lagoon cells, and is currently being used for agricultural purposes. The surrounding lands adjacent to the site are all agricultural fields with the residential buildings in the colony located approximately 400 m to the west (see Plan L1 in Appendix D).

Soil would be excavated in the area of the proposed lagoon expansion for construction of the lagoon dikes and drainage ditching. The surrounding lands would continue to be utilized for agriculture after the expansion is completed.

2.4 Land Use Designation/Zoning Designation

Land use designation for the site and adjoining land as identified in a development plan adopted under The Planning Act or The City of Winnipeg Act, and the zoning designation as identified in a zoning by-law, if applicable:

The lagoon expansion site is zoned as Agricultural 2, based on zoning designations in the RM of De Salaberry.

2.5 Description of Development

Description of proposed development and schedule for stages of the development, including proposed dates for planning, design, construction, commissioning, operation, and decommissioning and/or termination of operation (if known), identifying major components and activities of the development as applicable (e.g. access road, airstrip, processing facility, waste disposal area, etc.).

2.5.1 Project Schedule

Lagoon design is proposed to begin upon receipt of an environmental licence. Lagoon expansion/construction works are proposed to begin in the summer of 2014. Use of the discharge drain would commence upon receipt of environmental licence for temporary use with the existing lagoon cells, until construction of the lagoon expansion occurs.

The proponent would like to begin using the drainage route for discharge in October 2013. Commissioning and operation of the lagoon is proposed to begin upon completion of construction and after approval for use is obtained from Manitoba Conservation. No date for decommissioning has been set for the lagoon.

2.5.2 Basis for Proposed Lagoon Expansion Site Selection

The location for lagoon expansion was chosen based on discussions with the proponent, proximity to the existing colony (as discussed below) and proximity to the existing property boundaries.

Manitoba Conservation's guidelines for the location of a wastewater treatment lagoon (Design Objectives for Standard Sewage Lagoons, Province of Manitoba, Environmental Management, July 1985) are outlined in the following table. A description of the proposed expansion site in relation to each of the guidelines is also provided in the table.

Table A: Location of Proposed Lagoon Upgrade Sites in Relation to Manitoba Conservation Guidelines

Manitoba Conservation Guideline	Proposed Relation to Site
Lagoons must be located a minimum of 460 m from any community centre.	The proposed lagoon expansion site is located beyond 460 m from the nearest community centre.
Lagoons must be located a minimum of 300 m from any residence. (The distance is to be measured from the centreline of the nearest dike).	The proposed lagoon expansion site is located approximately 400 m from the nearest residence in the Blue Clay Hutterite Colony.
Consideration should be given to sites in which prevailing winds are in the direction of uninhabited areas.	The prevailing winds are typically from the north and west. The proposed lagoon expansion site is located east of the Blue Clay Hutterite Colony
Sites with an unobstructed wind sweep across the lagoon are preferred.	The surrounding land is open agricultural land with no nearby windbreaks.
Areas that are habitually flooded shall be avoided.	The lagoon expansion will be situated approximately 1.9 km from the Arnaud Drain and approximately 2 km from the Ste. Elizabeth Drain. Flooding is not expected in the area, as there have been no reports of flooding around the existing lagoon cells. The top of dikes of the proposed lagoon expansion cell would be constructed at a higher elevation than the surrounding lands.
Areas of porous soils and fissured rock formations should be critically evaluated to avoid creation of health hazards or other undesirable conditions.	A liner will be utilized in the lagoon expansion cell construction according to Provincial guidelines, thus reducing the possibility of groundwater contamination.

The lagoon expansion area is located beyond all setback distances required by Manitoba Conservation and in an area that meets other provincial siting requirements, therefore there are no expected concerns for the location of the expansion cell. Plan L1 in Appendix D, shows the minimum setback distance requirements for the expanded lagoon to the local residences and the colony.

2.5.3 Lagoon Drainage Route

The proposed Blue Clay lagoon effluent discharge would be to the south and west, towards the Arnaud Drain (Third Order Drain), via the proposed lagoon perimeter and discharge ditch, an existing local farming drain south of the colony, the Municipal Road ditch and an existing local drain south of the Municipal Road (see Plan L2 in Appendix D). The Arnaud Drain flows to the northwest for approximately 6 km into Marsh River (Third Order Drain) which continues flowing north to the Rat River. The total length of the drainage route prior to reaching the Arnaud Drain is approximately 2.6 km (see Plan L4 in Appendix D). The design of the lagoon expansion will utilize this drainage route for lagoon effluent discharge. Until construction of the new cell is completed, the existing Storage Cell #1 will also utilize the proposed discharge route to the south and west of the existing lagoon cells.

2.5.3.1 Fish Species Information

The following fish species have been identified in Arnaud Drain according to the Fisheries Inventory Habitat and Classification System (FIHCS): fathead minnows and brook stickleback. Fisheries information was not available for the Marsh (see July 11, 2013 email correspondence from Manitoba Conservation and Water Stewardship – Fisheries Branch in Appendix B).

2.5.3.2 Water Quality Information

Manitoba Conservation and Water Stewardship were contacted for water quality data in Arnaud Drain and Marsh River. Water quality data was not available for Arnaud Drain, however historic data was available for Marsh River. Summarized water quality data from selected parameters are provided below. Samples were retrieved from the nearest monitoring station to the lagoon site (No. MB05OES003), which is located west of Otterburne, Manitoba, approximately 23 km north of Blue Clay Farms. The samples were recorded between May 1977 and April 1999.

Table B: Average Water Quality in the Sturgeon Creek

Parameter	Average Concentration	Unit
Ammonia Dissolved	0.15	mg/L
Ammonia Soluble	0.67	mg/L
Coliforms, Fecal	1100.60	MPN/100 mL
Coliforms, Total	2141.98	MPN/100 mL
pH	7.63	pH units
Nitrogen Dissolved NO ₃ & NO ₂	0.46	mg/L
Nitrogen Total Kjeldahl (TKN)	1.47	mg/L
Oxygen Dissolved	7.29	mg/L

Parameter	Average Concentration	Unit
Phosphorus Total (P)	0.52	mg/L
Total Dissolved Solids (TDS)	913.93	mg/L
Total Suspended Solids (TSS)	23.25	mg/L

Based on the average concentrations shown in Table B, Marsh River has naturally high levels of fecal and total coliforms.

2.5.4 Access Road

The existing lagoon site does not have an access road as the lagoon does not accept truck hauled wastewater and vehicle traffic for maintenance is minimal. An access road will also not be required for the proposed lagoon upgrade, as vehicle access to the lagoon cells will not be required.

2.5.5 Population Contributing Effluent

Population data was obtained from the discussions with Blue Clay Farms. The proponent indicated that the service area would include only the residential population on the Blue Clay Hutterite Colony. No population outside of the colony would be utilizing the lagoon and therefore no additional populations were considered in the lagoon upgrade. The colony currently has a population of 101 people living in communal residences and it was estimated that the population would experience an annual growth rate of 1.5%. This would generate a year 20 population of 136 people.

2.5.6 Wastewater Production

2.5.6.1 Organic Loading

The organic loading calculation is based upon the organics in typical residential wastewater. A typical value of 0.076 kg BOD₅/person/day was utilized to estimate the organic loading from the residential population within the colony, through the piped collection system. No organic loading from truck hauling was considered for the Blue Clay Farms Lagoon.

The current daily organic loading from piped sources in the community is approximately 7.7 kg BOD₅/day (i.e. 101 people x 0.076 kg BOD₅/person/day). These daily loadings are expected to increase to 10.3 kg BOD₅/day (i.e. 136 people x 0.076 kg BOD₅/person/day) in year 20, due to the increase in population.

Table 1 in Appendix B shows the current and projected year 20 organic loadings to the lagoon.

2.5.6.2 Hydraulic Loading

The hydraulic loading to the wastewater treatment lagoon is comprised of water usage and infiltration throughout the piped collection system. The per capita wastewater production identified for the community was estimated to be 350 L/person/day, based off of typical residential water usage for other rural communities in southern Manitoba. The current Manitoba guidelines require a lagoon to have sufficient storage for a 230 day period over the winter months, however based upon discussion with the proponent, for ease of operation the lagoon upgrade will be designed with a 365 day storage period.

The total hydraulic loading to the lagoon from all sources is estimated to be 48 m³/day in design year 20. The total hydraulic capacity of the lagoon would need to be approximately 17,378 m³ over the 365 day storage period. Table 1 in Appendix B shows the current and projected year 20 hydraulic loading to the lagoon.

2.5.7 Lagoon Sizing Requirements

The upgraded lagoon would consist of one new primary cell and two storage cells, each with 4:1 inner and outer side slopes. The operating depths, freeboard and discharge inverts are described below.

The lagoon will be sized to handle the year 20 organic and hydraulic loadings from the Blue Clay Hutterite Colony population, as discussed above.

2.5.7.1 Primary Cell

A facultative lagoon operates at various organic efficiencies throughout the year with the commonly accepted organic treatment rate being 56 kg BOD₅/ha/day, at a height of 0.75 m in the lagoon primary cell. At this treatment rate, the minimum required surface area at a height of 0.75 m from the floor in the primary cell would be approximately 1,846 m², considering the year 20 projected organic loading rate.

The existing primary cell has a surface area of approximately 2,601 m², with a flat bottom area of 45 m x 45 m. This primary cell was designed with a maximum operating level of 1.5 m, as per Manitoba Conservation requirements.

2.5.7.2 Storage Cells

The storage capacity of a facultative lagoon is calculated by the combined volume of the “top half” of the primary cell (liquid storage from 0.75 m depth

to 1.5 m depth) and the volume of the storage cells from the discharge pipe invert elevation to the maximum liquid level. The required hydraulic storage requirement during the 365 day period, for year 20 hydraulic loadings would be approximately 17,378 m³. The hydraulic storage capacity of Storage Cells #1 and #2 would be approximately 15,187 m³, while the remaining hydraulic capacity (2,191 m³) would come from the top half of the primary cell.

The proposed cut-off wall and dikes of Storage Cell #2 will tie into the existing east lagoon dike of Storage Cell #1, and an intercell pipe will be required between the two storage cells. The proposed operating depth of Storage Cell #2 will be 1.5 m, with a freeboard of 1.0 m and a discharge pipe invert located at 0.3 m above the cell floor elevation.

Typical operation of the storage cell in a facultative lagoon designed with a 365 day storage period will allow for one discharge per year at peak design loading. If the water quality testing results are acceptable, the intercell valve between the primary and Storage Cell #1 would be closed and the volume of the storage cells from the discharge pipe invert elevation to the maximum operating level would be discharged. This discharge would occur in the fall prior to the winter storage period. Once the storage cells are fully discharged, the intercell valve between the primary cell and Storage Cell #1 would be opened and the lagoon cells would be allowed to equalize and fill up during the winter storage period. This discharge procedure would be repeated each year.

2.5.8 Topography and Geotechnical Review

2.5.8.1 Past Geotechnical Investigations

Canada-Manitoba Soil Survey

Reconnaissance Soils Survey data of the area indicated that the soils consist of Osborne Clay in the vicinity of the existing lagoon and lagoon expansion area. These lacustrine clay and alluvial deposits have been developed on flat or depressional topography and are considered to have poor drainage. Detailed soil survey information was not available for the project area. The agricultural suitability classification for the area is considered “Class 2”, which would not have any limitations for development of a wastewater treatment facility under the Nutrient Management Regulation.

2.5.8.2 Geotechnical Investigation

A geotechnical investigation was completed by JRCC on May 14, 1991 during the original lagoon design planning to determine the suitability of the site for the proposed lagoon. This information was utilized in the conceptual design of the proposed lagoon expansion.

Test Holes

Five test holes were excavated during the geotechnical investigation to a maximum depth of 3.0 m. The test holes were excavated at the site of the existing lagoon cells to determine whether the soils were suitable for use as an in-situ clay liner, and whether soils could be used for potential borrow material.

Soil Profile

The soil profile was consistent between test holes at the site and consisted of organic topsoil (0.3 m thick), followed by a layer of medium plastic clay with some silt and sand (down to 1.0 m), and finally a high plastic clay with trace silt was identified to the bottom of the test holes. Bedrock and boulders were not encountered in the test holes.

Details of the soil profile in each test hole can be found in the test hole logs, attached in Appendix C.

Laboratory Analysis

Five bagged soil samples at various depths were submitted to Hardy BBT Ltd. for particle size analysis. The laboratory analysis indicated that the upper mantle of the site consists of a clay silt soil with lesser percentages of silt at greater depths below the surface. The analysis confirmed that the soils are a moist high plastic clay with lesser amounts of silt and trace sand.

Three Shelby tube samples were also obtained from the completed lagoon dikes at depths of 1.5 m, 2.0 m and 3.0 m below the surface. These samples were submitted to HBT AGRA Ltd. for permeability analysis. The results of this analysis indicated that the soils varied in permeability between 1.6×10^{-9} cm/sec and 9.1×10^{-9} cm/sec.

Details of Laboratory test results and analysis for both the bagged samples and Shelby tube samples have been included in Appendix C.

Discussion

Manitoba Conservation guidelines require a standard wastewater lagoon clay liner to be a minimum of 1.0 m in thickness and have a maximum hydraulic conductivity (i.e. the potential rate of fluid movement through the soil) of 1×10^{-7} cm/sec or less. This low rate is to protect the underlying groundwater from lagoon seepage.

Based on the results of the onsite investigation and laboratory analysis, there is a layer of high plastic soils in the vicinity of the lagoon expansion area which would be suitable for use in-situ as a lagoon liner. This soil layer would be suitable for a horizontal liner assuming it is homogeneous throughout, with no preferential flow paths. However, if a pocket or seam of unsuitable material was discovered during construction, this unsuitable soil would be removed and replaced with re-compacted suitable clay soil.

2.5.8.3 Topography

The topography in the area of the proposed lagoon expansion was obtained through a GPS survey during the site investigation. From the topographical investigation, the site is relatively flat with a maximum elevation difference of approximately 0.37 m across the site, with a gentle slope to the south and west. The average elevation across the expansion area to the south is 239.99 m (ASL). No surface water was observed during the site investigation. A discharge route ditch will need to be constructed from the lagoon discharge pipe to the existing farming drain located at the south end of the colony in order to achieve the required flow to the Arnaud Drain to the Southwest, following the drainage route as shown in Plan L2 of Appendix D.

2.5.9 Lagoon Regulatory Requirements

2.5.9.1 Province of Manitoba Design Objectives

The Province of Manitoba Design Objectives for Standard Sewage Lagoons, were used as a guideline in the layout and design of the lagoon expansion.

Organic Loading

Although a facultative lagoon operates at various organic efficiencies throughout the year, an average organic treatment capacity of 56 kg BOD₅/ha/day at a depth of 0.75 m in the primary cell has been utilized for design purposes.

Hydraulic Loading

According to current guidelines a facultative lagoon cannot be discharged between November 1 and June 15 (230 day winter storage period). Therefore, the lagoon must have the storage capacity for this time period based upon half the volume of the primary cell and the storage cell volume from the invert of the discharge pipe to the maximum liquid level.

Lagoon Liner

Sewage lagoons are to be designed and constructed such that the interior surface of the proposed lagoon is underlain by soil with a thickness of at least one metre and having a hydraulic conductivity of 1×10^{-7} cm/sec or less. In the absence of soils with a hydraulic conductivity of 1×10^{-7} cm/sec or less, the interior surfaces of a lagoon could be lined with a synthetic liner.

Effluent Quality Requirements

Any new or expanding wastewater treatment lagoons are required to meet the *Manitoba Water Quality Standards, Objectives and Guidelines - Tier 1 Water Quality Standards* at a minimum, for discharged effluent. The effluent standards specific to the Blue Clay Farms lagoon would be:

- 200 fecal coliforms/100 ml or 200 E. coli/100 ml
- 25 mg/L BOD
- 25 mg/L TSS
- 1 mg/L Total Phosphorus or demonstrated nutrient reduction strategy.

2.5.9.2 Nutrient Management Plan

New nutrient reduction guidelines were released in the *Manitoba Water Quality Standards, Objectives, and Guidelines, November 28, 2011*. As outlined in Section 2.5.9.1 above, the regulations include province wide standards for phosphorus reduction. Under the new nutrient standards, a 1.0 mg/L phosphorus limit immediately applies for all new, expanding or modified wastewater treatment facilities. The exception being small wastewater treatment facilities that serve a population of less than 2,000 equivalent people, which have the option of implementing a nutrient reduction strategy instead of the 1.0 mg/L phosphorus limit. Nutrient reduction strategies include, but are not limited to, effluent irrigation, trickle discharge or constructed wetlands.

The *Lake Winnipeg Stewardship Board - Report to the Minister of Water Stewardship, December 2006* recommended several strategies for nutrient management with particular emphasis on phosphorus reduction. Based upon these strategies, the following options were considered for nutrient management at the Blue Clay Farms wastewater treatment lagoon.

Phosphorus Reduction by Filtration

Sewage treatment plant technology, such as chemical addition and filtration systems could be utilized to reduce the phosphorus concentration in the

lagoon. The effluent could be pumped through a filtration system prior to discharge. A chemical flocculent such as alum would have to be added to the wastewater prior to filtration. Backwash containing the phosphorus would be sent back to the primary cell where it settles out into sludge. The sludge will accumulate in the lagoon for approximately 20 - 25 years before requiring removal.

This level of treatment is costly as equipment and housing is required as well as annual operating costs and chemical costs. An electrical power source is also required, such as a hydro line to the lagoon. It is therefore not a feasible option for the Blue Clay Farms lagoon due to the higher capital cost and operating and maintenance costs.

Phosphorus Reduction by Surface Chemical Treatment

This option involves application of chemicals such as alum to wastewater in the storage cells to reduce the level of phosphorus in the treated effluent, if prior to discharge the phosphorus concentration in the wastewater is found to be greater than 1.0 mg/L. The alum is broadcast onto the surface of the storage cells utilizing a gas driven pump and spray system from the top of the dike, or from a boat on the surface of the cells. The alum produces a chemical reaction with the phosphorus causing a pin floc. The pin floc of phosphorus and the turbidity settle to the bottom. The effluent can then be discharged from the storage cells with a reduced level of phosphorus. This option requires higher operation and maintenance costs and was not the preferred option for the Blue Clay Farms lagoon.

Constructed Wetlands

Constructed wetlands are used to polish treated effluent from a lagoon, and have the potential to provide nutrient reduction. However, they can require large land areas for construction, have increased odour potential, can favour mosquito breeding (due to vegetation type, very shallow effluent and minimal wind action) and add cost to the project. In addition, the use of constructed/engineered wetlands requires further investigation regarding their effectiveness under climatic conditions in Manitoba. Due to the uncertain effectiveness of the system and the increased cost, the use of constructed/engineered wetlands for the Blue Clay Farms lagoon was not considered feasible.

Effluent Irrigation

Effluent from the lagoon to this point has been pumped into an irrigation system and applied to the surrounding agricultural fields. This option is no

longer feasible for Blue Clay Farms due to difficulties in timing the effluent discharge with seasonal crop irrigation requirements. Operation is also becoming difficult for the proponent and equipment replacement can be costly. Therefore, the option of continued crop irrigation with wastewater effluent is not a recommended option for the Blue Clay Farms lagoon.

Trickle Discharge

Slower discharge is expected to increase opportunity for nutrients to be taken up by growing plants along the discharge route, which is a means of reducing phosphorus concentration in the treated effluent. The proposed drainage route is to the southwest, towards the Arnaud Drain (Third Order Drain), via the lagoon perimeter ditch, the existing local farming drain and the Municipal road ditch. The total length of the drainage route prior to reaching the Arnaud Drain is approximately 2.6 km (see Plan L4 in Appendix D). The Arnaud Drain flows to the northwest for approximately 6 km into Marsh River (Third Order Drain) which continues flowing north. The total length of the drainage route is approximately 8.6 km prior to reaching Marsh River. The maximum discharge volume from the lagoon will be approximately 15,187 m³ (the total available volume in the storage cells). If the entire volume was discharged over a four week period, the average discharge rate would be approximately 6.3 L/sec. Based on the trickle discharge rate from the lagoon and the length of drainage route, it is expected that natural uptake of nutrients by the plants and soils will occur.

Public Awareness

In conjunction with nutrient reduction methods through treatment, preventative measures can also be taken to reduce nutrients in the wastewater influent. As all of the influent to the Blue Clay Farms lagoon would be residential in nature, Blue Clay Farms is encouraged to inform residents in the colony of nutrient reducing strategies, such as using non-phosphate based soap and cleaning products for domestic use. This would reduce the amount of phosphorus being released into the lagoon and reduce the requirements for treatment.

Recommended Option

As the population being serviced by the Blue Clay Farms lagoon is less than 2,000 people, a nutrient reduction strategy would be recommended, as opposed to a phosphorus limit of 1.0 mg/L prior to discharge. Therefore, the recommendation for the Blue Clay Farms lagoon would be to utilize a trickle discharge from the storage cells (as described above). This option would require the least amount of operation and would be the most cost effective. In

addition, Blue Clay Farms is encouraged to notify residents in the colony about the importance of nutrient source reduction in their homes.

2.5.10 Summarized Selected Design Criteria

The following selected criteria would be used for design purposes:

- A total design population of 136 people being serviced from the piped collection system in the Hutterite colony in design year 20, for organic and hydraulic loading capacities
- A projected organic loading rate of 10.3 kg BOD⁵/day in design year 20
- A projected hydraulic loading rate of 48 m³/day in design year 20
- A minimum total hydraulic storage capacity in the lagoon cells of 17,378 m³
- A hydraulic storage period of 365 days
- A height of 2.5 m from the cell floor to the top of dike in the proposed Storage Cell #2
- The discharge pipe invert is proposed to be 0.3 m above the cell floor elevation in Storage Cell #2
- Discharge from the lagoon is expected to follow an existing ditching route south and west towards Arnaud Drain (Third Order Drain)
- The horizontal liner will be constructed with a minimum 1.0 m thick in-situ clay liner in Storage Cell #2
- A 3.0 m wide vertical cut-off wall constructed with re-worked clay soils will extend a minimum of 1.0 m into the horizontal clay liner and extend to the top of dike elevation in Storage Cell #2
- The horizontal liner below the interior slopes of Storage Cell #2 will be constructed with re-worked clay soils
- A 4:1 slope will be used for the inner and outside dikes of Storage Cell #2
- A 1.5 m high barbed wire fence with lockable gate would be installed around the perimeter of the lagoon cells
- Rip rap will be installed around the ends of the intercell and discharge piping in Storage Cell #2
- A perimeter ditch will be constructed around Storage Cell #2 and will extend to the existing farming drain at the south end of the colony
- Site markers, warning signs, and valve markers will be installed.

2.5.11 Lagoon Layout

The lagoon would consist of an existing primary cell, an existing Storage Cell #1 and a new Storage Cell #2 constructed to the east of Storage Cell #1. The proposed lagoon layout is shown on Plan L3 in Appendix D.

2.5.12 Lagoon Construction Detail

2.5.12.1 General, Conceptual Liner Design and Construction Techniques

Conceptual plans (Plans L1 to L7) for the lagoon expansion are provided in Appendix D.

Storage Cell #2 would be excavated and the dikes constructed with excavated and compacted soil. The inner and outer dike slopes would be constructed at 4:1. In-situ clay soils will be used for the horizontal lagoon liner. A 3.0 m wide vertical cut-off wall would be extended a minimum of 1.0 m below the horizontal liner, and constructed of re-worked clay soils from the site excavation. The horizontal lagoon liner beneath the inner slopes of Storage Cell #2 would consist of 1.0 m thick re-compacted and re-worked clay soils. While the in-situ horizontal liner is expected to meet the minimum permeability requirements, re-working this portion of the cell liner will ensure excavating the inner slopes of the lagoon cells, is not necessary if any unsuitable material is discovered during excavation and construction (see Plan L5 in Appendix D). The new Storage Cell #2 would have a proposed height of 2.5 m from the cell floor to the top of dike.

It is proposed that the top of dike elevation for the existing and proposed lagoon cells will match for ease of operation. The proposed lagoon dike cut-off wall will tie in with the existing lagoon dike cut-off wall. The existing discharge pipe located in the south dike of Storage Cell #1 will become an intercell pipe between Storage Cell #1 and Storage Cell #2. A discharge pipe would be installed in the west dike of Storage Cell #2 with rip rap around the pipe ends to prevent erosion.

The interior and exterior dike slopes in Storage Cell #2 would be constructed with a compacted mixture of soils available on site. A perimeter ditch around the Storage Cell #2 would be constructed and connected to the existing lagoon perimeter ditch. This ditch would also need to be extended to the existing farming drain located at the south end of the colony. The outer slope and perimeter drainage system would prevent surface drainage from entering into the lagoon and prevent ponding of surface water around the perimeter of the lagoon cells.

The specifications should state that the outer dikes, interior dikes of Storage Cell #2 from the high water mark to the top of dike, top of dikes and ditch embankments are to be seeded with a grass such as brome, to prevent soil erosion. The proposed barbed wire fence would be installed along the perimeter of the existing and proposed lagoon cells, outside of the lagoon dikes, as there is currently no lagoon fencing. A lockable gate would be installed in the perimeter fencing large enough for vehicle access.

2.5.12.2 Construction Details

All topsoil would be removed to a minimum depth of 0.3 m from the new cell construction area including the lagoon cell floor and dike area. The cell floor surface of the newly constructed primary cell is to be scarified to a minimum depth of 0.15 m and compacted to a minimum Standard Proctor Density of 98%.

Construction of the new lagoon cell liner (cell bottom and cut-off walls) should be in accordance with the following specifications:

1. The horizontal liner of Storage Cell #2 shall be constructed of in-situ clay soil material.
2. The vertical cut-off wall of Storage Cell #2 shall be constructed of re-worked clay soil material.
3. The liner shall be a minimum of one metre in thickness and shall have a hydraulic conductivity of 1×10^{-7} cm/sec or less at all locations.

Embankment and liner material, should be compacted with a minimum of eight passes of a sheepsfoot roller on a 150 mm compacted lift. The cell bottom will be graded to a tolerance of ± 50 mm.

The lagoon construction specifications should indicate that the sheepsfoot roller shall have a minimum foot pressure of no less than 1,700 kPa (250 psi). The drum diameter of the sheepsfoot roller should not be less than 1,200 mm. Each roller should be equipped with cleaning fingers designed to prevent the accumulation of material between the tamping feet. The foot pressure would be calculated by taking the total mass of the roller and dividing it by the greater of: the area of the maximum number of tamping feet in one row parallel to the axis of the roller, or by 5 percent of the total foot area. The roller feet should be at least 200 mm long and should have a minimum area of at least 4,500 mm².

A limited range of moisture content should be permitted. The material shall not be so wet nor so dry that compaction equipment cannot compact the fill

into a homogeneous mass. Material too wet shall be dried or wasted and material too dry shall be wetted. All constructed earthen lagoon components shall be graded to a tolerance of ± 50 mm.

2.5.13 Decommissioning

The existing lagoon cells will continue to be utilized after the upgrade is completed. Lagoon decommissioning will be considered and examined by the proponent after design year 20 has passed, or at the time a new replacement lagoon is proposed.

2.5.14 Lagoon Maintenance

Maintenance of the expanded lagoon will include:

- Maintaining the fencing and gate
- Maintaining the intercell and discharge piping and valves
- Maintaining grass cover on dikes to a height of no more than 0.3 m in height
- Maintain a program to prevent and remove burrowing animals
- Maintain rip rap at location of lagoon discharge to prevent erosion of soils
- Monitor liquid level of lagoon.

3.0 POTENTIAL ENVIRONMENTAL IMPACTS

The biophysical and socioeconomic environment as related to the development, and potential impacts of the development on the environment.

3.1 Releases to Air, Water, Land

3.1.1 Air

In general, nuisance odours occur in facultative lagoons that are improperly sized and organically overloaded. Odours are also generated under anaerobic conditions. During the summer, the lagoon would be aerobic at the surface, facultative at the centre and anaerobic at the bottom. Minimal to no treatment would occur in the winter due to the ice cover on the surface; the treatment process would predominantly be anaerobic during winter. Therefore, the lagoon may generate some odours for a short time each spring during the thawing or turn-over period when water temperature inversion causes turbulence in the lagoon cells and gases produced from the anaerobic treatment process are brought to the surface. Prevailing winds in the area can carry odours if the area is exposed and wind breaks are not utilized around the lagoon cells.

There is also a potential for greenhouse gas emissions during construction works from heavy equipment and transport vehicles. Impacts from dust generation are not expected as the construction area will meet the minimal setback distances from residences.

Environmental management practices to mitigate the above potential impacts to the air are provided in Section 4.1 of this report.

3.1.2 Water

Pollutants that may be released into surface and ground water during the operation of the lagoon include coliforms, organic wastes, suspended solids, and other materials that are typically disposed of into the sewer system in the Blue Clay Farms Hutterite Colony. Pollutants in the wastewater produced by the colony are expected to be residential in nature.

Pollutants that have a potential to be released into the surface or ground water during the lagoon upgrade construction activities, include petroleum hydrocarbons (PHCs) from heavy equipment and sediments from soil erosion.

Surface Water

Surface water may be impacted if the wastewater is not sufficiently treated and subsequently discharged from the lagoon. Effluent discharged from the lagoon would eventually reach the Arnaud Drain and the Marsh River. There is also potential to

impact surface water via sedimentation from soil erosion in the drainage route during the construction works.

The discharge from the lagoon should not cause or contribute to flooding in or along the drainage route. There is no potential to impact the navigation of surface waters as a result of the lagoon project, as the proposed drainage route is not in the immediate vicinity of a navigable body of water.

Groundwater

There is a potential for groundwater impacts if wastewater leaks/seeps through the lagoon liner or forcemain pipe and into the groundwater below. There is also a potential for groundwater impacts from equipment leaks or fuel spills during construction.

Environmental management practices to mitigate the above potential impacts to water are provided in Section 4.2 of this report.

3.1.3 Land

The land would be significantly altered by construction of the lagoon dikes and discharge ditching. Fencing would be installed around the perimeter of the lagoon cells.

Pollutants that may be released to the land are predominantly petroleum hydrocarbons (PHCs), which could be released during construction activities. Equipment leaks, or re-fuelling incidences, could result in an impact to the land as a result of construction activities.

Disturbed areas can be impacted through soil erosion if not covered or re-vegetated. Environmental management practices to mitigate the above potential impacts to the land are provided in Section 4.3 of this report.

3.2 Wildlife

The proposed lagoon site is located in the Lake Manitoba Plan Ecoregion of Canada. Characteristic wildlife includes white-tailed deer, coyote, rabbit and ground squirrel. Bird species include waterfowl.

The Manitoba Conservation Data Centre was contacted regarding the proposed lagoon project and indicated that there were no occurrences of rare species at the proposed lagoon expansion site in their database. Refer to the Manitoba Conservation Wildlife and Ecosystem Branch, July 15, 2013 email correspondence, attached in Appendix B.

Impacts to wildlife and wildlife habitat are not expected, as the lagoon expansion is to be located on agricultural land which is regularly disturbed by farming activities.

3.3 Fisheries

Impacts to fish along the discharge route are unlikely as the lagoon effluent would be discharged after fish spawning has normally occurred and only when the treated effluent meets current Manitoba Conservation water quality guidelines for surface discharge.

3.4 Forestry

There are no potential impacts to forestry as the area of lagoon expansion has been previously cleared due to agriculture and no forestry areas would be impacted.

3.5 Vegetation

Characteristic vegetation in the Lake Manitoba Plain ecoregion is classified as being a transitional area between areas of boreal forest to the north and aspen parkland to the southwest. It is a mix of trembling aspen/oak groves and rough fescue grasslands.

Manitoba Conservation Wildlife and Ecosystem Protection Branch was contacted regarding occurrences of rare or endangered vegetative species in their database at the proposed lagoon expansion site. There were no occurrences of rare species identified at the development site. Refer to Manitoba Conservation Wildlife and Ecosystem Protection Branch email correspondence dated July 15, 2013, attached in Appendix B.

No significant impacts to native vegetation in the development area are anticipated, as the site is currently agricultural land which is disturbed regularly through farming activities.

3.6 Noise Impacts

There is a potential for noise impacts in the immediate area due to the heavy equipment utilized during construction. Mitigation measures described in Section 4.4 below will be in place during the construction works. Other than maintenance vehicles (for mowing grass), the operation of the lagoon itself, will not have a potential for noise impacts.

3.7 Health and Safety

There is a potential for impacts to the health and safety of workers and the public during the construction works. Mitigation measures described in Section 4.5 below will be in place during the construction works.

3.8 Heritage Resources

The Manitoba Historic Resources Branch was contacted regarding the proposed site. The Historic Resources Branch indicated that the potential to impact significant heritage resources is

low and that they have no concerns with the project. Refer to the Manitoba Historic Resources Branch July 10, 2013 email correspondence in Appendix B.

Blue Clay Farms has also reviewed the site location and has no concerns for the proposed development site in regards to heritage or historic resources. While impacts to historic or heritage resources are not expected at the site, there is a potential for an unexpected discovery when excavating an area which has not previously been excavated. Mitigation measures described in Section 4.6 below will be in place during the construction works.

3.9 Socio-Economic Implications

The lagoon expansion is not expected to have adverse socio-economic impacts. In fact, construction related economic activity is likely to have a positive economic impact on the surrounding community. In addition the Hutterite colony would have increased wastewater capacity upon completion of the project, which will allow for more convenient lagoon operation.

3.10 Aesthetics

The lagoon expansion is not expected to have adverse impacts on the general aesthetics of the area, as the lagoon construction would occur adjacent to the existing lagoon cells.

4.0 MANAGEMENT PRACTICE

Proposed environmental management practices to be employed to prevent or mitigate adverse implications from the impacts identified above.

4.1 Mitigation of Impacts to Air

To reduce the potential for odour nuisance in the colony, the organic loading to the lagoon primary cell will not exceed the maximum allowable organic loading rate of 56 kg BOD₅/ha for the lagoon primary cell. Therefore, nuisance odours as a result of organic over-loading are not expected.

Although the lagoon would likely generate some odours for a short time each spring, during the thawing or turn-over period, prevailing (i.e. northwesterly) winds should not cause odours to drift toward the Hutterite Colony, which is west of the lagoon. Furthermore, the proposed lagoon upgrade would be located a minimum of 300 metres from the nearest residence and 460 metres from the centre of the Hutterite Colony, as required by Manitoba Conservation.

Emissions from construction equipment and transport vehicles will be controlled through regular maintenance by the contractor, and will meet all provincial and local standards. Dust suppression methods (i.e. water spraying) will be utilized at the construction site if dry conditions create excessive dust through construction activities and transport, which becomes a nuisance to colony residents. Due to the setback distance, it is unlikely that dust will have any impact on the colony.

4.2 Mitigation of Impacts to Water

4.2.1 Surface Water

Impacts to surface water from discharge of lagoon effluent are not expected, as the lagoon effluent would not be discharged unless Tier I Manitoba Water Quality Standards, Objectives and Guidelines are met, as follows:

1. The organic content of the effluent, as indicated by the five day biochemical oxygen demand would not be greater than 25 mg/L
2. The total suspended solids would not be greater than 25 mg/L
3. The fecal coliform content of the effluent, as indicated by the MPN index would not be greater than 200 per 100 ml of sample, or Escherichia coli content not greater than 200 per 100 ml of sample.
4. The total phosphorus content of the effluent would not exceed 1 mg/L or have a demonstrated nutrient reduction strategy.

Impacts to surface water due to discharge of the lagoon are not expected, as treatment will occur in the lagoon cells and measures such as a trickle discharge can be utilized to further reduce nutrient loading to downstream surface waters.

Erosion from excess material stockpiles would be prevented by the use of silt fencing at drainage locations and by either covering the soil stockpiles or seeding with grass. Clean rock (free of fine materials) from an appropriate land-based source would be utilized to eliminate occurrence of erosion at the lagoon discharge outlet. Silt fencing would be installed in the perimeter and discharge route ditching during construction and should remain in place until grass growth is established. Perimeter ditch slopes would be seeded with grass to control erosion and sediment entry into the discharge route. Disturbance of the soils adjacent to the perimeter ditches and discharge route would be minimized during construction.

To minimize impacts from construction equipment on surface waters, the construction specifications should outline to the contractor the requirements for handling and storage of fuels and hazardous materials during construction, as per Federal and Provincial regulations. The specification should state wording similar to the following:

- Diesel or gasoline should be stored in double walled tanks or have containment dikes around fuel containers for volumes greater than 68.2 L (15 gallons) or in compliance with provincial regulations
- Clean up material should be available at the site, consisting of a minimum of 25 kg of suitable commercial sorbent, 30 m² of 6 mil PVC, and an empty fuel barrel for spill collection and disposal
- Fuel storage and hazardous material areas established for project construction should be located a minimum of 100 m from a water body, and comply with provincial regulations
- Waste hazardous materials from construction activities and equipment must be properly collected and disposed of in compliance with provincial regulations
- In the event of spills or leaks of fuels and hazardous materials, the contractor or operator should notify Manitoba Conservation.

Hazardous material handling and storage are to follow all Provincial and Federal regulations including WHMIS and spill containment requirements.

The specifications should state that when working near water with construction equipment:

- Construction equipment is to be properly maintained to prevent leaks and spills of fuels, lubricants, hydraulic fluids or coolants
- There can be no re-fueling or servicing of construction equipment within 100 m of a water body.

There would be no impacts to navigation as a result of the lagoon project, as the discharge route is not a navigable body of water. If flooding occurs along the drainage route, Blue Clay Farms must not discharge the lagoon. The discharge should not cause or contribute to flooding in or along the drainage route.

4.2.2 Groundwater

Seepage of effluent from the lagoon is unlikely to affect groundwater as the new lagoon Storage Cell would utilize a clay liner, having a hydraulic conductivity of 1×10^{-7} cm/sec or less, as required by Manitoba Conservation guidelines.

Mitigation of potential impacts to groundwater during the lagoon construction activities from fuel handling, equipment leaks or fuel spills, would follow the same procedures as described in Section 4.2.1 above.

4.3 Mitigation of Impacts to Land

As the lagoon would utilize a clay liner, seepage to the surrounding land is not expected. To minimize the potential for the release of Petroleum Hydrocarbon (PHC) pollutants into the soil, the mitigation measures described in Section 4.2.1 above outlining fuel-handling procedures should be followed.

To minimize the potential for slope erosion, the outside slopes of the dikes would be constructed with a 4:1 slope and the dike tops, outside slopes, perimeter ditch and soil stockpiles would be seeded with grass. The discharge outlet location would be covered with rip rap to minimize potential soil erosion into the ditch during discharge events.

4.4 Mitigation of Noise Impacts

To minimize the potential for noise impacts, construction equipment and transport vehicles should have mufflers working properly, and construction activities should be limited to daylight hours only.

4.5 Mitigation of Impacts to Health and Safety

To minimize impacts to health and safety of construction workers and the public, the construction specifications should state that the contractor have a safety program in place, in accordance with all Federal and Provincial Health and Safety Regulations. During construction, site access will be limited to the construction crew only. Personal protective equipment will be worn in accordance with the contractor's safety program.

4.6 Mitigation of Impacts to Heritage Resources

If any significant historic or heritage resources are discovered in the course of excavation or construction, the specifications should identify that works are to temporarily cease and an investigation of the site is to be conducted by Manitoba Historic Resources Branch and any other authority as may be required.

5.0 RESIDUAL AND CUMULATIVE EFFECTS

Residual environmental effects remaining after the application of mitigation measures, to the extent possible expressed in quantitative terms relative to baseline conditions

No negative residual effects are anticipated through the construction and operation of the upgraded wastewater treatment lagoon, due to the mitigation measures described above. Positive residual effects are expected from the properly sized wastewater treatment system, which will allow for ease of lagoon operation in the future.

6.0 MONITORING AND FOLLOW-UP

Proposed follow-up activities that will be required at any stage of development (eg. Monitoring, inspection, surveillance, audit, etc.)

Monitoring of the lagoon operation is to be conducted by a trained lagoon operator, who is to ensure the lagoon is operated under the requirements of the environmental licence. The operator is to ensure liquid levels in the lagoon cells are maintained within the required limits; conduct sampling of lagoon effluent prior to discharge; and is to ensure water quality guidelines as described in the environmental licence are met. Water quality and sampling requirements of Environment Canada will also need to be met under the *Wastewater Systems Effluent Regulations*. The construction contractor is to ensure that grass growth occurs on slopes and disturbed areas, after the construction activities are completed.

7.0 FUNDING AND APPROVALS

Name and address of any Government Agency or program (federal, provincial or otherwise) from which a grant or loan of capital funds have been requested (where applicable). Other federal, provincial or municipal approvals, licences, permits, authorizations, etc. known to be required for the proposed development, and the status of the project's application or approval.

Funding for this project is being obtained privately from the proponent. No additional approvals, licences or permits are required for the lagoon construction and operation. Blue Clay Farms will also be responsible for registering the lagoon with Environment Canada and provide annually monitoring reports to Environment Canada under the *Federal Wastewater Systems Effluent Regulations*.

8.0 PUBLIC CONSULTATION

Results of any public consultations undertaken or to be undertaken in conjunction with project planning.

Public consultations by the Blue Clay Farms have not been conducted to date for surrounding communities or residents outside of the Hutterite Colony, and are not currently being planned. Public comments will be received by Manitoba Conservation through the public registry during the Environmental Act Proposal review period.

9.0 CONCLUSION

Based on the design of the project and the implementation of the mitigation measures identified in Section 4.0 above, no significant negative environmental impacts are anticipated.

The proponent would like to complete the requirements of the Environment Act Proposal as soon as possible so that the lagoon construction can begin by the time specified in Section 2.5.1 above.

J. R. Cousin Consultants Ltd. requests that a draft copy of the licence be forwarded for review prior to the issue of the final licence.

APPENDICES

APPENDIX A

Land Title (Number 1159542/1)

Land Title (Number 1159541/1)

Crown Lands & Property Agency – Lands Branch, July 9, 2013 Email Correspondence

APPENDIX B

Table 1: Blue Clay Farms Population, Hydraulic, and Organic Loading Projections

Manitoba Conservation and Water Stewardship Fisheries Branch, July 11, 2013
Email Correspondence

Manitoba Conservation Wildlife and Ecosystem Protection Branch, July 15, 2013
Email Correspondence

Manitoba Historic Resources Branch, July 10, 2013 Email Correspondence

APPENDIX C

Test Hole Logs

Hardy BBT Ltd. Soil Analysis Results

HBT AGRA Ltd. Letter Report of Soils Permeability Analysis Results, August 5, 1992

APPENDIX D

Title Page

Plan L1: Proposed Lagoon Expansion Location Plan with Setbacks

Plan L2: Proposed Discharge Plan

Plan L3: Lagoon Expansion Layout

Plan L4: Proposed Drainage Route

Plan L5: Lagoon Dike Details

Plan L6: Valve, Valve Marker, Sign, Rip Rap, Ditch and Silt Fence Details

Plan L7: Fence and Gate Details

Appendix A

Land Title (Number 1159542/1)

Land Title (Number 1159541/1)

Crown Lands & Property Agency – Lands Branch, July 9, 2013 Email
Correspondence

Land Title (Number 1159542/1)

DATE: 2012/05/10
 TIME: 22:50

MANITOBA
STATUS OF TITLE

TITLE NO: 1159542/1
 PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	DUBOFF, EDWARDS, HAIGHT
ORIGINATING OFFICE...	WINNIPEG	ADDRESS.....	1900 - 155 CARLTON STREET
REGISTERING OFFICE...	WINNIPEG		WINNIPEG MB R3C 3H8
REGISTRATION DATE....	1990/04/19	LTO BOX NO....	71
COMPLETION DATE.....	1990/05/09	CLIENT FILE...	200571-1201(BLUMENHOF)
		PRODUCED BY...	SYSTEM for Series: 4208807/1

LEGAL DESCRIPTION:

BLUMENHOF HOLDING CO. LTD.

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

S 1/2 OF SE 1/4 SEC 9-4-3 EPM

ACTIVE TITLE CHARGE(S):

1936565/1	ACCEPTED	MORTGAGE	REG'D: 1995/08/10
	FROM/BY:	BLUMENHOF HOLDING CO. LTD.	
	TO:	CANADIAN IMPERIAL BANK OF COMMERCE	
	CONSIDERATION:	\$3,500,000.00	NOTES:
CHARGES AFFECTING THIS INSTRUMENT:			
4208811/1	ACCEPTED	AMENDING AGREEMENT INCLUDING LAND	
4208811/1	ACCEPTED	AMENDING AGREEMENT INCLUDING LAND	REG'D: 2012/05/02
	FROM/BY:	CANADIAN IMPERIAL BANK OF COMMERCE	
	TO:	BLUMENHOF HOLDING CO. LTD.	
	CONSIDERATION:		NOTES:

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	BLUMENHOF HOLDING CO. LTD. BOX 13 PLUM COULEE, MANITOBA	R0G 1R0

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1284448/1	T	1990/04/19	\$2,002,250.00	\$2,202,250.00
	PRESENTED BY:	BAKER, ZIVOT & COMPANY		
	FROM:	BLUE CLAY FARMS LTD.		
	TO:	BLUMENHOF HOLDING CO. LTD.		

FROM TITLE NUMBER(S):

1151597/1 ALL

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2012/05/10 OF TITLE NUMBER 1159542/1

***** STATUS OF TITLE 1159542/1 CONTINUED ON NEXT PAGE *****

DATE: 2012/05/10
TIME: 22:50

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TITLE NO: 1159542/1

STATUS OF TITLE

PAGE: 2

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... WINNIPEG
REGISTERING OFFICE... WINNIPEG
REGISTRATION DATE.... 1990/04/19
COMPLETION DATE..... 1990/05/09

PRODUCED FOR.. DUBOFF, EDWARDS, HAIGHT
ADDRESS..... 1900 - 155 CARLTON STREET
WINNIPEG MB R3C 3H8

LTO BOX NO.... 71
CLIENT FILE... 200571-1201(BLUMENHOF)
PRODUCED BY... SYSTEM for Series: 4208807/1

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SE	9	4	3E
NOTE:	S 1/2			

ACCEPTED THIS 19TH DAY OF APRIL, 1990
BY R.CRIERIE FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF WINNIPEG.

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2012/05/10 OF TITLE NUMBER 1159542/1.

***** END OF STATUS OF TITLE 1159542/1 *****

Land Title (Number 1159541/1)

DATE: 2012/05/10
 TIME: 22:50

MANITOBA
STATUS OF TITLE

TITLE NO: 1159541/1

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	DUBOFF, EDWARDS, HAIGHT
ORIGINATING OFFICE...	WINNIPEG	ADDRESS.....	1900 - 155' CARLTON STREET
REGISTERING OFFICE...	WINNIPEG		WINNIPEG MB R3C 3H8
REGISTRATION DATE....	1990/04/19	LTO BOX NO....	71
COMPLETION DATE.....	1990/05/09	CLIENT FILE...	200571-1201(BLUMENHOF)
		PRODUCED BY...	SYSTEM for Series: 4208807/1

LEGAL DESCRIPTION:

BLUMENHOF HOLDING CO. LTD.

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

NE 1/4 AND N 1/2 OF SE 1/4 SEC 9-4-3 EPM

ACTIVE TITLE CHARGE(S):

1936565/1	ACCEPTED	MORTGAGE	REG'D: 1995/08/10
	FROM/BY:	BLUMENHOF HOLDING CO. LTD.	
	TO:	CANADIAN IMPERIAL BANK OF COMMERCE	
	CONSIDERATION:	\$3,500,000.00	NOTES:
CHARGES AFFECTING THIS INSTRUMENT:			
4208811/1	ACCEPTED	AMENDING AGREEMENT INCLUDING LAND	
4208811/1	ACCEPTED	AMENDING AGREEMENT INCLUDING LAND	REG'D: 2012/05/02
	FROM/BY:	CANADIAN IMPERIAL BANK OF COMMERCE	
	TO:	BLUMENHOF HOLDING CO. LTD.	
	CONSIDERATION:		NOTES:

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	BLUMENHOF HOLDING CO. LTD. BOX 13 PLUM COULEE, MANITOBA	ROG 1R0

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1284448/1	T	1990/04/19	\$2,002,250.00	\$2,202,250.00
PRESENTED BY: BAKER, ZIVOT & COMPANY				
FROM: BLUE CLAY FARMS LTD.				
TO: BLUMENHOF HOLDING CO. LTD.				

FROM TITLE NUMBER(S):

1151617/1 ALL

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2012/05/10 OF TITLE NUMBER 1159541/1

Crown Lands & Property Agency – Lands Branch, July 9, 2013 Email
Correspondence

Oswald Wohlgemut

From: Little, Karen (CLPA) [Karen.Little@gov.mb.ca]
Sent: Tuesday, July 09, 2013 9:12 AM
To: 'Oswald Wohlgemut'
Subject: RE: Blue Clay Colony Lagoon - Mineral Rights

Good morning Oswald, according to our records this date, the mines & minerals and sand & gravel in NE & SE 9-4-3 EPM were originally granted with the surface in 1882. The Crown has no interests.

Based on Certificate of Titles 1159542/1 for S ½ of SE 9-4-3 EPM and 1159541/1 for NE and N ½ of SE 9-4-3 EPM, ownership of the mines & minerals and sand & gravel remain within these surface titles.

Sincerely,

Karen Little

Supervisor of Crown Lands Registry

Crown Lands and Property Agency

308 - 25 Tupper Street North

Portage la Prairie MB R1N 3K1

P (204) 239-3805 F (204) 239-3560

Toll Free 1-866-210-9589

karen.little@gov.mb.ca



An Agency of MB Infrastructure and Transportation

From: Oswald Wohlgemut [<mailto:owohlgemut@jrcc.ca>]
Sent: July-08-13 4:53 PM
To: Little, Karen (CLPA)
Subject: Blue Clay Colony Lagoon - Mineral Rights

Hello Karen,

JR Cousin Consultants Ltd. is submitting an Environmental Act Proposal on behalf of Blue Clay Farms, regarding the Wastewater Treatment Lagoon expansion project (located at SE 9-4-3 EPM). We have attached a copy of the certificate of titles for the parcel of land proposed in the construction works. Could you confirm who owns the mineral rights in these parcels of land?

Let me know if you have any questions.

Thank you,

Oswald Wohlgemut, M.Sc.
Environmental Scientist

J.R. Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

Appendix B

Table 1: Blue Clay Farms Population, Hydraulic, and Organic Loading Projections

Manitoba Conservation and Water Stewardship Fisheries Branch, July 11, 2013
Email Correspondence

Manitoba Conservation Wildlife and Ecosystem Protection Branch, July 15, 2013
Email Correspondence

Manitoba Historic Resources Branch, July 10, 2013 Email Correspondence

Table 1: Blue Clay Farms Population, Hydraulic, and Organic Loading Projections

TABLE 1: BLUE CLAY FARMS - POPULATION, HYDRAULIC AND ORGANIC LOADING PROJECTIONS

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
Calendar Year	Design Year	Population	Hydraulic Loading			Organic Loading		
		Hutterite Colony	Daily per Capita	Daily Wastewater	Wastewater Volume	Daily per Capita B.O.D.	Daily B.O.D.	Primary Cell
		Population	Wastewater Production*	Production	For 365 Days		Production	Area Req'd at 0.75 m
		Growth per year	Hutterite Colony	Hutterite Colony	Hutterite Colony	Hutterite Colony	Hutterite Colony	Hutterite Colony
		1.5%	(litres)	(cu. m.)	(cu. m.)	(kg)	(kg)	(sq. m.)
2013	0	101	300	30	11,060	0.076	7.7	1,371
2014	1	103	300	31	11,225	0.076	7.8	1,391
2015	2	104	300	31	11,394	0.076	7.9	1,412
2016	3	106	300	32	11,565	0.076	8.0	1,433
2017	4	107	300	32	11,738	0.076	8.1	1,455
2018	5	109	300	33	11,914	0.076	8.3	1,477
2019	6	110	300	33	12,093	0.076	8.4	1,499
2020	7	112	300	34	12,274	0.076	8.5	1,521
2021	8	114	300	34	12,458	0.076	8.6	1,544
2022	9	115	300	35	12,645	0.076	8.8	1,567
2023	10	117	300	35	12,835	0.076	8.9	1,591
2024	11	119	300	36	13,028	0.076	9.0	1,615
2025	12	121	300	36	13,223	0.076	9.2	1,639
2026	13	123	300	37	13,421	0.076	9.3	1,663
2027	14	124	300	37	13,623	0.076	9.5	1,688
2028	15	126	300	38	13,827	0.076	9.6	1,714
2029	16	128	300	38	14,034	0.076	9.7	1,739
2030	17	130	300	39	14,245	0.076	9.9	1,766
2031	18	132	300	40	14,459	0.076	10.0	1,792
2032	19	134	300	40	14,675	0.076	10.2	1,819
2033	20	136	300	41	14,896	0.076	10.3	1,846

* Includes infiltration

Manitoba Conservation and Water Stewardship Fisheries Branch,
July 11, 2013 Email Correspondence

Oswald Wohlgemut

From: Janusz, Lauren R (CWS) [Lauren.Janusz@gov.mb.ca]
Sent: Thursday, July 11, 2013 1:34 PM
To: 'Oswald Wohlgemut'
Cc: Biggin, Wade (CWS); Klein, Geoff (CWS)
Subject: Fisheries Info: Arnaud Drain and Marsh River

Hi Oswald,

I've checked the Fisheries Inventory and Habitat Classification System for Arnaud Drain and Marsh River. For Arnaud Drain fathead minnows and brook stickleback were identified from a sampling event in 2004 and 2005. There is no fisheries information for Marsh River. There is fisheries information for the Rat River. Marsh River enters into the Rat River prior to the Rat entering the Red River. The Rat River is classified as a class 2 waterbody (slight limitations to the production of fish) and provides year round support to a number of large and small bodied fish species.

The following species have been recorded: carp, quillback, silver redhorse, brown bullhead, channel catfish, bluegill, sauger, golden redhorse, yellow perch, black crappie, iowa darter, black bullhead, blacknose dace, blacknose darter, brook stickleback, burbot, central mudminnow, chestnut lamprey, emerald shiner, fathead minnow, finescale dace, goldeye, johnny darter, longnose dace, northern pike, northern redbelly dace, pearl dace, river shiner, rock bass, sand shiner, shorthead redhorse, silver chub, silver lamprey, spotfin shiner, stonecat, tadpole madtom, walleye and white sucker. Historically the Rat has been stocked with rainbow, brook and brown trout.

General Fisheries Use: recreational angling, general limits apply.

As a reminder regarding the FIHCS, the data comes from a number of sources and as such we cannot guarantee the species listed are 100% accurate. Also the species when entered are not linked to a location so the list includes everything reported to be found in the waterbody.

There is no habitat specific information in the files for either Arnaud Drain or Marsh River.

I have cc'd the Regional Fisheries Manager as he may have additional information or corrections to what has been provided. I ask that Geoff respond directly to you and cc myself if he does.

Have a great day.

Laureen Janusz
Fisheries Science and Fish Culture Section
Fisheries Branch
Conservation and Water Stewardship
Phone: 204 945-7789
Cell: 204 793-1154
Email: Laureen.Janusz@gov.mb.ca

From: Oswald Wohlgemut [<mailto:owohlgemut@jrcc.ca>]
Sent: July-10-13 1:18 PM
To: Janusz, Lauren R (CWS)
Subject: Arnaud Drain and Marsh River - Fisheries Info

Hello Lauren,

J.R. Cousin Consultants Ltd. (JRCC) is preparing an Environment Act Proposal on behalf of Blue Clay Farms for the Hutterite Colony Lagoon Expansion Project. The proposed expansion **will** be located adjacent to the existing lagoon cells

and will discharge into Arnaud Drain located at 4-4-3 EPM. Arnaud Drains flows into Marsh River approximately 6 km to the northwest.

If you have the data, please provide a list of fish species known to exist in the Arnaud Drain and Marsh River. Please also provide any fish spawning information for this area, as we would like to include this information in the Environment Act Proposal.

Please do not hesitate to contact us if you have any questions.

Thank you,

Oswald Wohlgemut, M.Sc.
Environmental Scientist

J.R. Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

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Manitoba Conservation Wildlife and Ecosystem Protection Branch,
July 15, 2013 Email Correspondence

Oswald Wohlgemut

From: Friesen, Chris (CWS) [Chris.Friesen@gov.mb.ca]
Sent: Monday, July 15, 2013 3:40 PM
To: 'Oswald Wohlgemut'
Subject: RE: Blue Clay Colony Lagoon Upgrade - Species at Risk

Oswald

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. **An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present;** in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife and Ecosystem Protection Branch, Manitoba Conservation.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information please contact me directly at (204) 945- 7747.

Chris Friesen
Biodiversity Information Manager
Manitoba Conservation Data Centre
204-945-7747
chris.friesen@gov.mb.ca
<http://www.gov.mb.ca/conservation/cdc/>

From: Oswald Wohlgemut [<mailto:owohlgemut@jrcc.ca>]
Sent: July-10-13 2:07 PM
To: Friesen, Chris (CWS)
Subject: Blue Clay Colony Lagoon Upgrade - Species at Risk

Hello Chris,

J.R. Cousin Consultants is conducting an Environment Act Proposal on behalf of Blue Clay Farms for the Hutterite Colony lagoon expansion project. The construction works will occur at SE 9-4-3 EPM (see attached plan). The area proposed for expansion is an existing agricultural field located adjacent to the existing lagoon cells. Works will include dike construction, perimeter ditch construction and fence installation.

Please provide information on any at risk wildlife and plant species that are known to exist in the location outlined above, as well as any registered habitat areas, as we would like to include that information in the Environmental Assessment.

Please let us know if you have any questions.

Thank you,

Oswald Wohlgemut, M.Sc.
Environmental Scientist

J.R. Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

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Manitoba Historic Resources Branch, July 10, 2013 Email Correspondence

Oswald Wohlgemut

From: Sitchon, Myra (CHT) [Myra.Sitchon@gov.mb.ca]
Sent: Wednesday, July 10, 2013 11:24 AM
To: 'Oswald Wohlgemut'
Subject: RE: Blue Clay Colony Lagoon Upgrade - Heritage Resources

Hi Oswald,

Thanks for sending in the proposal. I have reviewed the plan and determined that our office has no concerns with the project.

If you have any questions, please do not hesitate to contact me.

Cheers,

Myra

Myra L. Sitchon,
Impact Evaluation Archaeologist,
Archaeological Assessment Services Unit,
Historic Resources Branch
Main Floor- 213 Notre Dame Avenue, Winnipeg, MB R3B 1N3
myra.sitchon@gov.mb.ca

Phone: (204) 945-6539
Toll Free: 1-800-282-8069+extension(6539)
Fax: (204) 948-2384
Website: <http://www.manitoba.ca/heritage>



Culture, Heritage and Tourism

From: Oswald Wohlgemut [<mailto:owohlgemut@jrcc.ca>]
Sent: July-10-13 8:46 AM
To: Sitchon, Myra (CHT)
Subject: Blue Clay Colony Lagoon Upgrade - Heritage Resources

Hello Myra,

J.R. Cousin Consultants is conducting an Environment Act Proposal on behalf of Blue Clay Farms, for the upgrade of the existing Hutterite Colony lagoon. The construction works will occur at SE 9-4-3 EPM (see attached plan). The area proposed for expansion is existing agricultural land adjacent to the existing lagoon cells. Works will include dike construction, perimeter ditch construction and fence installation.

Please provide any comments or concerns you may have with the proposed project, in regards to historic or heritage resources, as we would like to include that information in the Environment Act Proposal.

Thank you,

Oswald Wohlgemut, M.Sc.
Environmental Scientist

Appendix C

Test Hole Logs

Hardy BBT Ltd. Soil Analysis Results

HBT AGRA Ltd. Letter Report of Soils Permeability Analysis Results,
August 5, 1992

Test Hole Logs

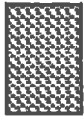
SYMBOL INDEX



Pt. : Peat and other highly organic soils



GW. : Well graded gravels, and gravel sand mixtures



GM. : Silty gravels, gravel-sand-silt mixtures



SP. : Poorly graded sands, or gravelly sands



SM. : Silty sands, sand-silt mixtures



SC. : Clayey sands, sand-clay mixtures



ML. : Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity



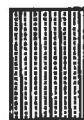
MH. : Inorganic silts, fine sandy or silty soils



CL. : Inorganic clays of low plasticity, gravelly, sandy or silty clays, lean clays



CH. : inorganic clays of high plasticity, fat clays



OL. : Organic silts and organic silty clays of low plasticity



OH. : Organic clays of high plasticity

J.R. COUSIN CONSULTANTS LTD.
TEST HOLE LOG SHEET

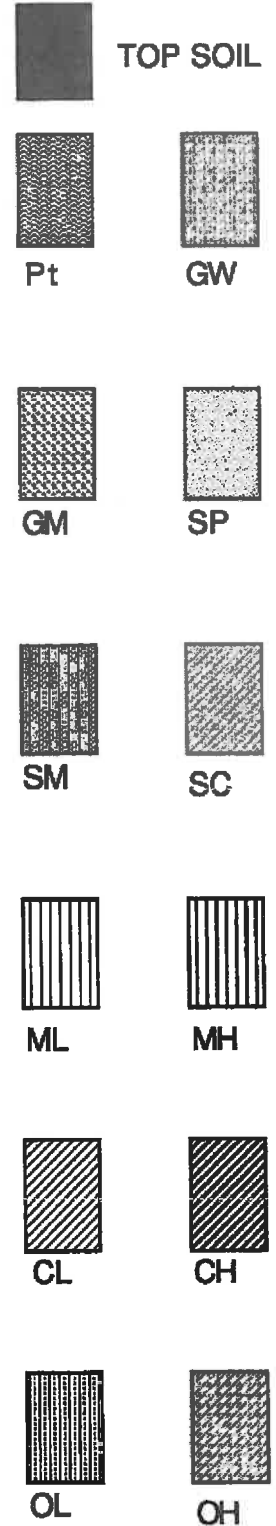
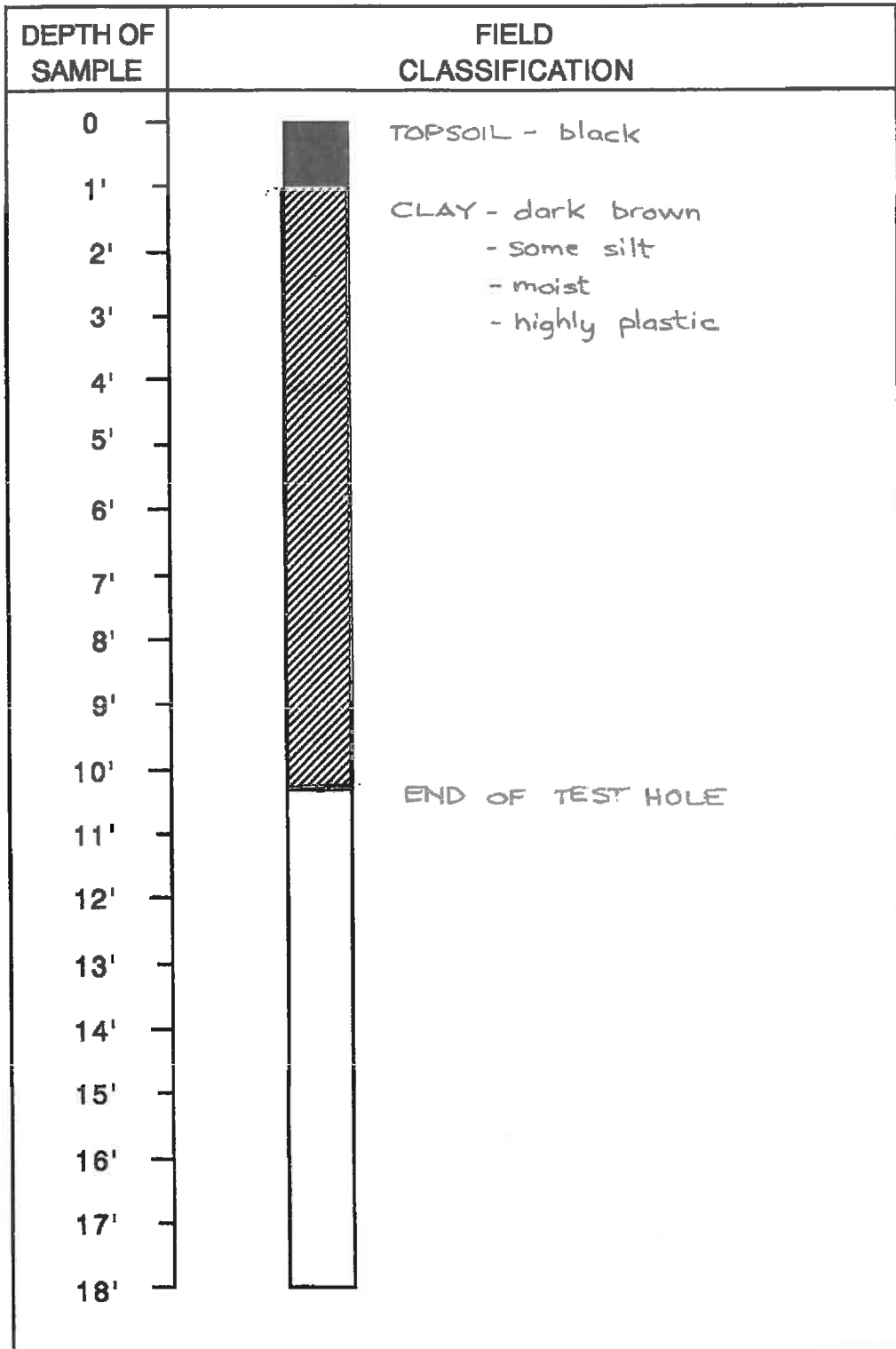
LOCATION : BLUE CLAY FARMS

DATE : MAY 14, 1991

LOCATION OF BORING : SECTION 9-4-3 E ; 595 m N , 249 m E

PROJECT : WASTEWATER LAGOON

TEST HOLE # 1



J.R. COUSIN CONSULTANTS LTD.
TEST HOLE LOG SHEET

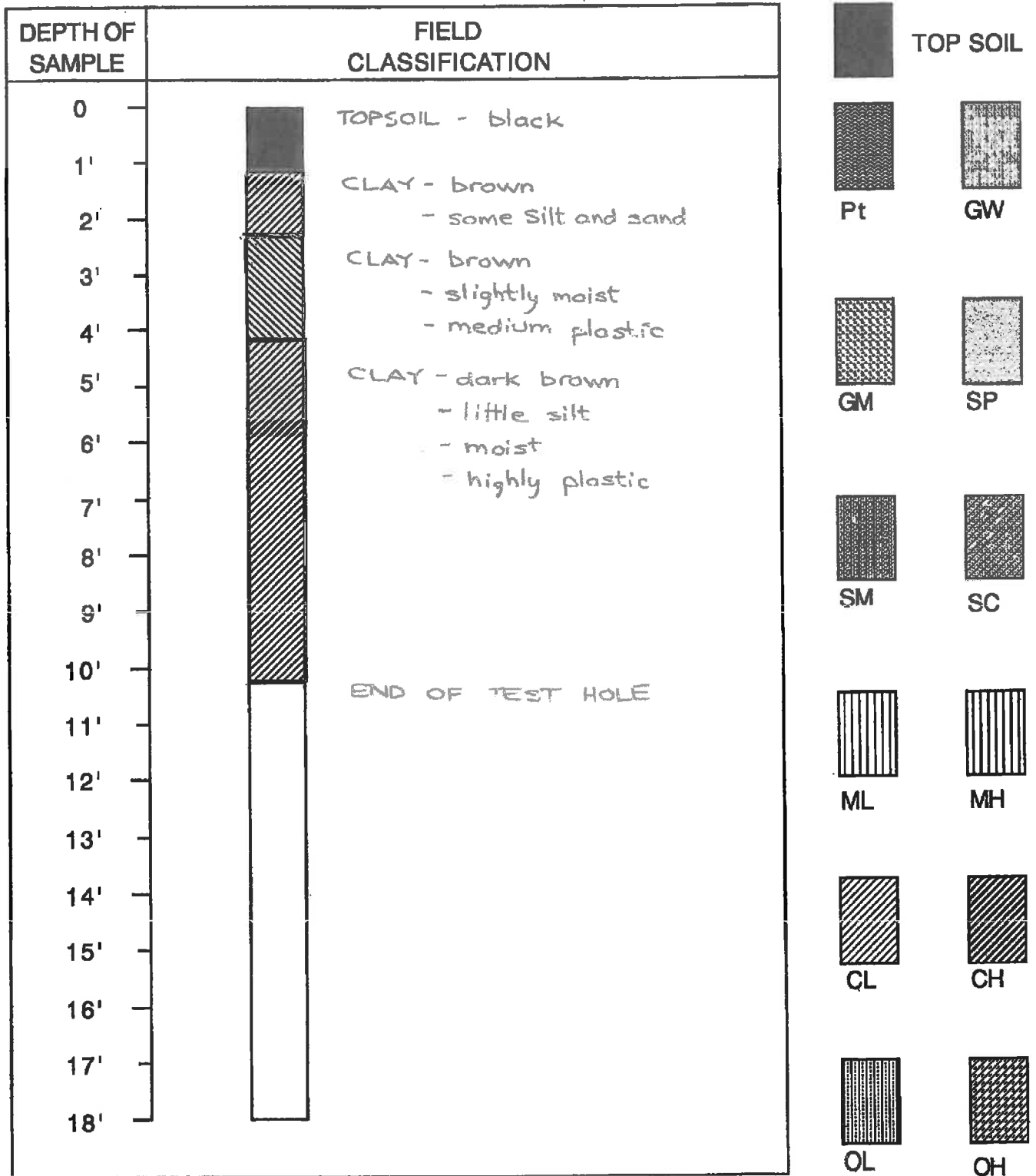
LOCATION : BLUE CLAY FARMS

DATE : MAY 14, 1991

LOCATION OF BORING : SECTION 9-4-3 E ; 635 m N , 249 m E

PROJECT : WASTEWATER LAGOON

TEST HOLE # 2



J.R. COUSIN CONSULTANTS LTD.
TEST HOLE LOG SHEET

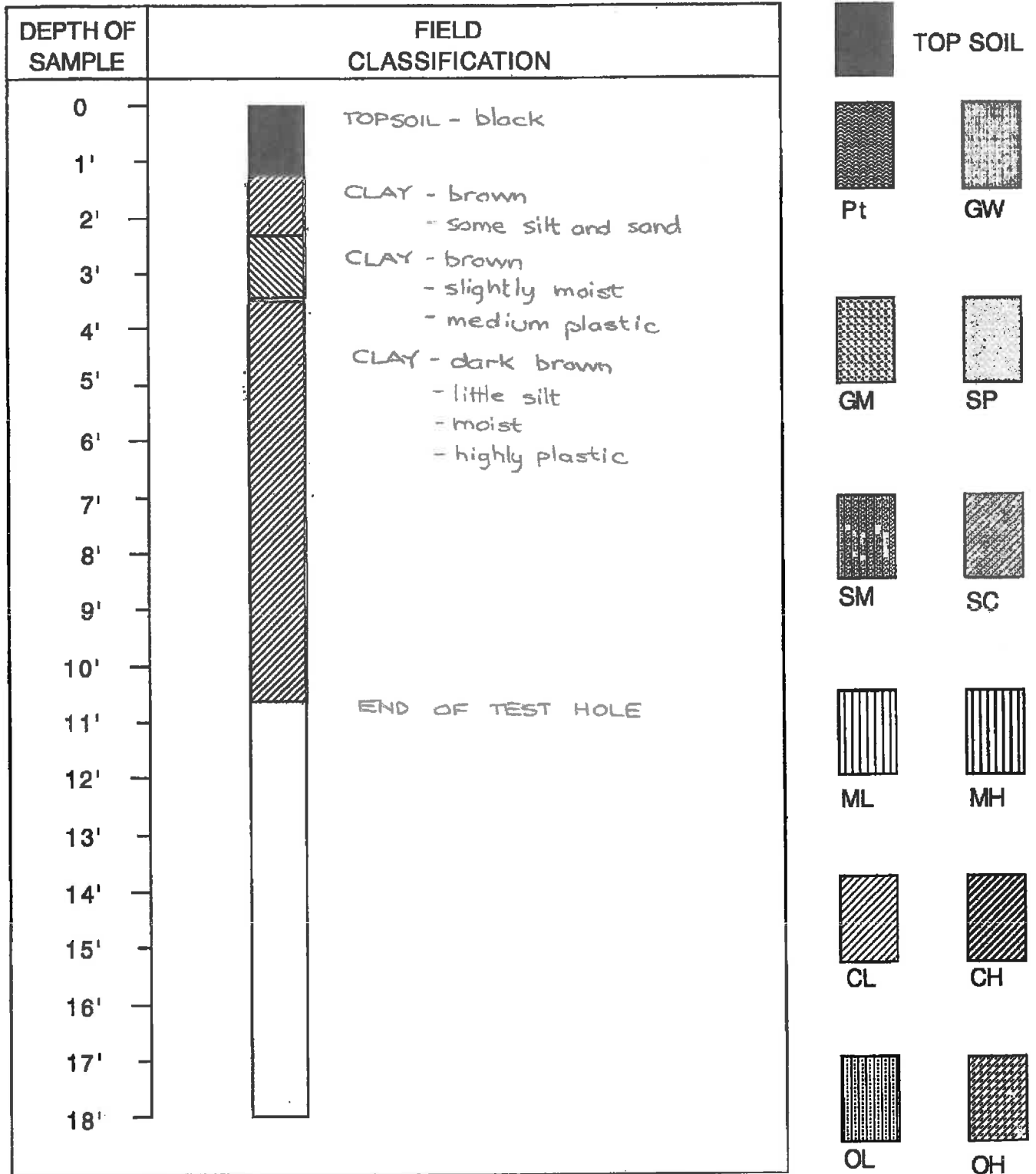
LOCATION : BLUE CLAY FARMS

DATE : MAY 14, 1991

LOCATION OF BORING : SECTION 9-4-3 E ; 700 m N , 249 m E

PROJECT : WASTEWATER LAGOON

TEST HOLE # 3



J.R. COUSIN CONSULTANTS LTD.
TEST HOLE LOG SHEET

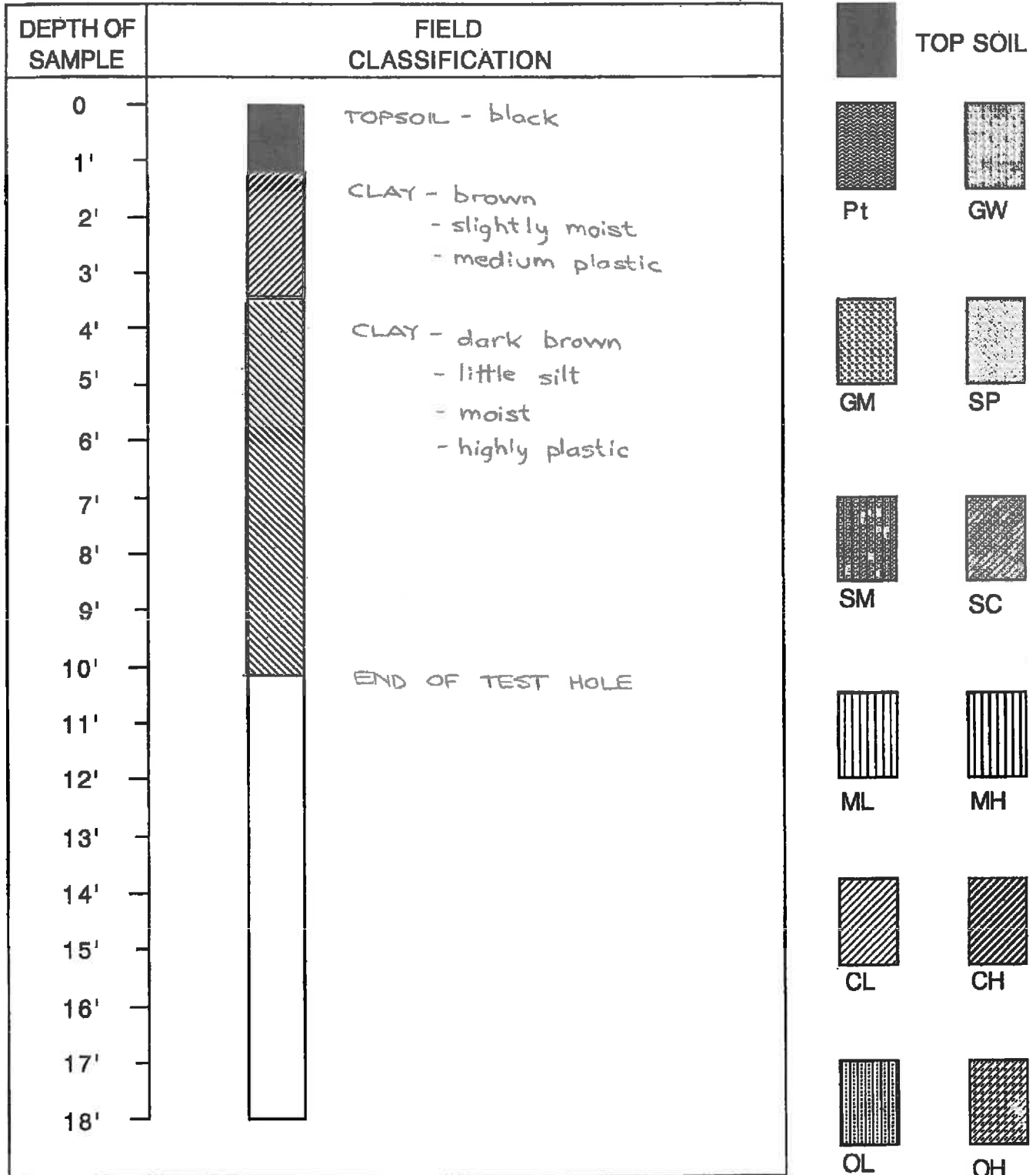
LOCATION : BLUE CLAY FARMS

DATE : MAY 14, 1991

LOCATION OF BORING : SECTION 9-4-3 E; 750 m N, 249 m E

PROJECT : WASTEWATER LAGOON

TEST HOLE # 4



J.R. COUSIN CONSULTANTS LTD.
TEST HOLE LOG SHEET

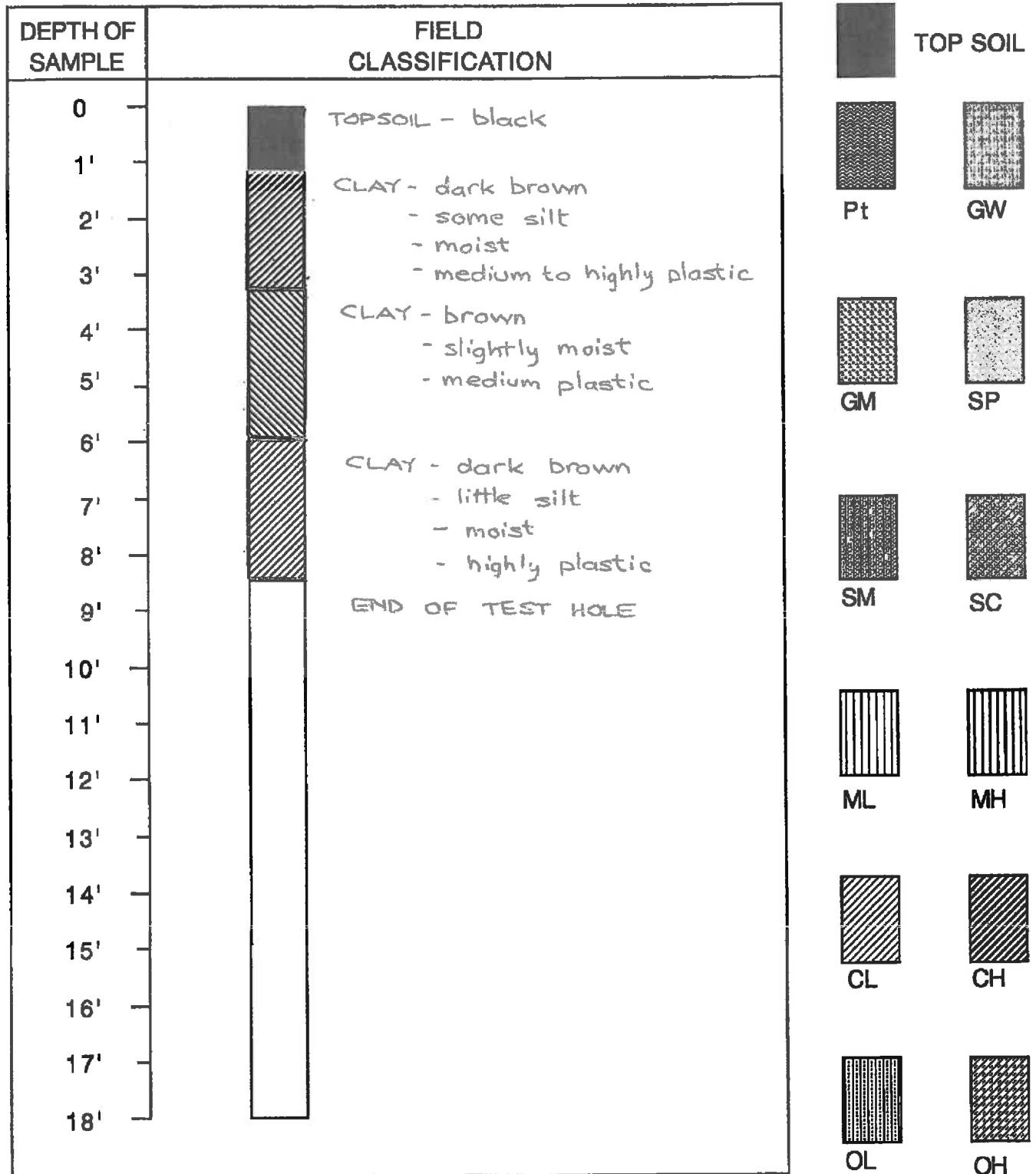
LOCATION : BLUE CLAY FARMS

DATE : MAY 14, 1991

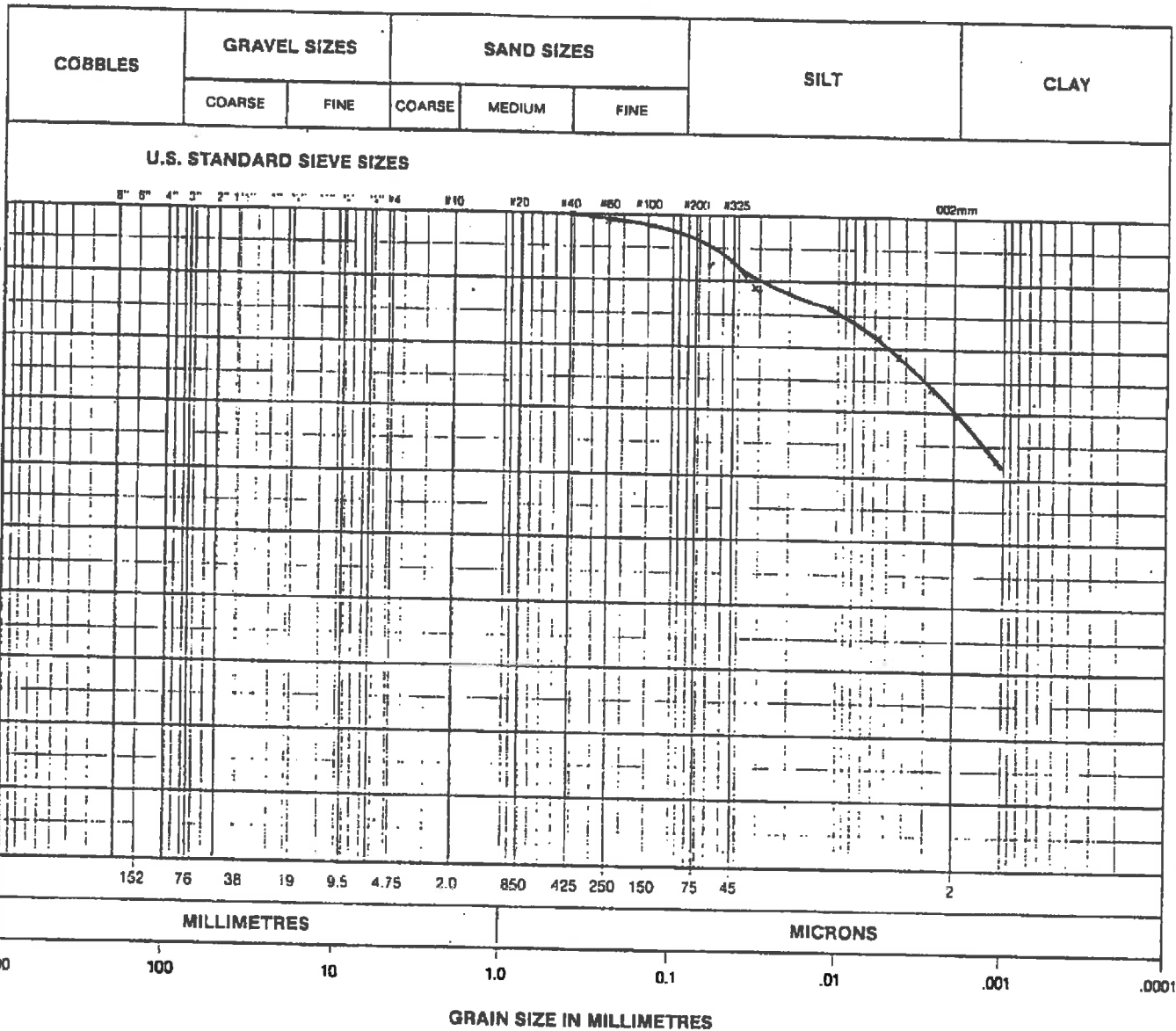
LOCATION OF BORING : SECTION 9-4-3 E; 530 m N, 249 m E

PROJECT : WASTEWATER LAGOON

TEST HOLE # 5



Hardy BBT Ltd. Soil Analysis Results



REMARKS: CH - CLAY, HIGH PLASTIC, MOIST,
DARK BROWN WITH BLACK, SILT SIZES,
TRACE OF SAND & ORGANICS

SUMMARY	
D ₁₀ = _____ mm	GRAVEL _____ %
D ₃₀ = _____ mm	SAND <u>3.0</u> %
D ₆₀ = _____ mm	SILT <u>27.0</u> %
C _u = _____ mm	CLAY <u>70.0</u> %
C _c = _____ mm	

NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM



Hardy BBT Limited
 CONSULTING ENGINEERING & PROFESSIONAL SERVICES

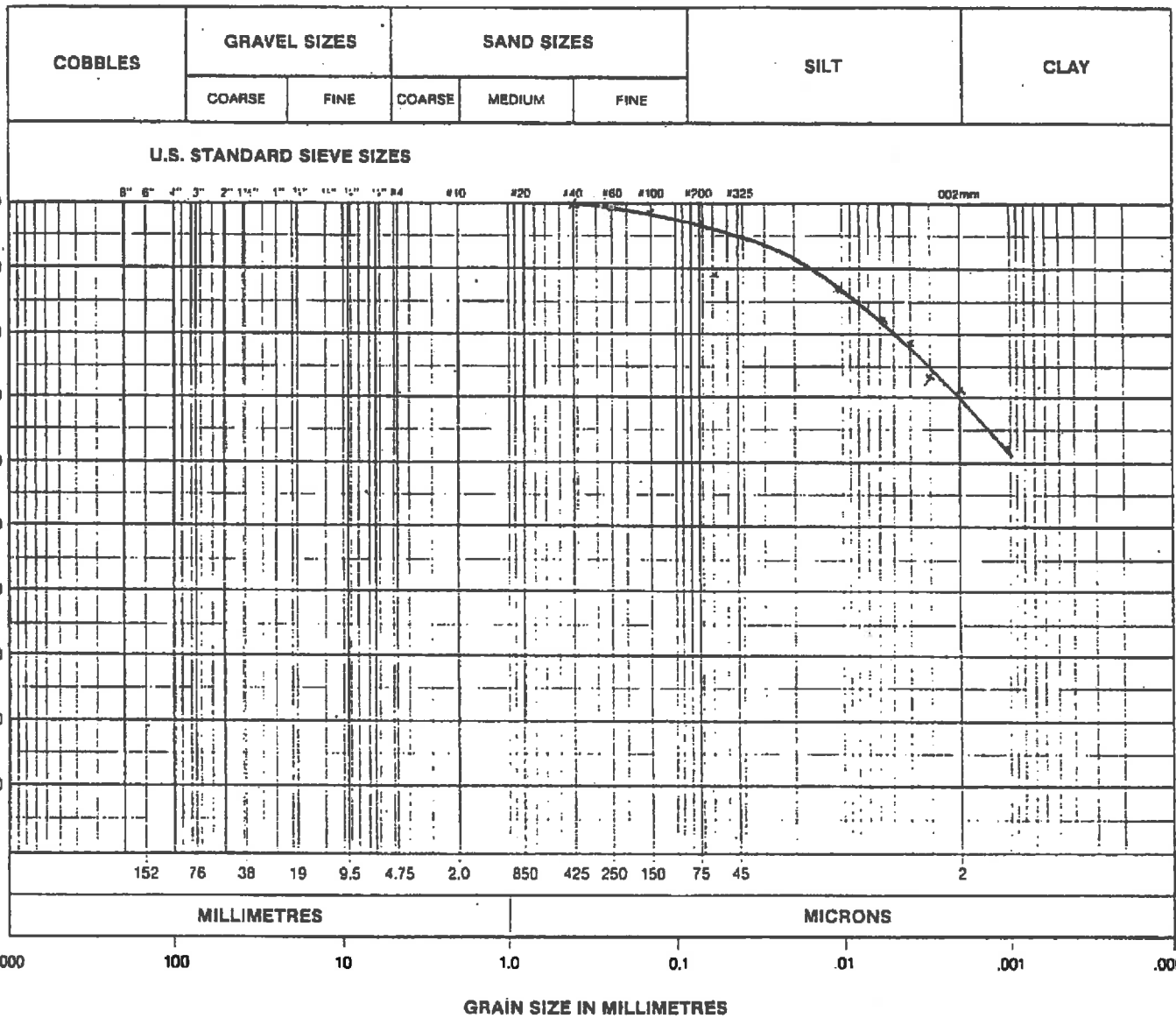
J. R. COUSINS
BLUE CLAY

Test Hole No. 3 Sample 18 Depth 1'

DK . GRAIN SIZE DISTRIBUTION

JOB NO. WX-07337

MAY 23/91



REMARKS: CH- CLAY, HIGH PLASTIC, MOIST
MEDIUM BROWN, TRACE OF SAND, SOME
SILT SIZES.

NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM

SUMMARY	
D ₁₀ = _____ mm	GRAVEL _____ %
D ₃₀ = _____ mm	SAND <u>4.0</u> %
D ₆₀ = _____ mm	SILT <u>26.0</u> %
C _u = _____ mm	CLAY <u>70.0</u> %
C _c = _____ mm	



Hardy BBT Limited
 CONSULTING ENGINEERING & PROFESSIONAL SERVICES

J.R. COUSINS
BLUE CLAY

Test Hole No. 3 Sample 19 Depth 2'

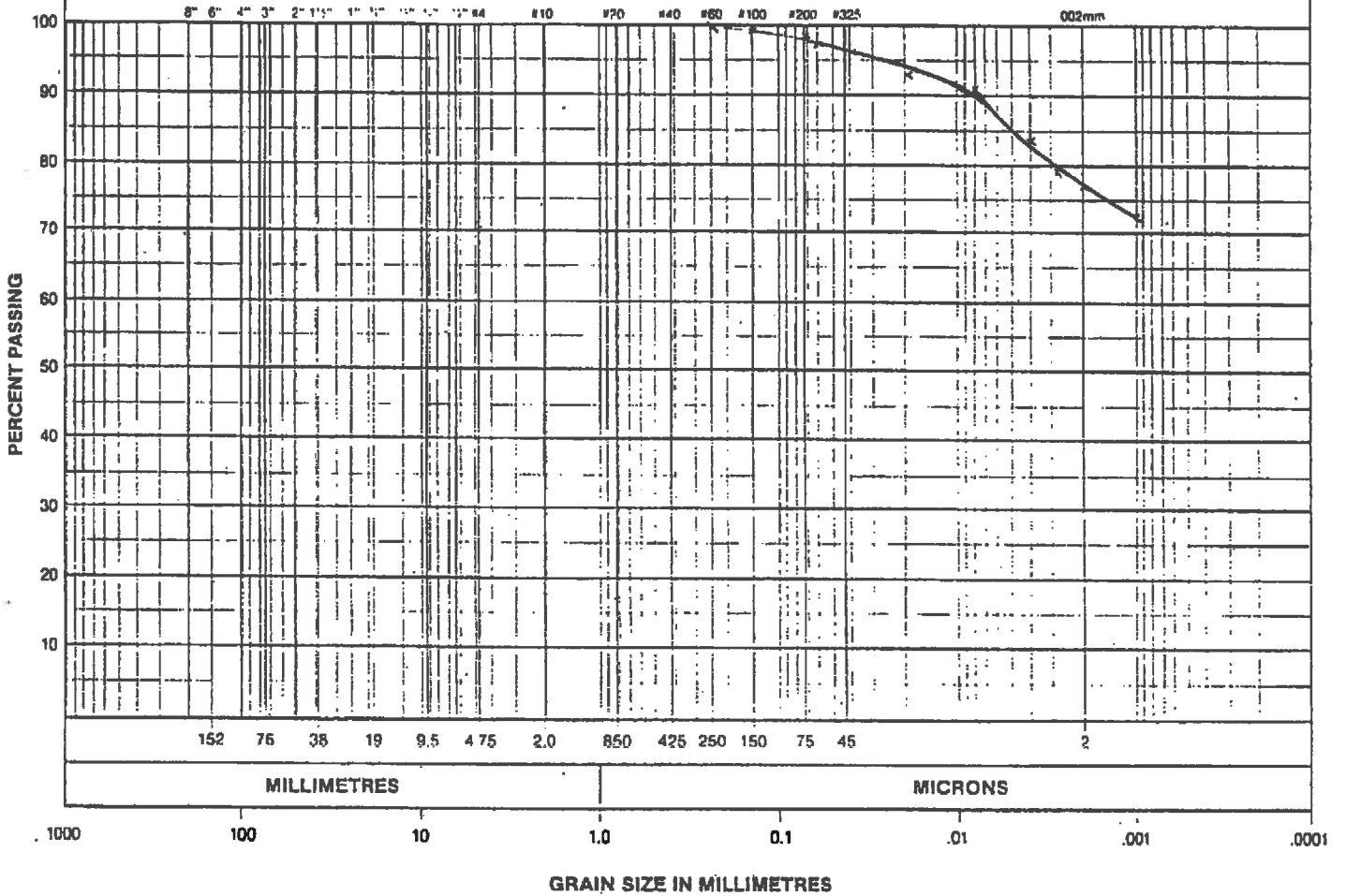
GRAIN SIZE DISTRIBUTION

JOB NO. Wx-07337

May 23/91

COBBLES	GRAVEL SIZES		SAND SIZES			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

U.S. STANDARD SIEVE SIZES



REMARKS: CH-CLAY, HIGH PLASTIC, DAMP,
MOTTLED GREY BROWN, SOME SILT, TRACE
OF SAND

NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM

SUMMARY	
D ₁₀ = _____ mm	GRAVEL _____ %
D ₃₀ = _____ mm	SAND <u>2.0</u> %
D ₆₀ = _____ mm	SILT <u>22.0</u> %
C _u = _____ mm	CLAY <u>76.0</u> %
C _c = _____ mm	



Hardy BBT Limited
 CONSULTING ENGINEERING & PROFESSIONAL SERVICES

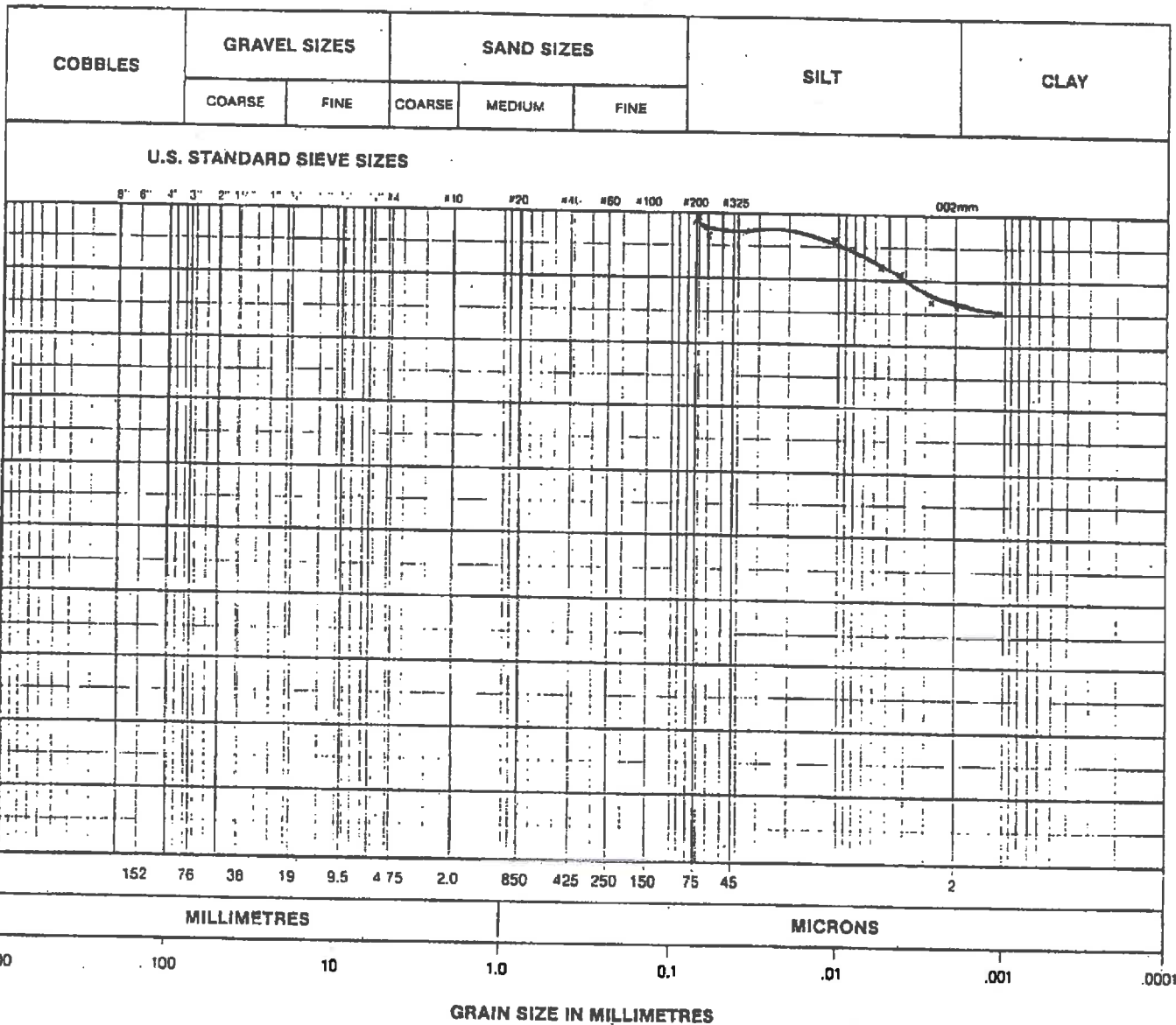
J.R. COUSINS
BLUE CLAY

Test Hole No. 3 Sample 20 Depth 3'

JH GRAIN SIZE DISTRIBUTION

JOB NO. Wx-07337

MAY 23/91



REMARKS: CH-CLAY, HIGH PLASTIC, MOIST,
LIGHT BROWN, SOME SILT,

NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM

SUMMARY	
D ₁₀ = _____ mm	GRAVEL _____ %
D ₃₀ = _____ mm	SAND <u>1.0</u> %
D ₆₀ = _____ mm	SILT <u>13.0</u> %
C _u = _____ mm	CLAY <u>86.0</u> %
C _c = _____ mm	

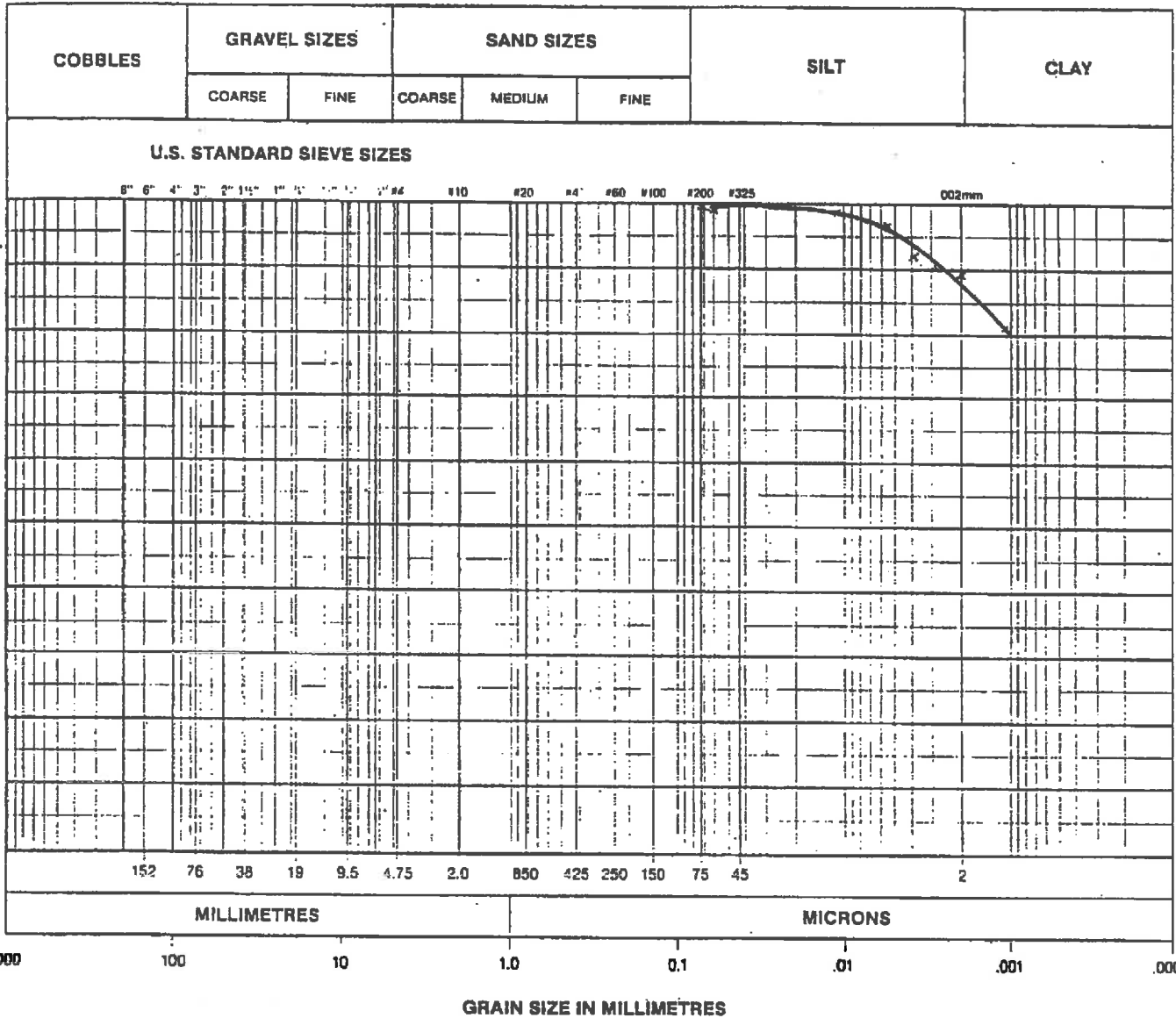


J. R. COUSINS
BLUE CLAY

Test Hole No. 3 Sample 21 Depth 4'

DW **GRAIN SIZE DISTRIBUTION**

JOB NO. Wx-07337 May 23/91



REMARKS: CH- CLAY, HIGH PLASTIC, MOIST,
LIGHT BROWN, TRACE OF SILT.

SUMMARY	
D ₁₀ = _____ mm	GRAVEL _____ %
D ₃₀ = _____ mm	SAND _____ %
D ₆₀ = _____ mm	SILT <u>11.0</u> %
C _u = _____ mm	CLAY <u>89.0</u> %
C _c = _____ mm	

NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM



Hardy BBT Limited
 CONSULTING ENGINEERING & PROFESSIONAL SERVICES

J. R. Cousins
BLUE CLAY

Test Hole No. 3 Sample 23 Depth 6'

DR GRAIN SIZE DISTRIBUTION

JOB NO. WX-07337

MAY 23/91

HBT AGRA Ltd. Letter Report of Soils Permeability Analysis Results,
August 5, 1992

HBT AGRA Limited

Engineering & Environmental Services

95 Scurfield Blvd.
Winnipeg, Manitoba
R3Y 1G4
Tel (204) 488-2997
Fax (204) 489-8261

August 5, 1992

J.R. Cousin Consultants Ltd.
91A Scurfield Blvd.
Winnipeg, Manitoba
R3Y 1G4

Attention: Mr. J. Cousin, P. Eng.

Dear Sir:

RE: **PERMEABILITY TESTING**
BLUE CLAY LAGOON
HBT AGRA LIMITED PROJECT NO. WX-07337

As requested, permeability testing has been carried out on three relatively undisturbed Shelby tube soil samples submitted to this office by a representative of J.R. Cousin Consultants Ltd.

The permeability testing was conducted in a triaxial cell utilizing the constant head method after saturation of the samples by back pressure techniques. Distilled water was used as the permeant and a differential pressure head of 5 pounds per square inch was used for all of the tests. A summary of the laboratory test results obtained are provided in Table I.

TABLE I
SUMMARY OF PERMEABILITY TEST RESULTS

Borehole No.	Sample No.	Depth (feet)	Coefficient of Permeability (cm/sec)
2	S1	5	2.0×10^{-9}
2	S2	10	9.1×10^{-9}
3	S2	6.5	1.6×10^{-9}

All of the soil samples consisted of a plastic clay.

Thank you for the opportunity to be of service. If you have any questions or require any additional information, please do not hesitate to contact this office.

Yours truly,

HBT AGRA Limited

Brian A. Ross

**Brian A. Ross
Manager, Winnipeg Operations**

/pa

Dist (3) Addressee

WX7337.BAR

Appendix D

Title Page

Plan L1: Proposed Lagoon Expansion Location Plan with Setbacks

Plan L2: Proposed Discharge Plan

Plan L3: Lagoon Expansion Layout

Plan L4: Proposed Drainage Route

Plan L5: Lagoon Dike Details

Plan L6: Valve, Valve Marker, Sign, Rip Rap, Ditch and Silt Fence Details

Plan L7: Fence and Gate Details

BLUE CLAY FARMS 98 LTD.

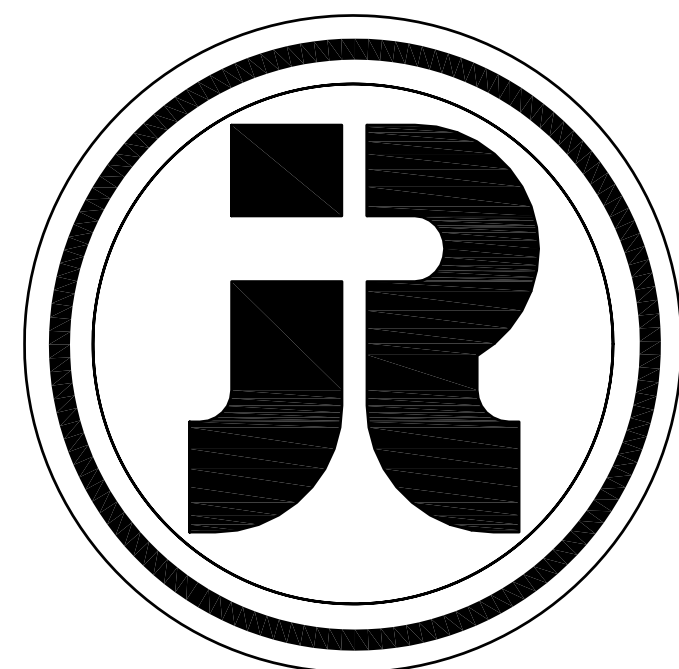
BLUE CLAY LAGOON ALTERATION ENVIRONMENT ACT PROPOSAL

PRELIMINARY
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PLAN INDEX

LAGOON

- PLAN L1.** PROPOSED LAGOON EXPANSION LOCATION PLAN WITH SETBACKS
- PLAN L2.** PROPOSED DISCHARGE PLAN
- PLAN L3.** PROPOSED LAGOON EXPANSION LAYOUT
- PLAN L4.** PROPOSED DRAINAGE ROUTE
- PLAN L5.** LAGOON DIKE DETAILS
- PLAN L6.** VALVE, VALVE MARKER, SIGN, RIP RAP, DITCH AND SILT FENCE DETAILS
- PLAN L7.** FENCE AND GATE DETAILS



J. R. Cousin Consultants Ltd.
Consulting Engineers and Project Managers

91A Scurfield Blvd.
ph: (204) 489-0474
email: info@jrcc.ca

Winnipeg, MB R3Y 1G4
fax: (204) 489-0487
website: www.jrcc.ca

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BLUE CLAY FARMS
HUTTERITE COLONY
HOUSING

EXISTING LAGOON

PROPOSED
STORAGE CELL

SE 1/4 Sec. 9Twp. 4, Rge 3 E.P.M.

460.000

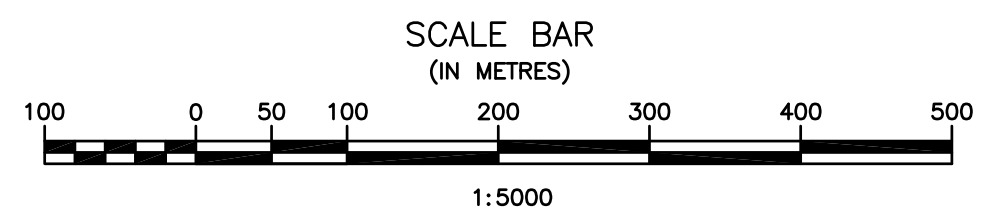
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460.000

MUNICIPAL ROAD

ARNAUD DRAIN

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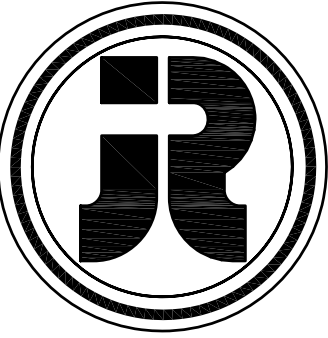
No.	REVISIONS	DATE	INITIALS

B.M. EL.

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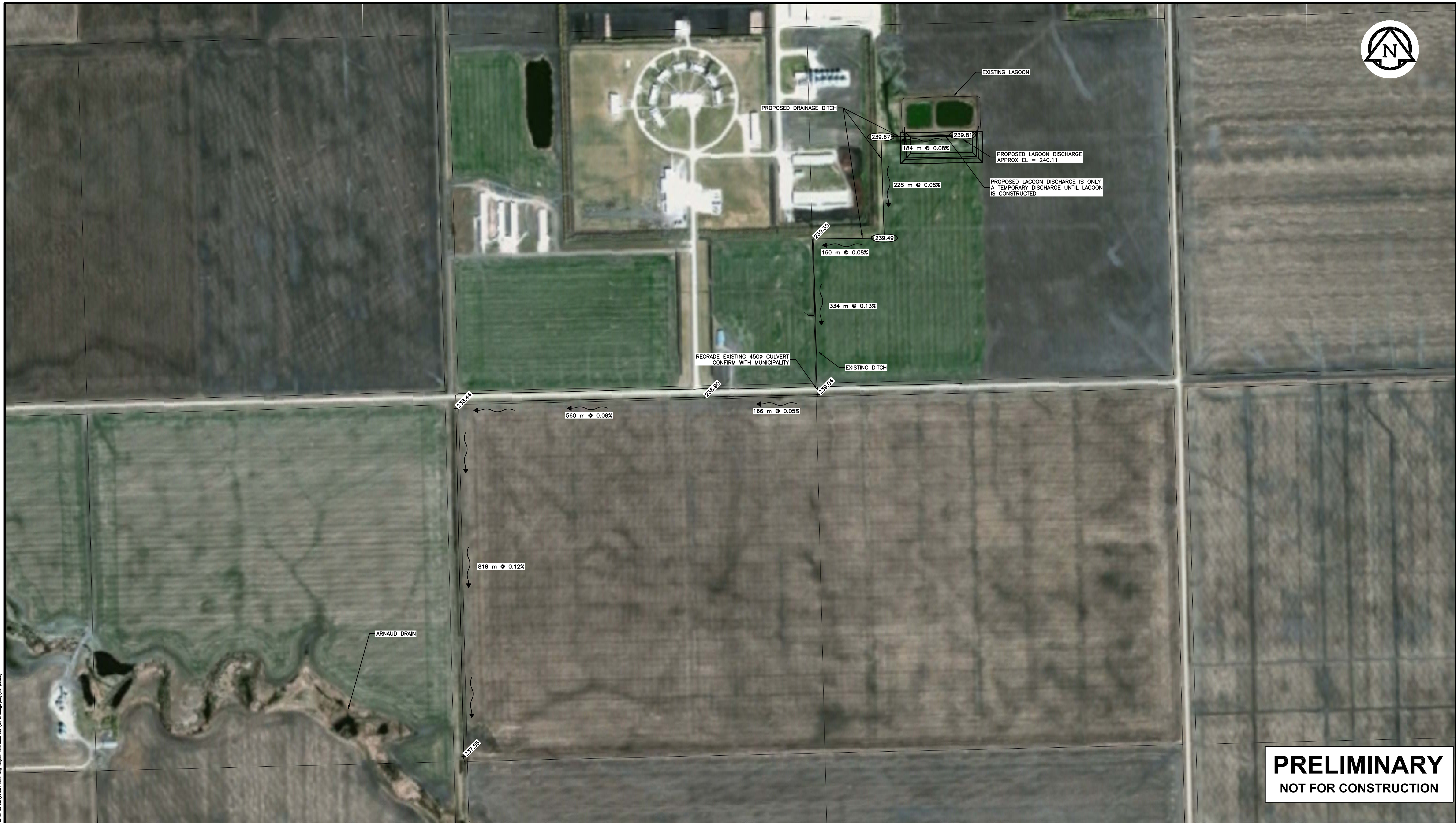
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PROF. OF MANITOBA
SEP 11 2013
J.G.
DICK
Member
2198



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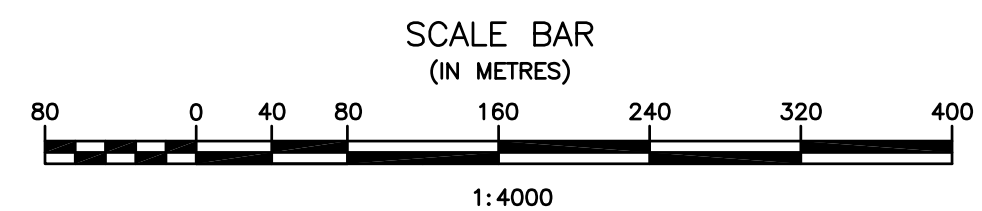
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DRAWN BY: RH	SCALE: 1:5000
REVIEWED BY: JD	DATE: 13/08/20
	PLAN: L1
	SHEET: 1 OF 7

Sept 11, 2013 - 11:06am P:\2007\273 Blue Clay Farms 98 Lagoon Alteration EAP\04 Drawings\DWG\L1.dwg



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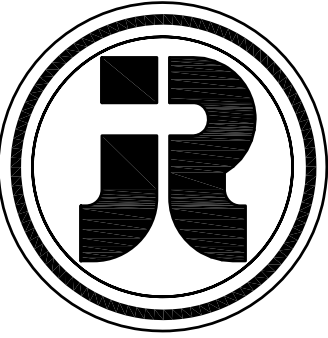


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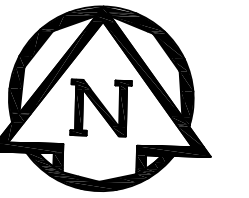
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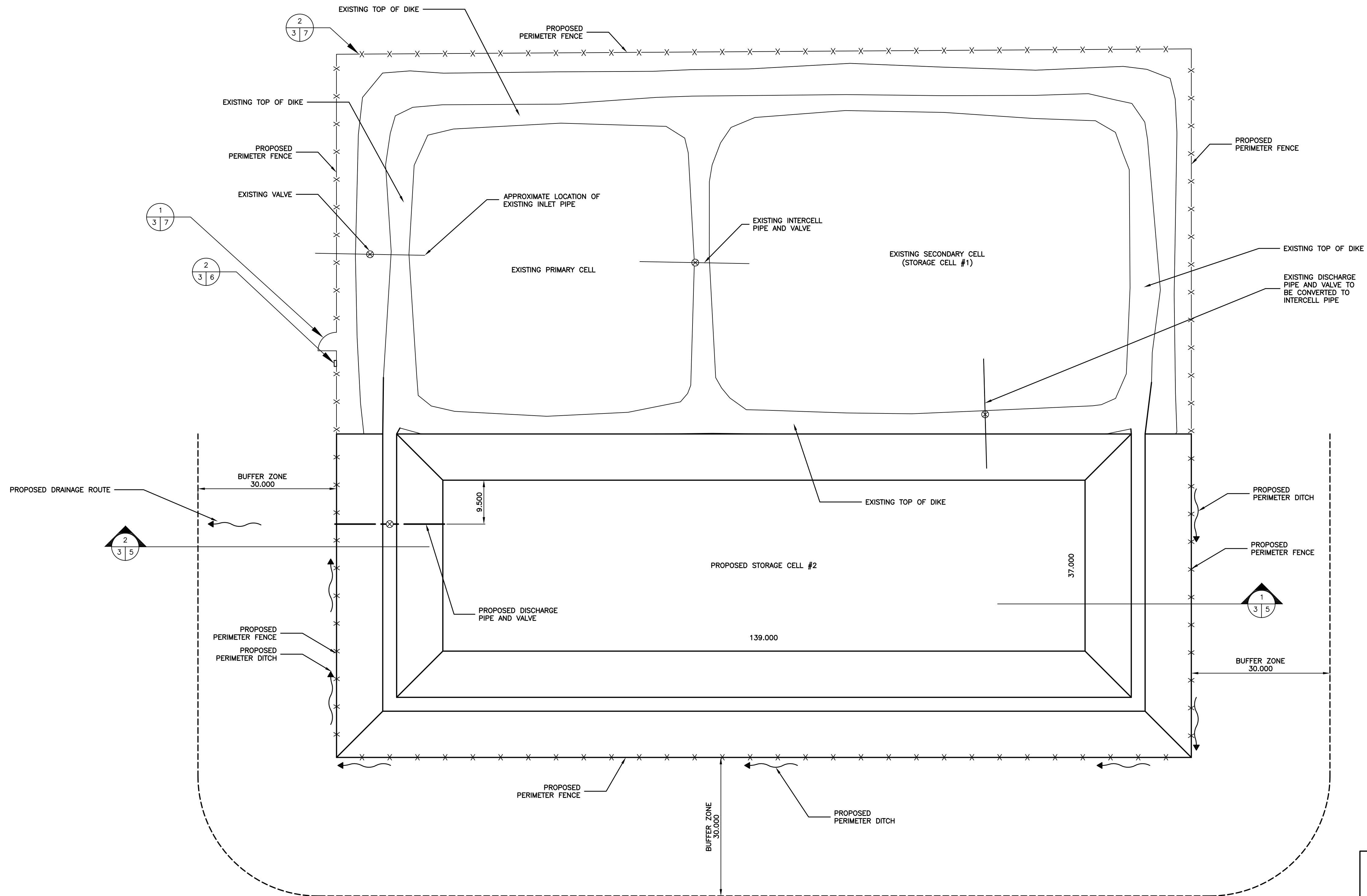
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DESIGNED BY: OW	TITLE: PROPOSED DISCHARGE PLAN
DRAWN BY: RH	SCALE: 1:4000
REVIEWED BY: JD	DATE: 13/08/20
	PLAN: L2
	SHEET: 2 OF 7

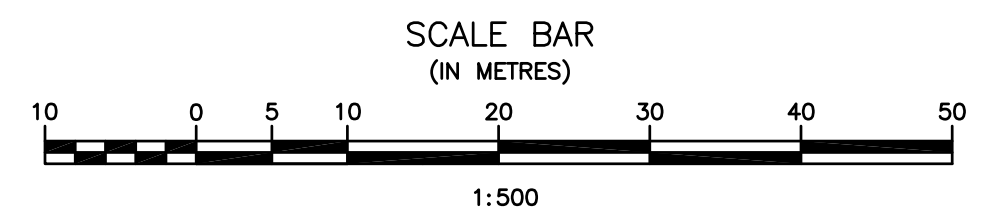


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PROPOSED DRAINAGE



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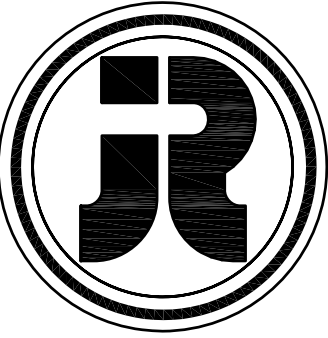


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DESIGNED BY: OW	TITLE: PROPOSED LAGOON EXPANSION LAYOUT
DRAWN BY: RH	SCALE: 1:500
REVIEWED BY: JD	DATE: 13/08/20
	PLAN: L3
	SHEET: 3 OF 7

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TWP 5

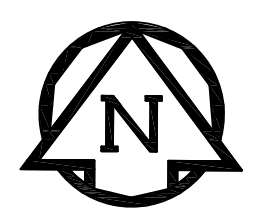
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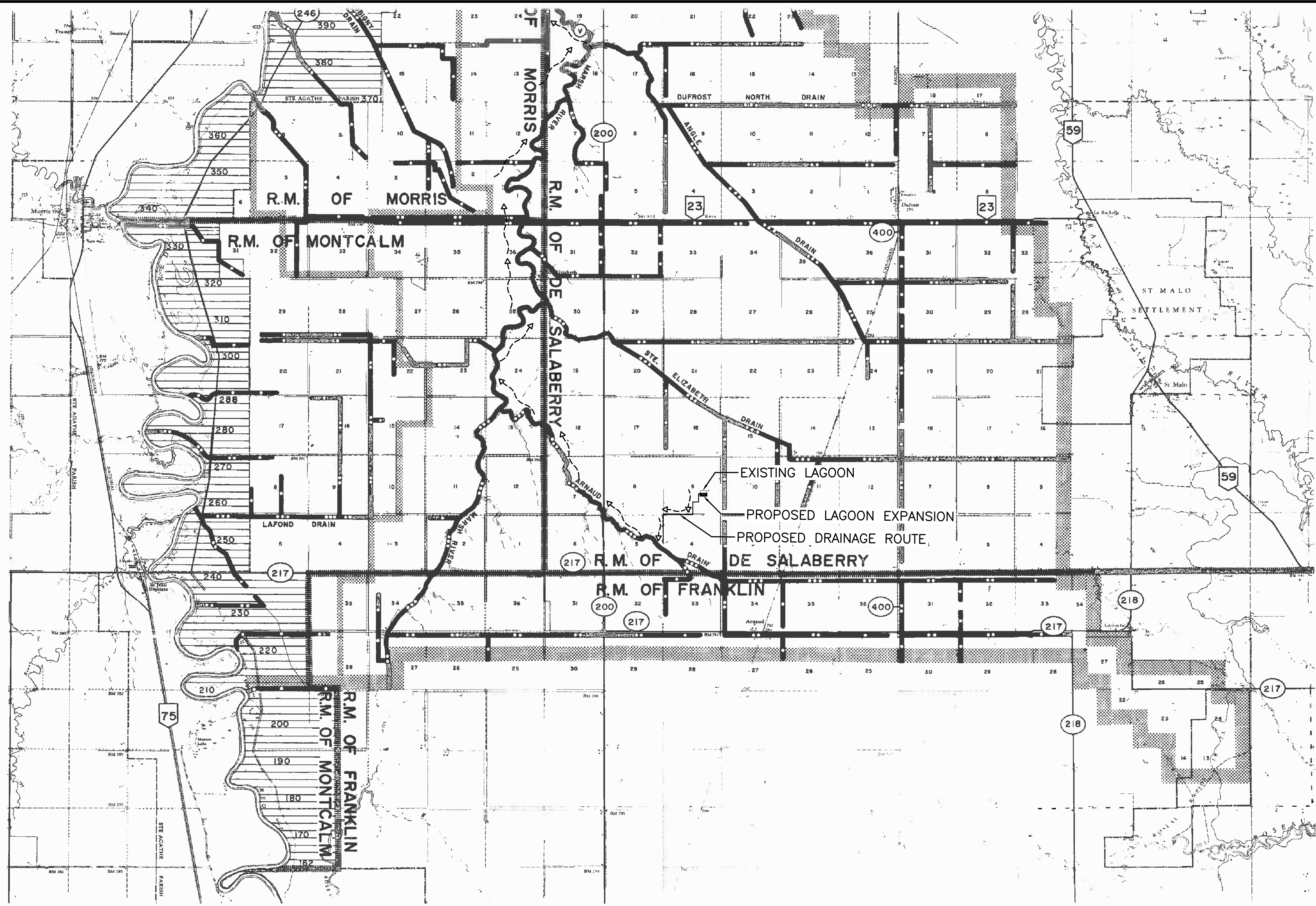
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TWP 3

TWP 3



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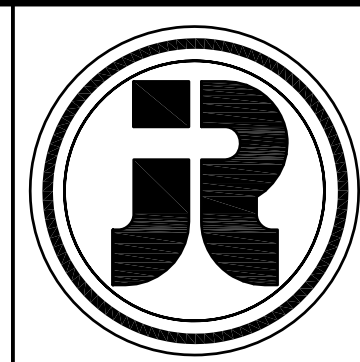
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DESIGNED BY: OW
DRAWN BY: RH
REVIEWED BY: JD

PROJECT: BLUE CLAY FARMS 98 LTD.
BLUE CLAY LAGOON ALTERATION EAP
TITLE: PROPOSED DRAINAGE ROUTE

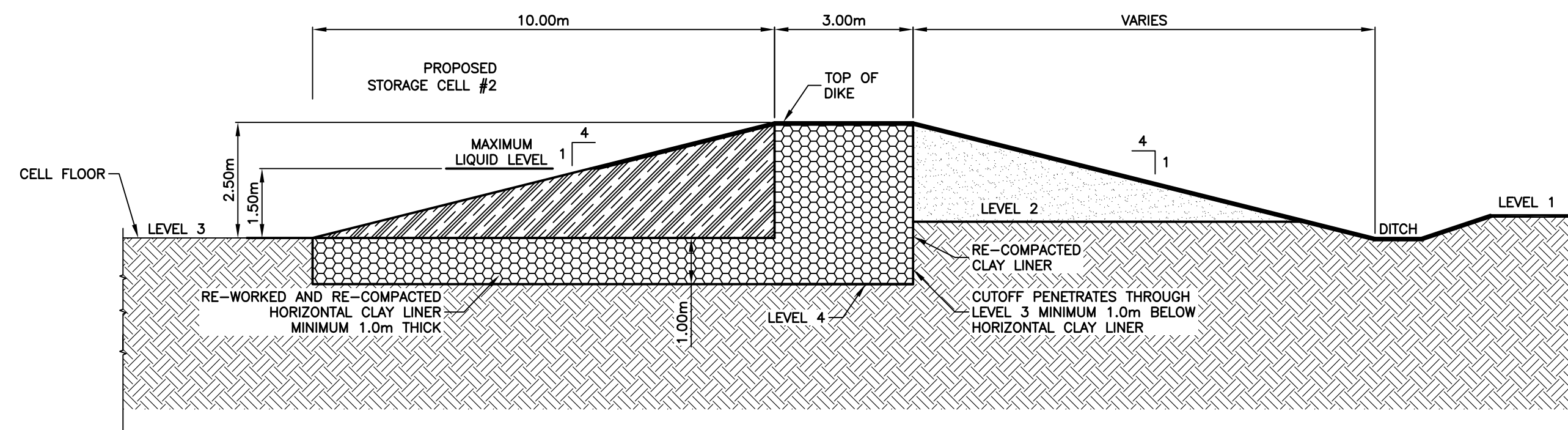
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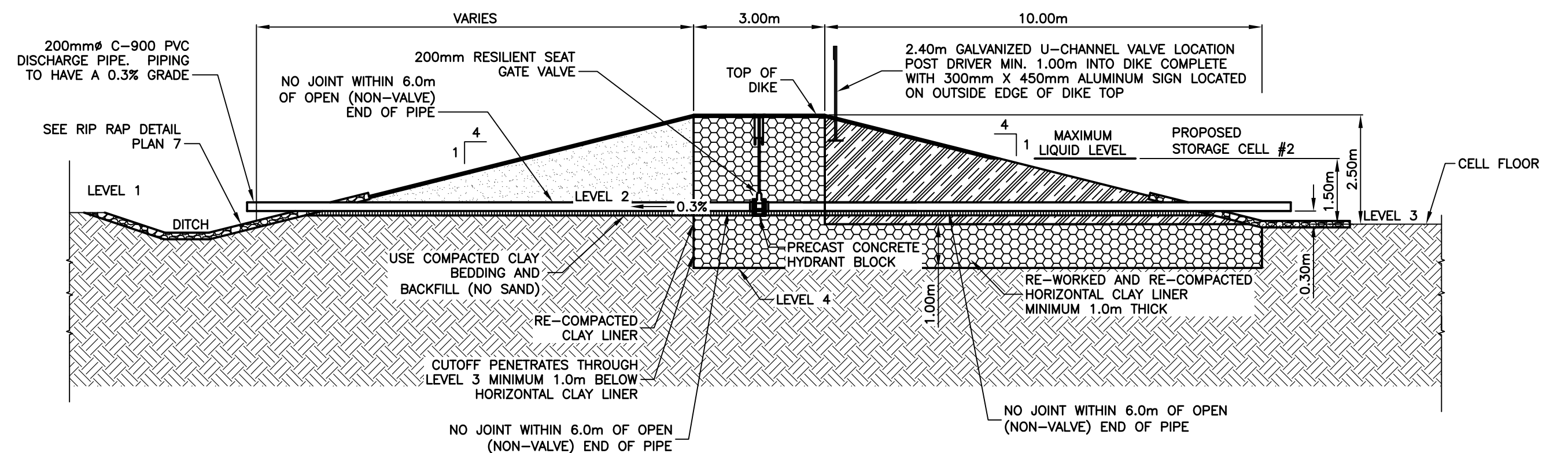
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- | | | | |
|--|---|--|--|
| | EXCAVATED AND COMPACTED HIGH PLASTIC CLAY TYPE SOIL | | TOPSOIL |
| | EXCAVATED AND COMPACTED SOIL MATERIAL | | EXCAVATED AND COMPACTED MIXTURE OF SOILS |
| | INSITU SANDY CLAY SOIL | | INSITU HIGH PLASTIC SOIL |

- | | |
|---------|---|
| LEVEL 1 | PRE-CONSTRUCTION EXISTING PRAIRIE ELEVATION |
| LEVEL 2 | ELEVATION FOLLOWING REMOVAL OF ORGANICS |
| LEVEL 3 | FINISHED CELL BOTTOM ELEVATION |
| LEVEL 4 | BOTTOM OF LINER ELEVATION |



1
3 | 5
TYPICAL STORAGE CELL PERIMETER DIKE
SCALE = 1:100



2
3 | 5
PERIMETER DIKE AT DISCHARGE PIPE
SCALE = 1:100

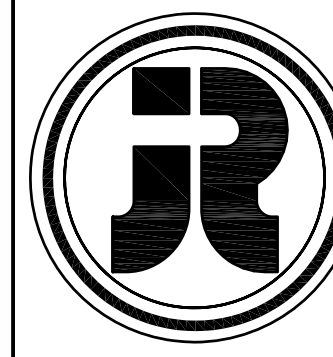
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SEP 11 2013
J.G.
DICK
Member
2798
REGISTERED PROFESSIONAL ENGINEER

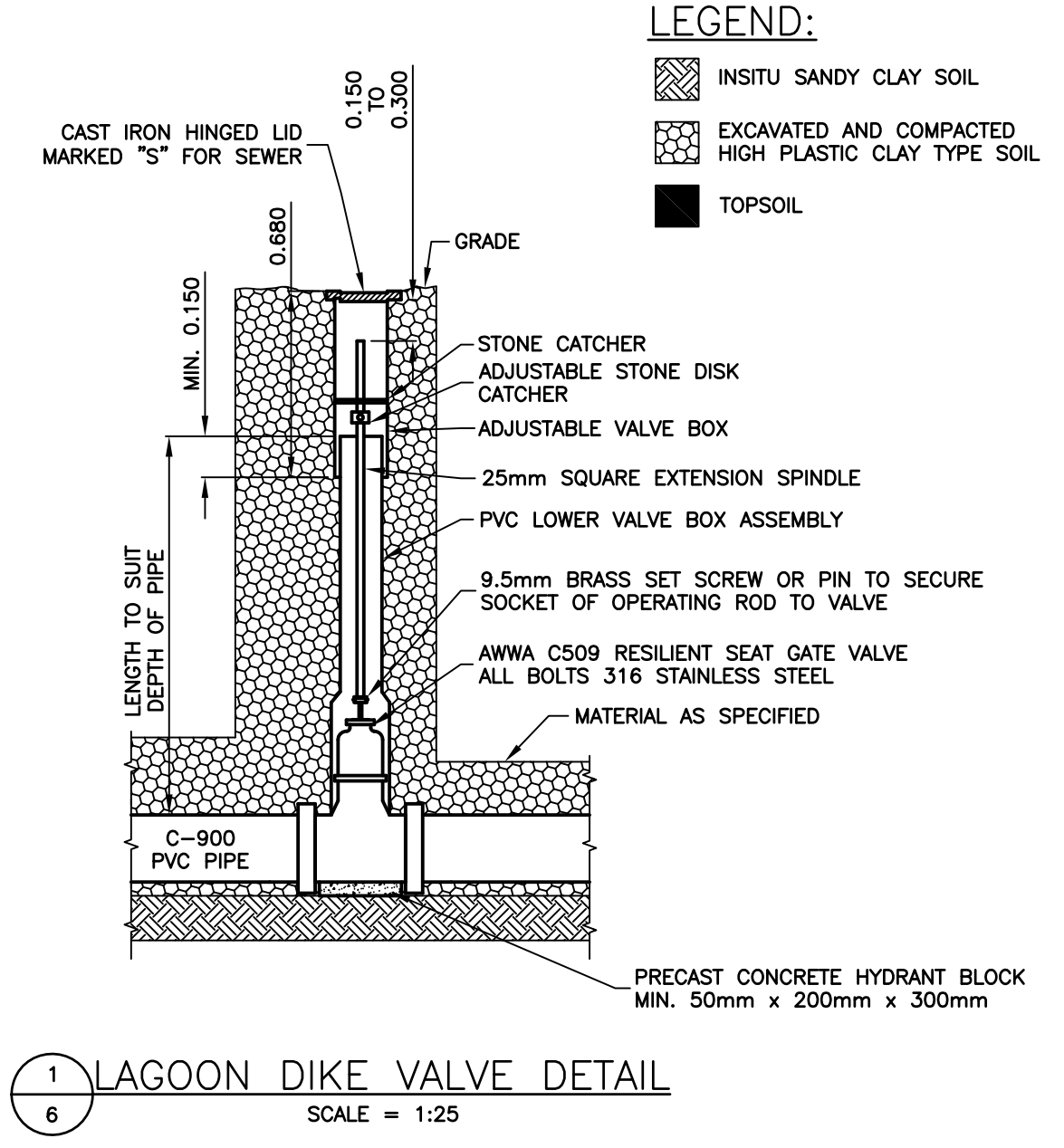
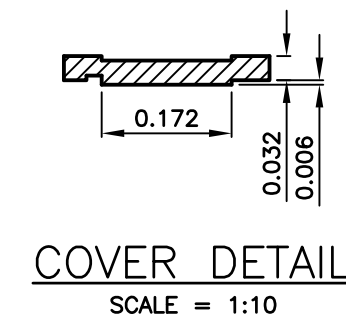


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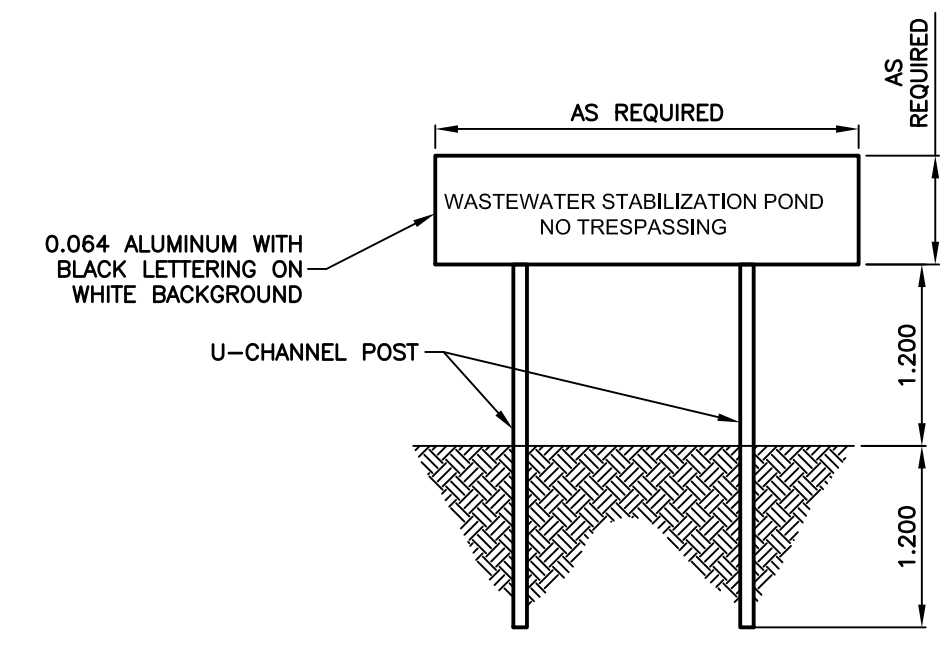
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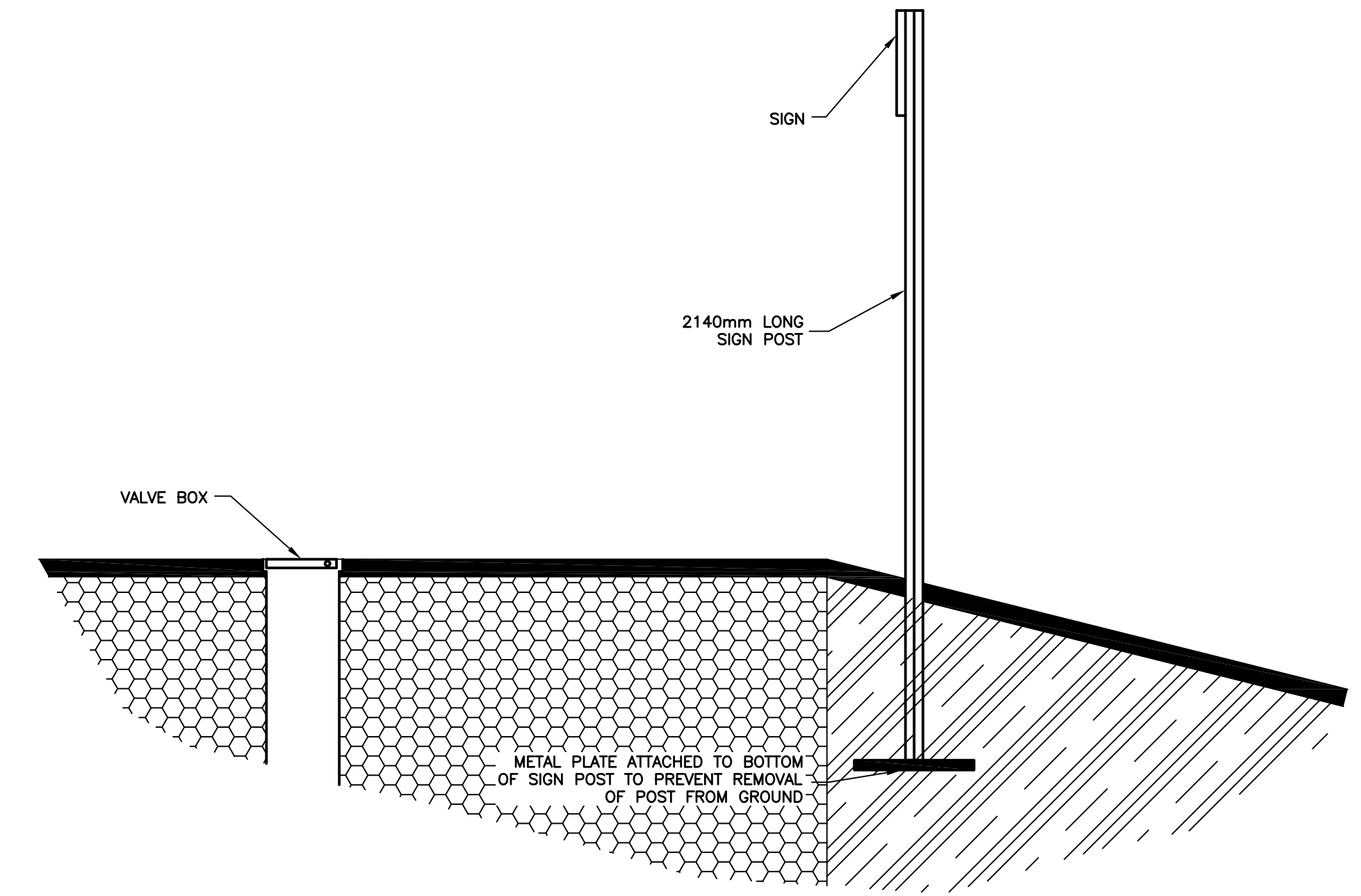
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DRAWN BY: RH	SCALE: AS NOTED
REVIEWED BY: JD	DATE: 13/08/20
	PLAN: L5
	SHEET: 5 OF 7



1 LAGOON DIKE VALVE DETAIL
SCALE = 1:25

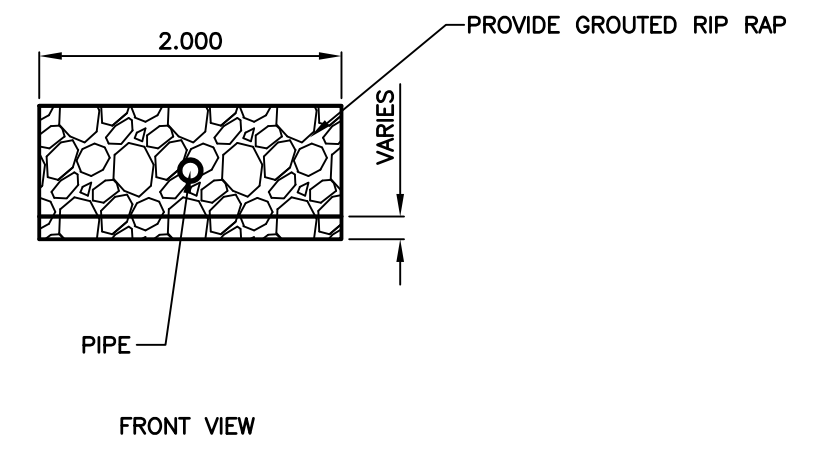
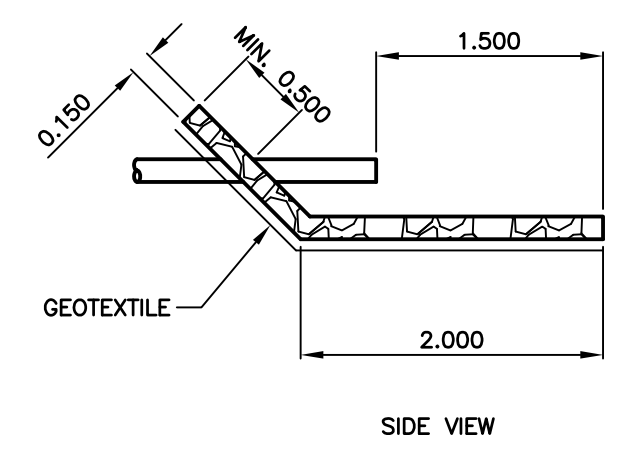


2 LAGOON SITE MARKER DETAIL
SCALE = 1:50



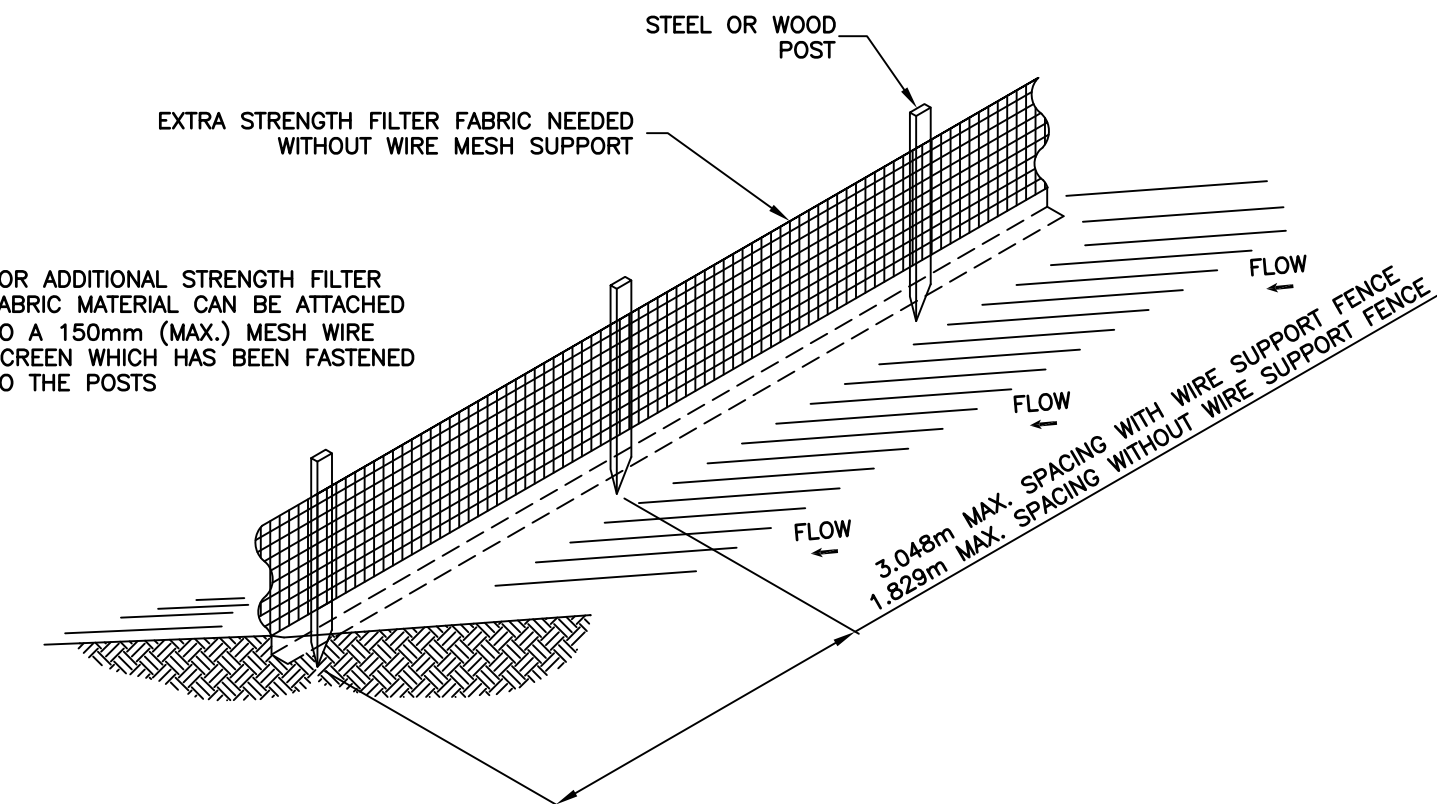
3 VALVE MARKER DETAIL
SCALE = 1:15

NOTES:
- MINIMUM SIGN SIZE: 300mm X 450mm
- MINIMUM POST LENGTH: 2140mm
- CROSSING MARKERS TO BE SET IN 200mmØ X 1.0m CONCRETE AS PER SPECIFICATIONS



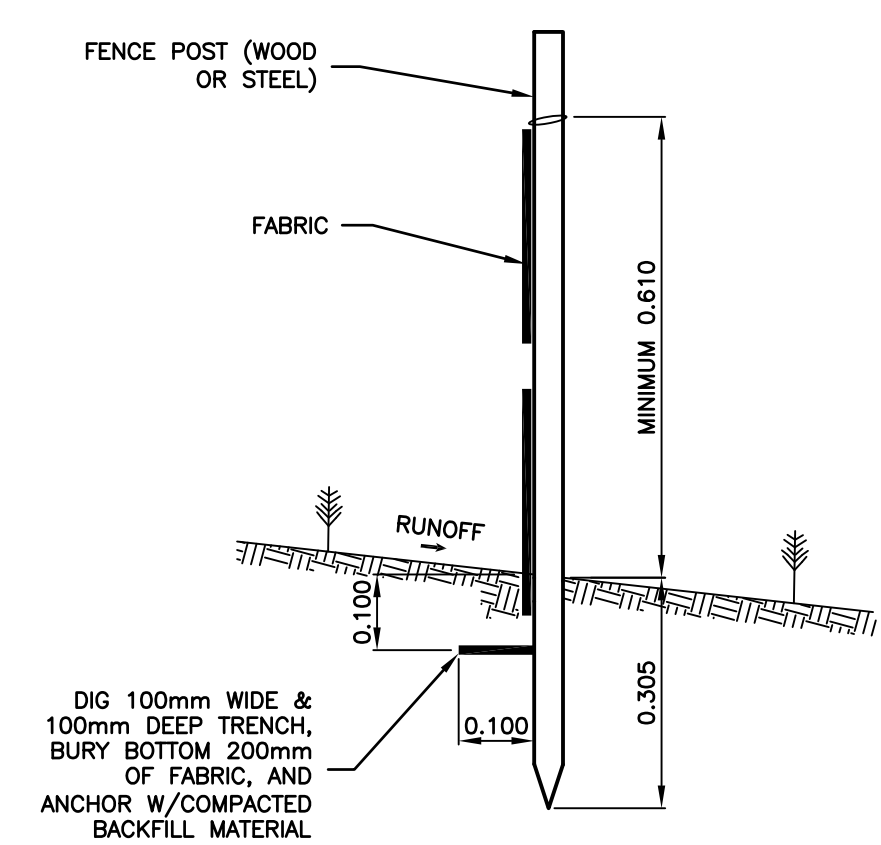
NOTE:
- RIP RAP MATERIAL SHALL BE WELL GRADED 125mm TO 200mm HARD, DENSE, ROUNDED & DURABLE FIELD STONE.

4 RIP RAP DETAIL
SCALE = 1:50

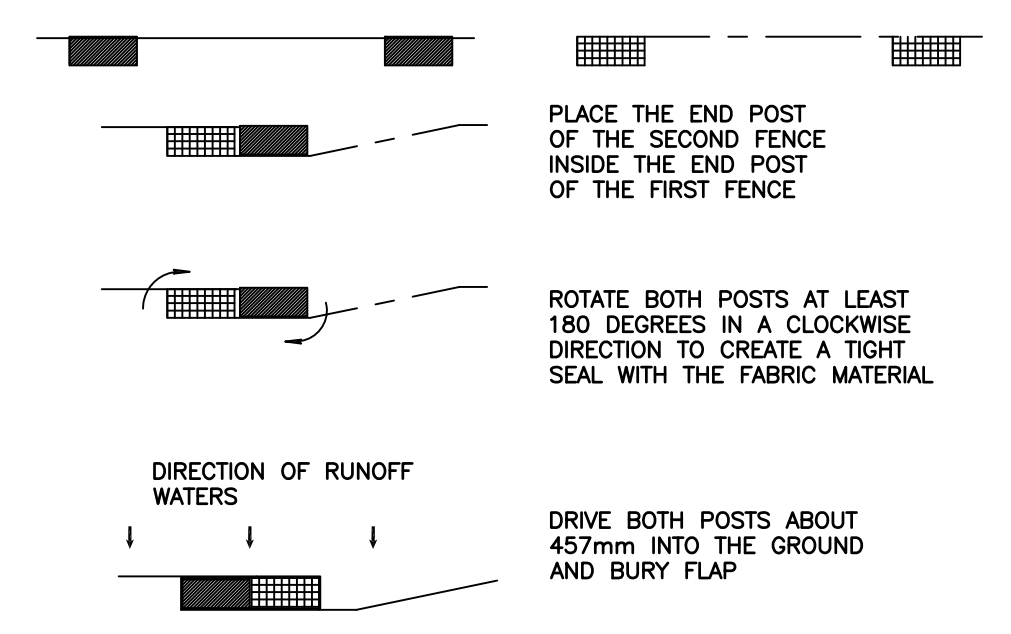


- NOTES:
1. THE HEIGHT OF A SILT FENCE SHALL NOT EXCEED 914mm.
 2. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS.
 3. POSTS SHALL BE SPACED A MAXIMUM OF 3.048m APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 300mm. WHEN EXTRA STRENGTH FABRIC IS USED WITHOUT THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 1.829m.
 4. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 100mm WIDE AND 100mm DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
 5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 25mm LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 50mm AND SHALL NOT EXTEND MORE THAN 914mm ABOVE THE ORIGINAL GROUND SURFACE.
 6. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 200mm OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 914mm ABOVE THE ORIGINAL GROUND SURFACE.
 7. THE TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE FILTER FABRIC.
 8. SILT FENCING TO BE POLYPROPYLENE SYNTHETIC FIBRE WITH ULTRAVIOLET STABILIZERS. AMOCO 1198 OR APPROVED EQUAL.
 9. WOOD POSTS TO BE 38mm X 89mm (2" X 4"), POINTED AT ONE END AND FABRICATED.
 10. INSTALL ALL SUPPORTING POSTS ON THE DOWN SLOPE SIDE OF THE FENCING
 11. MAINTAIN SILT FENCE THROUGHOUT CONSTRUCTION AND UNTIL REVEGETATION OCCURS.

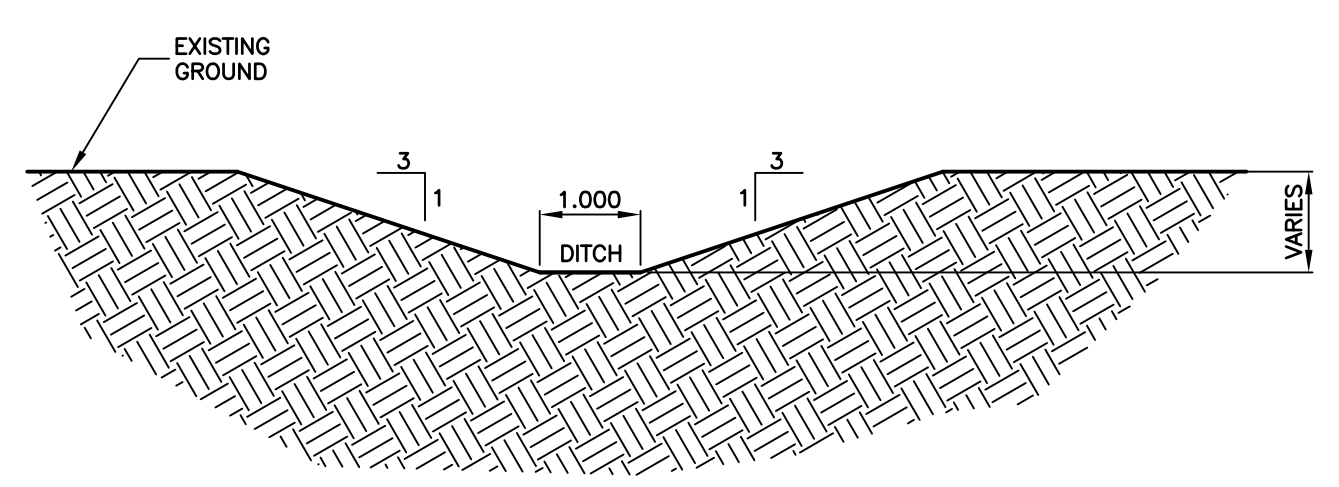
6 SILT FENCE DETAIL
SCALE = 1:40



7 SILT FENCE SECTION
SCALE = 1:10



8 ATTACHING TWO SILT FENCES
SCALE = 1:10

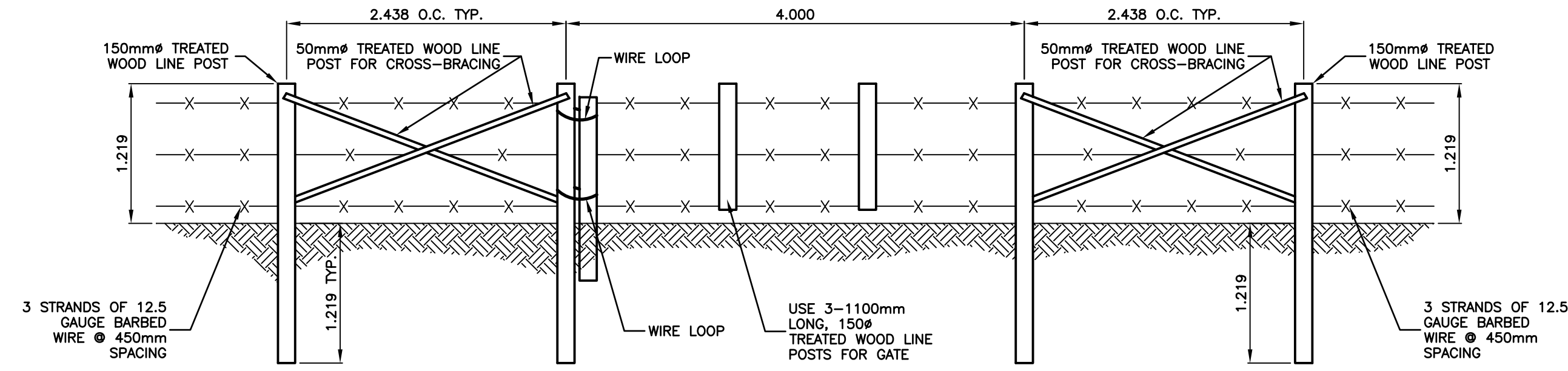


5 TYPICAL DISCHARGE DITCH DETAIL
SCALE = 1:75

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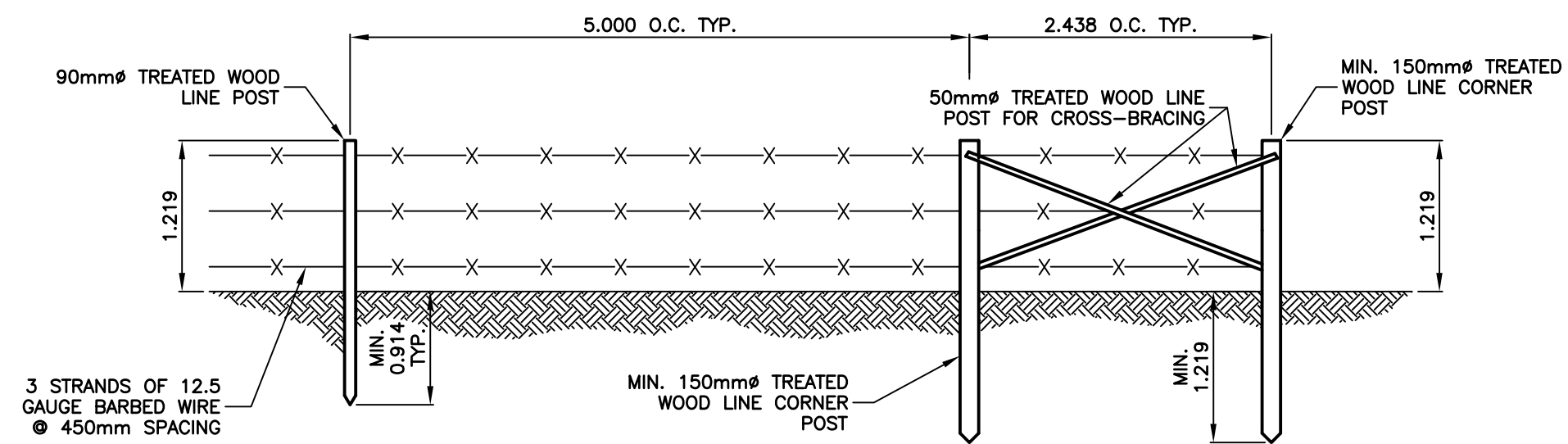
				B.M. EL.	 Certificate of Authorization J.R. Cousin Consultants Ltd. No. 234 Date: 13/09/11		 ENGINEER'S SEAL J.G. Dick Registered Professional Engineer		 J. R. Cousin Consultants Ltd. Consulting Engineers and Project Managers 91A Scurfield Blvd. Winnipeg, MB R3Y 1G4 ph: (204) 489-0474 fax: (204) 489-0487 email: info@jrcc.ca website: www.jrcc.ca <i>Engineering Excellence since 1981</i>		CODE: B-273.01 DESIGNED BY: OW DRAWN BY: RH REVIEWED BY: JD	PROJECT: BLUE CLAY FARMS 98 LTD. BLUE CLAY LAGOON ALTERATION EAP TITLE: VALVE, VALVE MARKER, SIGN, RIP RAP, DITCH AND SILT FENCE DETAILS SCALE: AS NOTED DATE: 13/08/20 PLAN: L6 SHEET: 6 OF 7
No.	REVISIONS	DATE	INITIALS	LOCATIONS OF UNDERGROUND STRUCTURES/UTILITIES AS SHOWN ARE BASED ON AVAILABLE INFORMATION BUT NO GUARANTEE IS GIVEN OR IMPLIED THAT ALL EXISTING UNDERGROUND STRUCTURES/UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL UNDERGROUND STRUCTURES/UTILITIES MUST BE OBTAINED FROM THE APPROPRIATE AUTHORITY/OWNER, BY THE CONTRACTOR, BEFORE PROCEEDING WITH CONSTRUCTION.								

Sep 11, 2013 - 11:05am P:\2009\273 Blue Clay Farms 98 LAG\273201 Blue Clay Lagoon Alteration EAP\04 Drawing\JRC\DWG\JRC.dwg



NOTE:
 - PROVIDE CROSS BRACING AT CORNERS POSTS
 IN BOTH DIRECTIONS

1 BARBWIRE FENCE AND GATE
 SCALE = 1:40



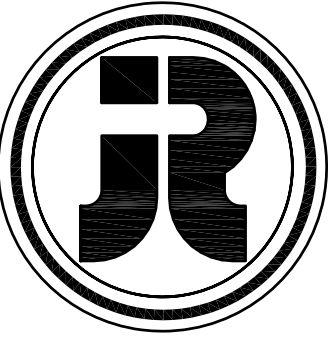


NOTE:
 - PROVIDE CROSS BRACING AT CORNERS POSTS IN BOTH DIRECTIONS.
 - SHOWN DIAMETER REFERS TO SMALLEST END OF POST.

2 FENCE DETAIL
 SCALE = 1:50

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