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DATE 24 September 1998

TO/DEST. Coordinator
Planning and Environment Committee

FROM/EXP. Environment and Transportation Commissioner

SUBJECT/OBJET **TRAIL ROAD WASTE FACILITY AND NEPEAN LANDFILL SITE - 1997 ANNUAL MONITORING REPORT**

DEPARTMENTAL RECOMMENDATION

That the Planning and Environment Committee recommend that Council receive for information the *Final Report for the 1997 Monitoring and Operating Program* for the Trail Road Waste Facility and Nepean Landfill Site.

INTRODUCTION

In accordance with the terms and conditions of the Certificate of Approval for the Nepean Landfill Site (A 461301) and the Certificate of Approval for the Trail Road Waste Facility (A 461303), the Region of Ottawa-Carleton must submit an annual site progress and monitoring report to the Ontario Ministry of the Environment (MOE).

The *Final Report for the 1997 Monitoring and Operating Program* was submitted to the MOE. The purpose of this report is to provide information on the operational status of both the Trail Road Waste Facility and the closed Nepean Landfill Site. A copy of the Executive Summary as prepared by Golder Associates is attached as Annex A. A reference map of the sites and surrounding areas is attached as Annex B.

BACKGROUND

During 1997, the Trail Road Waste Facility and Nepean Landfill Site were in compliance with the terms and conditions of their respective certificates of approval. The 1997 monitoring and operating program report describes the monitoring, operating, and capital development activities at the Trail Road and Nepean sites during 1997.

Nepean Landfill Site

The Nepean Landfill Site began receiving waste in the early 1960's. It no longer receives waste and is closed. The site was regraded in 1991 to promote surface water run off and capping was completed in 1993. The final landscaping was completed in 1994.

The groundwater flow pattern is similar to that of previous years. The deep aquifer flows north towards the dewatering pond in the bufferland north of the Trail Road Waste Facility. The shallow aquifer flows south and west to spring-fed ponds in the bufferland. The extent of leachate migration in the deep aquifer is determined to be south of Cambrian Road on regional property. Leachate effects from the Nepean Landfill in the shallow aquifer occur west just beyond Moodie Drive and south on the Burnside property. The surface water in the upper reaches of the agricultural drain immediately west of Moodie Drive exceeds the Provincial Water Quality Objectives for ammonia and iron; however, further along the drain, prior to discharge to the Leamy Drain, all provincial surface water quality objectives are met.

Surface waters flow from the spring-fed ponds and the dewatering pond through a series of agricultural drains and eventually to the Jock River. The surface water quality southwest of the Nepean Landfill continues to exhibit minor leachate effects that are within livestock drinking water criteria. The Jock River water quality remains unaffected by surface water discharges from the closed Nepean Landfill Site.

Landfill gas migration is controlled by an active gas extraction system which was installed in 1993. The landfill gas is processed at the gas flaring station at the Trail Road Waste Facility. Data indicates that landfill gas impacts do not extend beyond the bufferlands owned by the Region.

Water supply wells on site and on adjacent private properties are no longer used for drinking water. Bottled water continues to be supplied as a precaution for staff at the landfill site and for some of the site's closest neighbours. The acquisition of additional bufferland and implementation of a remedial action plan as required by the MOE are underway as part of the regulatory closure plan. Over the years, the acquisition of several properties has been settled. The remaining properties are under negotiation and some may require expropriation and Ontario Municipal Board hearings.

Trail Road Waste Facility

The groundwater flow pattern is similar to that of previous years. The deep aquifer flows towards the spring-fed pond in the bufferland north of the Trail Road Waste Facility, known as the "dewatering pond". Leachate migration in the deep aquifer from the Trail Road Waste Facility is contained directly beneath the landfill. The shallow aquifer flows north-east and discharges as springs in the forested bufferland north of the filling area on the regional clay plain. Leachate effects in these areas are completely contained on the Region's property.

The surface waters from the dewatering pond and the springs in the bufferland forest, which flow north through agricultural and roadside ditches and eventually to the Jock River, meet Provincial Water Quality Objectives. The water quality of the Jock River remains unaffected by surface water discharges from the Trail Road Waste Facility.

In 1991, the landfill gas control system was switched from a passive venting system to an active gas extraction system that flares the gas at the flaring station. The active landfill gas extraction and flaring system continues to reduce greenhouse gas emissions. Landfill gas migration patterns are similar to that of previous years with movement south into an area where additional bufferland was acquired.

Water supply wells on site and on adjacent private properties are no longer used for drinking water. As a precaution, bottled water is provided.

The Trail Road Waste Facility received 219,879 tonnes of waste in 1997, of which 144,011 tonnes was landfilled. In 1996, the Trail Road facility received 220,165 tonnes of waste, of which 161,252 tonnes was landfilled. Based on historical trends, it is estimated that the site will reach approved capacity by the middle to late year 2006; however, these projections are likely conservative in light of current and future waste diversion options.

A permanent composting facility was built on the bufferland north of the Trail Road Waste Facility in 1994. All leaf and yard material received at the site in 1997 went to the permanent composting facility. In 1997, 16,983 tonnes of leaf and yard material and brush were received for composting. An additional 560 tonnes of commercial leaf and yard material and 382 tonnes of Christmas trees were brought to the composting facility. In 1996, 19,481 tonnes of residential leaf and yard waste were received at the composting facility. An additional 686 tonnes of commercial leaf and yard waste and 54 tonnes of Christmas trees were also received. All compost is sampled prior to leaving the site to ensure that MOE requirements are met. All of the compost produced in 1997 met the MOE requirements. The compost will be screened and sold in 1998.

The permanent Household Special Waste Depot accepted material from 11,073 vehicles in 1997 and 11,447 vehicles in 1996.

Capital and Operating Projects

The following projects were initiated or completed in 1997:

- installation of Stage 3 Interim Landfill Gas Collection System;
- installation of several new groundwater monitoring wells;
- testing of a temporary perimeter misting system for odour mitigation;
- continuation of the property acquisition program to provide bufferland, where required.

CONSULTATION

A presentation on the Trail Road Waste Facility and Nepean Landfill Site was given to the City of Nepean Public Works Committee in July 1998. A copy of the *Final Report for the 1997 Monitoring and Operating Program* for the Trail Road Waste Facility and the Nepean Landfill Site has been filed with the Regional Clerk's Department and is available for viewing.

FINANCIAL IMPLICATIONS

The monitoring program and subsequent report were prepared through a contract with Golder Associates Limited for 1997. Funds for the contract are budgeted for annually in the Solid Waste Division Operating Budget.

CONCLUSION

The Trail Waste Facility and Nepean Landfill Site continue to operate in accordance with the terms and conditions of their respective certificates of approval.

Approved by
M. J. E. Sheflin, P.Eng.

DR/PM/

Attach. (2)

EXECUTIVE SUMMARY

The Trail Road and Nepean Landfill were both in compliance with their Certificate of Approval during 1997.

The Regional Municipality of Ottawa-Carleton (RMOC) owns and operates both the Trail Road and Nepean Landfill sites. The Trail Road Landfill receives waste from most of Ottawa-Carleton.

The Nepean Landfill has not received municipal solid waste since 1980. The Nepean Landfill received final cover in 1993 incorporating an engineered geomembrane hydraulic barrier cap and active gas collection system.

The Trail Road Landfill has operated since 1980 to receive municipal solid waste. Trail Road Landfill is divided into distinct stages of operation. Stages 1 and 2 were designed based on a natural attenuation landfill. These stages were covered in 1988 and 1991, respectively, with a low permeability geomembrane cap to reduce leachate generation through infiltration. Stages 3 and 4, the approved final stages of the Trail Road Landfill, were both designed based on engineered containment and have a single composite bottom liner (clay and geomembrane) and leachate collection system. Landfilling currently takes place in Stage 3. Landfill gas is controlled at the site through an active gas collection system and flaring station for all capped stages and the closed Nepean Site. A groundwater and surface water monitoring program documents changes in groundwater and surface water quality and determines how they are being influenced by the landfill site.

OPERATIONS

Gross waste received in 1997 was 219,879 tonnes. The net amount of waste landfilled was 144,011 tonnes. Of the 75,868 tonnes of material diverted from the landfill, 57,899 tonnes was clean fill used at the site for daily and interim waste cover, dykes, roads and slopes.

As of November, 1997 the remaining theoretical air space in Stage 3 for waste material is 503,400 cubic metres. The Stage 4 design capacity is 1,920,000 cubic metres without final cover.

The estimated remaining capacity of Stages 3 and 4 is as follows:

ESTIMATED REMAINING CAPACITY OF STAGES 3 AND 4*

	Volume Remaining Below Approved Final Waste Contours (cu.m.)	**Theoretical Stage Life from January 1, 1998 (years)**	**Theoretical Completion Date**
Stage 3	503,400	1.5 to 2.0	early to mid 1999 to 2000
Stage 4	1,920,000	6 to 6.5	mid to late 2006

* Based on the 1990 development and operation plan.

The theoretical date includes the west sideslope area of Stage 3 which can only be filled on initiation of Stage 4.

Based on previous site experience, **landfilling** in **Stage 4 will likely commence** at least 12 months prior to the theoretical completion of Stage 3; that is, **by mid 1999.**

Capital works at Trail Road Landfill during 1997 included:

- Installation of Stage 3 Interim Gas Collection System
- Initiation of final design of the leachate forcemain
- Repairs to groundwater monitor M6B and installation of additional groundwater monitors
- Set-up and operation of a misting system to control odours from the Stage 3 cell.

During 1997, the **Trail Road Landfill operated in compliance** with its Provisional Certificate of Approval.

The were no operations or capital works ongoing at the Nepean Landfill Site during 1997. The only activity was:

- Selection of a consultant to design a groundwater collection and disposal system and implement the design selection

During 1997, **the Nepean Landfill was in compliance** with its Provisional Certificate of Approval.

ENVIRONMENTAL CONCLUSIONS

Leachate influence on groundwater is assessed on the basis of: 1) a physical hydrogeology approach that addresses the flow path and rate of groundwater moving in the groundwater system; 2) a chemical hydrogeology approach that addresses the alteration of groundwater quality by leachate influences. These two approaches must be combined to provide conclusive scientific evidence of influence of landfill leachate. This methodology was used to determine how surface water and groundwater quality are influenced by the landfill sites.

In the assessment of landfill influence, the study area was subdivided into discussion areas for the surface water and groundwater monitoring locations. The surface water discussion areas are shown on Figures 3.18, 3.19 and 3.20. The groundwater discussion areas are shown on Figure 3.13.

Two principal overburden aquifers, one shallow, one deep, are identified at Nepean and Trail Road Landfill sites. The groundwater monitoring program documents leachate influence in these aquifers.

Careful review of monitoring data and spatial analysis using a Geographical Information System has shown that bromide and boron are key parameters in the assessment of leachate influences at the sites. In the absence of boron and bromide, elevated chloride, alkalinity, iron, hardness, organic

carbon and nitrogen compounds in much of the groundwater near Trail Road and Nepean Landfills are attributed to manmade sources such as fertilizer, road salt and septic systems.
Upper bounds of linear groundwater flow velocity in the vicinity of both landfill sites has been determined to be in the order of several metres per year in the deep and shallow aquifer. Localized higher linear velocities of groundwater flow may occur due to increased horizontal gradients brought about by topography and geology.

The Nepean Landfill has existed since about 1960 or some 38 years, whereas Stages 1 and 2 have existed since about 1980 or some 18 years. These landfill areas are natural attenuation facilities, without engineered bottom containment. The estimated groundwater velocity, together with the age of the landfills, provides an indication of the maximum distance which leachate could have migrated in the groundwater beyond the waste. Therefore, under similar hydrogeologic conditions, leachate influences from Nepean Landfill would have migrated farther than those from Trail Road Landfill Stages 1 and 2.

The natural attenuation stages of the Trail Road Landfill influence groundwater quality in the shallow aquifer and deep aquifer. Leachate influence on the shallow aquifer extends to the north and is entirely contained on RMOC property, as the shallow aquifer pinches out to the north on RMOC property. Surface water discharge from the property to the northeast meets Provincial Water Quality Objectives (PWQO). Leachate effects on the upper part of the deep aquifer are identified directly below the landfill. Leachate effects on the deep aquifer from Trail Road Landfill have not been identified elsewhere. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities. Water quality in other areas of the deep aquifer have elevated key parameters that are not necessarily attributed to the landfill site. These areas are on RMOC property and are included in the ongoing monitoring program

Leachate effects from Nepean Landfill occur in the shallow aquifer to the west beyond Moodie Drive and south onto the Burnside property. Groundwater flow interpretation suggests that the main direction of leachate affected groundwater movement is to the west. The sand pinches out on the clay plain west of Moodie Drive and the groundwater discharges to the surface water system at this location. Exceedance of PWQO is measured at the headwaters of the surface water system for ammonia and iron. This surface water system is a series of agricultural ditches connected to Leamy Agricultural Drain that discharges to the Jock River. The total dissolved inorganic load in the surface water in Leamy Agricultural Drain is increased, however, input from leachate effects does not cause exceedance of PWQO. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities.

No effects of leachate from the Nepean Landfill are measured in the deep aquifer at monitoring locations beneath the landfill or to the west and south. Leachate effects exist to the northeast of Nepean Landfill in the deep aquifer and extend beneath the northwest corner of the Trail Road Landfill property (refer to Northwest of Trail Road Landfill Area, Figure 3.13) and are measured in the bottom portion of the aquifer. Monitors completed in the middle portion of the deep aquifer beyond the northwest corner of the Trail Road Landfill property suggest that leachate effects have not reached Cambrian Road. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities.

Dilute leachate effects at monitoring well M40 (situated within North of Trail Road Landfill Area II, Figure 3.13) in the deep upper aquifer have been measured since 1994. Based on the groundwater flow velocity and time frame of landfilling, the measured leachate influence is likely from the Nepean Landfill.
Methane generation from the Trail Road and Nepean Landfill sites continues as in previous years. Methane gas levels continue to be elevated along Trail Road south of Stages 1 and 2. However, no structures are present in these areas.

The upward trend in iron concentration in excess of PWQO at the dewatering pond was reversed and declined in 1997.

Iron concentrations in the shallow groundwater flow system are increasing in the general area between the dewatering pond and the composting facility, and could represent a future source of increasing iron in the downgradient receptor, which is the dewatering pond.

The additional groundwater monitors installed in 1997 were of great benefit in further addressing the physical hydrogeology and geochemistry at the site.

RECOMMENDATIONS

In the 1996 Annual Report, recommendations were provided for reductions to the site monitoring programs, and these revisions were approved by the MOEE. It is considered that these reductions to the programs remain justified. The monitoring program together with the technical justification are provided in Appendix N and are summarized here.

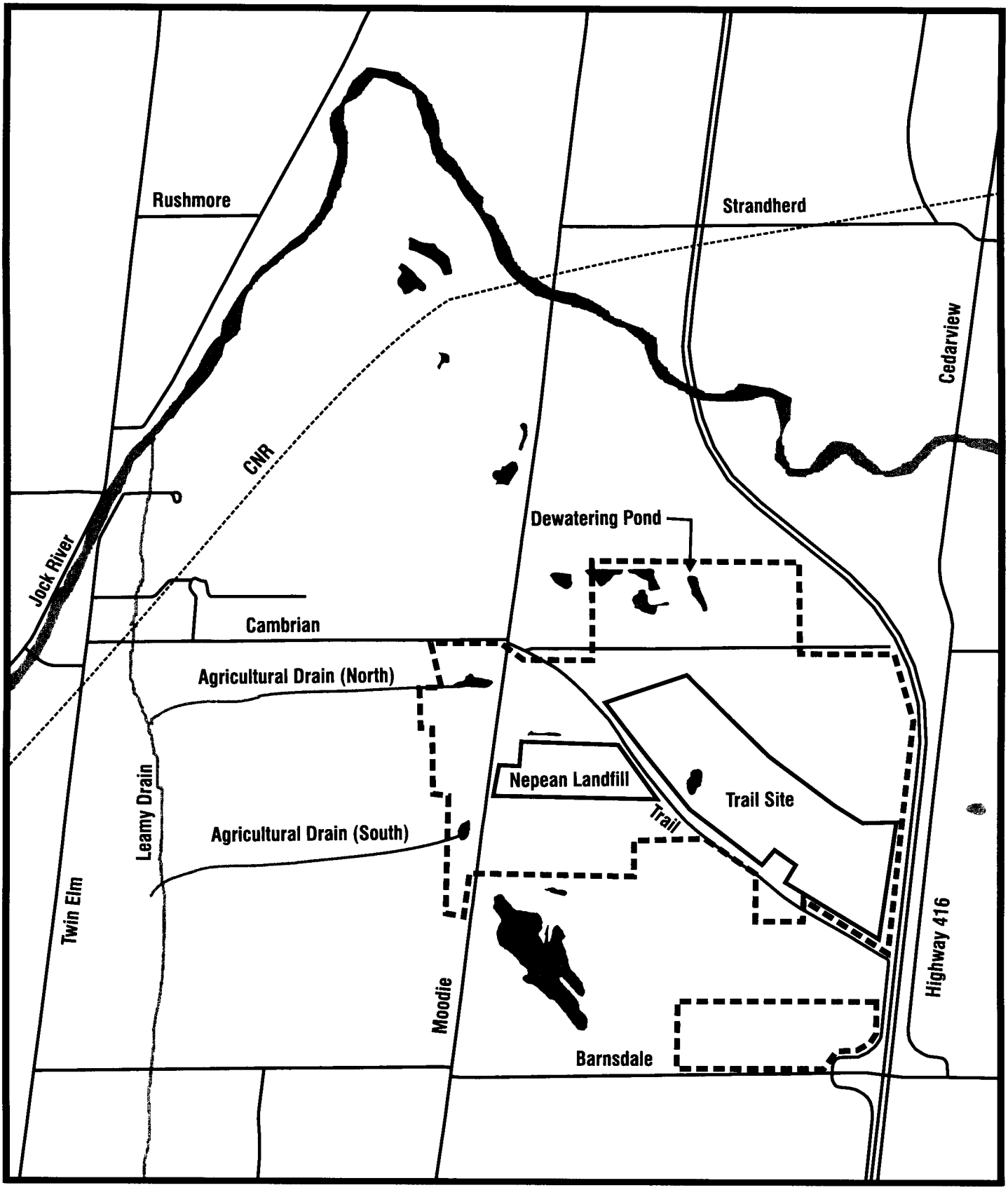
The monitoring program is based on the following main considerations:

- bromide and boron, together with chloride, are the most important leachate effect indicators;
- seasonal variations in leachate influences on groundwater quality do exist and need to be documented at key compliance locations, hence key monitors are suggested for three times yearly monitoring;
- build up a database of the vertical distribution of leachate effects northeast from the Nepean Landfill and near the Trail Road Landfill;
- effects of leachate on groundwater west, south and northwest of Nepean Landfill are well understood;
- surface water quality in the Jock River is not affected by leachate; discharging streams to the Jock River which receive water originating from the landfills all meet PWQO for the effects brought about by leachate and,
- little monthly variations exist at surface water monitoring locations, which is as expected since the streams are groundwater discharge fed and groundwater quality does not generally change rapidly.

In view of the current observations of increasing iron concentrations upgradient of the dewatering pond, it is recommended that the monitoring program be enhanced in that area to study the possible reasons that iron concentrations are increasing.

The scope of such study would consist of the installation of 5 to 7 additional shallow monitoring wells, an increased water quality monitoring frequency following discrete rainfall events or dry periods, and water quality monitoring specifically aimed at changes in redox conditions and organic indicators such as DOC, tannins and lignins and bacteria.

ANNEX B


Rushmore
Strandherd
Cedarview
CNR
Jock River
Dewatering Pond
Cambrian
Agricultural Drain (North)
Nepean Landfill
Trail Site
Trail
Leamy Drain
Agricultural Drain (South)
Twin Elm
Moodie
Highway 416
Barnsdale
Approximate Bufferland Boundry