

WITNESS STATEMENT OF

ANTHONY J. CRUTCHER

WALTER M. GRAZIANI

CITY OF BURLINGTON

(with respect to BURLINGTON LANDFILL SITE APPLICATION FOR
CONTINUED USE by Regional Municipality of Halton)

ENVIRONMENTAL ASSESSMENT BOARD HEARING

May 14, 1984

Reference No. 1354

Conestoga-Rovers & Associates Limited

PUBLIC HEARING
WITNESS STATEMENT FOR
ANTHONY J. CRUTCHER
WALTER M. GRAZIANI

- (a) Anthony J. Crutcher
Conestoga-Rovers & Associates Limited
651 Colby Drive
Waterloo, Ontario
N2V 1C2
519-884-0510 (Curricula Vitae attached)
- Walter M. Graziani
Conestoga-Rovers & Associates Limited
651 Colby Drive
Waterloo, Ontario
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519-884-0510 (Curricula Vitae attached)
- (b) Conestoga-Rovers & Associates Limited are Engineering Sub-Consultants for the City of Burlington through the firm of Ecoplans Limited.
- (c) The evidence given by A.J. Crutcher and/or W.M. Graziani will be of a factual nature.
- (d) The evidence given by A.J. Crutcher and/or W.M. Graziani will be directed to the following topics, as related
- Site Hydrogeology
 - Groundwater Monitoring and Sampling
 - Groundwater Chemistry
 - Leachate plume definition and attenuation
 - Landfill Expansion and Operation

1.0 INTRODUCTION

The Regional Municipality of Halton would like to expand the existing Burlington Landfill Site as a short term remedy to the growing problem of Solid Waste Disposal within the Region of Halton. M.M. Dillon Ltd. on behalf of the Regional Municipality of Halton has prepared an application for landfill expansion and has documented information supporting expansion of the landfill in a 3 volume report entitled, "Burlington Landfill Site: Application for Continued Use", dated March, 1984.

Conestoga-Rovers & Associates Limited (CRA) on behalf of the City of Burlington has reviewed the supporting three volume documentation as prepared by Dillon for the expansion application and has made representation to the City of Burlington.

On April 24, 1984 the City of Burlington enacted a conditional resolution of support of the expansion application. The resolution stated "That the City of Burlington adopt as its preferred alternative for the disposal of solid waste by landfill in the City of Burlington in the short term the Region of Halton's proposed interim expansion of the Burlington site on the conditions....."

Of the seven (7) conditions outlined by the City of Burlington, CRA is prepared to offer evidence as pertaining to the following conditions:

- (1) "That the expansion be redesigned to provide 20 metre setbacks from the top of banks and the contingency leachate collection plan for Falcon Creek be reconsidered accordingly;"

Part of the reasons for this condition as outlined further in Section 2.5 are:

- alternate contingency system construction
- additional buffer for gas migration
- greater margin of safety

- (4) "That the City of Burlington be consulted on the detailed engineering of the site:"

Major reasons for this condition as outlined further in Section 2.5 are:

- design as presented is of a conceptual nature
- leachate system design is critical
- final cover thickness
- separation of new from existing disposal areas

- (6) "That the Region undertake the cleanup of the existing plume from the current landfill site;"

Major reasons for this condition as discussed in Section 2.4 are:

- leachate plume definition and any possible remedial requirements need to be better defined
- implementation of a phased investigative program to define the existing plume should be enacted so that its impact and remedial measures if required can be addressed

On May 2, 1984 a meeting between Region of Halton and City of Burlington representatives was held. General agreement was reached on the various issues related to the above conditions as stated above was reached. At this meeting, it was agreed that the technical parties should have a further meeting to discuss Condition (6).

On May 8, 1984 a meeting was held between the hydrogeological consultants of the Region of Halton (Gartner Lee and Associates Limited), the City of Burlington (Conestoga-Rovers & Associates Limited) to further discuss Condition (6). It was agreed at this meeting that a phased program involving additional on-site wells, and sampling should be implemented for further plume definition and assessment of plume risk and shale attenuation properties.

2.0 POINTS OF EVIDENCE

The points of evidence will be principally directed to the three volume report entitled "Burlington Landfill Site Application For Confirmed Use, March 1984". The more specific items are addressed below.

2.1 SITE HYDROGEOLOGY

CRA is in general concurrence with the hydrogeology of the site as presented in the documentation. Minor clarification is required in the report as to the interpretative nature of presented groundwater contours.

2.2 GROUNDWATER MONITORING AND SAMPLING

The type of groundwater wells as installed for monitoring are not sufficient for the type of detailed analysis required at this site. A proper well stabilization and development program is required to ensure chemical and hydraulic stability of the groundwater before sampling.

2.3 GROUNDWATER CHEMISTRY

The groundwater chemical results as presented in the Volume 2 report are questionable due to

poor well development and stabilization, and well construction not suitable for organic sampling and analysis.

2.4 EXISTING LEACHATE PLUME DEFINITION AND ATTENUATION

Leachate plume definition, and the resultant calculation of shale attenuation properties are questionable due to the inherent level of doubt in the chemical data used to calculate them.

A phased program should be designed and implemented to further define the plume extent, shale attenuation capacity, potential plume impact, and possible remedial measures for plume cleanup. A technical committee should be established to oversee this program to ensure all parties are in agreement with the investigative program. This committee would have at a minimum, representatives of the Region of Halton, City of Burlington, and the Ministry of the Environment.

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role for a
rep. of the
WBC Group?*

2.5 LANDFILL EXPANSION AND OPERATION

Most of the operational information in the Volume 3 report dealing with

landfill operation is conceptual in nature. The City of Burlington would need to be consulted in the detailed design of landfilling systems of the expansion to be ensured that the design is workable and meets acceptable standards.

Some particular items from the documentation will be addressed as presented below:

1. The use of 2' thick soil final cover is deemed inadequate. At a minimum, a 3' thick final cover should be used. The bottom 2' of which should be constructed of native (to the site) till material, and the top 1' of a soil material supportive of vegetative cover.
2. The expansion should be redesigned to allow for a 20 m setback, referenced (tied in) to the existing fence line, and agreed upon by all parties. This would provide more working area, and easier access for a contingency leachate/gas system, if required.

Further alternatives for a contingency leachate collection system for the protection of Falcon Creek should be examined. It is CRA's opinion that

What are
they?

the present contingency plan is a last resort and would cause massive disruption to the overall ecosystem of the creek. The 20 metre setback should provide sufficient room for other alternatives to be considered.

The increase of setback from 10 to 20 metre would also provide a higher degree of safety on slope stability and provide an extra buffer for potential of gas migration.

3. The new expansion portion should be separated hydrogeologically from the older site. This could be done by leaving in place existing interim and final cover soils in place and landfilling directly over these soils. The only hydraulic connection for the new and old landfill portions would be the connection of the new leachate collection system to the old landfill perimeter system.

This segregation would help to minimize the possibility of leachate movement through the refuse to the south, should the leachate collection system fail. The older portion of the site (southern part) has been landfilled directly on the shales and has a higher degree of uncertainty with respect to leachate migration.

2.6 SUMMARY

Based on our review of the documentation supporting the Application for Continued Use of the Burlington Landfill site, CRA is of the opinion that the expansion of the site can be made environmentally and hydrogeologically suitable for continued landfilling.

Concepts as discussed under Section 2.5 such as increased cover thickness, increased setback, hydraulic separation of the new and old landfill and detailed design discussed and reviewed with representatives of the City of Burlington would help to make the expansion area more environmentally and hydrogeologically suitable.

Seems to imply that the site is env'ly and hydro. suitable, but can be made even more so.

Based on the present monitoring system and data available, the definition and impact of the existing leachate plume and the attenuation capacity of the shale cannot be practicably obtained. Therefore, the impact of the present plume cannot be properly addressed. A phased program as briefly discussed under Section 2.4 should be implemented.

if this is the case, how can landfill be safe? - unless expansion will not add to plume

APPENDIX A

CURRICULA VITAE

Anthony J. Crutcher

Walter Graziani

ANTHONY J. CRUTCHER, M.A.Sc., P. Eng.

EDUCATION: B.A.Sc. University of Waterloo, 1976
 M.A.Sc. University of Waterloo, 1977

EMPLOYMENT: 1982 - Principal, Director of Operations, Conestoga-Rovers &
 Present Associates Limited

 1979-82 Associate, Conestoga-Rovers & Associates Limited

 1976-79 Project Engineer, Conestoga-Rovers & Associates

 1976-77 Teaching Assistant, University of Waterloo

 1975-76 Junior Engineer, Frank A. Rovers & Associates Ltd.

 1974-75 Research Assistant, University of Waterloo

 1973 Engineer Assistant, Water Pollution Control
 Directorate, Environment Canada, Ottawa

AFFILIATIONS: Association of Professional Engineers of Ontario

 Member of Canadian Water Resources Association

 Member of National Solid Wastes Management Association

 Member of Governmental Refuse Collection & Disposal Association

PROFILE OF
PROFESSIONAL
ACTIVITIES: - Design of solid waste disposal sites

 - Research into leachate attenuation mechanisms

 - Groundwater hydraulic modelling

 - Research into computer model analysis of leachate migration
 from waste disposal sites including finite element and mass
 balance techniques

 - Applying mass transport modelling techniques to predict future
 contaminant plume configurations at five existing waste
 disposal sites

PROFILE OF
PROFESSIONAL
ACTIVITIES
(CONT'D):

- Groundwater availability and interference studies
- Design of groundwater monitoring programs
- Design of landfill gas monitoring programs
- Engineering management of waste disposal operations
- Design of pits and quarries
- Environmental impact evaluation of aggregate extraction operations
- Environmental impact evaluations of hazardous waste disposal sites
- Design of wastewater disposal systems
- Floodplain mapping using both hand calculations and computer modelling techniques
- Environmental impact assessments
- Landfill gas recovery and utilization research
- Design of landfill gas recovery and utilization systems
- Development of procedures for siting landfill sites
- Expert testimony at Environmental Assessment Board Hearings, Ontario Municipal Board Hearings and Niagara Escarpment Commission
- Several papers presented across Canada and U.S.A.

PUBLICATIONS: A. Published Refereed Papers

- "The Numerical Analysis of Contaminant Migration from Sanitary Landfills" proceedings of the Twelfth Canadian Symposium on Water Pollution Research, University of Toronto, February 1977 (with J. F. Sykes)
- "Methane Gas Utilization from a Landfill Site", Journal of the Energy Division, ASCE, May, 1981 (with E. A. McBean and F. A. Rovers)
- "The Impact of Gas Extraction of Landfill-Generated Methane Gas Levels", Water, Air, and Soil Pollution, Vol. 16, 1981, pg. 55 - 66 (with E. A. McBean and F. A. Rovers)
- "Leachate Collection Design for Containment Landfills", Journal of the Environmental Engineering Division, ASCE, Vol. 108, No. EE1, February, 1982 (with E. McBean, R. Poland and F. A. Rovers)
- "Temperature as an Indicator of Landfill Behavior", Water, Air and Soil Pollution, Vol. 17, 1982, pg. 51-59 (with E. A. McBean and F. A. Rovers)
- "Influence Assessment of Landfill Gas Pumping", Water, Air and Soil Pollution, Vol. 22, 1984, pg. 227-239 (with E.A. McBean and F. A. Rovers)

PUBLICATIONS:

Papers

- "Modelling Sanitary Landfill Leachates Using a Chemical Mass Balance Technique", paper presented at AGU Spring Annual Meeting, Washington, D.C., May 1977 (with J. F. Sykes)
- "Landfill Site Selection", paper presented at the 16th Annual International Seminar & Equipment Show, Governmental Refuse Collection & Disposal Association, Calgary, Alberta, August, 1978 (with F. A. Rovers, H. Mooij)
- "The Design of a Natural Leachate Attenuation System", Proceedings of The First Annual Conference of Applied Research and Practice on Municipal and Industrial Waste, Madison, Wisconsin, September 10 - 13, 1978 (with F. A. Rovers)
- "Safety Procedures for Hazardous Waste Remedial Works", Proceedings of the Second Annual Conference of Applied Research and Practice on Municipal and Industrial Waste, Madison, Wisconsin, September 17 - 21, 1979 (with D. H. Haycock, F. A. Rovers, W. J. McDougall)
- "Methane Gas, A Heat Source for Municipal Greenhouses", paper presented at Ontario Parks Association Annual Educational Conference, Toronto, Ontario, February, 1980.
- "Extraction and Utilization of Unprocessed Landfill Generated Methane Gas", paper presented at AGU Spring Annual Meeting, Toronto, Ontario, May, 1980 (with F. A. Rovers)
- "Statistical Analysis of Landfill-Generated Methane Gas Data", paper presented at AGU Spring Annual Meeting, Toronto, Ontario, May 1980 (with E.A. McBean)
- "Recovery & Utilization of Landfill Gas", Conference Papers, ENERGO'83 - Ontario Energy Opportunities in Biomass Conference, sponsored by the Ministry of Energy, Sheraton Centre, Toronto, Ontario, March 6 to 9, 1983.
- "Landfill Gas Recovery and Utilization in Canada", Proceedings from the Technical Sessions of the GRCDA 21st Annual International Seminar and Equipment Show, Winnipeg, Manitoba, Canada, August 29 through September 1, 1983.
- "Canadian Activities in Landfill Gas Recovery and Utilization", paper presented at GRCDA 7th International Landfill Gas Symposium, Sheraton Regal Inn, Piscataway, New Jersey, April 9-13, 1984.

C. Published Reports

- "Groundwater Contaminant Modelling - A State of the Art Review", Environment Canada, 1977 (with J. F. Sykes, F. A. Rovers and G. J. Farquhar)
- "Contaminant Migration in Three Great Lakes Drainage Basins - Mississauga Landfill Site", Fisheries and Environment Canada, 1977 (with J. F. Sykes, F. A. Rovers and G. J. Farquhar)
- "Small Municipal Waste Disposal Site Selection", Fisheries and Environment Canada, 1978 (with F. A. Rovers)
- "Gas Recovery & Utilization from a Municipal Waste Disposal Site - Final Report", Environment Canada, Technical Development Report EPS 4-EC-81-2, November 1981 (with F. A. Rovers)
- "Gas Recovery & Utilization from a Municipal Waste Disposal Site - Statistical Analysis of Monitoring Data", Environment Canada, 1979 (with E. A. McBean)

WALTER M. GRAZIANI, B.A.Sc., P. Eng

EDUCATION:

1981	B.A.Sc., Civil Engineering, University of Waterloo
1981 - Present	Completing a M.A.Sc., Civil Engineering, University of Waterloo

EMPLOYMENT :

1984	Project Engineer Conestoga-Rovers & Associates Limited
1983	Engineer Hydrology Consultants
1981- 1983	Junior and Intermediate Engineer Conestoga-Rovers & Associates Limited
1980	Student Research Engineer (work term) Dominion Foundaries and Steel Co. (DOFASCO), Hamilton
1979	Energy Conservation Engineer (work term) I.B.M. Canada Limited, Toronto, Ontario
1979	Pollution Control Inspector (work term) Regional Municipality of Niagara, St. Catharines
1977	Surveyor (work term) Regional Municipality of Niagara, St. Catharines

AFFILIATIONS:

Member in good standing of Canadian Society of Civil
Engineering (CSCE)
Association of Professional Engineers of Ontario

PROFILE OF
PROFESSIONAL
ACTIVITIES:

- Design of solid waste disposal sites
- Design of groundwater monitoring programs
- Design of landfill gas monitoring programs
- Analytic modelling of stream and river wastewater assimilation capacity
- Impact analysis of air contaminant emissions

PROFILE OF
PROFESSIONAL
ACTIVITIES:
(cont'd)

- Preparation of air emissions approval documents
- Feasibility analysis for landfill gas recovery
- Design of construction dewatering system
- Landfill gas recovery and utilization research
- Landfill gas recovery and utilization system design
- Environmental impact analysis of and research into landfill gas migration
- Design of landfill gas venting systems
- Construction supervision, construction contract and specification preparation
- Landfill hydrogeologic studies
- Preparation of landfill operation and management plans, including end use plans
- Preparation of environmental assessment documents and reports
- PCB waste evaluations and remedial measure designs

PUBLICATIONS:

A. Papers

- "Recovery & Utilization of Landfill Gas", paper presented at ,
ENERGO'83 - Ontario Energy Opportunities in Biomass Conference
Sheraton Centre, Toronto, Ontario, March 6 to 9, 1983.
(with A.J. Crutcher)
- "Landfill Gas Emissions - A Potential Problem?", paper
presented at the Landfill Seminar, Pollution Control
Association of Ontario, Toronto, Ontario, March 2, 1983 (with
A. Koven, S. Hazen)