# THE NATION MUNICIPALITY

## VILLAGE OF LIMOGES
## LIMOGES SEWAGE LAGOONS

## REPORT ON REPAIR WORKS TO LEAKS

LECOMPTE ENGINEERING LTD.
1417-C Cyrville Road, Suite 201
Ottawa, Ontario
K1B 3L7
Tel : (613) 236-6662
Fax : (613) 236-2945
Lecompte@trytel.com

JANUARY 2003

LEL FILE: 52054

# TABLE OF CONTENTS



# LIST OF APPENDICES

## 1.0 INTRODUCTION

On September 30th, 2002 J.P. Gélinas and D. Laflèche, OCWA Operators, met on the lagoon site with Gaëtan Beauchesne, P.Eng. of Lecompte Engineering Ltd. At this time they identified three (3) possible leaks; the first being near the outfall chamber, the second near the connection pipe between cell no. 2 and the future east cell and third along the future concrete connecting pipe to the outfall of the future cell.

Following this meeting Lecompte Engineering Ltd. advised Jacques Breen, OCWA Operations Manager, that the period of maintenance had expired on June 13th, 2002. Therefore we were of the opinion that the cost involved for any repair works after the warranty period should be done under the maintenance budget.

On October 1st, 2002, Mr. Bill McCallum from OCWA Toronto, visited the lagoon site. Mr. McCallums' report is included herewith along with various correspondance.

On October 7th, 2002, our firm met with the following personnel from these various agencies :

Jacques Breen, OCWA Manager
J.P. Gélinas, OCWA Operator
Daniel Laflèche, OCWA Operator
Marc Robert, MOE Cornwall
Mark Lecompte, Technician, Lecompte Engineering Ltd.
Gaëtan Beauchesne, P.Eng., Lecompte Engineering Ltd.

This meeting took place to discuss the most appropriate solution to repair these leaks.

On October 3rd, 2002 it was agreed upon that our firm would be in charge of coordinating the necessary works to correct the present leaks. This mandate was confirmed at a later date by the Council of the Nation Municipality. Refer to the attached resolution no. 671-2002.

## 2.0 THE TEAM AND SOLUTION

It was agreed upon with Council that Lecompte Engineering Ltd. would coordinate the work between the various sub-contractors to repair the leaks.

Mike and Bruce Casselman from Cruickshank Construction Ltd. were assigned to locate the leaks. They installed dykes in front of each leak, lowered the liquid level and observed the direction in which the liquid was flowing. The liquid was following along the connecting pipes and coming back under the polyethylene liner. It was evident to conclude that the pipes had been previously lifted by the frost leaving a free passage underneath them. The polyethylene membrane was not disturbed around the connecting pipes and no leaks were noticed at this location.

For the second operation, we hired Marathon Drilling Co. Ltd. to inject a pressure grouting material in the voids in order to impermeate the granular material and create a consolidated bentonite plug.

Twenty four (24) hours after this operation OCWA Operators refilled cell no. 2 with the incoming liquid as well as the liquid from cell no. 1.

## 3.0 REHABILITATION

**1- The pipe from the outlet box located at cell no.2 to outlet chamber.**

As shown on the attached photographs had a portion of the pipe lifted from its original position due to the formation of ice inside the pipe.

The grade of the pipe was properly restored by removing the soil underneath and then by placing two (2) concrete ballasts of $3m^3$, 25mPa with a pumper truck over the existing pipe.

**2- The incoming concrete pipe from the future cell to the existing outlet chamber.**

Three (3) sections were removed and stored at 10 meters away along the enclosure fence for future use. The end pipe was sealed tight by means of a concrete cap secured with galvanized steel angles and anchor bolts. Also a 0.95m of earth was placed over the pipe for frost protection.

## 4.0 CONCLUSION

Since the Maintenance Warranty had expired we respectively request that the cost involved to repair the leaks and associated work be carried out under the maintenance budget.

Most of the correctional work was carried out at cost with the exception of the bentonite injection.

A few weeks since these operations took place, inspections of the site revealed that these corrections and repair works seem to be adequate and no subsequent leaks have been observed. The monitoring of the lagoon shall continue.

Prepared by :
**LECOMPTE ENGINEERING LTD.**


Jacques Lecompte, P.Eng.
January 27th, 2003

52054-rpt.lks

# APPENDIX I

## Correspondence

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

October 3, 2002
Our File : 52054

**Ontario Clean Water Agency**
Alfred Hub
P.O. Box 252
2017 Main Street
Lefaivre, Ontario
K0B 1J0

**Attention:** **Jacques Breen, Operations Manager**
**Re :** **The Nation Municipality – Village of Limoges Sewage Lagoons**

Dear Sir,

Following our letter of September 30th, 2002 and my telephone conversation of today with Mrs. Mary McCuaig, it was decided that we will be in charge to coordinate the necessary work to correct the present leak (s) at the Limoges Lagoon.

A detailed report of the findings and repair work will follow to the Municipality of the Nation with a copy to be forwarded to you.

Before starting any remedial work, we will coordinate the appropriate timing with your operators, Jean Pierre Gélinas and Dan Laflèche.

Yours truly,
**LECOMPTE ENGINEERING LTD.**

Gaëtan Beauchesne, P.Eng.

GB/sk
Encl.
c.c. Mary McCuaig, Clerk, the Nation Municipality
J.P. Gélinas, OCWA Operator

52054-ltr-wrk

1417-C CYRVILLE ROAD, SUITE 201, OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

September 30, 2002
Our File : 52054

**Ontario Clean Water Agency**
Alfred Hub
P.O. Box 252
2017 Main Street
Lefaivre, Ontario
K0B 1J0

**Attention:** **Jacques Breen, Operations Manager**
**Re :** **The Nation Municipality – Village of Limoges Sewage Lagoons**

Dear Sir,

We wish to inform you that the period of maintenance for the above noted project expired on June 12th of this year.

As you are aware, the cost involved for any repair work after the warranty period should be included within the maintenance budget.

Following my site meeting with J.P. Gélinas and D. Laflèche earlier today, we have identified the possibility of three leaks indicated on the attached sketches.

Please take note that the remedial work should take place immediately in order to correct the leak. The normal procedure of advising your superior should also be carried out.

We believe that the repair work can be done rapidly at a reasonable cost. We will be glad to assist you should you require any assistance in this matter.

Yours truly,
**LECOMPTE ENGINEERING LTD.**

Gaëtan Beauchesne, P.Eng.



GB/sk
Encl.
c.c. Mary McCuaig, Clerk, the Nation Municipality
J.P. Gélinas, OCWA Operator

52054-ltr-lag

FAXED

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# MEMO

**TO :** Jacques Breen, OCWA, Alfred Hub
J.P. Gélinas, OCWA, Operator
Marc Robert, MOE Cornwall
Dan Byveld, Cruickshank Construction Ltd.

**FROM :** Gaëtan Beauchesne, P.Eng., Lecompte Engineering Ltd.

**SUBJECT :** Scheduled meeting for the necessary corrections for the leak (s) at the Limoges Sewage Lagoons

**DATE :** October 3, 2002

**FILE NO. :** 52054

---

We wish to confirm that a special meeting is scheduled below to discuss an emergency plan for the remedial work necessary to correct the leak (s) at the Limoges Sewage Lagoons.

Date : Monday, October 7th, 2002
Time : 9:00 a.m.
Location : Limoges Water Treatment Plant
209 Limoges Road
Limoges, Ontario

**LECOMPTE ENGINEERING LTD.**

Gaëtan Beauchesne, P.Eng.

GB/sk

c.c. Mary McCuaig, Clerk, the Nation Municipality

52054-mem.mee

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

October 9, 2002

Our file: 52-054

The Nation Muncipality
958 Route 500 West
Casselman Ontario
K0A 1M0

**Re: Village of Limoges**
**Emergency repairs to leaks in sewage lagoon**

Attention: Ms Mary McCuaig, clerk

Dear Ms McCuaig,

The problem experienced at the Limoges sewage lagoon has been identified as two leaks and a third leak resulting from the previous one as indicated on the attached sketch.

Our mandate in respect to this emergency repair with the Nation Municipality is to coordinate all necessary remedial work in order to permanently correct the leaks. A progress report on the findings and remedial work will then be forwarded to the Client as well as to OCWA and the MOE.

A meeting was held on site Monday October 7, 2002. Refer to the attached copy of the minutes. All remedial works will be carried out by the original contractor and his sub-contractors.

Following the meeting, a revised plan of action was established as follows:

-The sewage liquid level of cell no.2 will be lowered in accordance with the authorized discharge rate contained in the C of A in order to have access to the interconnecting piping between the outlet box and the transfer chamber at both locations. It will take approximately 33 days to discharge the present working volume at an average discharge rate of 30L/s.

-The stone protection and geo-textile will be removed by hand to verify the adequacy of the watertight joint between the liner and the concrete pipe at both locations.

-All necessary corrections will take place at that time if the watertight seals have failed as expected. If not, other methods such as bentonite injection will be used for sealing the leaks permanently. Each parties involved will be advised in advance of the proposed method of correction.

In the meantime, the workers who will be involved in the removal of the stone protection and geo-textile, will be immunised against the following:

DTP (diphtheria, tetanus and polio) covered under the Ontario Health plan.
Hepatitis A (not covered - cost $45 to $50)
Hepatitis B (not covered - cost $45 to $50)

As well, the transfer pipe from the outlet chamber to the future cell will have to be reinstated with joint restrainers. A meeting will take place with the contractor for the coordination of this work.

Sincerely,
LECOMPTE ENGNEERING LTD.

for
Gaëtan Beauchesne, P.Eng.
Project Manager

c.c.
Jacques Breen, Operations Manager, OCWA
Marc Robert, Senior Environmental Officer, MOE Cornwall
Joseph Rybak, P.Eng. , Project Manager, OCWA
Jean-Pierre Gélinas, Limoges Chief Operator, OCWA
Mike Casselman, Project Manager, Cruickshank

ml/GB

ltr-1.doc

**Ontario Clean Water Agency**

Ontario Clean Water Agency

Bill McCallum
Project Engineering Officer
Phone: 416-314-4255
FAX: 416-314-8300



# *Facsimile*

| | |
|---|---|
| To: | Gaetan Beauchene, Lecompt Engineering |
| @Fax: | 613 - 236 - 2945 |
| From: | Bill McCallum |
| Date: | October 31, 2002 |
| Re: | **Limoges Sewage Lagoons Repairs Work Plan** |
| Pages: | 1, including this |

We are in receipt of your recent correspondences on the exfiltration from the lagoons, as you are aware OCWA is the Project Manager for The Municapality of The Nation for this Project and as such act on behalf of the Municipality. All comunication and correspondance on this project should be directed to the Project Manager J.S. Rybak P.Eng.

It is our understanding that you have done some initial investigation In order to determine the actual cause of this exfiltration, how ever there is a lack of detail as to how the what the final solution will be. Your letter to the Municipality dated October 9, 2002, page 2 first paragraph outlines step one (1) in the process of determining where the leak may be. While the second (2) second paragraph suggest possible remedail methods that are not based on any actual knowledge of the actual nature of the cause of the leak.

The operators have indicated that the lagoon cell No. 2 has been lowered to the point where a site visit may provide you with some more information and they anticapte the lagoon will be fully discharge by late October or early November 2002.

We strongly suggest that you visit the site in order to obtain as much information as posible in order to prepare a more detailed remedial plan.

This plan should be submitted to the Project Manager with a copy to the Municipalities Operations Manager for review and comments on your proposed method of repair at least a week prior to commencement of any remedial work.

During OCWA's site visit with the Municipal Clerk and the operators, several anomilies were found.

1. No dresser couplings on the outfall discharge piping as indicated on the "As Constructed" drawings

2. Excessive leakage into the outlet chamber on the east wall approximatley 200 mm from the north wall .from the
3. Failure of the ladder rungs in outlet chamber.
4. Open joints on the future lagoon pipe
5. As built drawings; complete set along with the C. D. as required by the Engineering Agreement

Access to the lagoon site (following approval of Work Plan) now an operating facility must be coordinated through the Chief Operator of the facility Mr. J.P. Gelians.

In your final paragraph on page 2 you briefly describe proposed work on transfer pipe to the future cell. Have you or will you be addressing preventing posible freezing of this pipe?

In your Minitues of Meeting held at the Limoges W.T.P. On October 7, 2002 page 3 item 11 paragraph 3 you indicate a cost of $1500.00 per day. Please elaborate on this, as it is our position that any costs to correct this problem are not the responsibilty of the Municipallity.

C.c. Mary McCuiag The Municipallity of the Nation
Bcc Jacques Breen Operations Manager OCWA

will be carrying out some

**Ontario Clean Water Agency**
**Agence Ontarienne Des Eaux**

Ontario Clean Water Agency
1 Yonge Street, Suite 1700
Toronto, Ontario
M5E 1E5

Phone: (416) 314-4622
Fax: (416) 314-4308
E-mail: jrybak@ocwa.com

14.2
(ii)

# *FACSIMILE*

To: Mary McCuaig.
Fax #: ( ) 613-764-3310.
cc:
Fax #: ()

From: **J.S. Rybak, P.Eng.**
**Project Manager**
**Project Development & Technical Services**

Re: The Nation Projects.

Date: October 28, 2002
Pages: 7, including this page

Municipalité de la Nation
Received
OCT 29 2002
Reçu
The Nation Municipality

Yours truly,

*J.S. Rybak*

Réunion Conseil
Council Mtg 11 / 11 / 02
D M YR

Action reports
Clerk
Greffier

**Ontario Clean Water Agency**
**Agence Ontarienne Des Eaux**

Dir. Line: (416) 314-4622
e-mail: jrybak@ocwa.com

October 28, 2002

Mrs. Mary McCuaig, Clerk
The Nation Municipality
958 Highway #500 West
R.R. 3
Casselman, ON K0A 1M0

Dear Mrs. McCuaig:

**Re: The Nation Municipality**
**Ongoing Construction Projects**

Further to your recent discussions, we wish to provide the following information related to the ongoing construction and deficiency issues for recent projects:

Limoges Lagoon: OCWA PDG staff undertook an inspection of the facilities and there are a number of issues to be dealt with (see attached). The consultant, Lecompte Engineering, has agreed to take the lead in the investigation and planning of remedial repairs of the Limoges lagoon. They have agreed to work with the municipality and OCWA to try and resolve the concerns. Further work cannot be done until the lagoon is completely discharged, which we anticipate to be late this week or early next week. At least one lagoon cell needs to be drained to allow proper access to the areas. Once we have received and reviewed the consultant's repair procedures, we will be able to provide you with more information at that time.

St. Albert Lagoon: OCWA did an initial dig of the site a few weeks ago. However, there was no conclusive evidence found (see attached). Further investigation needs be done. PDG are presently preparing a detailed work plan in conjunction with Golders that would see some test excavations taking place inside the lagoon berms and at the interior base of the berms. To minimize damage to the cell bottoms, it is PDG's preference to undertake this work once there is sufficient cold weather to allow the entry of heavy equipment into the lagoon cells. However, based on Operational concerns we recommend that this work not be undertaken until the lagoons are discharged in the Spring of 2003. More information will be available shortly.

Fournier Wastewater Treatment System: The Fournier plant appears to be operating as it was designed. The process within the plant converts Ammonia to Nitrates. The effluent leaving the facility exceeds the objectives as listed in the Certificate of Approval. As an unachieved objective, it will be reviewed by Ministry staff but is not considered a non-compliance issue at this point. For the municipality as the owner, and OCWA as the operator, there are concerns about the long-term effect of not meeting an effluent objective and the expectations from the Ministry that there will be a plan put in place to remedy the unachieved objective. The choices would likely be to change or modify the process within the facility or change the Certificate of Approval.

PDG has indicated to the consultant that we require a plan of action to deal with these issues including amending the Certificate of Approval if necessary to ensure compliance. In the event that action is not forthcoming soon, PDG will be recommending action against the consultant.

As your operator, we would like to resolve these remaining issues to ensure that all facilities are operating effectively and efficiently.

Yours very truly,
**ONTARIO CLEAN WATER AGENCY**

**J. S. Rybak, P.Eng.**
**Project Manager**
**Project Development and Technical Services**

cc: OCWA Operations (Attn: J. Breen, P.Eng.)
OCWA Operations (Attn: J. Kingsbury, P.Eng.)

**Ontario Clean Water Agency**

Ontario Clean Water Agency

Phone:
FAX: 416 314 8300
email:

# *Memorandum*

*To:* *Memo to File*
*From:* *Bill McCallum*
*cc:* *The Municipality of The Nation;*
*Mary McCuaig, Clerk*
*Bcc:* *OCWA; Jacque Breen*
*Date:* *Monday, October 28, 2002*

**Re: Limoges Lagoons**
**Project No. 88 - 1232**
**Contract No. 5341 - 04**

On Tuesday October 1, 2002, I visited the site along with the Municipality of The Nation's Clerk M. J. McCuaig, OCWA operators J.P. Gelinas and Dan Lafleche to investigate the cause of excessive exfiltration.

The contract was substantially complete on December 12, 2000 and the official noticed published on December 18, 2000 with the lagoons placed into service in the spring of 2001.

Exfiltration had been noted by the operational staff in several locations. The three (3) noticeable locations, being at the toe of the berms adjacent to the future (east & south) lagoon valve chambers and at outfall the valve chamber.

We first investigated the leak at the southerly future lagoon inlet pipe. There was clear signs running water at the exposed capped end of the pipe, which when exposed back to the second joint (to the spring line of the pipe) several leaks were noted at the pipe cap joint and both the first and second exposed joints. In addition a hole of approximately 60 mm was seen at the second joint. The possible cause of the leaks at the joints is frost heave as there was insufficient cover to the pipe to protect it or the surrounding bedding from freezing.

The next area investigated was at the outfall chamber where significant flow was seen coming into the chamber on the east side and the sound of running water was heard from inside the chamber but no flow through the outlet valving. When the out fall piping south of the chamber was exposed just north of the post and wire fence water was seen flowing along the bedding towards the outfall.

When the pressure was relieved from around the piping the sound of flowing ceased.

On a second visit on Wednesday October 2, 2002 investigation of the outfall chamber and the east chamber were carried out using a vacuum truck.

At the outfall chamber water was found flowing along the outlet pipe from the direction of the lagoons (possibly the east lagoon only) and water out of the chamber from the westerly pipe. The "as built" drawing indicated that both these pipes had dresser couplings within 450 mm of the chamber. These had not installed. Their purpose is to allow differential settlement between the piping and the chamber.

Before the piping from the lagoon to the easterly chamber was exposed work was stopped in order to avoid any failure of the berm as water was flowing at a significant rate proving that water from the lagoon was the reason the area of the easterly ditch was waterlogged while other ditches in the area were dry due to the extremely dry spring and summer.

The consultant has indicated that they and the contractor will be undertaking repairs as soon as the lagoon levels are sufficiently lowered.

Note; Lagoon contents are currently being discharged and it is anticipated the discharge will be by late October early November, 2002.

As soon as the lagoons are drained the consultant / contractor will be notified to begin repairs.

***Bill McCallum***

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

November 4, 2002
Our File : 52054

**Ontario Clean Water Agency**
1 Yonge Street
Suite 1700
Toronto, Ontario
M5V 1E5

**Attention:** **Bill McCallum, Project Engineering Officer**
**Re :** **The Nation Municipality**
**Village of Limoges**
**Limoges Sewage Lagoons Repairs Work Plan**

Dear Sir,

In respect to the above noted project and further to your memo dated October 31st, 2002, we wish to comment as follows:

1- We do not concur that the Project Manager for the Nation Municipality for this project is OCWA Project Management because as you are aware, the maintenance period on this project expired on June 12th, 2002 and therefore neither OCWA Project Management, nor Lecompte Engineering Ltd. nor Cruickshank Construction Ltd. has a contractual obligation with the Nation Municipality. However, because of the nature of the problem, we were authorized by the Nation Municipality to coordinate all necessary remedial work in order to permanently correct the leak (s). We contacted the original contractor, Cruickshank Construction Ltd., and they accepted to carry out all remedial works.

2- Yes, we have done some initial investigation in order to determine the actual cause of the leak (s). On our site visit of October 7th, 2002, we verified the exterior slopes and perimeter ditches for signs of potential leak (s). We found that water was being piped into the ditch just in front of the transfer chamber (Type 2) which is located on the east berm of cell no. 2 and also observed water ponding in the vicinity of the transfer pipe to the future cell which is located south east of the lagoon. This is why we have good reason to suspect the integrity of the joints between the liner and the pipe at both locations.

.../2

1415 DRVILLE ROAD, SUITE 201, OTTAWA, ONTARIO, K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

3- Yes, we do not have the knowledge to ascertain the nature of the leak (s). This will only be concluded when the stone protection and geotextile will be removed and the adequacy of the watertight joint between the liner and the pipe will be uncovered and checked carefully at both locations.

4- The sewage working volume is now fully discharged. Mr. Casselman from Cruickshank Construction Ltd. was informed of this situation and will program his mobilization as soon as possible.

5- As previously noted in our letter of October 9th, 2002 to the municipality, all parties involved including yourself will in informed on the proposed remedial plan to permanently correct the leak (s). The method of correction will be confirmed prior to initiating the work.

6- There is no dresser couplings on the discharge piping as indicated on the "As-Constructed" drawings because a PSX positive seal gasket was used instead. Please refer to the attached shop drawing approved March 17th. 2000. We will make the necessary modifications to the as-built plan.

7- The leakage into the outlet chamber will be checked after the lowering of the sewage liquid of cell no. 2.

8- The ladder rungs located in the outlet chamber will be repaired by the Contractor.

.../3

9- The open joints on the transfer pipe for the future cell will be reinstated by the Contractor using joint restrainers to prevent any lateral movement caused by freezing and thawing cycles.

10- Duties of Consulting Engineering as per agreement for projects no. 51-0048-01 and 50-0062-01 duly signed December 11th, 1997; Article 1, (n) refer to mylar for as-constructed drawing of the work. The client instructed our firm to supply two (2) sets of as-built plans of all the contracts. Further copies can be reproduced like a xerox copy at the printer of their choice.

11- Coordination of the work including the access to the lagoon site will be done with Mr. Jean Pierre Gélinas, the Chief Operator of the facility.

12- The cost of injecting bentonite was estimated at $1,500 per day (excluding the cost of bentonite) according to the Contractor Cruickshank Construction Ltd.

Yours truly,
**LECOMPTE ENGINEERING LTD.**

Gaëtan Beauchesne, P.Eng.

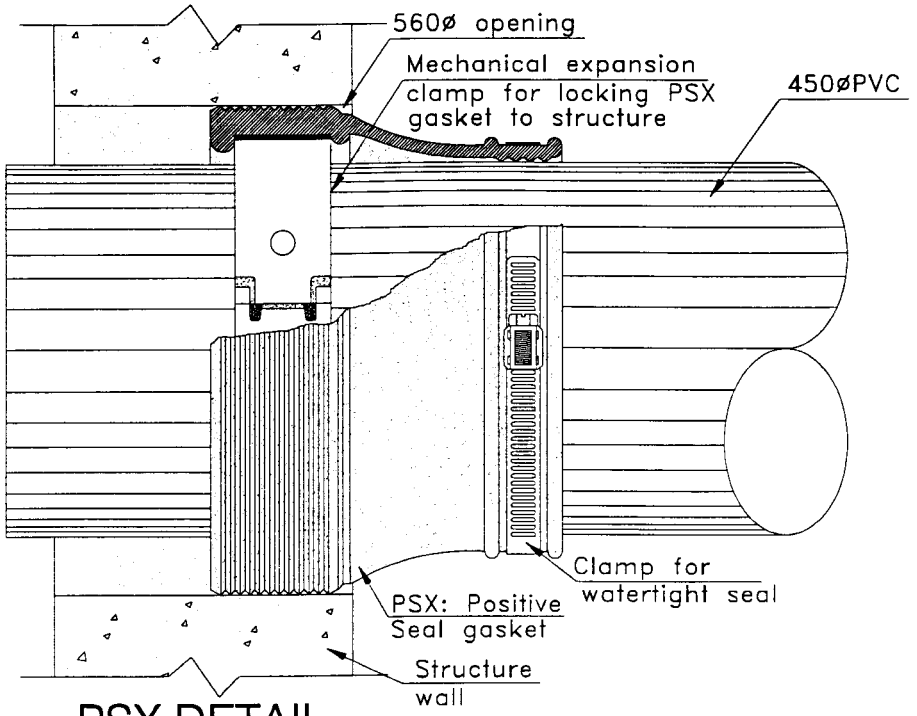
GB/sk

Encl.

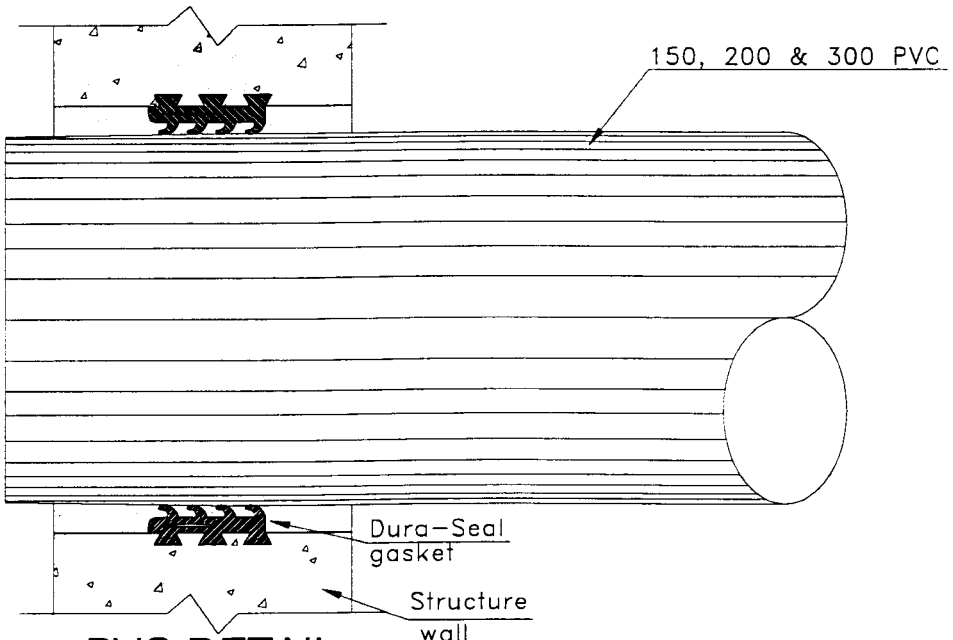
c.c. Mary McCuaig, Clerk, the Nation Municipality
Joseph Rybak, P.Eng., OCWA
Jacques Breen, OCWA
J.P. Gélinas, Operator, OCWA
Marc Robert, MOE Cornwall

52054-ltr.pln

M-CON PRODUCTS INC.
2150 Richardson Rd.,
Carp, Ontario, K0A 1L0
Tel:613-831-1736 Fax:613-831-2048
www.mconproducts.com




PSX DETAIL




PVC DETAIL

| NO. | REVISION | DATE | BY | APPROVED | DATE |
|---|---|---|---|---|---|

CONTRACTOR:
CRUICKSHANK CONSTRUCTION
HWY. 2 EAST
MORRISBURG ONTARIO

JOB NAME: LIMOGES CONTRACT 4

PSX & PVC GASKET DETAILS

DWG. NO.: 200025-G

| | |
|---|---|
| DRN. BY: | C.O. |
| CHK. BY: | |
| DATE: | 03/07/00 |
| SCALE: | N.T.S. |

*MANUFACTURING ONLY*

# LECOMPTE ENGINEERING LTD.

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

**LECOMPTE ENGINEERING LTD.**
**1417-C CYRVILLE ROAD**
**SUITE 201**
**OTTAWA, ONTARIO**
**K1B 3L7**
**TELEPHONE: (613) 236-6662**
**TELEFAX: (613) 236-2945**

NOV 13/02

**TELEFAX COVER LETTER**

**DATE:** November 13, 2002

**TO:** **(Attention)** Jacques Breen, Operations Manager

**(Company)** OCWA
**(Address)** Lefaivre, Ontario

**(Fax)** (613) 679-4735

**Regarding and/or Special Instructions:**
The Nation Municipality - Village of Limoges
Limoges Sewage Lagoon Repairs

Please see the attached Resolution #671-2002 regarding the above noted project...

c.c. Joseph Rybak, P.Eng., OCWA

NOV 13/02

**Our Project Number:** 52054

**FROM:** Jacques Lecompte, P.Eng.

**Total Number of Pages:** 2 **(including this cover page.)**

**Original will follow by mail:** **Yes_____ No_X___**

**If transmission is incomplete, or you are experiencing difficulties, please contact the person indicated below at (613) 236-6662.**
**Sent by:** Shelley

# APPENDIX II

## Minutes of Meeting dated October 7th, 2002

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

1417-C CYRVILLE ROAD., SUITE 201, OTTAWA, ONTARIO K1B 3L7
TEL (613) 236-6662 FAX (613) 236-2945

# MINUTES OF MEETING

**DATE:** October 7, 2002

**LOCATION:** Limoges Water Treatment Plant

**PREPARED BY:** Mark Lecompte

**PROJECT:** Village of Limoges-sewage lagoon

**FILE NO:** 52-054 ✓

**PURPOSE:** Remedial work due to various leaks in sewage lagoon

**PRESENT:**

Jacques Breen, Operations Manager, OCWA
Jean-Pierre Gélinas, Limoges Chief Operator, OCWA
Daniel Laflèche, Operator, OCWA
Mike Casselman, Project Manager, Cruickshank
Marc Robert, Senior Environmental Officer, MOE Cornwall
Gaetan Beauchesne, P.Eng. LEL
Mark Lecompte, LEL

**COPIES TO:**

All present
Mary McCuaig, Clerk, Nation Municipality
Joseph Rybak P.Eng., Project Manager, OCWA

FORM 101

Note Any errors or omissions should be reported to LECOMPTE ENGINEERING LTD

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS
INGÉNIEURS CONSEILS



DATE October 9, 2002

DOSSIER 52-054

| Items discussed: DÉTAILS | ACTION À PRENDRE PAR |
|---|---|

1) **Correspondence concerning Emergency repair to Lagoon:** Preamble: The purpose of the meeting is to make preparations to effect repair work at at the Limoges sewage Lagoon. The operators have noticed various leaks at 1) the outfall chamber and at 2) the transfer chamber at the east of cell no. 2 at midspan. Correspondence related to these remedial works is to be forwarded to the following persons.

a) Consulting Engineer: Gaetan Beauchesne, P.Eng.

b) Nation Municipality: Ms Mary McCuaig, Clerk

c) OCWA: Jacques Breen, Operations Manager and JP Gélinas, Chief Operator.

d) Contractor: Mike Casselman, Project Manager Cruickshank

e) MOE Cornwall: Marc Robert, Senior Environmental Officer

2) **Notification to concerned bodies:** The MOE Regional Director would have to be notified should it be necessary to go to condition 1.3 of the C of A. We would like to avoid this possibility if possible.

3) **Site supervision staff:**

a) Mark Lecompte will be the Consultant's site inspector.
b) The Contractor's superintendant will be confirmed later.
c) The site representative from the various subcontractors such as Marathon Drilling, Sewermatic and the membrane supplier Solmax are To be determined.

4) **Documents:** Contract Drawings and Shop drawings that are relevant to problem areas will be kept on site for reference.

FORM. 102A

| DÉTAILS | ACTION À PRENDRE PAR |
|---|---|

5) **Access to site:** a) Gate keys have been passed to Mark.
b) Plan of routes to site will be forwarded if need be.

6) **Potential Sub-Contractors:**
Geo-membrane work: Solmax, Richard Nadeau
Possible bentonite injection which is a quick Drying expanding type of cement by Marathon Drilling, Bob Klatt.
Plumber, vacuum truck and tv camera inspection could be carried out by Mr. John Brulé of sewermatic and Gordon Thomas of Embrun Sanitation.

7) **Plan of Action and Work Procedure:**

One option would be to empty cell no. 2 as per C or A (approx. time, 33 days) to expose the piping between the outlet box and transfer chamber where the memorane is present. The granular material and geo-textile will be removed by hand to verify the integrity of the joints between the liner and the concrete pipe at both locations. Corrections will be carried out as necessary.

Should the joints appear to be o.k., then the injection of bentonite will be used to seal the leaks permanently at various locations down the discharge pipe. This would be considered option 2.

Safety requirements under the Ontario Health and Safety Act are to be followed.

8) **Report on Findings and Remedial work:**

A report on the findings during the remedial work will be prepared and then submitted to the concerned parties.

9) **Photographs:** Photographs will be taken of the work during the construction.

| DÉTAILS | ACTION À PRENDRE PAR |
|---|---|

10) **Sewage storage requirement for cold weather conditions:** We should be able to meet the sewage storage requirement of 1' over the outlet box when we transfer to cell no. 2.

11) **Environmental consideration:** Environmental consideration will be present for the duration of the works.

**Other pertinent notes:**

-Cell no. 1 was partially discharged last year.
-The automatic discharge system seems to be working fine.
-The dilution ratio is approximately 14:1

-Larry Kyle was the inspector on site at the time of construction. We have been in contact with him about the history of the project and where problems may have occurred.

-Mike Casselman mentioned that the cell could be lowered about half way. Afterwards, bentonite could be injected at various points on the discharge piping. The cost for this work would be about 1500$ a day excluding the cost of the bentonite.

-Currently the cell is being emptied at a rate of about 30L/s.

-Only cell no. 2 is leaking.

-Has the ground shifted around the type 2 chamber and the outlet box? This will be verified by Lecompte Engineering.

-An emergency discharge request is quite difficult to obtain. Should a request be made for condition 1.3 of the C of A, it would have to be forwarded to Brian Ward of the MOE who is the Regional Director.

-The effluent which is leaking is very clear.

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS
INGÉNIEURS CONSEILS



DATE October 9, 2002

DOSSIER 52-054

| DÉTAILS | ACTION À PRENDRE PAR |
|---|---|

-Grab samples have been taken from cell no. 2 and send to the laboratory for analysis. Results will be forwarded to the consultant as soon as they become available.

-After the meeting, the parties present headed to the lagoon site to verify the leaks first hand.

Prepared by:
LECOMPTE ENGINEERING LTD.

Mark Lecompte
October 9, 2002

# APPENDIX III

## Council Resolution # 671-2002

CORPORATION OF THE NATION MUNICIPALITY
CORPORATION DE LA MUNICIPALITÉ DE LA NATION

13.1

Type: Ordinaire

Date: Le 11 nov. 2002

Résolution No.: 671-2002

Proposée par / Moved by: R. Lecompte

Appuyée par / Seconded by: Marcel Groulx

LAGUNES DE LIMOGES

Qu'il soit résolu que Lecompte Engineering soit autorisé à coordonner les travaux de réparation avec l'entrepreneur original. Un rapport détaillé des résultats et réparations sera soumis au Conseil;

Des copies du rapport seront envoyées au département de la gestion et opération des projets de l'Agence ontarienne des eaux pour leur dossier.

LIMOGES LAGOONS

Be it resolved that Lecompte Engineering Ltd. be authorized to coordinate the repair work with the original contractor and submit to Council a detailed report on the findings and repairs;

Copies of the report shall be forwarded to OCWA, Project Management and Operation Division for their records.

VOTE:

| Pour / For | Contre / Against |
|---|---|
| | |
| | |
| | |
| | |
| | |

Cette résolution est:
This resolution is:

Adoptée / Carried: ✓
Rejetée / Defeated:
Modifiée / Amended:

DÉCLARATION D'INTÉRÊT / DISCLOSURE OF INTEREST

Nom / Name: _____
a (ont) déclaré ses (leur) intérêts, laissé son (leur) siège(s) et quitté la salle du Conseil.
Disclosed his (her, their) interest, vacated his (her, their) seat(s) and left Council chambers.

Greffière ou Greffière adjointe/
Clerk or Deputy-Clerk

[redacted]

# APPENDIX IV

## Effluent Discharge – Dilution Ratio

## 12.3 DILUTION RATIO

The minimum dilution ratio required to meet the Provincial Water Quality Objectives are indicated in Table 12.1. These dilution ratio were established in the HCR implementation study prepared by Gore & Storrie.

**TABLE 12.1**
**DILUTION RATION**

| PERIOD | DILUTION RATION | AVERAGE DAILY FLOWRATE AT CASTOR RIVER ($m^3/s$) | AVERAGE ALLOWABLE DAILY DISCHARGE FLOWRATE (L/s) |
|---|---|---|---|
| March 15-31 | 100:1 | 18 to 35 | 180 to 350 |
| April 1-30 | 100:1 | 8 to 50 | 80 to 500 |
| October 1-31 | 45.0:1 | 2.1 to 4.3 | 47 to 96 |
| November 1-30 | 13.0:1 | 4.0 to 8.4 | 308 to 646 |
| December 1-15 | 13.0:1 | 4.8 to 7.4 | 369 to 569 |

Note : Dilution ration = River flowrate at point of discharge ÷ sewage lagoon discharge rate

## 12.4 RANGE OF EFFLUENT DISCHARGE

The highest average daily discharge flowrate (646 L/s) is reached in November according to table 12.1. This flowrate is sufficient to discharge the total effluent volume stored under Phase III (i.e. 375,300 $m^3$) within 6.7 days.

The effluent discharge pipes, and the diffusers will be designed to handle the equivalent of this flowrate plus 10% (710 L/s).

A 450 mm (18") wide Parshall Flume is to be used for the following reasons :

- the maximum flowrate that can be measured by this 450 mm Parshall flume is 678 L/sec
- the minimum flowrate that can be measured the Parshall flume is 5 L/sec

# APPENDIX V

## Certificate of Approval No. 3-1820-97-986

5341.04

C of A file

Ministry of the Environment / Ministère de l'Environnement

Ontario

AMENDMENT TO CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3-1820-97-986
Notice No. 1

The Nation Municipality
#958 Route 500 West, RR #3
Casselman, Ontario
K0A 1M0

Site Location: Village of Limoges Sewage Treatment Facility
Parts 4, 5 & 6, Lot 26, Concession 6
The Nation Township, United Counties Of Prescott & Russell

*You are hereby notified that I have amended Certificate of Approval No. 3-1820-97-986 issued on May 13, 1998 for sanitary sewers, sewage pumping station and forcemains and sewage treatment facility serving the Village of Limoges in the Nation Municipality, as follows:*

Condition No. 5 of the Certificate is hereby amended to permit the construction of the following works:

Sewage Treatment Facility

- A two cell waste stabilization pond, rated at 1073 $m^3$/d average day flow, located on Part of east half of Lot 29, Concession 6 and Part of west half of Lot 26, Concession 6, having a total volume of approximately 227,600 $m^3$;
- Alum injection system consisting of two (2) chemical feed pumps each rated at 60 L/hr and two (2) 13,620 L storage tanks located in the blower/alum feed building having a footprint of 9.25 m X 7.0 m;
- Twelve (12) submerged static tube aerators in each pond cell and two (2) positive displacement blowers, one duty and one standby, each rated at 170 L/s @ 48 kPa;
- Activate carbon odour control facility consisting of eight (8) drums, four duty and four standby, and two (2) blowers all located in the Odour Control Building;
- Hydrograph controlled release system consisting of knife gates and actuators, kiosk, parshall flume chamber and direct digital controllers;
- Outfall sewer and shore discharge into Castor River;

# APPENDIX VI

## Site Diary Reports

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 1

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Tuesday, November 19th, 2002

**Weather:** -7° mostly cloudy, snow in late afternoon

**Hours Worked:** 8:00 A.M. to 6:00 P.M.

**Our File:** 52-054

---

Preamble:

The purpose of the remedial works is to repair three (3) leaks that were observed at the Limoges sewage lagoon. One leak is at the transfer chamber on the east berm of cell no. 2 at midspan of the access road where the pipe passes through the berm for a future lagoon cell. The other leak is at the outlet chamber somewhere along the outlet pipe. This in turn, leaks around the outlet chamber and then around the 600mm dia. concrete discharge pipe. It is believed that the leaks may be where the pipes intersect the polyethylene liner which was installed around the perimeter of both cells. The liquid was discharged from cell no. 2 as per the C of A in order for the works to take place. Cell no. 1 is therefore being filled and we can ascertain that both leaks originate from cell no. 2 since there is no present leakage now, as we are set to begin the works.

Crew: 1 foreman (Hubert Casselman)
3 labourers

The contractor for the remedial works is Cruickshank Construction from Morrisburg, and he mobilized on site today. He was also the general contractor on this contract for the Limoges sewage treatment project. The work began by removing the rip-rap stone up to the HDPE liner at two locations and the placing of hay bails and sand bags to build a dyke.
Clear polyethelene sheets were placed on the outside of the 'hay bail' dyke and granular



1417-C CYRVILLE ROAD., SUITE 201, OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

material was placed over the plastic to hold it in place. The plastic is essential to help make the dyke impermeable even though it is probably inevitable that there will be some form of leak in these dykes. 5' long stakes were planted into the bails of hay and the clear plastic was nailed to them laterally.

The day was spent building these two dykes. The dyke at site 1 was worked on until 3:40 in the afternoon. Site 2 where the dyke is of smaller size, was worked on until at 6:00 P.M.

Another problem which was brought to our attention is the 450mm dia. discharge pipe which has buckled under the effects of the freezing and thawing in the lagoon cell. Elevations on the pipe were taken and are as such:

1 2.272 top of pipe @ beginning of berm
2 1.945 top of 'balooned' pipe
3 2.127 top of pipe at beginning of discharge line

Note: the elevations shown on the pipe are not geodetic

1 - 2 = 0.327m difference

3 - 2 = 0.145m difference

The outfall pipe will therefore have to be lowered.
These elevations were checked at 4:15 P.M.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 5, 2003

52051-sit.in1

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 2

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Wednesday, November 20th, 2002

**Weather:** -3° mostly cloudy

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers

The day was spent completing the sandbag, polyethelene and hay dykes at both locations (interconnecting chamber type 2 and outfall pipe) in order to de-water the area where the pipe crosses the berm through the HDPE liner. Minor leaks remain in the dykes therefore a sump pump will be needed during the duration of the works. The stone protection located on the inside face of the berm as well as the geotextile membrane were being gently removed by hand and, therefore, this operation was time consuming.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 5, 2002

52054-sit.in2

1417-C CYRVILLE ROAD., SUITE 201 OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 3

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Thursday, November 21st, 2002

**Weather:** -1° sunny periods

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers

The work today involved touching up the hay dykes at both leak locations (interconnecting chamber type 2 and outfall pipe). The pipes are now being exposed and we shall be continuing to clear the material around the pipe to verify the area where the pipe passes through the polyethelene liner at the first leak. The liner will not be present at the outfall pipe, since the liner is on the outside perimeter of both cells.

The 600mm dia. discharge pipe has a horizontal bend in it. Part of the day was spent removing fill underneath it to stabilize the slope of the pipe. This operation may take a few days as the progress of the work is time consuming.

A Cat shovel was mobilized on site to remove sections of the 600mm dia. concrete pipe near the outfall chamber for future cell.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 5, 2002

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 4

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Friday, November 22nd, 2002

**Weather:** 5° rain

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers
1 shovel & operator

The pipes at both areas are now pretty cleared of any material and we can see where the pipe passes through the liner. The integrity of the joint is fine and there is no leak through the area near type 2 chamber. However, where the HDPE liner ends near the bottom of the cell, liquid is seeping thoroughly. Without knowing exactly where the leak is occuring at the two sites, it is probably following the stone trench of the pipe and then leaking around the chambers. Therefore, the best alternative is to inject bentonite at various points along the pipe up to the interconnecting and outfall chambers.

A representative from Marathon Drilling came on site in the afternoon to verify the site and discuss these options with us. His crew is scheduled to be on site Monday, November 25, 2002.

The 600mm dia. PVC discharge pipe continued to be lowered by the crew. We have stabilized the slope of the pipe towards the outfall chamber.



1417-C CYRVILLE ROAD, SUITE 201, OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

Three sections of the 600mm dia. concrete pipe near the outfall chamber for the future cell were removed today and stored along the fence for future use. The cap was re-installed and secured with galvanized angles and anchor bolts.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 6, 2002

52054-sit.in4

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 5

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Monday, November 25th, 2002

**Weather:** -7° sunny

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers
1 shovel & operator

The outfall discharge pipe now has a proper slope on it towards the outfall chamber. Two concrete collars or ballasts were poured this morning to secure the pipe in place. The concrete quantity is 3 cubic meters and the strength is 25 Mpa.

The crew from Marathon Drilling did not come on site as predicted. We are awaiting them.

Work continued on keeping the de-watered areas clear; especially where the pipe meets the HDPE liner.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 6, 2002

52054-sit.in5

1417-C CYRVILLE ROAD, SUITE 201, OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 6

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Tuesday, November 26th, 2002

**Weather:** 1°, cloudy with sunny periods

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers
1 shovel & operator

Two holes were excavated or one at each location for the drillers depending on how they plan to inject the bentonite. They have not come on site yet and we are still awaiting them. Grades were staked on site to ensure that the point of injection of the bentonite is below the outfall sewer pipe and interconnecting pipe. Work on the ladder of the Parshall Flume chamber was carried out last Friday and verified by me today.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 6, 2002

52054-sit.in6

1417-C CYRVILLE ROAD., SUITE 201, OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 7

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Wednesday, November 27th, 2002

**Weather:** 2° mostly cloudy

**Hours Worked:** 8:00 A.M. to 5:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers
1 shovel

Marathon Drilling has still not shown up on site. Most all the work has been performed and we are awaiting the arrival of the drillers for the bentonite injection.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 9, 2002

52054-sit.in7

**LECOMPTE ENGINEERING LTD.**

CONSULTING ENGINEERS - INGÉNIEURS CONSEILS

# SITE DIARY REPORT No. 8

**Owner:** Nation Municipality

**Project:** Repairs to leaks in Sewage Lagoon - village of Limoges, Ontario

**Contractor:** Cruickshank Construction

**Date:** Saturday, November 30th, 2002

**Weather:** 1° mostly cloudy

**Hours Worked:** 9:00 A.M. to 6:00 P.M.

**Our File:** 52-054

---

Crew: 1 foreman (Hubert Casselman)
3 labourers
1 shovel & operator
3 drillers (Marathon Drilling) + project manager for one hour

Marathon Drilling mobilized on site and spent the day filling 4 drill holes with bentonite grout. There were two (2) drill holes for each location. These injection points are shown on the revised contract drawings. Seven (7) bags of bentonite grout were used for the drill holes and twenty (20) bags of hole plug were used in the areas where the outfall and interconnecting pipes reach the berm or the HDPE liner at the inside toe of the berm. This materal (hole plug) expands to 4 times its size and should add an extra protection to secure the leaks.



1417-C CYRVILLE ROAD., SUITE 201 OTTAWA, ONTARIO K1B 3L7 - TEL. (613) 236-6662 FAX (613) 236-2945

The drill holes were drilled up to the depth of the underside of the interconnecting pipe and the outfall pipe near the outfall chamber. While the injection of bentonite was taking place, traces of the bentonite material could be seen at the de-watered dyke areas where the pipes are present. This is a good sign that we may have a sealed area.

Work began on the dismantling of the dykes at these two areas.
Work was finalized at 6:00P.M.

Prepared by:
**LECOMPTE ENGINEERING LTD.**

Mark Lecompte
December 9, 2002

52054-sit.in8




Construction of dyke
to isolate pipe @
type 2 Chamber

Nov. 19 '02


Construction of dyke
to isolate pipe @
type 2 Chamber
Nov. 19 02


Pipe @
type 2 chamber
Nov. 20 02


dyke @ type 2 chamber
Nov. 19 02


Pipe through liner
@ type 2 chamber
Nov. 25 02


Pipe from future
cell near outfall
chamber
Oct. 7 '02


3 sections
of pipe removed
& stored along
fence
Nov. 22 '02

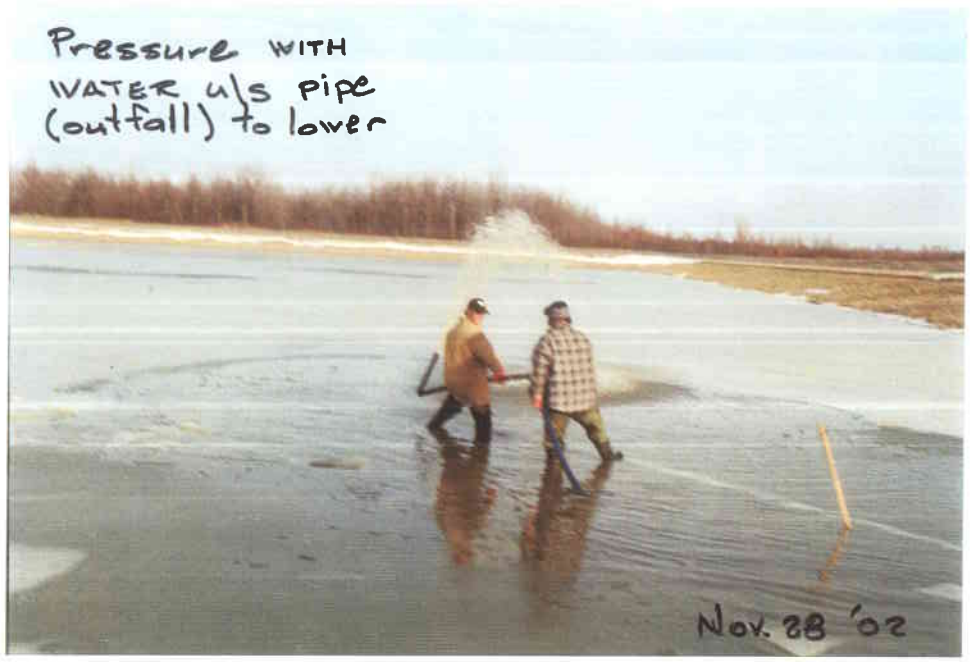

Pipe from
future cell
near outfall
chamber
Oct. 7 '02


Cap replacement
with L & A. Belts
@ outfall chamber
Nov. 22 '02

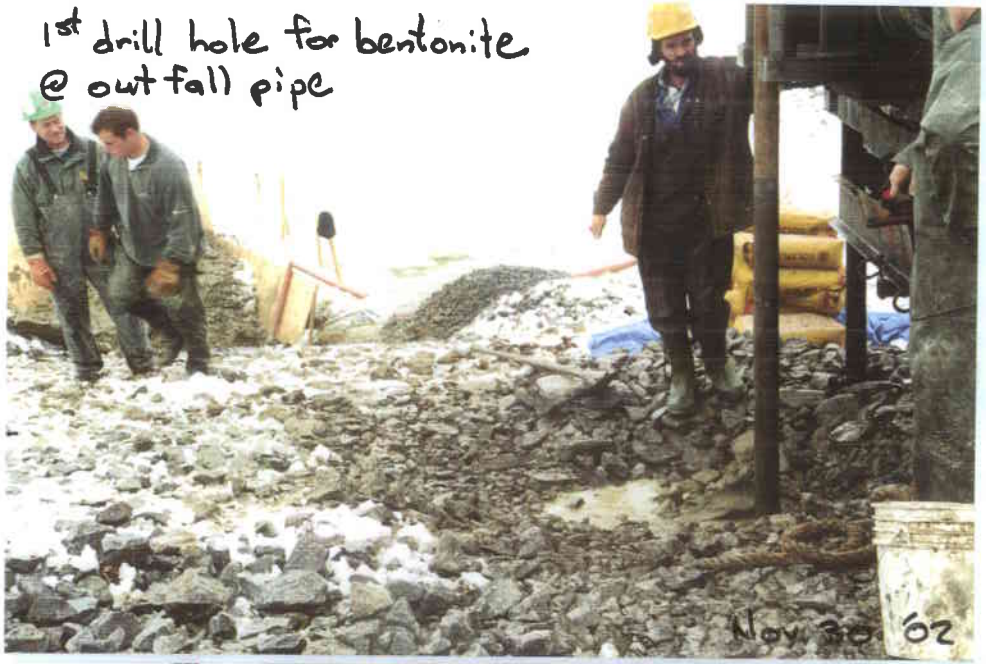

Removing Rip-Rap
to expose outfall
pipe @ leak 2
Nov. 27 '02


Removing fill
under outfall
pipe to lower
Nov. 22 '02


Removing
Rip-Rap
@ leak 2
Nov. 27 02


Pressure WITH
WATER u/s pipe
(outfall) to lower
Nov. 28 '02


Drilling equipment
for 1st hole
@ outfall chamber
Nov. 30 '02


1st drill hole for bentonite
@ outfall pipe
Nov. 30 '02


2nd drill hole
for bentonite
@ outfall ch.
Nov. 30 '02


Adjusting
drill @
hole 2, outfall
chamber
Nov. 30 02


Mixing of bentonite

Drill hole 1 for bentonite @ type 2 chamber



type 2 chamber reinstated


Dyke @
outfall pipe


Dyke @ outfall
pipe + outfall pipe
Nov. 21 '02


Conc. ballasts
@ outfall pipe
Nov. 29 '02


Dismantling
of dyke
outfall pipe
@ proper grade
Nov. 30 '02