

Schedule C – Notice of Completion
City of North Bay
Merrick Landfill: Leachate Management

Pursuant to the Municipal Class Environmental Assessment
As established by the Municipal Engineers Association

The City of North Bay has completed a Class Environmental Assessment – Schedule C Process – to develop a Long Term Leachate Management Plan for the Merrick Landfill Site. The Merrick Landfill Site is located approximately 20 km north of urban North Bay on Sand Dam Road. This Remedial Action Plan became necessary after exceedence of Water Quality Objectives in the Little Sturgeon River were detected in 1999. The development of the management plan has been overseen by a Steering and Liaison Committee made up of known stakeholders. This Notice commences a 30-day public review of study findings and the process followed. An Executive Summary of the Environmental Study Report has been placed on the City of North Bay Web Site at www.city.north-bay.on.ca. Full ESR documentation can be reviewed at:

Drafting Department
Engineering and Environmental Services
3rd Floor, North Bay City Hall
200 McIntyre Street East
North Bay, Ontario

Monday to Friday 8:30 AM to 4:30 PM

The Environmental Study Report recommends that leachate be collected and pre-treated before leachate is release to the natural environment for polishing through natural attenuation. The study recommends that collection and pre-treatment of leachate from the existing landfill be implemented as soon as possible at a cost of \$4 million and that collection and pre-treatment of leachate from future landfill activity be phased over the balance of the life of the landfill (approximately 20 years) at an estimated cost \$6 million.

If you wish to comment on the final recommendations, written comments must be filed with the City Engineer within 30 days of the date of this notice. If concerns regarding this project cannot be resolved through discussions with the municipality, a person may request that the Mnister of Environment and Energy make a order within the provisions of Part II of the Environmental Assessment Act (referred to as a Part II order). The Minister of Environment and Energy must receive requests for a Part II order, at the address below by July 8th, 2002. If no request for a Part II order is received by July 8th, 2002 it is the City of North Bay intention to proceed to implement the recommendations embodied in the Environmental Study Report.

Minister of Environment and Energy
135 St. Clair Avenue West, 10th Floor
Toronto, Ontario, M4V 1P5

This Notice is issued on Saturday June 8th 2002.

John Simmonds, P Eng
City Engineer
City of North Bay
P. O. Box 360 North Bay On.
P1B 8H8

City of North Bay

Merrick Landfill:

Leachate Management Plan

Environmental Study Report – Executive Summary

Prepared by: City of North Bay

May 31, 2002

Merrick Landfill: Leachate Management Plan

Environmental Study Report – Executive Summary

Introduction:

The Merrick landfill, located 21 km north of the City of North Bay, accepts waste generated by the City of North Bay, Township of North Himsforth and several unorganized townships surrounding the landfill site. Like other cities, the majority of the waste generated in the landfill catchment area is putrescible, including food residues, paper, yard and household wastes, and wood etc. When these materials degrade within the landfill, their decay releases various inorganic and organic chemicals. At the same time as waste is decaying, water from precipitation infiltrates the landfill surface and percolates through the waste. The percolating water becomes enriched with the dissolved minerals and organics to produce a liquid termed “leachate”. A typical leachate will have relatively high concentrations for a wide range of minerals and compounds, as compared to natural ground water.

The Merrick Landfill has been approved as a natural attenuation site, which means that leachate is allowed to leave the landfill site, with renovation or attenuation of contaminants to achieve acceptable levels of contamination at the property line of the site. Attenuation occurs in the ground water and in a surface water-mixing zone on landfill property. The mixture of leachate and natural ground water, termed “leachate plume” travels along the ground water flow path in the soil. At the Merrick Landfill, the underlying soils are sandy in nature, distributed as various layers including gravelly sand and sand, as well as finer sands and silts. It was anticipated that the leachate plume would discharge to, and mix with, a surface water receptor, which is the Little Sturgeon River, located about 550 m from the edge of the waste fill area.

The discharge of the leachate plume to a surface water receptor can be considered acceptable provided that leachate concentrations are reduced to a specified level based on the Ontario Provincial Water Quality Objectives. When leachate flows through the subsurface, chemical concentrations decrease as a result of a variety of physical and chemical processes, collectively known as “natural attenuation”. Attenuation processes include dilution with “clean” ground water, bacterial degradation, chemical precipitation and absorption onto soil grains physical filtering by soils and mixing with surface waters. Monitoring of ground water quality, surface water quality and aquatic habitat in the Little Sturgeon River, and comparison of that information against prescribed “trigger levels” is an integral part of the operation of a natural attenuation landfill site.

At the Merrick Landfill, some of the leachate, predicted to travel through the subsurface, and to be attenuated en route, has short-circuited and has surfaced as seeps to ground surface starting approximately 100 m west of the waste fill area and from point further west. This seepage was not anticipated in the original evaluation and design of the landfill site. Upon emerging at surface, this partially renovated leachate flow rapidly overland to reach the Little Sturgeon River. When this partially renovated leachate mixes with the river water, there can be a decline in the river water quality. During most of the year, river flows are sufficient to dilute this partially renovated leachate to within the Provincial Water Quality Objectives. The City however detected that exceedences were occurring during low flows. A collection/pumping and infiltration system, installed in 2000 and operational as of May of 2001, is temporarily diverting and infiltrating the partially renovated leachate to allow for a permanent solution to be devised and implemented. This temporary solution continues to rely on attenuation.

The City of North Bay has retained the geoscience and engineering consulting firms of Jagger Hims Limited and Henderson, Paddon Environmental Inc. respectively to develop both short-term and long-term management solutions for this leachate seepage problem. Extensive review and assessment of site conditions, including seep flow measurements, hydrogeologic assessments, water quality sampling, interpretation of leachate plume measurements, hydrogeologic assessments, interpretation of leachate plume location and strength, and a review of historical documentation has been performed. A Management Strategy with preferred options has been devised from the technical assessment, Steering Committee input and from public input.

The preferred long-term leachate management solutions are described below. The selection of the preferred solution for the Merrick Landfill Site has met criteria for approval pursuant to the Environmental Assessment Act. The current studies have been completed under the general requirements of a Schedule C Class Environmental Assessment Process for Municipal Projects.

This ESR Executive Summary is supported by extensive technical documentation including a report summarizing the planning process that was completed, the results obtained from points of public contact and direction that has been provided by the Steering and Advisory Committees (which have functioned as one committee) and by North Bay City Staff. This ESR is being filed for a 30 day public review which will be initiated by the Issuance of a Notice of Completion to be publicly advertised in the local media. Any member of the public or any agency has the right to request a Part II Order, within the 30-day review period. Requests for a Part II Order must be made in writing to the proponent (City) and to the Minister of Environment and Energy and must be received within the review period. A copy of the Notice of Completion with specific appeal instructions is appended to this report.

Problem Statement:

“The City of North Bay must undertake remedial action to deal with the leachate exceedances at the Merrick Landfill Site as a result of four consecutive exceedances of Provincial Water Quality Objectives for Iron as measured in the Little Sturgeon River at the point of discharge from the City’s property (Water Quality Monitoring Station SW-P) in violation of Certificate of Approval A 530116 Section 27 (6) ii).”

Section 27 (6) ii) of Certificate of Approval A 530116 states:

“Notwithstanding clauses 27 (5b and c) above, where there are four consecutive exceedances at SW-P of Iron or Phenolics at levels exceeding PWQO or background (where background exceeds PWQO) and these exceedances are accompanied by aesthetic degradation and where reasons for the exceedance is contamination originating from the landfill, remedial action shall be required and revised impact predictions and an assessment of the need to implement remedial measures are not required. In this case, the implementation schedule may not be made contingent on the results of further surface water sampling.”

Four consecutive exceedances of PWQO for Iron were recorded at monitoring site SW-P on August 11th, Sept 15th, 21st and 28th, 1999 while investigating C. of A. exceedances at the same location.

Recommended Remedial Action Plan:

The Recommended Remedial Action Plan is to collect and treat the leachate to achieve a high level of remediation and to return the treated leachate effluent to the groundwater regime for final polishing. The Remedial Action Plan preserves the natural attenuation principle that the site was originally designed to meet with enhancement through leachate pre-treatment.

Collection techniques to be employed will utilize two different strategies. For the existing landfilled area (Cells 1 and 2 and the northern half of 3 and 4) a system of purge wells at the western perimeter of the Cells 2 and 4 will intercept leachate moving through the ground water regime through a groundwater pumping system (see Figure 1). Leachate will be collected from the balance of the landfill through the installation of a clay liner, if a feasible source of clay can be identified, or a synthetic liner complete with lateral collection to a pumping system.

A strategy to reduce volumes of leachate collected will be completed by progressive capping of landfill portions reaching final contours with a silty clay material that will allow water penetration at a controlled rate and by reducing the volume of groundwater that flows to the purge well system through drainage improvements and groundwater flow interruption techniques on the east side of landfill adjacent to Cells 1, 3, 5 and 7.

Leachate treatment will be achieved using a piloted Waterloo Biofilter that is demonstrated to provide treatment equivalent to treatment achieved by the same technology used at Nottawasaga Landfill site, or in default of demonstrating adequate biofilter performance, using an evaporation technology, also to be piloted to achieve a high level of treatment. The leading evaporation technology is the Atlantis Autoflash technology owned by Donson Engineering of North Bay. The trucking of leachate to the North Bay Sewage Treatment Plant for treatment will not be used as a permanent treatment method but may be used as a temporary or gapping treatment option when the selected primary treatment system is not operational due to repairs or maintenance work. It should be noted that the evaporation technology has no effluent disposal but instead has a residue management strategy.

On site storage will be provided to hold a minimum of 1-day worth of leachate at maximum capacity for the entire wastewater volume generated. The short-term collection/pumping/infiltration system will be left in place indefinitely and will continue to operate to polish the leachate that gets past the purge well system (purge wells are estimated to be 75% effective). The volume of leachate that is expected from the unlined portion will be reduced when the final cap is installed. Treated effluent will be disposed of in a shallow infiltration trench located adjacent to the landfill on the west side and north of the site to permit final polishing through natural attenuation. The City will evaluate the use of methane captured from the landfill site to enhance the performance of the Biofilter to treat raw leachate or to provide cost efficiencies in the operation of the evaporation technology.

The performance of the recommended strategy in combination has been calculated to meet effluent criteria at the City property line (SW-P).

The quantities of leachate to be produced can be summarized as follows:

Maximum Volume of Leachate

1. Lined portion of landfill area after all cover is complete 0.5 L/sec
2. Lined portion of landfill area before final cover is complete 0.8 L/sec
3. Unlined portion of landfill collected with Purge Wells 4.8 L/sec

Total Volume used for Treatment and Storage Calculations 5.6 L/sec*

* This total represents the maximum volume of leachate derived from the lined portion of landfill maximum plus the value from the unlined portion of the landfill.

Table 1: Remedial Action Plan Components – Financial Analysis

Project Component	Total Capital Cost	Annual Operating Cost
- Purge Wells (6) for Unlined portion of site	\$ 104,500	\$ 14,200
- Storage for 1 day (415 m3)	\$ 100,000	\$ 0
- Waterloo Biofilter Treatment System for Purge Well leachate	\$ 2,468,000	\$ 178,000
- Infiltration Trench for Purge Well leachate treated in Biofilter	\$ 304,000	\$ 6,000
- Pumping Station/force main for Purge Wells	\$ 150,000	\$ 2,700
- Capping of Cells 1, 2, & N1/2 of 3 and 4	\$ 430,000	\$ 0
- Upgrades to short term Pumping Station	\$ 50,000	\$ 0
- Drainage Works and Groundwater Cut off wall	\$ 200,000	\$ 1,000
- Expanded Monitoring Network	\$ 100,000	\$ 20,000
- Design Engineering and Consulting	\$ 100,000	\$ 0
Sub Total – Existing Site	\$ 4,006,500	\$ 221,900
- Excavation of Organics in Cells 3,4,5,6	\$ 100,000	\$ 0
- Preparation of Sub grade for Liner*	\$ 568,000	\$ 0
- Lining of all Future Cells (S½ 3, 4 + 5,6,7&8)*	\$ 1,800,000	\$ 0
- Collection System	\$ 467,000	\$ 0
- Storage for 1 day	\$ 24,000	\$ 0
- Waterloo Biofilter Treatment System for Lined Site leachate with PS	\$ 900,000	\$ 135,500
- Methane recovery system	\$ 250,000	\$ 20,000
- 925 m of shallow disposal trench and PS	\$ 151,000	\$ 18,000
- Capping of Cells S½ 3, 4 + 5,6,7 & 8	\$ 670,000	\$ 0
- Pilot Testing of Biofilter/Evaporator	\$ 100,000	\$ 0
- Design Engineering and Consulting	\$ 100,000	\$ 0
Sub Total – Future Landfill	\$ 5,130,000	\$ 173,500
Contingencies	\$ 900,000	\$ 0
Total Cost (excluding financing costs)	\$10,036,000	\$ 354,400

* These costs reflect the cost of placing a composite Geosynthetic Clay Liner (GCL)/ High Density Polyethelene (HDPE) liner on the base of future landfill cells. The preferred solution is to find a suitable local source of clay and to replace the GCL/HDPE liner with 0.9 m of clay that has a maximum of 5×10^{-8} cm/sec hydraulic conductivity.

Monitoring and Certificate of Approval Implications

The existing Merrick Landfill Site Certificate of Approval has a staged monitoring program that increases as the landfill site expands. There are ground and surface water monitoring programs that must be undertaken each year and there are set trigger levels set for both ground and surface water quality. Results of the annual monitoring program are documented in annual reports. If exceedences of trigger parameters are observed there are verification and reporting criteria established in the Certificate of Approval that the City must follow to report findings to the Ministry of Environment and/or the public.

Surface Water evaluation includes analysis of surface water chemical and physical properties as well as fisheries, aquatic insects and aesthetics. This monitoring, assessment and reporting criteria has proven itself to work by compelling the City to identify the above remedial action plan once the potential impact from natural attenuation was recognized from actual field data and before serious environmental damage could occur. The Certificate of Approval continues to apply to the Merrick Landfill Site and will ultimately determine if the proposed remedial action plan is successful. If it is not the City will again have to study any problem encountered and devise additional strategies to deal with landfill impacts to the surrounding environment. The monitoring program will be expanded to monitor the water chemistry of raw leachate and treated leachate and to monitor quantity data to determine treatment effectiveness. New monitoring equipment where required will be added to the existing and planned monitoring network to assess potentially new impacts from shallow infiltration trench disposal of effluent.

Implementation:

The purge well collection system and treatment together with capping of the existing site and related drainage improvements should be implemented as soon as possible. The existing collection and infiltration system should continue to be operated on an indefinite basis. The quantity of leachate that emanates from the existing part of the landfill and reaches the collection system should be significantly reduced with capping of the site and leachate removal through the purge well system. A decision on the need for and operational guidelines for the existing collection and treatment system should be evaluated in Annual Reports submitted to the Ministry of the Environment and Energy.

The need for collection and treatment for future parts of the landfill site can be phased in as needed. The clay liner can be added at half or full Cell widths at a time and thus the full lining of the site would not be completed for up to 15 years in the future, assuming that there is about 20 years of landfill space remaining. Similarly leachate treatment can be phased in if Biofilter treatment is proven to be effective. It is not possible to phase in Evaporation technology. Concentrated leachate that will be collected on the liner may be treated through the Biofilter set up to treat diluted leachate from the purge well system until enough quantity of concentrated leachate is generated to justify the initiation of evaporation treatment. The quantity of concentrated leachate will be small in proportion to dilute leachate. The evaporator would only operate periodically after initial installation until sufficient quantities of leachate were generated to warrant full time operation.

An anticipated implementation schedule is provided in Table 2 below.

Full conceptual design, costing and an evaluation of the effectiveness of all alternative considered are presented in supporting documentation prepared by Jagger Hims Ltd and Henderson Paddon Environmental which are available at North Bay City Hall, 3rd Floor – Engineering and Environmental Services Department – for review.

Table 2: Anticipated Timing for Implementation of Merrick Landfill Leachate Collection and Treatment System

Project Description	2002	2003	2004	2005	2006	2007	+2008
Detailed Design and Engineering	X						
Pilot Testing of Waterloo Biofilter	X						
Drainage Improvements	X	X					
Improvements to existing Collection system	X	X					
Capping of Existing Site	X	X					
Pilot Testing of Evaporator		X					
Installation of Purge Wells		X					
Installation of Purge Well Treatment		X					
Installation of Shallow Trench Disposal		X					
Lining of S 1/2 of Cells 3 & 4		X					
Collection System for S 1/2 of Cells 3 & 4		X	X				
Treatment System for S 1/2 of Cells 3 & 4			X				
Capping of Cells 3 & 4				X	X		
Lining of Cells 5 & 6						X	X
Collection System for Cells 5 & 6						X	
Treatment System for Cells 5 & 6						X	
Capping of Cells 5 & 6							X
Lining/Collection/Treatment Cell 7& 8							X
Capping of Cells 7 & 8							X
Methane Collection							X

Schedule C – Notice of Completion
City of North Bay
Merrick Landfill: Leachate Management

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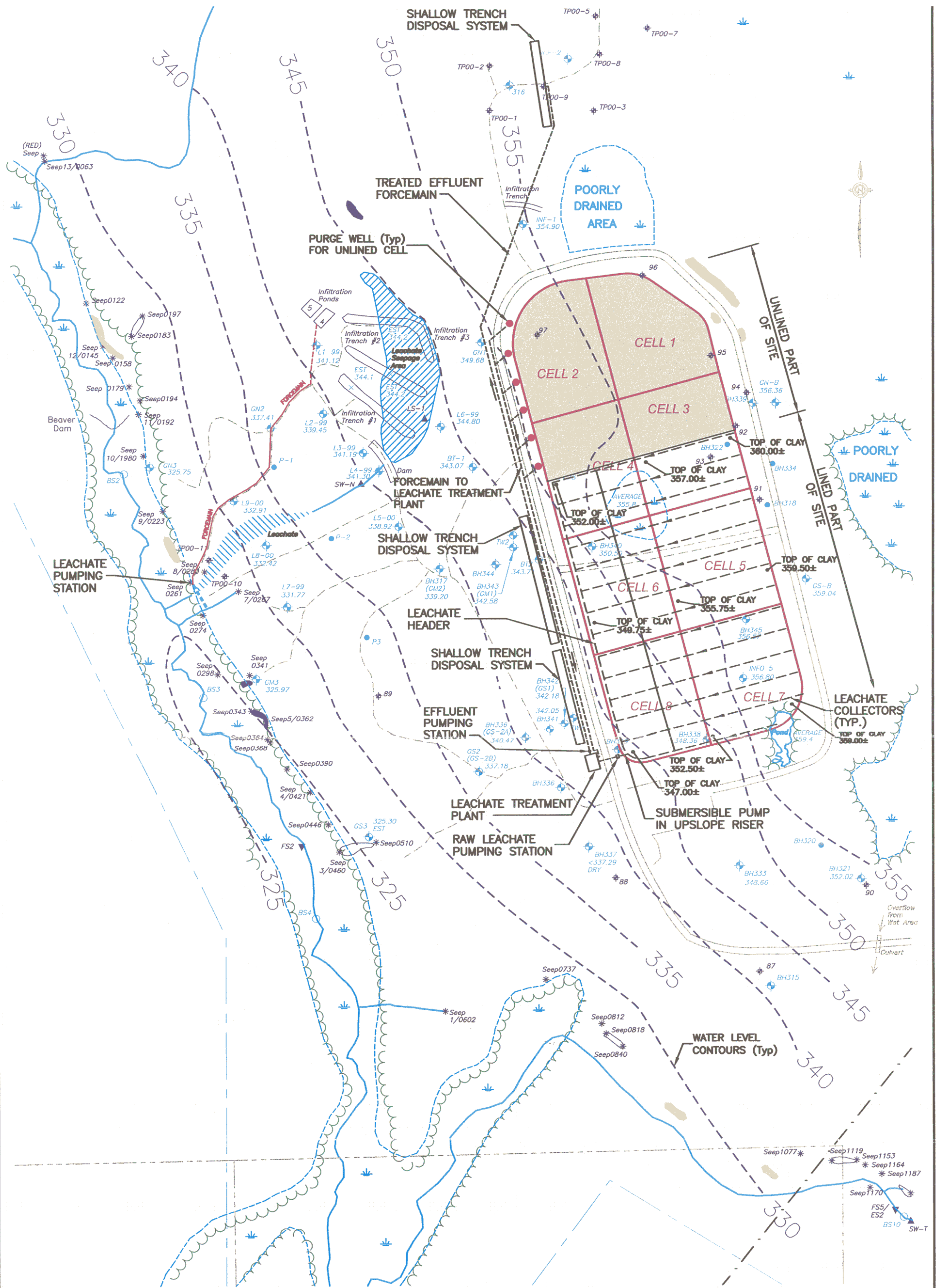
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Minister of Environment and Energy
135 St. Clair Avenue West, 10th Floor
Toronto, Ontario, M4V 1P5

This Notice is Issued on Saturday June 8th 2002.

John Simmonds, P Eng
City Engineer
City of North Bay
P. O. Box 360 North Bay On.
P1B 8H8



**PROPOSED WORKS
NORTH BAY MERRICK LANDFILL SITE**



HENDERSON, PADDON
ENVIRONMENTAL INC.
ENVIRONMENTAL ENGINEERS & SCIENTISTS
OWEN SOUND ♦ THE BLUE MOUNTAINS ♦ COLLINGWOOD
PHONE (519) 376-7612

DESIGN	F C F
DRAWN	T C G
APPROVED	F C F
DATE	27/05/02
SCALE	1 : 5000
FILE No.	100708
FIG. No.	1