# APPLICATION FOR AN ENVIRONMENT ACT LICENCE FOR A NEW TWO CELL WASTEWATER TREATMENT LAGOON IN THE R.M. OF SHELL RIVER


To: Environmental Approvals
Manitoba Conservation
123 Main Street
Winnipeg, MB R3C 1A5

Proponent: The Rural Municipality of Shell River

As Represented by:
Stantec Consulting Ltd.
905 Waverley Street
Winnipeg, MB R3T 5P4

December 2010

**Stantec File No. 111212580**

**Stantec Consulting Ltd.**
905 Waverley Street
Winnipeg MB R3T 5P4
Tel: (204) 489-5900
Fax: (204) 453-9012

December 17, 2010
File: 111212580

Manitoba Conservation
Environmental Approvals
123 Main Street
Winnipeg, MB R3C 1A5

**Attention:** **Ms. Tracey Braun, M.Sc., Director**

Dear Ms. Braun:

**Reference:** **Application for an Environment Act Licence for a New Two Cell Wastewater Treatment Lagoon in the R.M. of Shell River**

On behalf of the R.M. of Shell River, we are submitting twenty-seven (27) copies of the Application for an Environment Act Licence for a new two cell wastewater lagoon.

We enclose the $5,000 Licence Application Fee. The undersigned is to be contacted regarding any questions that may arise.

Sincerely,

**STANTEC CONSULTING LTD.**

Tim Stratton, P. Eng
Project Manager
Tel: (204) 489-5900
Fax: (204) 453-9012
tim.stratton@stantec.com

c. Dione Cherneski, CAO - R.M. of Shell River
David Shwaluk - MWSB

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**APPENDICES**

# 1.0 Development Information

The R.M. of Shell River intends to construct a new two cell wastewater lagoon on NE 20-25-28W, adjacent to PTH 83 as shown on the plan bound in at the back of this document. This site is across PTH 83 from the existing Town of Roblin wastewater lagoon system. The proposed new lagoon will operate as a completely separate facility and will have no interconnection with the existing Roblin lagoon system. The treated lagoon effluent from the proposed lagoon will drain by ditch to an existing ditch which drains the Roblin lagoon treated effluent to the Shell River, as shown on the plan.

The proposed new lagoon will be a truck dump facility only. There will be no piped wastewater going to the lagoon. Appendix 2 contains the "R.M. of Shell River Wastewater Lagoon Pre-Design Study" which provides engineering design and details of the proposed works.

# 2.0 Description of Development

## 2.1 CERTIFICATE OF THE TITLE AND LEGAL DESCRIPTION

The “Agreement to Lease” and the “Certificate of Title” are attached in Appendix 1. The land is owned by the Town of Roblin and is being leased to the R.M. of Shell River. The proposed lagoon development is located on NE 20-25-28W in the Province of Manitoba.

## 2.2 OWNER

The land is owned by the Town of Roblin, who have signed an “Agreement to Lease” with the Rural Municipality of Shell River.

## 2.3 MINERAL RIGHTS

The Province of Manitoba is the owner of the mineral rights.

## 2.4 EXISTING LAND USE

The proposed lagoon site is land currently being irrigated in the summer with a portion of the treated effluent from the Town of Roblin wastewater lagoon. The new lagoon would occupy approximately 6.5 hectares of this 65 hectare irrigation site. The remainder of the site will continue to be irrigated with treated effluent from the existing Roblin lagoon. The treated effluent from the proposed lagoon will travel by ditch approximately 1.7 km east to the Shell River.

## 2.5 LAND USE DESIGNATION

The proposed lagoon site is currently zoned AG.

## 2.6 PUBLIC HEARINGS

There have been no public hearings held with respect to this project.

## 2.7 DESCRIPTON OF THE PROPOSED DEVELOPMENT

A complete engineering description of the design and method of operations is contained in Appendix 2 “R.M. of Shell River Wastewater Lagoon Pre-Design Study”.

## 2.8 AGRICULTURAL OR INDUSTRIAL WASTES

No agricultural or industrial wastes, including petroleum products, will be put in the lagoon or stored on site.

## 2.9 DOMESTIC WATER SUPPLY

There are no domestic water wells within 1600 m of the proposed lagoon site. The nearest wells show 3 m of clay and clay till underlain by sand and gravel.

# 3.0 Environmental Impact and Management Practices

## 3.1 ENVIRONMENTAL IMPACTS

The proposed sewage lagoon site is located south of Roblin on NE ¼ Section 20 - TWP 25 - RGE 28W. A soil test drilling program was undertaken in this area on October 29, 2010. Hydraulic conductivity testing was done on two Shelby tube clay samples from the site and hydraulic conductivities of $1.2 \times 10^{-8}$ cm/sec and $1.5 \times 10^{-8}$ cm/sec were achieved by laboratory testing (reports appended). The test results indicate that the clay meets the Manitoba Conservation requirement of $1 \times 10^{-7}$ cm/sec and is a suitable construction material for a sewage lagoon. The consistency of the clay found indicates that a 1 m minimum floor clay liner exists. The clay floor would be compacted.

The constructed clay lagoon will be tested for hydraulic conductivity after construction to confirm that it meets Manitoba Conservation requirements. The R.M. will monitor odor. A sign will be posted by the R.M. to indicate the location of the sewage lagoon.

After the treated effluent from the operating lagoon has been successfully tested, it will be released into the north ditch of the municipal road and flow approximately .20 km east and under PTH 83 to a location 250 m east of PTH 83 where it will connect with the existing ditch which drains the Town lagoon. A new culvert would be installed under PTH 83. The treated effluent would then proceed approximately 1.25 km east and south to the Shell River along the south ditch of PR 583, as shown on the plan.

We have the following specific comments with respect to Item VIII of the “Description of the Development” in the “Environment Act Proposal Form”.

**a) Type, Quantity and Concentration of Pollutants to be Released into the Air, Water or on Land.**

Treated, tested effluent, meeting the Licence requirements, would be discharged into the ditch system between June 16 and October 31 of any year. The effluent discharge ditch to the Shell River is a long established lagoon treated effluent drain. Drainage approvals from MIT will be acquired for the culvert crossing and drainage route.

From the point of receipt of discharge, the Shell River travels approximately 30 km south flowing into Lake of the Prairies.

**b) Impact on Wildlife**

There will be minimal impact on wildlife. The proposed site is agricultural land with no tree or bush cover. The lagoon would be entirely fenced to keep wildlife out. The lagoon surface water in the region includes sloughs, lakes and rivers and the addition of a relatively small

wastewater lagoon will have negligible effect on the water use patterns of waterfowl and other wildlife.

**a) Impact on Fisheries**

A list of fish found in the Shell River is contained in Appendix 3.

The treated lagoon effluent will be held until June 16 which will minimize concerns with respect to spring ammonia levels, and the effluent will have met Licence requirements for all discharge parameters.

It is expected there will be one discharge in the spring and one in the fall, with an estimated discharge of 26,500 $m^3$ at a flow of 22 lps and each discharge lasting up to 14 days.

There is expected to be no adverse impact of this lagoon discharge on the Shell River fishery after its entry to the Shell River 1.7 km east of the lagoon site.

**b) Impact on Surface and Groundwater**

The new lagoon cells will have a tested clay liner, which limits hydraulic conductivity to the Manitoba Conservation requirement of 1 x $10^{-7}$ cm/sec or less. Therefore the lagoon is expected to have no affect on the groundwater. The proposed lagoon site is currently used as an irrigation field for treated effluent from the Town of Roblin lagoon. The irrigation will continue on the remaining part of the quarter section. Therefore, the lagoon site field is already established as a wastewater use area.

The two nearest water wells, approximately 1,600 m away from the site, show approximately 3 m of clay and clay till underlain by sand and gravel. The nearest residence is 1,600 m away from the site.

The proposed lagoon is expected to have minimal affect on the Shell River. The Office of Drinking Water advises that there are no public or semi-public jurisdictions using the Shell River as a drinking water source.

The R.M. would participate in a watershed based management study, and nutrient reduction program, if requested. The R.M. will monitor phosphorus and nitrogen and would be prepared to precipitate out phosphorus in the lagoon with alum in the future if required. Appropriate environmental impact mitigation measures for silt/sediment control will be used during and after construction.

**c) "Forestry Related Impacts"**

There will be no impact on forestry.

**d) "Air Quality"**

There is expected to be no affect on air quality except the possibility of some odour during the spring breakup. There may be some minor dust created during construction but it is likely the clay will be relatively moist.

**e) "Heritage"**

There are no known heritage resources on the site.

**f) "Socio-Economic"**

The proposed new wastewater lagoon will provide excellent treatment for wastewater in the region and decrease or eliminate overloading of other facilities currently receiving this wastewater.

**g) "Visual"**

The lagoon will be a low profile earthen dyke structure approximately 1.5 m above natural ground, with a 1.5 m high fence and gate. The grass on the dykes will be regularly cut. The additional visual impact on the area will be minimal.

## 3.1 ENVIRONMENTAL MANAGEMENT PRACTICES

Proposed environmental management practices will be undertaken in accordance with recommended "Operation and Maintenance of Sewage Lagoons" manual and the Environment Licence, both as issued by Manitoba Conservation.

### 3.1.1 OPERATION

The R.M. of Shell River will have a lagoon operator trained under the training program for a "Small System" sewage treatment facility. Normally, the lagoon would be discharged once in the summer and once in the fall. The following procedures would be followed with respect to discharging the lagoon.

Step 1: Close the valve between the primary and secondary cells two weeks before sampling.

Step 2: Sample the secondary cell after the connecting valve between the primary and secondary cell has been closed for two weeks. Sample bottles and sample preservation and submission procedures can be obtained from accredited laboratories.

Step 3:

a) If the samples tested meet criteria, open the discharge valve from the secondary cell and discharge the contents, not before June 16. Discharge would be completed within a week.

b) If the samples tested do not meet criteria, it is necessary to repeat the sampling until bacteriological criteria are met. Once met, discharge can take place.

Step 4: When the secondary cell is drained, the discharge valve would be closed.

Step 5: Open the valve between the primary and secondary cell and control the water levels in the cells such that there is a minimum of .3 m in the primary and a maximum level of 1.5 m.

### 3.1.2 MAINTENANCE

**Spring, Summer and Fall Maintenance**

The majority of maintenance is carried out in the spring, summer and fall of each year as weather permits. Typical maintenance tasks include:

- Grass on the dykes of the lagoon should be cut on a regular basis. The grass should not exceed 0.3 meters in length. Deep rooted weeds should be removed to prevent deterioration of the dykes.
- Inspect fence and gate for damage and repair as required.
- The outfall ditch should be kept clear of obstructions and the grass cut.
- Gate valves should be operated in spring, summer and fall to ensure they are in proper working order.
- If encountered, animals burrowing on the dykes of the lagoon should be removed and the holes filled. If assistance in animal control is required, contact Manitoba Conservation.
- Check for erosion on the dykes and the outfall ditch. If erosion is present, erosion repairs should be undertaken. This may include re-grading, grass planting or stone rip-rap.
- Regular road maintenance should be undertaken to ensure access to the site at all times. Culvert should be cleared of blockage.
- Ensure the discharge valve is closed when not draining.

**Winter Maintenance**

Typical maintenance tasks include:

- Snow clearing of the access road to ensure lagoon access.
- The lagoon liquid levels should be maintained at a minimum of 0.15 meters.
- Ensure the discharge valve is closed.

## 3.2 TYPICAL LAGOON DETAILS

Typical Lagoon details are included in the appended Study and on Plan 2.0, Lagoon Site Plan and Details. The details include:

- Access Road and Truck Dump Structure

- Interconnecting pipe and valve
- Fence and gate
- Splash pads
- New Discharge pipe, valve and structure
- Treated effluent drainage ditch

## 3.3 MITIGATION OF SILT RUNOFF DURING CONSTRUCTION

Silt fences and/or straw waddles will be placed around the construction area as required to protect the drainage routes during construction.

## 3.4 DISTANCE FROM EXISTING STRUCTURES

The proposed lagoon is approximately 1,600 m from the nearest inhabited building.

## 3.5 SLUDGE DISPOSAL PLAN

The Sludge Disposal Plan is as follows:

- Sludge in the primary cell would be monitored on an annual basis and removed when a significant accumulation occurs (200 – 300 mm). It is expected that a minimum of ten years will pass before sludge removal is required. A Manitoba Conservation Licence would be obtained by the R.M. for sludge disposal.
- At removal time, the sludge would be dewatered on site, removed from site, and then applied to agricultural land in accordance with disposal methods approved by Manitoba Conservation.

## 4.0 Schedule

Construction of the proposed wastewater lagoon is scheduled to start in June, 2011. The completed new facility would commence operation, upon approval by Manitoba Conservation, likely in August of 2011.

## 5.0 Funding

This project is being funded by the Canada-Manitoba Infrastructure Program with 1/3 funding each by Canada, Province of Manitoba and the R.M. of Shell River.

# APPENDIX 1

# Agreement to Lease and Certificate of Title

November 9, 2010

Mr. Tim Stratton, P.Eng
Senior Project Manager
Stantec
905 Waverley Street
Winnipeg, Mantioba
R3T 5P4

**RM OF SHELL RIVER PROPOSED LAGOON PROJECT**

This is to advise you that the Town of Roblin has agreed to lease to the RM of Shell River approximately 20 acres of NE 20-25-28W. Please proceed with the application for the Environment Act Licence.

**RM of Shell River**

Albert Nabe, Reeve

Dione Cherneski, CAO

**Town of Roblin**

Betty Nykyforak, Mayor

Twyla Ludwig, CAO

pc Dave Shwaluk, Chief Engineer
The Manitoba Water Services Board

IRRIGATION LAND

Address For Service

Box 730,
Roblin, Manitoba, R0L 1P0

# MANITOBA
## Certificate of Title
UNDER THE REAL PROPERTY ACT

Cert. No. 153018

District Of DAUPHIN

Sworn Value: $ 150,000.00
Consideration: $ 150,000.00

From Title: 141099
Instrument No.: 93-3264

THE TOWN OF ROBLIN,

is registered owner SUBJECT TO such entries recorded hereon, in the following described land:

The NE 1/4 20-25-28 WPM.

SUBJECT TO the reservations and provisoes contained in the Grant from the Crown.

SIGNED this March 16th 1993.

District Registrar

| Instrument Type | Instrument Number | Date | Land Transferred To | New C.T. Number | For the District Registrar |
|---|---|---|---|---|---|
| | | | | | |

C.T. 153018

| Instrument Type | Instrument Number | Instrument Date | Target Registration | Particulars | For the District Registrar | Discharges Regn. # | Discharges Date | Discharges For District Registrar |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

AC - Assignment of Caveat / cession de notification d'opposition
Agmt - Agreement to Amend or Extend Mortgage / convention de modification d'hypothèque
BL - Builder's Lien / privilège du constructeur
C - Caveat / notification d'opposition
E - Easement / servitude
J - Judgment / jugement
L - Lien / privilège
Misc - Miscellaneous / divers
M - Mortgage / hypothèque
MM - Mortgage of Mortgage / sous-hypothèque
NEPS - Notice Exercising Power of Sale / avis de vente en exécution
PDM - Partial Discharge of Mortgage / mainlevée partielle en matière d'hypothèque
PL - Plan / plan
PostP - Postponement / subordination de charge
PPS - Personal Property Security Notice / avis en matière de sûreté sur les biens personnels
PWA - Party Wall Agreement / convention en matière de murs mitoyens
PWC - Partial Withdrawal of Caveat / retrait partiel de notification d'opposition
TM - Transfer of Mortgage / transfert d'hypothèque
TS - Tax Sale / vente pour défaut de paiement de taxe
WN - Withdrawal of Notice / retrait d'avis

Duplicate Certificate of Title Issued

| Request Number | Date | Recipient |
|---|---|---|
| 93-3264 | 93 03 16 | Marcel J. J. R. Gregoire, Roblin |

# APPENDIX 2

# R.M. of Shell River Wastewater Lagoon Pre-Design Study

# R.M. OF SHELL RIVER
# WASTEWATER LAGOON
# PRE-DESIGN STUDY

Prepared for:

The R.M. of Shell River
and
The Manitoba Water Services Board


Prepared by:
Stantec Consulting Ltd.

December 2010

File: 111212580

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# 1.0 Introduction

Stantec Consulting Ltd (Stantec) was retained in October 2010, by the R.M. of Shell River (R.M.) and the Manitoba Water Services Board (MWSB), to undertake a Pre-Design Study for a new wastewater lagoon. The study is to be followed by an Environment Act Proposal Application to secure a Licence, and subsequently design and construction.

The R.M. of Shell River is currently in need of a new wastewater treatment facility. Currently, wastewater is being delivered to other wastewater facilities, primarily the Town of Roblin wastewater lagoon, which were not designed to include the R.M. of Shell River wastewater.

The site chosen for the proposed new lagoon is on NE 20-25-28W adjacent to the existing Town of Roblin wastewater lagoon which is directly across PTH 83, as shown on the plan, bound at the back of this document. The two lagoons would be totally independent of each other. The existing treated effluent discharge ditch to the Shell River would be shared. The proposed new lagoon site is currently an irrigated quarter section using treated effluent from the Town of Roblin lagoon during the summer as required. Therefore, the land use as a wastewater site is already established.

Stantec's scope of work for this Study and the Environmental Act Proposal includes:

a) Review the nature and scope of the project as defined by the Board;

b) Review design parameters;

c) Review all previous reports and documents as may be related to the Project;

d) Undertake site soil drilling and hydraulic conductivity testing;

e) Undertake a topographic survey of the site and outfall ditch and obtain other available information;

f) Assess general groundwater conditions;

g) Liaise with stakeholders on issues which may affect the Project;

h) Consult with the R.M. and MWSB for advice on local conditions and preferences;

i) Population projections;

j) Preliminary design and siting of lagoon;

k) Assess organic and hydraulic loading;

l) Determine quantities;

m) Provide a cost estimate for recommended work;

n) Prepare and submit for Board approval a draft Pre-Design Study, including recommendations and a cost estimate;

o) Prepare site plan and lagoon details suitable for Proposal to secure an Environment Act Licence;

p) Prepare and submit twenty-seven (27) copies of an Environmental Act Proposal to secure a Licence including the $5,000 Application Fee;

q) Respond to queries during the technical committee Proposal review process.

## 2.0 Design Population

The contributing 20-year sewage hydraulic and organic wastewater loading design population for the lagoon is estimated as follows and is based on information provided by the R.M.

1. Permanent Dwelling Contributors:

| CONTRIBUTOR | PRESENT | 20 YEAR PROJECTION |
|---|---|---|
| Wastewater Holding Tanks | 30 | 148 |
| Associated Holding Tank Population | 75 | 370 |
| Wastewater Septic Tanks | 755 | 800 |
| Associated Septic Tank Population | 1888 | 2000 |

2. Seasonal Contributors:

| CONTRIBUTOR | PRESENT | 20 YEAR PROJECTION |
|---|---|---|
| Wastewater Holding Tanks | 65 | 127 |
| Associated Holding Tank Population | 162 | 318 |

There are no present or future institutional, commercial or industrial contributors expected within the 20 year design period. However, there is an additional 2.5 hectares available on the selected site for expansion in the future if required.

# 3.0 Lagoon Hydraulic Loading Design

The 20-year design sewage hydraulic loading calculations are as follows:

## 3.1 DESIGN PARAMETERS

- Permanent Residences – 270 litres per capita per day (lpcpd) for holding tanks
- Seasonal Residences – 125 lpcpd for holding tanks
- Septage generation from septic tanks – 250 litres per capita per year
- Maximum daily septage – 1 truck load at 4550 litres

## 3.2 ANNUAL HYDRAULIC LOADING (SEWAGE & SEPTAGE)

- Permanent holding tanks; 370 persons @ 270 lpcpd x 350 days = 35,000 $m^3$
- Seasonal holding tanks; 320 persons @ 125 lpcpd x 140 days = 5,600 $m^3$
- Septic tank septage; 2000 persons @ 250 lpcpy = 500 $m^3$

Total Annual Hydraulic Loading (to the nearest 1000 $m^3$) = 41,000 $m^3$

Assuming 310 hauling days per year, the average number of truck loads per day at 4550 litres per truck load is 30 truck loads. A maximum of 60 truck loads may be appropriate for maximum day.

Based on the information above, there would be 500,000 ÷ 4550 = 110 septage loads per year between June 16 and October 15 of a year. Therefore, the lagoon will be designed for a maximum of two truck loads of septage per day.

## 3.3 AVERAGE DAILY SUMMER HYDRAULIC LOADING

- 35 truck loads @ 4550 ℓ =160,000 ℓ

## 3.4 MAXIMUM DAILY SUMMER HYDRAULIC LOADING

- 60 truck loads @ 4550 ℓ =275,000 ℓ

## 3.5 WINTER AVERAGE DAILY HYDRAULIC LOADING

- 25 truck loads @ 4550 ℓ =115,000 ℓ

# 4.0 Lagoon Organic Loading Design & Cell Sizing

## 4.1 MAXIMUM DAY ORGANIC LOADING

The maximum day organic loading on the lagoon establishes the minimum primary cell size. The domestic sewage organic loading calculation is hydraulically based and has been set at 250 mg/ℓ $BOD_5$ for trucked wastewater. We have set the maximum trucked septage loading at two 4,550 ℓ truck loads per day. It will be the responsibility of the R.M. to limit septage dumping to two truck loads per day. Septage organic loading has been set at 7,000 mg/ℓ $BOD_5$. Based on the above parameters, the design maximum organic daily loading is:

| | | |
|---|---|---|
| Trucked: 275,000 ℓ @ 250 mg/ℓ | 68.8 | kg/day $BOD_5$ |
| Septage: 2 truck loads @ 4,550 ℓ @ 7,000 mg/ℓ | 63.7 | |
| **MAXIMUM DAY ORGANIC LOADING** | **132.5** | **kg/day $BOD_5$** |

## 4.2 PRIMARY CELL SIZE

The maximum allowable primary cell organic loading is 56 kg/day/hectare at the lagoon cell full supply level (FSL) of 1.5 m depth. Therefore, the primary cell size should be 132.5 / 56 = 2.4 hectares.

The total storage in the primary cell calculates to be 33,200 $m^3$. One half of the primary cell's hydraulic storage can be used for winter hydraulic storage. The allowable half storage for the primary cell is therefore .5 x 33,200 = 16,600 $m^3$.

## 4.3 WINTER STORAGE AND NEW SECONDARY CELL SIZE

The lagoon must be capable of storing wastewater for 230 days, which is the period of November 1 to June 15. Therefore, required winter storage is 230 days times the average day winter hydraulic loading of 115,000 ℓ equals 26,500 $m^3$.

Therefore, the proposed secondary cell will have a minimum storage of 26,500 – 16,600 = 9,900 $m^3$. This translates to a new secondary cell with .8 hectare surface area at full supply level of 1.5 m liquid depth. As this is a relatively small secondary cell compared to the 2.4 hectare primary cell, we recommend that it be upsized to 1.2 hectare. This will provide allowance for dead storage and emergency storage, and also storage for potential future phosphorus precipitate, at nominal cost. With the 1.2 hectare secondary cell shown on the plans, the secondary storage is 14,200 $m^3$ for total storage of 30,800 $m^3$, 16% higher than the minimum storage of 26,500 $m^3$.

# 5.0 Site Soils

## 5.1 TEST HOLE DRILLING PROGRAM

Paddock Drilling undertook a test hole drilling program on October 29, 2010 at the proposed lagoon expansion site. Eight holes were drilled to a depth of 3 m each. Two Shelby tubes were taken of clay samples. All holes had homogenous clay. One hole had a sand seam at 2.4 m to 2.5 m depth. Considering maximum excavation will be approximately 1.1 m, this sand seam should not affect the 1 m of clay lagoon floor liner. Drilled holes were backfilled with bentonite granules to ensure a watertight seal. Borehole logs are provided in Appendix A.

## 5.2 SOIL LABORATORY TESTING RESULTS

Hydraulic conductivity tests were carried out on the two insitu Shelby tube clay samples by National Testing Laboratories Ltd., a geotechnical engineering and laboratory testing firm. Both samples met the required maximum hydraulic conductivity volume of $1 \times 10^{-7}$ cm/sec with results of $1.2 \times 10^{-8}$ and $1.5 \times 10^{-8}$ cm/sec. Therefore the clay is suitable for a wastewater lagoon and will have a minimum 1 m floor clay liner.

The hydraulic conductivity test results are contained in Appendix B.

# 6.0 Surveys

## 6.1 TOPOGRAPHIC SURVEY

A geodetic topographic survey was undertaken on November 9 and 10, 2010 on the lagoon and treated effluent outfall ditch. The attached plan shows the contours of the lagoon site and elevations of the outfall ditch.

## 6.2 LAGOON TREATED EFFLUENT OUTFALL DITCH

Treated wastewater effluent would be directed to the south ditch of the section road on the north side of the site. The survey indicates that the natural flow is west to east. This ditch leads 200 m east to PTH 83 and a new culvert would be installed under PTH 83. From this point the effluent would proceed 250 m east and connect with the existing Town of Roblin effluent drainage ditch which leads another 1.25 km to the Shell River. Therefore, the proposed new lagoon treated effluent drainage route is primarily an existing effluent outfall drainage route.

# 7.0 Lagoon Cell Physical Design Criteria

The general design criteria for the sewage lagoon are:

- 4/1 inside slopes
- 3/1 outside slopes
- top to bottom elevation change = 2.5 m
- maximum liquid operating depth = 1.5 m
- minimum distance from habitation = 300 m
- minimum berm width = 3 m
- minimum freeboard = .9 m
- minimum liquid depth = .3 m
- domestic wastes only
- seed 4 m of inside slopes, top and outside slopes
- gate valves on interconnecting and discharge pipes
- 1 m clay liner

# 8.0 Treated Effluent Quality and Discharge Dates

The lagoon as proposed in the Environment Licence Application will be designed to provide the following treated effluent parameters:

| | |
|---|---|
| $BOD_5$ | < 30 mg/ℓ |
| Total Suspended Solids | < 30 mg/ℓ |
| Fecal Coliform | < 200 per 100 ml |
| Total Coliform | < 1,500 per 100 ml |
| SAR | $\leq$ 6 |
| Treated Effluent Discharge | June 16 to October 31. |

As with all facultative wastewater lagoons, there is the future potential for phosphorus reduction to < 1 mg/ ℓ using alum precipitation or other method, as a requirement of Manitoba Conservation.

## 9.0 Preliminary Quantities and Opinion of Capital Cost Estimate

| | | Unit | Quantity | Unit Price | Amount |
|---|---|---|---|---|---|
| 1 | Minor Clearing & Grubbing | l.s. | 1 | $ 3,000 | $ 3,000 |
| 2 | Topsoil Stripping, Stockpiling and Replacement | c.m. | 12,500 | $ 5 | $ 62,500 |
| 3 | Common Excavation | c.m. | 23,500 | $ 7 | $ 164,500 |
| 4 | Unsuitable Material Removal | c.m. | 2,000 | $ 8 | $ 16,000 |
| 5 | Interconnecting Pipe System | l.s. | 1 | $15,000 | $ 15,000 |
| 6 | Compact Lagoon Floor | l.s. | 1 | $ 5,000 | $ 5,000 |
| 7 | Discharge Pipe System Including Rip Rap | l.s. | 1 | $25,000 | $ 25,000 |
| 8 | Truck Dump Structure | l.s. | 1 | $30,000 | $ 30,000 |
| 9 | Granular Material for Road | c.m. | 100 | $ 50 | $ 5,000 |
| 10 | Culvert Under PTH 83 | l.s. | 1 | $75,000 | $ 75,000 |
| 11 | Ditching | l.s. | 1 | $25,000 | $ 25,000 |
| 12 | Seeding | l.s. | 1 | $10,000 | $ 10,000 |
| 13 | Fence and Gate | l.s. | 1 | $20,000 | $ 20,000 |
| 14 | Post Construction Testing | l.s. | 1 | $ 7,000 | $ 7,000 |
| | **Sub-Total Construction Cost** | | | | **$ 463,000** |
| | **Engineering and Construction Cost Contingency (30%)** | | | | **$ 137,000** |
| | **TOTAL ESTIMATED OPINION OF CAPITAL COST (not including, GST, MWSB costs, or land costs)** | | | | **$600,000** |

# 10.0 Recommendations

We recommend that a new two cell wastewaster lagoon be constructed on NE 20-25-28W as shown on the plan. This site is presently being used for treated wastewater irrigation disposal and therefore the land use is already established. Also, the existing Town of Roblin lagoon system is approximately 400 m away from the proposed site. The treated effluent discharge route is also already established as it is currently being used for the Roblin lagoon system.

The hydraulic conductivity tests show that the site clay meets the required Provincial standard of $1 \times 10^{-7}$ cm/sec.

Stantec's opinion of capital cost estimate for the proposed new two cell lagoon is $600,000, including 30% engineering and construction contingency, but not including GST, MWSB costs, or land costs.

# APPENDIX A

# Test Hole Logs

**Rural Municipality of Shell River Lagoon Site Investigation Drilling Program on NE 20-25-28W by Paddock Drilling.**
**Site is on Town of Roblin Irrigation Quarter**
**October 29, 2010**
**Test Holes Observed by T. Stratton of Stantec**
**Test Hole Locations Shown on Accompanying Plan**
**Holes Drilled to 3 m Depth Only**

| | | |
|---|---|---|
| TH # 1 | 0 - .25 m | Topsoil |
| | .25 m - 3.0 m | Brown, medium plastic clay with some silt, sand and gravel inclusions |
| | | Note: Clay stiffer from 2 m to 3 m |
| | | Note: Shelby Tube #1 taken at .6 m to 1.2 m |
| TH # 2 | 0 - .10 m | Topsoil |
| | .10 m - 3.0 m | Same clay as TH #1 |
| TH # 3 | 0 - .15 m | Topsoil |
| | .15 m - 3.0 m | Same clay as TH #1 |
| TH # 4 | 0 - .25 m | Topsoil |
| | .25 m - 3.0 m | Same clay as TH #1 |
| TH # 5 | 0 - .15 m | Topsoil |
| | . 15 m - 3.0 m | Same clay as TH #1 |
| | | Note: Shelby Tube #2 taken at .9 m to 1.5 m |
| TH # 6 | 0 - .10 m | Topsoil |
| | .10 m - 3.0 m | Same clay as TH #1 |
| | | Note: Drainage ditch directly to south |
| TH # 7 | 0 - .15 m | Topsoil |
| | .15 m - 2.4 m | Same clay as TH #1 |
| | 2.4 m - 2.5 m | Wet sand with some clay and silt |
| | 2.5 m - 3.0 m | Same clay as TH #1 |
| TH # 8 | 0 - .30 m | Topsoil |
| | .30 m - 3.0 m | Same clay as TH #1 |

# APPENDIX B

# Hydraulic Conductivity Test Results

THE NATIONAL TESTING LABORATORIES LIMITED
*Established in 1923*

199 Henlow Bay
Winnipeg, MB R3Y 1G4
Phone (204) 488-6999
Fax (204) 488-6947
Email info@nationaltestlabs.com
www.nationaltestlabs.com

Stantec
905 Waverley Street
Winnipeg, Manitoba
R3T 5P4

December 1, 2010

Project: Shell River Lagoon

Attention: Tim Stratton

Two Shelby tube samples, identified as ST1 and ST2, were submitted to our laboratory on November 1, 2010. The soil samples were tested in accordance with ASTM D5084, Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter. The test results for the soil samples are provided on the attached hydraulic conductivity reports and are summarized in the following table:

| Sample ID | Hydraulic Conductivity, "$k_{20}$" |
|---|---|
| ST1 | $1.2 \times 10^{-8}$ cm/s |
| ST2 | $1.5 \times 10^{-8}$ cm/s |

The hydraulic conductivity results for the Shelby tube samples are less than the specified maximum hydraulic conductivity value of $1.0 \times 10^{-7}$ cm/s.

We appreciate the opportunity to assist you in this project. Please call if you have any questions regarding this report.

German Gl.

German Leal, B.Sc., E.I.T.
Project Manager Geotechnical Engineering

THE NATIONAL TESTING LABORATORIES LIMITED
Established in 1923

# HYDRAULIC CONDUCTIVITY
# ASTM D5084

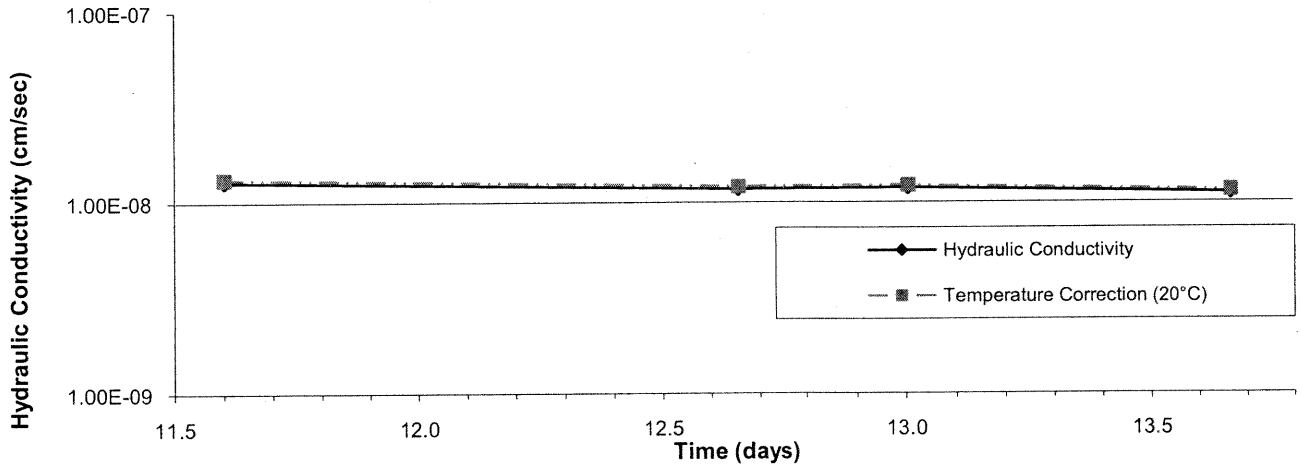
Stantec Consulting Ltd.
905 Waverley Street
Winnipeg, Manitoba
R3T 5P4

PROJECT: Shell River Lagoon

Attention: Tim Stratton

| | |
|---|---|
| **SAMPLE I.D.:** | **ST - 1** |
| SOIL TYPE: | Brown, firm, moist, medium plasticity sandy clay and trace gravel |
| DATE TESTED: | November 16 to 30, 2010 |
| CONFINING PRESSURE (kPa): | 137.9 |
| EFFECTIVE SATURATION STRESS (kPa): | 34.5 |
| HYDRAULIC GRADIENT: | 19.1 |
| TYPE OF PERMEANT LIQUID: | De-aired Water |
| HYDRAULIC CONDUCTIVITY, "k" (cm/s): | 1.2E-08 |
| **HYDRAULIC CONDUCTIVITY, "$k_{20}$" (cm/s):** | **1.2E-08** |

| | Height (mm) | Diameter (mm) | Wet Mass (g) | Dry Density ($g/cm^3$) | Water Content (%) | Saturation (%) |
|---|---|---|---|---|---|---|
| **Initial Reading** | 78.4 | 72.5 | 669.9 | 1.745 | 18.5 | 90.7 |
| **Final Reading** | 77.8 | 72.4 | 671.8 | 1.748 | 20.0 | 98.7 |




November 30, 2010

REVIEWED BY: German Leal

THE NATIONAL TESTING LABORATORIES LIMITED

# HYDRAULIC CONDUCTIVITY
# ASTM D5084

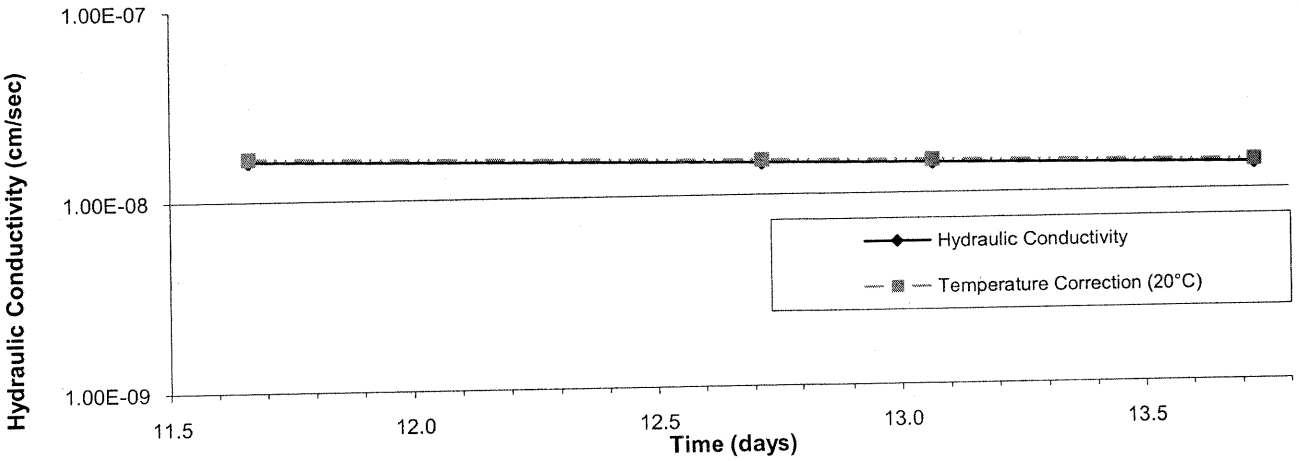
Stantec Consulting Ltd.
905 Waverley Street
Winnipeg, Manitoba
R3T 5P4

PROJECT: Shell River Lagoon

Attention: Tim Stratton

| | |
|---|---|
| **SAMPLE I.D.:** | **ST - 2** |
| SOIL TYPE: | Brown, firm, moist, medium plasticity sandy clay and trace gravel |
| DATE TESTED: | November 16 to 30, 2010 |
| CONFINING PRESSURE (kPa): | 137.9 |
| EFFECTIVE SATURATION STRESS (kPa): | 34.5 |
| HYDRAULIC GRADIENT: | 19.1 |
| TYPE OF PERMEANT LIQUID: | De-aired Water |
| HYDRAULIC CONDUCTIVITY, "k" (cm/s): | 1.5E-08 |
| **HYDRAULIC CONDUCTIVITY, "$k_{20}$" (cm/s):** | **1.5E-08** |

| | Height (mm) | Diameter (mm) | Wet Mass (g) | Dry Density ($g/cm^3$) | Water Content (%) | Saturation (%) |
|---|---|---|---|---|---|---|
| **Initial Reading** | 78.4 | 72.4 | 683.7 | 1.856 | 14.0 | 82.7 |
| **Final Reading** | 77.7 | 72.3 | 685.6 | 1.821 | 18.1 | 100.5 |




November 30, 2010

REVIEWED BY: German Leal

199 Henlow Bay, Winnipeg, Manitoba R3Y 1G4 Phone (204) 488-6999 Fax (204) 488-6947 Email info@nationaltestlabs.com

# APPENDIX 3

# Fish Inventory of Shell River

| Table 1: Recorded Fish Species of the Shell River, Manitoba | | |
|---|---|---|
| **Systematic Name** | **Common Name** | **Status** |
| Ichthyomyzon castaneus | Chestnut lamprey | Native |
| Salvelinus fontinalis | Brook Trout | Stocked |
| Oncorynchus mykiss | Rainbow Trout | Stocked |
| Salmo trutta | Brown Trout | Stocked |
| Luxilus cornutus | Common Shiner | Native |
| Notropis atherinoides | Emerald Shiner | Native |
| Notropis dorsalis | Bigmouth Shiner | Native |
| Notropis heterolepis | Blacknose Shiner | Native |
| Pimephales promelas | Fathead Minnow | Native |
| Playligobio | Flathead Chub | Native |
| Rhinichthys atratulus | Blacknose Dace | Native |
| Rhinichthys cataractae | Longnose Dace | Native |
| Semotilus atromaculatus | Creek Chub | Native |
| Catostomus commersonii | White Sucker | Native |
| Esox lucius | Northern Pike | Native |
| Carpiodes cyprinus | Quillback | Native |
| Myxostoma anisurum | Silver Redhorse | Native |
| Myxostoma macrolepidotum | Shorthead Redhorse | Native |
| Percopsis omiscomaycus | Troutperch | Native |
| Lota lota | Burbot | Native |
| Cyprinus carpio | Carp | Introduced |
| Culaea inconstans | Brook Stickleback | Native |
| Ambloplites rupstris | Rock Bass | Native |
| Etheostoma exile | Iowa Darter | Native |
| Etheostoma nigrum | Johnny Darter | Native |
| Perca flavescens | Yellow Perch | Native |
| Percina maculata | Blackside Darter | Native |
| Stizostedion vitreum | Walleye | Native |

Sources:


1. McCullough, B.R. and Franzin, W.G. 1996. Fishes Collected from the Canadian Portion of the Assiniboine River Drainage. Canadian Technical Report of Fisheries and Aquatic Sciences 2087. Fisheries and Oceans Canada. 62pp.
2. Steward, K.W. and Watkinson, D.A. 2004. The Freshwater Fishes of Manitoba. University of Manitoba Press. 276 pp.
3. TetrES Consultants Inc. 2004. Environmental Impact Assessment Issues – Scoping Report. Final Report to PFRA and MB Water Stewardship. No. 0320-A-03-00.

McCullough and Franzin (1996) listed 17 species that are at present known to occur in the Shell River (Table 1), including two species of salmonids. The report by TCI (2004) listed 24 species for the Shell River, including three species of salmonids. Master angler records from Tourism Manitoba indicate that master angler specimens of the following species have been caught in the Shell River: Carp, Goldeye/Mooneye, Rock Bass, Yellow Perch, Sauger, White Sucker and Walleye.

All but two of these species are found in Table 1. The discrepancy suggests the official record is not entirely accurate, and that the list of fish species for the Assiniboine River may be more appropriate. There are currently a total of 45 recorded fish species in the Assiniboine River (Stewart and Watkinson 2004). It is reasonable to expect that most of these would also be present in the Shell River. In addition, there may be an additional set of fish species present in the Shell River during spawning periods that would otherwise favor lake environments. These additional species may have become established over the years due to the construction of the Shellmouth Dam, completed in 1972. This dam has created new habitat (Lake of the Prairies) and has also substantively altered the migration and movement of fishes into and out of the Shell River.