

WASTE
QUANTITIES.

Exh. H15

EPA REVIEW OF

WASTE QUANTITY

PROJECTIONS

1986 03 05

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EPA REVIEW OF
WASTE QUANTITY PROJECTIONS

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THE REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the Solid Waste
Management Committee

From R. W. J. Moore, Director of Public Works
J. L. Rinaldo, Director of Finance

Date ^{March 5} 1986 03 05

Report No FIN 35/86-PW107/86

RE: EPA Review of Waste Quantity Projections

RECOMMENDATION:

1. THAT "The EPA Review of Waste Quantity Projections Report" prepared by C.N. Watson and Associates Ltd. as appended to joint Report FIN 35/86-PW 107/86 be adopted;
2. THAT "The EPA Review of Waste Quantity Projections Report" be circulated to the Government Review Team; and
3. THAT the Landfill Approvals Mailing list be informed of the availability of "The EPA Review of Waste Quantity Projections Report" and that copies be sent to those on the mailing list requesting same.

REPORT:

Attached for your consideration is the waste quantities report of C.N. Watson and Associates entitled "The EPA Review of Waste Quantity Projections". Subject to Committee and Council ratification, this document will form part of the EPA documentation and will be utilized to determine the appropriate size of landfill site required. This document supersedes the projections prepared in November 1984 and included in "Review and Supplement to Stage 2B, Selection of Candidate Sites", as well as an earlier projection completed in October 1983. Both of these previous projections are included in the attached document as Appendices A and B respectively.

The report reduces the required waste for disposal from 4.922 million tons, as estimated in November 1984, to 4.208 million

14.5%
reduction
by weight

tons. This represents a 14.5% reduction by weight. Details of this reduction are noted under section 4 of the waste quantity projection overview which follows.

Overview of Waste Quantity Projections

The purpose of this overview is to tie together various waste quantity analyses which began in 1982 and culminating with the documentation presented in the attached EPA Review. In summary, the main body of analysis is contained in the following four reports (of which #4 is the current report).

	<u>Date of Publication</u>	<u>Environmental Assessment Document Number*</u>
1. Stage 1 Waste Needs and Systems Analysis: Consolidation	May 1983	4
2. Final Report: Phase 2, Stage 2A, General Overview	October 1983	8
3. Final Stage 2B Review and Supplement	November 1984	21
4. EPA Review of Waste Quantity Projection	February 1986	N/A

1. Stage 1 Waste Needs and System Analysis

This was the initial analysis prepared in the waste quantity forecast exercise. Included in this document are two relevant projections which have been refined in subsequent years:

- a) a projection of waste quantites generated over the 20 year forecast period (then set as 1982-2001 inclusive); and
- b) a projection of waste quantites to be landfilled under the assumption of an Energy from Waste-based system over the same forecast period.

* As contained in Environmental Assessment for the Landfill Component of Halton's Solid Waste Management System - Environmental Assessment Number 1-82-0006-000, pp. S15-S19

The waste quantity forecast incorporated a review of Halton's solid waste disposal system over the period 1976 to 1982, as well as an examination of the related waste characteristics. The analysis calculated a waste per capita forecast and applied this to Halton's population forecast range over the period 1982 to 2001 inclusive. The resulting range of total possible waste for disposal, and the required site volumes related thereto*, are as follows:

- Low forecast: 4.5 million imperial tons** (9.0 million cu. yds.)
High forecast: 5.7 million imperial tons (11.4 million cu. yds.)

Within this initial document, an analysis was undertaken on the feasibility of solid waste systems for Halton which were not based upon a principle reliance on landfill. In this investigation, an energy from waste based system was reviewed and, based upon the analysis undertaken to that point, was identified as being a possible alternative. The required landfill component of this system was calculated to be 7.2 million cubic yards.

Because of these findings, the consultants were instructed by Council to proceed under the premise that a 20 year landfill would be required having a capacity of 7.2 million cubic yards. This estimate was to be reviewed after the completion of a preliminary energy from waste study (which was subsequently completed in August 1984).

2. Phase 2, Stage 2A Report (October 1983 Waste Quantities Update)

This review of the Stage 1 analysis re-examined the waste forecast undertaken in Stage 1 and also addressed the implications of declining waste generation figures which had occurred in 1983. As a result, an interim or short-term forecast was developed for the period from June 1984 up to June 1988 and as directed by Council this was integrated into the longer term 20 year forecast extending from June 1988 to June 2008.

* based upon the assumption of 1000 tons of waste per cubic yard.

** the waste quantity analysis, up to and including that presented in the current review, is expressed in imperial tons in order to maintain consistency with historical records and trends.

The interim forecast identified the need for a maximum of 1.5 million cubic yards of capacity and this capacity was added to the Stage 1 energy from waste-based 20 year forecasted capacity of 7.2 million cubic yards to arrive at a revised total landfill capacity requirement of 8.7 million cubic yards. This estimated capacity was utilized for the preparation of the Stage 2A report.

3. Phase 2, Stage 2B Report (November 1984 Waste Quantities Update)

*20 year landfill site
- 100% landfill first 8 years
- 50% landfill 50% EFU for last 12 years*

The November 1984 update, in addition to refining the October 1983 figures, incorporated new assumptions and data regarding energy from waste. Specifically, the report utilized Council's directive of September 5, 1984 instructing the consultants to seek capacity for a 20 year landfill site assuming that it would be 100% landfill based* for the first eight years (June 1988 to June 1996), and 50% landfill/50% energy from waste for the remaining twelve years (June 1996 to June 2008). Also, this update utilized information prepared and presented in the Preliminary Energy from Waste Feasibility Studies completed in August 1984.

The capacity calculations further reflected the fact that a continuation plan had been approved at the existing Regional landfill site and as a result only a portion of the interim capacity identified in the October 1983 update would be required (January 1987 to June 1988).

* net of waste which would be source separated.

The November 1984 update yielded the following tonnage and capacity requirements:

	Weight (million imperial tons)	Volume* (million cu. yds.)
Waste direct to Landfill		
a) interim (to June 88)	0.298	0.596
b) 20 year forecast period	3.389	6.778
EFW Ash and Non-Combustible	0.424	0.848
Total Waste Generated (Jan. 1987 - June 2008)	4.111	8.222
plus: Contingency for		
- high popul/high per capita waste possibility	0.695	1.390
- EFW downtime	0.115	0.230
- volume (lower than anticip. compaction, new waste)	0.738	1.476
Total Required Capacity	5.659	11.318

1.548

4. EPA Review of Waste Quantity Projections

The most recent review of waste quantity projections is contained in the analysis of the current report. It modifies information as presented in the November 1984 update in the following areas:

- refinements to:
- ① the start-up date of the new Regional landfill site from January 1987 to September 1988;
 - ② the long-term population forecast;
 - ③ the waste per capita assumptions; and
 - ④ the assumptions on EFW plant residues to the landfilled.

latest report
changes
nov 84 report
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AB {

- long-term pop. forecast
- waste per capita assumptions
- EFW plant

* based upon the assumption of 1000 tons of waste per cubic yard.

As previously noted the result of these changes is to reduce the projected quantities to be landfilled by 14.5% (from the November 1984 forecast) to a level of 4,208,000 tons. It should be noted that the current estimates relate only to quantities by weight and not by volume. The translation of the latest forecast into required volumes will be undertaken by Hydrology Consultants as part of their preliminary site design work program. By way of summary, the latest changes to the forecast vary from the November 1984 forecast as follows:

	Stage 2B Update Report Projection (November '84)	EPA Report Projection (January '86)	% Difference
"Most Probable" Long Term Waste Forecast	4,965,370 tons	4,683,175 tons	-5.7%
Waste to EFW	1,575,991 tons	1,477,449 tons	-6.3%
"Most Probable" Forecast of Waste to Landfill (including plant residue)	4,111,731 tons	3,582,180 tons	-12.9%
Total Landfilled Waste 1988-2008 (including all contingencies except volume)	<u>4,922,000</u> tons	<u>4,208,000</u> tons	-14.5%

Respectfully submitted

J. L. Rinaldo

J. L. Rinaldo
Director of Finance
and Regional Treasurer

R. W. J. Moore

R. W. J. Moore
Director of Public Works

DB/kv

[Signature]

REGION OF HALTON
E.P.A. REVIEW OF WASTE QUANTITIES PROJECTION

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February, 1986

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EXECUTIVE SUMMARY

REGION OF HALTON

E.P.A. REVIEW OF WASTE QUANTITIES PROJECTION

PREPARED BY C.N. WATSON AND ASSOCIATES LTD.

JANUARY, 1986

This review of the waste quantities projection and its impact on the size of the new landfill site is an update of March, 1983, October, 1983, and November, 1984 reports prepared as part of the Environmental Assessment (E.A.). The following issues were addressed in the review:

- ① • The timing for the opening of the new landfill and the Energy from Waste (EFW) plant(s);
- ② • Current directions in monthly waste totals and other factors (i.e. source separation) to determine any impacts on future landfilled waste quantities; *we have nothing since Jan 86*
- ③ • Impact of a revised Regional population projection on waste quantities;
- ④ • Calculation of annual landfill waste quantities.

The report projects Halton's total landfilled waste quantities over the forecast period (September, 1988 to September, 2008) to be 4,208,000 imperial tons (including all contingencies except the contingency for the volume requirement*). A comparison of the key findings of the projections used in the Stage 2C E.A. work and this revised forecast is set out below: *4.2 imperial tons.*

	Projection Used in Stage 2C (E.A.) November, 1984	Revised Projection January, 1986	% Difference
"Most Probable" Long Term Waste Forecast	4,965,370 tons	4,683,175 tons	- 5.7%
Waste to EFW	1,575,991 tons	1,477,449 tons	- 6.3%
"Most Probable" Waste to Landfill (including plant residue)	4,111,731 tons	3,582,180 tons	-12.9%
Total Landfilled Waste 20 Year (including all contingencies except volume*)	4,922,000 tons	4,208,000 tons	-14.5%

* The volume contingency covers the possibility of lower landfill densities and new waste (i.e. clean fill) being accepted at the site. Hydrology Consultants will make provisions for this (as required) in their calculations of landfill volume.

EXECUTIVE SUMMARY: E.P.A. REVIEW OF WASTE QUANTITIES PROJECTION - Cont'd

In each case, the revised projection is lower than the November, 1984 projection, with declines of 13% and 15%, respectively, in the "most probable" waste to landfill forecast (excludes contingencies) and the total landfilled waste (includes contingencies except volume) over the 20 year forecast period. The major reasons for this decline are:

- The quantity expected to be handled by source separation increased significantly. In the November, 1984 projection, the 2008 share recovered by source separation was 8%, while the corresponding figure in this projection is 15.9% as a result of the vigorous Regional program which is underway. *what has been established*

- The projected opening date of the landfill site changed from January 1, 1987 to September 1, 1988. This resulted in the exclusion of 300,000 tons of waste from the Interim Planning Period*, which could no longer be handled by the new landfill site.

- The Planning Department completed a revised long term population forecast. The high end forecast was revised downward from 409,500 to 362,600, a reduction of 11.5%. The new forecasts are generally in line with recent projections prepared by the Ministry of Treasury and Economics in August, 1985. *should be 364,600 per p. 106*

- The high waste per capita figure was reduced from 0.855 tons per capita in the November, 1984 forecast to 0.834 tons per capita, which is the highest level ever attained in the Region since records have been kept. The 1985 level was 0.796. *population forecast decline of 11.5% based on 1985 TEBA. what's their current projection at TEBA? lower still?*

- The plant residue assumption was reduced slightly from 26.9% of total waste to the plant to 25.48%, based on a refinement of the calculation in the E.F.W. Financial Report by Regional Staff. *0.834 tons per capita is this too high? see p. 19*

* The Interim Planning Period occurred prior to the 20 year long term forecast period and, therefore, represented additional waste.

1. INTRODUCTION

This brief review of the waste quantities projection and its impact on the size of the new landfill comprises Work Task 1 in the approved work program of the Economic Component for the Landfill Environmental Protection Act Work. The first draft of this review was prepared in September, 1985 with finalization occurring in January 1986, following input from Regional staff and consultants.

The most recent update of the waste quantities projection is contained in the November, 1984 report entitled "Review and Supplement to Stage 2B, Selection of Candidate Sites" (referred to as the Stage 2B Update Report) on pages 1 to 19. References are made to this report. It is attached as Appendix A. A similar methodology has been employed herein.

An update of the waste quantities forecast was also completed in October, 1983. This is attached as Appendix B.

All waste weight information in this review (as in the previous forecasts) is in imperial tons, unless otherwise noted.

The work program specifies that the following issues will be addressed in this review:

- The timing for the opening of the new landfill and the Energy from Waste (EFW) plant
- Current directions in monthly waste totals and other factors (i.e. source separation) to determine any impacts on future waste volumes
- Possibility of a revised Regional population projection which would impact on the waste projection
- Annual landfill waste volumes

1. INTRODUCTION - Cont'd

The purpose of the waste forecast developed in this review (as in the previous projections) was to provide long term, overall waste figures. We recognize that the waste quantities are unlikely to increase smoothly as in the projection. The more normal pattern would involve peaks and valleys, as has occurred in the past. A more detailed analysis of waste quantities in key time periods should be completed, as required.

2. THE FORECAST PERIOD

The Stage 2B Update forecast assumed that the new landfill site would open on January 1, 1987 and the EFW plant on June 1, 1996 (page 9 in Appendix A). Discussions with Regional staff in both the Public Works and the Finance Department indicate an opening date of September 1, 1988

for the new landfill site and September 1, 1996 for the EFW plant(s) should be used in the revised projection, based on current realities.

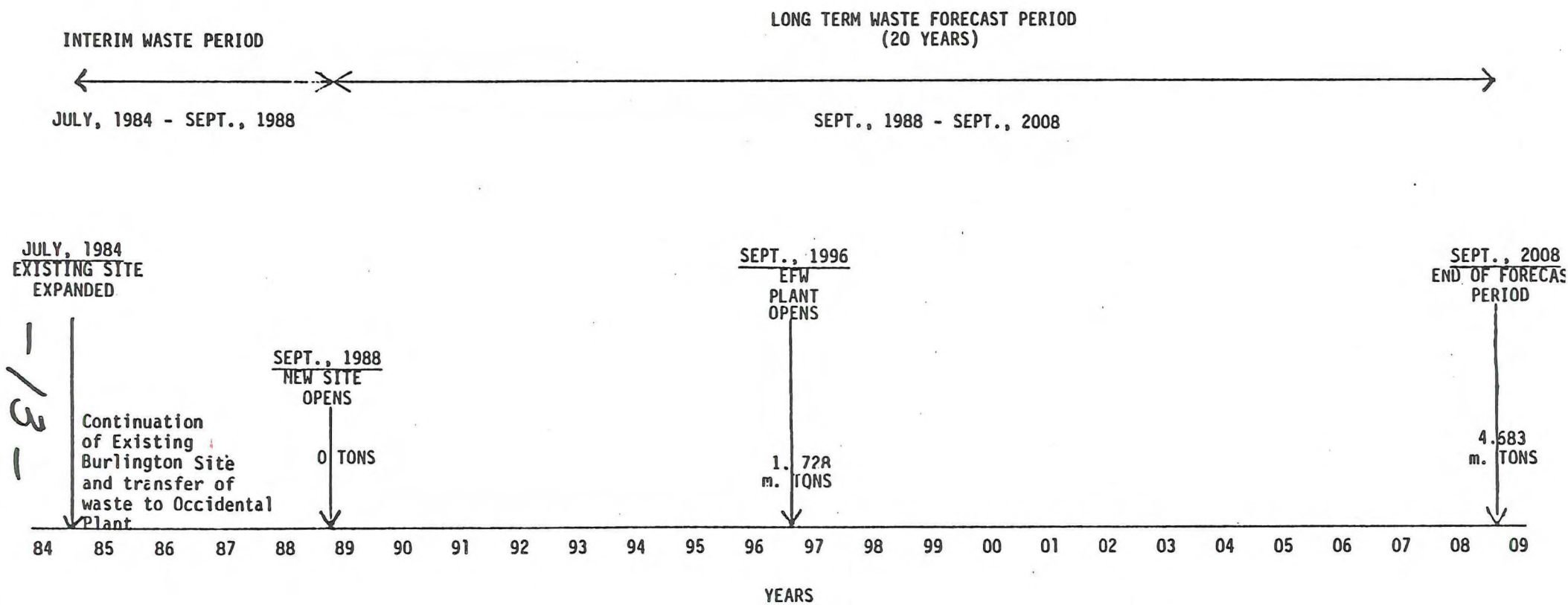
Similar to the Stage 2B Update Report, this projection is based on the assumption that the new landfill site will handle 100% of the waste for 8 years and 50% of the waste in the following 12 year period (plus ash and residue from the plant). This assumption reflects the most recent directive of Regional Council (September 5, 1984).

The forecast period is illustrated on Figure 1. If the EFW is operational prior to September, 1996, the life of the landfill would be extended. If creation of the plant(s) is phased, the life of the landfill could be less than 20 years, depending on the requirement for the various contingency allowances.

3. REVISIONS TO REGIONAL POPULATION PROJECTION

The waste quantities projection was calculated based on the rate of population increase and the number of tons of waste per capita. The forecast of annual population increase to 2001 was prepared by the

FIGURE 1: WASTE QUANTITIES FORECAST PERIOD



NOTE: TONNAGE FIGURES ARE CUMULATIVE

4.

3. REVISIONS TO REGIONAL POPULATION PROJECTION - Cont'd

Regional Planning Department in 1983 and used in the Stage 1 Report "Waste Needs and Systems Analysis". It was extended to 2008 for use in the long term waste forecast in the Stage 2B Update Report (Table 7 in Appendix A).

The Regional Planning Department has prepared an update to the landfill population forecasts*. These are used in the waste projections (Table 8) and the contingency allowance calculations.

4. TRENDS IN HALTON'S WASTE QUANTITIES

The quantities of waste landfilled in Halton for the years 1982, 1983, 1984 and 1985 to date are shown in Table 1.

In Appendix B, 1984 waste volumes were projected to return to more "normal" levels based on a review of the four major factors responsible for the decline in the previous year. The factors were: increased haul costs and tipping fee; weather conditions; recycling; and economic conditions. The Stage 2B Update projected a 1984 Halton waste volume of 200,000 tons (page A-15 in Appendix A). This, in fact, was very close to the actual figure of 200,341 tons (Table 1), indicating that the waste volume did rebound, as projected in 1983.

Table 2 outlines a comparison of tonnage landfilled in Halton by source from January to August in 1984 and 1985. The data reveals that there has been minimal change in the municipal waste volumes from Halton Hills, Milton and Oakville in 1985, compared to the previous year. The Burlington municipal waste, on the other hand, has declined by approximately 6%. A major reason identified by Regional staff was the timing of "Clean-Up" week which was held in May in 1984 and in September in 1985. The "No Charge" waste volume increased due to the establishment and popularity of the Container Stations in Milton and Oakville; residents may dispose of their wastes at no charge. Finally, the waste

*Projections received in a memo dated December 2, 1985.

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TABLE 1

TONS OF WASTE DISPOSED OF
AT HALTON REGION SITES
(INCLUDING WASTE EXPORTED TO OCCIDENTAL)
1982, 1983, 1984 AND 1985

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1985 % Monthly Change From 1984</u>
January	12,591	12,314	12,454	13,668	+ 9.7
February	15,115	11,328	13,262	12,348	- 6.9
March	15,964	13,831	13,423	15,146	+12.8
April	19,283	14,475	17,566	20,111	+14.5
May	21,317	20,151	22,447	22,164	- 1.3
June	<u>20,274</u>	<u>18,400</u>	<u>19,071</u>	<u>18,954</u>	- 0.6
SUB-TOTAL	104,544	90,499	98,223	102,391	+ 4.2
July	17,127	14,906	17,055	18,874	+10.7
August	17,750	17,174	18,287	18,339	+ 0.3
September	17,486	16,173	16,540	19,494	+17.9*
October	16,426	15,724	18,378	19,179	+ 4.4*
November	17,034	16,650	18,365	17,913	- 2.5*
December	<u>14,749</u>	<u>13,324</u>	<u>13,493</u>	<u>14,304</u>	+ 6.0*
TOTAL	205,116	184,450	200,341	210,494	

*Figures for September, October, November and December became available after the analysis was completed.

SOURCE: Compiled by C.N. Watson and Associates Ltd. from information provided by the Region of Halton

TABLE 2

COMPARISON OF (METRIC) TONNAGES LANDFILLED IN HALTON BY SOURCE
JANUARY - AUGUST, 1984 AND 1985

	<u>1985</u>	<u>1984</u>	<u>1984-85 % Increase</u>
Burlington Municipal Waste	23,154	24,584	(5.8)
Halton Hills Municipal Waste	6,069	6,016	0.9
Milton Municipal Waste	5,222	5,243	(0.4)
Oakville Municipal Waste	18,076	17,899	1.0
Private Haulers	71,295	65,885	8.2
No Charge	<u>2,808*</u>	<u>1,520</u>	<u>84.7</u>
Total Tonnes	126,624	121,147	4.5
Tons	139,603	133,565	4.5

SOURCE: Compiled by C.N. Watson and Associates Ltd. from
information provided by the Region of Halton

*with adjustment of 758 tonnes made for 1985

4. TRENDS IN HALTON'S WASTE QUANTITIES - Cont'd

volume from private haulers has increased by over 8%. Halton Public Works staff have identified two reasons for this. The volume of waste moving through the Halton Hills transfer station has increased; the reason for this is unclear, but this waste may have moved outside the Region or directly to the landfill site in the past.

The second factor was the increase in waste volume from Ford (by over 2,600 metric tonnes). Officials at Ford indicated that the company was no longer using Domtar in Mississauga for waste disposal as noted in the October, 1983 review (Appendix B, page B-9). The waste was shipped to the Halton landfill site as an interim measure, prior to start-up of their 70 metric tonne per day EFW plant. This would account for the temporary increase in waste volume. Start-up of the plant occurred in September, which is reducing the volumes again. However, Ford will continue to transport the ash and residue from the plant to the Halton site; this is estimated to be 10-15% of the waste weight. *Ford waste*

5. 1985 WASTE FORECAST

Table 3 forecasts 1985 waste quantities based on the 1982/83 (average) and 1984 situations using a similar technique to that used in the two previous reviews (Appendices A and B).

Projections based on recent months' data (July to November) show only minor variations of 1,000 - 3,000 tons between the low and the high forecasts based on 1984 experience and combined 1982/83 experience. Halton's forecast 1985 waste volume is projected to be 210,500 imperial tons*.

*1985 actual waste quantities; figure became available after analysis completed.

TABLE 3

FORECAST OF TONS OF WASTE TO BE LANDFILLED
IN HALTON REGION DURING 1985
BASED ON JANUARY - NOVEMBER DATA FOR 1982/83 (AVERAGE) AND 1984

	<u>YEAR TO DATE PERCENTAGES</u>		<u>1985 ANNUAL FORECAST (TONS)</u>	
	<u>1982/83 Average</u>	<u>1984</u>	<u>1984 Factors</u>	<u>1982/83 Factor Average</u>
January	.064	.062	220,452	213,563
February	.132	.128	203,250	197,091
March	.208	.195	211,087	197,894
April	.294	.283	216,512	208,412
May	.401	.395	211,233	208,072
June	.500	.490	208,961	204,782
July	.582	.575	210,896	208,359
August	.672	.667	209,301	207,744
September	.759	.749	212,414	209,615
October	.841	.841	211,982	211,982
November	.928	.933	210,279	211,412

Example of Calculation Methodology

1985 Waste Forecast for January based on 1984 factor $\frac{12,454 \text{ tons}}{200,341 \text{ tons}} = .062$

1985 January waste volume estimate $\frac{13,668 \text{ tons}}{.062} = 220,452 \text{ tons}$

SOURCE: Calculated from information in Table 1.

6. APPROACH TO LONG TERM WASTE FORECAST

The methodology used to forecast waste volumes in this review is very similar to that employed in the Stage 2B Update Report (pages A-15 to A-21 in Appendix A). This review should be read in conjunction with the previous work outlined in that section. A single "most probable" forecast is used with a contingency allowance to provide for the possibility of a higher waste volume.

*ie a max likelihood est.
ave. -> an
why not give a range & a confidence interval*

The forecast period for the long term waste forecast commences with the opening of the landfill site on September 1, 1988 and covers a 20 year period to September 1, 2008.

The Stage 2B Update Forecast (Table 7 in Appendix A) was based on a landfill volume for base year development (1988) which remained constant during the forecast period, plus cumulated tonnage from the population increase, derived from multiplying the population increase times the most probable waste volume per capita figure (.777 tons per capita).

Table 4 shows the landfilled waste tonnage, Halton Region population and the waste per capita figures from 1976 to 1985. Where necessary, population estimates have been used. The table illustrates that the waste per capita ratio fell significantly between 1982 and 1983 from 0.807 tons per capita to 0.700 tons per capita (-13.3%). [Since 1983, the ratio has moved upward and into a more consistent pattern, although well below pre-1983 levels.] The 1985 ratio is .796 tons per capita, only slightly above the factor used in the Stage 2B Update forecast for the population increase (.777 - Appendix A, Table 7). [The success of the source separation program accounts for much of the decline from pre-1983 levels.]

see p. 10

In the 1984 projection, the 1988 forecast was calculated using a base year figure for 1984, plus the population increase times waste per capita. The reason for using this approach was the unusual circumstances which prevailed at that time, resulting in a temporary but marked decline in the waste volume. Conditions in 1985 represent a return to more normal

TABLE 4
REGION OF HALTON
TONNAGE OF WASTE DISPOSED,
POPULATION AND WASTE PER CAPITA 1976-1985

<u>Year</u>	<u>Tons of Waste Disposed</u>	<u>Population</u>	<u>Waste Per Capita</u>
1985	210,500	264,498	.796
1984	200,341	263,900 (est.)	.759
1983	184,450	263,400 (est.)*	.700
1982	205,116	254,085	.807
1981	208,490	253,883	.821
1980	201,605	247,311	.815
1979	200,457	240,248	.834
1978	191,448	234,892	.815
1977	189,763	230,374	.824
1976	184,987	226,145	.818

*Estimate prepared prior to the publication of 1985 actual population. In the event that the 1983 population was lower, the waste per capita ratio would have been higher than shown.

SOURCE: Calculated from information provided by Halton Region with the following exceptions: 1985 population, Ministry of Revenue; 1984 population, interpolation.

6. APPROACH TO LONG TERM WASTE FORECAST - Cont'd

circumstances. For instance, there have been no changes or disruptions in the Halton waste management system (i.e. closing of landfill sites) which would affect haulers. More significantly, normal economic activity has been restored. As a result, it is appropriate to base this forecast review on the straightforward approach of total population times a waste per capita ratio.

The 1985 waste per capita ratio is 0.796 imperial tons per capita. In future years, there may be some additional rebound from the earlier decline, but in turn, the situation at Ford, where waste was landfilled for much of 1985, but is now being incinerated, should start to exert pressure on the ratio. Based on our opinion that 1985 was a representative year, we have assumed a waste per capita ratio of 0.80 tons for the forecast period.

what mean?
*how does opinion foundation
what based on*

7. SOURCE SEPARATION

The Stage 2B Update forecast considered the impact of the municipal source separation program in Halton by showing a specific reduction attributable to this source (Appendix A, Table 7). [Prior to 1981, the amount of waste disposed of in the landfill site was not significantly affected by this program.] However, Table 5 outlines the impact of the source separation program since 1982. The volume of waste handled by the program has increased significantly from less than 2,800 imperial tons in 1982 to an estimated 3.4 times that amount in 1985 (9,600 tons). The ratio of source separated waste to the total landfilled waste stream has increased from 1.4% in 1982 to an estimated 4.6% in 1985.

what are the projections?

The recent increase in the source separation volumes is due, in some part, to an increased level of service, with curbside pickup commencing in Oakville in mid-1983 and full service in Milton commencing in 1984. With the establishment of Regional co-ordination of the program in 1985, a momentum for the program was established in terms of advertising, organization, market identification, etc. Further, the program now includes industrial/commercial recycling.

TABLE 5

SOURCE SEPARATED WASTE AS A
PER CENT OF HALTON'S LANDFILL AND EXPORT WASTE STREAM

(IMPERIAL TONS)

	<u>Source Separated Waste</u>	<u>Landfill and Export Waste Stream</u>	<u>%</u>
1985	9,600 (est.)	210,500	4.6
1984	7,257	200,341	3.6
1983	3,948	184,450	2.1
1982	2,777	205,116	1.4

SOURCE: Region of Halton

7. SOURCE SEPARATION - Cont'd

In addition, the Provincial government has recently announced new recycling initiatives.

The Region of Halton Public Works Department has prepared preliminary forecasts of source separated waste volumes from 1985 to 1990. Significant increases are expected, with the low forecast range moving from 12,900 tons in 1986 to 27,600 tons in 1990. The 1990 forecast represents approximately 12% of the forecast waste stream compared to an estimated 4.6% in 1985. The major basis for this significant increase in volume handled by source separation is the very positive response the Region has received from the industrial/commercial sector to its initiatives on source separation. The expansion potential of the residential sector is more limited since all urban households in the Region now have curb-side pickup for newspapers, glass and tin.

The Region also prepared medium and high forecasts for source separated waste. These were not considered in completing this projection due to the absence of a "track record" for achieving these higher volumes (particularly for the industrial/commercial sector) and the significant increase that even the low forecast implies over the Stage 2B Update Report. Accordingly, a more conservative approach has been taken by considering the low forecast only.

medium & high forecasts not included what they are at all of forecast waste stream

The Stage 2B Update Report target for source separation (page A-20 in Appendix A) was based on an ultimate goal of 8% of total landfilled waste. In light of the current success of this program, the recent Regional initiatives and the proposed Provincial programs, 8% appears to be too conservative an assumption. Accordingly, the forecast incorporates the following assumptions for source separated waste quantities as a percent of total (landfill and E.F.W.) waste quantities:

- 9% in 1988, 10% in 1989 and 12% in 1990;

7. SOURCE SEPARATION - Cont'd

- an increase of 0.5% per annum from 1991 to 1993 (continuing the momentum established in the earlier period, albeit at a lower rate of increase);
- an increase of 0.25% per annum from 1994 to 1999 (reflecting the fact that the major sources will have been exploited, as well as the opening of EFW);
- *why slower* an increase of 0.1% per annum from 2000 to 2008 (assuming a slower rate of growth in the program to the end of the forecast period).

*15.8%
source
separation
by 2007*

Using these assumptions, the percentage of total waste handled by source separation in Halton in the final full year of the projection (2007) is 15.8%*.

The effect of this approach is to produce a net waste per capita figure in 2007 of .710 tons per capita, after the additional source separation deduction is made from the 0.80 tons/capita base figure. (Total tons of waste, minus source separated waste of 262,564, divided by total population of 369,600, equals 0.710 net tons per capita.)

8. REVISED LONG TERM WASTE FORECAST

Tables 6 to 9, respectively, show the calculation of the twenty year "most probable" waste forecast, the quantity of waste to be handled by EFW plant and the landfill, and the waste related contingencies.

The EFW is assumed to handle 50% of the waste commencing in September, 1996. It is recognized that the plant or plants are unlikely to handle precisely that percent of waste in each year, since any plant would operate at full capacity and plant capacity would not change each year. With an increasing waste stream over the forecast period and a fixed

*It should be noted that Table 6 shows the additional source separation volume over and above the current levels. For instance, the 2007 source separation volume (the last complete year) equals 11.2% of the waste forecast on the table. Adding this to the existing source separation percentage of 4.6% produces the total actual figure of 15.8%. The existing source separation volume is already accounted for in the 0.8 tons of waste per capita.

Table 6

Twenty Year Long Term "Most Probable" Waste Forecast for Halton Region
(September, 1988-September, 2008)

Year	Population Forecast	Waste Forecast (.80 Tons/Capita)	Additional Source Separation Deduction	Total Tons
1988 (4 mon)	276200	72917	3208	69708
1989	279700	223760	12083	211677
1990	283700	226960	16795	210165
1991	287600	230080	18176	211904
1992	292800	234240	19676	214564
1993	297600	238080	21189	216891
1994	302300	241840	22128	219712
1995	307200	245760	23101	222659
1996	311800	249440	24071	225369
1997	317200	253760	25122	228638
1998	322800	258240	26211	232029
1999	328200	262560	27306	235254
2000	333600	266880	28022	238858
2001	338800	271040	28730	242310
2002	344100	275280	29455	245825
2003	349100	279280	30162	249118
2004	354400	283520	30904	252616
2005	359500	287600	31636	255964
2006	364600	291680	32376	259304
2007	369600	295680	33116	262564
2008 (8 mon)	374500	200732	22683	178049
		5189329	506153	4683175

↑
this is
Halton's
Nov 86
med. forecast.

TABLE 7

TOTAL WASTE QUANTITY TO BE HANDLED BY EFW PLANT ASSUMING
8 YEARS OF 100% LANDFILL AND 12 YEARS 50% DIRECT TO LANDFILL
AND 50% TO EFW

Waste to EFW	1,477,449	tons
Residue* - Ash	188,818	tons
- Non-Combustibles	187,636	tons

Notes and Sources:

- (1) Waste to EFW was calculated based on information in Table 6 as follows:

Total Waste	4,683,175	tons
minus Sept. 1988 - Sept. 1996 Waste	1,728,276	tons
Sept. 1996 - Sept. 2008 Waste	2,954,899	tons
50% to EFW	1,477,449	tons

- (2) Residue - Ash was calculated at 12.78% of total waste to plant based on information from Regional Staff.
- (3) Residue - Non-Combustibles were calculated at 12.7% of total waste to plant based on information from Regional Staff.

*Bottom ash only

Corresponding Table in Stage 2B Update Report - Table 8 (Appendix A)

TABLE 8

TOTAL "MOST PROBABLE" WASTE QUANTITY TO BE HANDLED
BY NEW LANDFILL SITE 1988-2008

	<u>Tons</u>
Total Most Probable Waste Stream	4,683,175
Less Waste to EFW	<u>1,477,449</u>
Sub-Total	3,205,726
Plus Residue - Ash	188,818
- Non-Combustibles	<u>187,636</u>
Total	3,582,180

Corresponding Table in Stage 2B Update Report - Table 9 (Appendix A)

TABLE 9

TOTAL LANDFILLED WASTE 1988-2008
(INCLUDING CONTINGENCIES)

(IMPERIAL TONS)

Waste Direct to Landfill	3.206 million tons
EFW Residue - Ash	0.189 million tons
- Non-Combustibles	<u>0.188</u> million tons
Sub-total	3.583 million tons
Contingency for Waste Projection (High Population and High Waste Per Capita - 4.683 million tons x 11%)*	0.515 million tons
Contingency for EFW Plant Downtime Due to Emergencies and Unscheduled Maintenance (1.101 million tons** x 10%)	<u>0.110</u> million tons
Total	4.208 million tons

Note: The equivalent table in the Stage 2B Update Report includes a calculation of the landfill volume requirement for the above waste sources in addition to a contingency for the volume requirement. In this E.P.A. work, landfill volume will be more precisely calculated by Hydrology Consultants on annual waste volume figures.

* Assumes that the full contingency amount is landfilled

**Waste to EFW (1,477,449 tons) minus Non-Combustibles (187,636 tons) and Ash (188,818 tons)

SOURCE: Tables 6, 7 and 8

8. REVISED LONG TERM WASTE FORECAST - Cont'd

plant capacity, the percentage of the waste stream to be handled by the plant would necessarily fall over the forecast period. However, the Region's EFW study recommended a plant(s) with a capacity of 363 tonne (400 tons) per day. Under normal operating conditions, this plant(s) would handle % of the waste in 1997, dropping to % in 2008 (see Appendix C). Given the length of the projection period and the information available at present, the 50% assumption (which was directed by Council on September 5, 1984) is reasonable and the impact of a variance by a few percentage points is minimal.

A full explanation of the contingencies in Table 9 is contained in pages A-29 to A-32 of Appendix A. In summary, the contingency for waste projection incorporates an allowance for a combination of a high waste per capita figure and a high population forecast occurring in future. This was developed based on the Regional population projection (high forecast) and a waste per capita ratio of 0.834 tons. This figure represents the maximum figure achieved by the Region over the past ten years (Table 4). It occurred in 1979, a period when the economy was buoyant and the volume recovered through source separation was minimal. Consequently, it represents an adequate allowance for high waste per capita in future. The need for a waste projection contingency is based on the uncertainty inherent in a long term projection (to 2008) and the risk to the Region if more waste is generated and more landfill space required.

The second contingency for EFW downtime was included to allow for emergencies and unscheduled maintenance to the facility.

EFW
downtime

In a previous forecast completed November, 1984 (Appendix A), the corresponding table to Table 9 (page A-26) showed a calculation of landfill volume requirement for the above waste sources, in addition to a contingency for the volume requirement. This engineering contingency was established by Hydrology Consultants and covered the possibility of

8. REVISED LONG TERM WASTE FORECAST - Cont'd

lower landfill densities being achieved and new waste (i.e. clean fill) being accepted at the site. In this E.P.A. work, Hydrology Consultants will complete the landfill volume calculations and make separate provision for the contingency since it is an integral part of their land sizing and conceptual design work.

A comparison of the key findings in the 1984 projection (Appendix A) and this revised forecast is set out below:

	Stage 2B Update Report Projection (Appendix A)	Revised Projection	% Difference
Most Probable Long Term Waste Forecast	4,965,370 tons	4,683,175 tons	- 5.7%
Waste to EFW	1,575,991 tons	1,477,449 tons	- 6.3%
Waste to Landfill (including plant residue)	4,111,731 tons	3,582,180 tons	-12.9%
Total Landfilled Waste 1988-2008 (including all contingencies except volume)	4,922,000 tons	4,208,000 tons	-14.5%

what if EFW never built?

All of the key figures in the projection have decreased with declines of 12 to 15% in the most probable waste quantity to the landfill and the total waste quantity including all contingencies. The major reasons for this decline are:

- The significant increase in the quantity to be handled by source separation. In the Stage 2B Update Report, the 2008 share recovered by source separation was 8%, while the corresponding figure in this projection is 15.9%.
- The projected opening date of the landfill site changed from January 1, 1987 to September 1, 1988.. This resulted in the exclusion of 300,000 tons of waste from the Interim Planning Period, which would no longer be handled by the new landfill site. (Appendix A, pages A-17 and A-25)

8. REVISED LONG TERM WASTE FORECAST - Cont'd

*reduction
in
population
forecast*

- The Planning Department has completed a revised long term population forecast. The high end forecast has been refined downward from 409,500 to 362,600, a reduction of 11.5%. The revised forecasts are generally in line with recent projections prepared by the Ministry of Treasury and Economics in August, 1985.

*waste per capita
from .855 to
.834
tons*

- The high waste per capita figure was reduced from 0.855 tons per capita in the Stage 2B Update Forecast (page A-31 of Appendix A) to 0.834 tons per capita. The reasons are cited above.
- The plant residue assumption was reduced slightly from 26.9% of total waste to the plant to 25.48%, based on a refinement of the calculation in the E.F.W. Financial Report by Regional Staff.

In summary, the revised projection for landfilled waste quantity in Halton Region 1988-2008 (including contingencies) is 4,208,000 tons.

*4.2 million
tons
including
contingencies*

9. ANNUAL LANDFILLED WASTE QUANTITIES

The annual landfilled waste quantities divided into types of waste are shown in Table 10. The total landfill tonnage (4,207,431 tons) corresponds with the 4,208,000 ton figure shown in Table 9.

Table 10

Annual Waste Volumes by Source for Halton Region, 1988-2008
(Imperial Tons)

Year	Projected Tonnage (excluding Source Sep.)	Landfilled Tonnage	High Waste Contingency (11% of Pro- jected Tonnage)	Plant Residue (Non-Combust- ibles at 12.7% of Waste to Plant)	Plant Residue (Ash at 12.78% of Waste to Plant)	E.F.W. Downtime Contingency (10% of Net Waste to Plant)	Total Landfi Tons (includ ing Continge cies)
1988 (4 mon)	69708	69708	7668	0	0	0	77
1989	211677	211677	23284	0	0	0	234
1990	210165	210165	23118	0	0	0	233
1991	211904	211904	23309	0	0	0	235
1992	214564	214564	23602	0	0	0	238
1993	216891	216891	23858	0	0	0	240
1994	219712	219712	24168	0	0	0	243
1995	222659	222659	24492	0	0	0	247
1996	225369	188183	24791	4723	4752	2771	225
1997	228638	114319	25150	14519	14610	8519	177
1998	232029	116015	25523	14734	14827	8645	179
1999	235254	117627	25878	14939	15033	8766	182
2000	238858	119429	26274	15167	15263	8900	185
2001	242310	121155	26654	15387	15484	9028	187
2002	245825	122913	27041	15610	15708	9159	190
2003	249118	124559	27403	15819	15919	9282	192
2004	252616	126308	27788	16041	16142	9412	195
2005	255964	127982	28156	16254	16356	9537	198
2006	259304	129652	28523	16466	16570	9662	200
2007	262564	131282	28882	16673	16778	9783	203
2008 (8 mon)	178049	89025	19585	11306	11377	6634	137
	4683178	3205728	515150	187637	188818	110100	42074

SOURCE: Table 9

APPENDIX A
NOVEMBER, 1984 REVIEW OF
WASTE QUANTITIES
FROM
"REVIEW AND SUPPLEMENT TO
STAGE 2B, SELECTION OF
CANDIDATE SITES"

SECTION 1 - REVIEW OF WASTE QUANTITIES FORECAST

1.1 Background

This section outlines the evolutionary process used to develop a waste quantities forecast and the required landfill volume for the Halton Landfill Environmental Assessment, culminating in the production of the waste forecast and required landfill volume to be used in Stage 2C of the project and in the Stage 2B review.

The forecast used in Stage 2B was prepared in February 1983 as part of the Stage 1: Waste Needs and Systems Analysis Report. It was based on a time period from 1982-2001. In October 1983, an initial forecast update was prepared, focussing on the short term (1984-1988) or interim waste period. This report recognized that the long term forecast would ultimately have to be re-examined to: cover the period from June, 1988-2008; provide continuity with the Interim Waste Forecast; and incorporate the effects of some emerging changes in waste volumes which revealed themselves in 1983. In June 1984, the Energy From Waste Preliminary Feasibility Study was published. The analysis was based on a waste quantities forecast for the 20 year period from 1988-2007, developed by extrapolating the projection in the Stage 1 report and incorporating more detailed assumptions concerning ash residue, production capacity, etc.

Sub-section 1.2 highlights the changes which have occurred since the original forecast. Sub-section 3 describes, using flow diagrams, the results of the Stage 1 and Interim Waste forecasts. Sub-section 1.4 outlines trends in Halton's waste quantities, while sub-section 1.5 describes the updated waste quantities forecast which is to be employed in Stage 2C of the landfill assessment. Sub-section 1.6 converts this waste quantities forecast into the landfill volume requirement, incorporating the effect of the EFW plant(s), the Interim Waste period update and contingency allowances.

1.2 Changes Since the Stage 1 Forecast

1.2.1 Consolidation of the Interim and Long Term Waste Forecasts

There is a need to ensure that these two forecasts are internally consistent not only with respect to timing but also with regard to the assumptions on which they were based.

1.2.2 Revised Forecast Period

The Stage 1 forecast was based on the twenty year 1982-2001 forecast period, as it wasn't possible to allow for the implementation of waste management options prior to their selection. The forecast has now been changed to June 1988 to June 2008 and the interim period is now projected to end in May 1988. Within the forecast period, residential, industrial and commercial development is expected to be more extensive in the years after 2001, as compared to the early 1980's, because of the compounding effect of growth during that interval.

1.2.3 New Solid Waste Management System

The landfill volume for the Incineration (Energy from Waste) Option in the Stage 1 Report ranged from 5.7 million cu.yd. to 7.2 million cu.yd. The volume calculations were based on the assumption that 25% of the waste would move directly to the landfill and 75% to the EFW plant. (Regional Council directed the Environmental Assessment team to seek a site which would accommodate the 7.2 million cubic yard figure (Council Resolution June 22, 1983)).

Regional Council, as a result of the findings of the E.F.W. Preliminary Feasibility Study, have now directed that the Landfill Environmental Assessment team seek a landfill site which will accommodate 100% of the waste for eight years (June 1988-1996) and 50% of the waste for a 12 year period (June 1996-2008) during which a EFW plant is assumed to handle the remainder of the waste.

1.2.4 A Major Reduction in Waste at Halton's Landfill Site in 1983

The Stage 1 report waste forecast was based on Halton population and waste disposal data of the solid waste weighed at Halton landfill sites from 1976 to 1982. A weighed waste figure was applied to the Stage 1 waste forecast. The term "weighed" waste is omitted in this text since the explanation of derived waste quantities is provided herein. In 1983, however, there was a major decline in the amount of waste landfilled in the Region. The reasons for this reduction and its implications were discussed in an up-date Report, October, 1983 of the waste forecast for the interim period, 1984-1988.

In this report it is now possible to supplement the earlier analyses with data for the first 8 months of 1984, and one of the consequences will be the change in the waste per capita figure which played a major role in the forecast.

1.2.5 Contingency Allowance

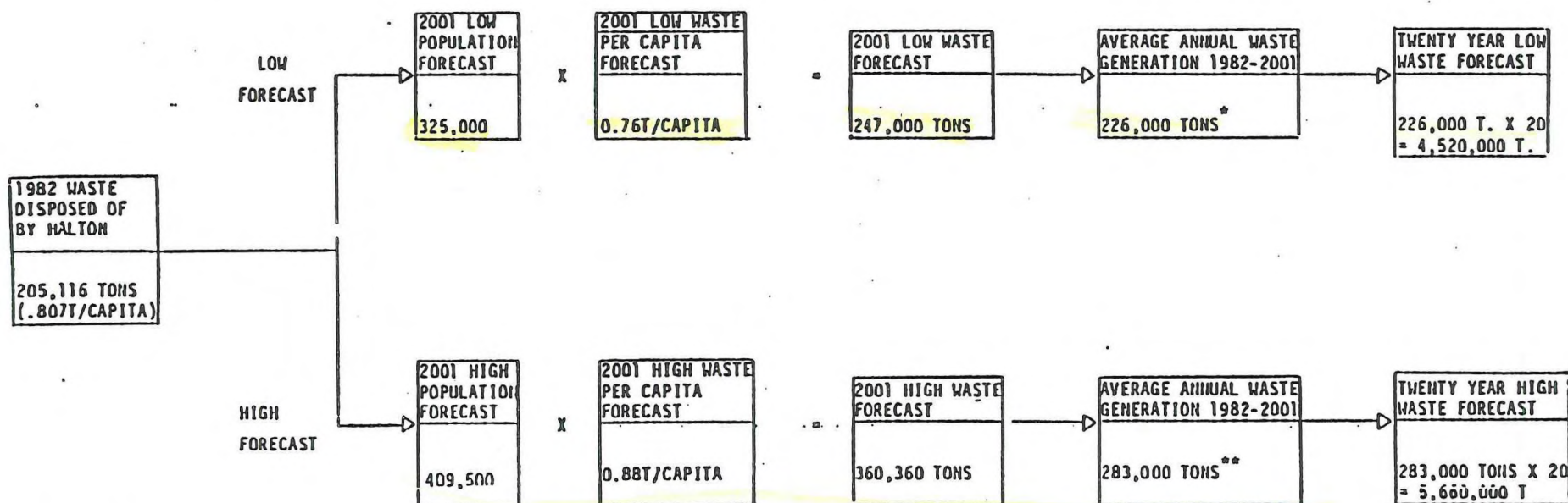
The landfill space requirements developed from the waste forecast in the Stage 1 Report (Chart 18) were adjusted to provide contingency for a number of items, including incinerator facility downtime, clean fill, the possibility of unforeseen wastes and an allowance for source separated waste. The basis for more detailed and accurate assumptions in these contingency areas is gradually emerging and updating is therefore possible in this matter as well.

1.3 Previous Forecasts

The results of the two Halton waste forecasts prepared to date are outlined on the following flow charts:

Figures 1 and 2: Stage 1 Report waste forecast for the period 1982-2001 with total landfill space requirements calculated in cubic yards.

FIGURE 1: STAGE 1 REPORT WASTE QUANTITIES FORECAST (1982-2001)
FOR THE DEVELOPMENT OF LANDFILL SPACE REQUIREMENTS (CHART 18).



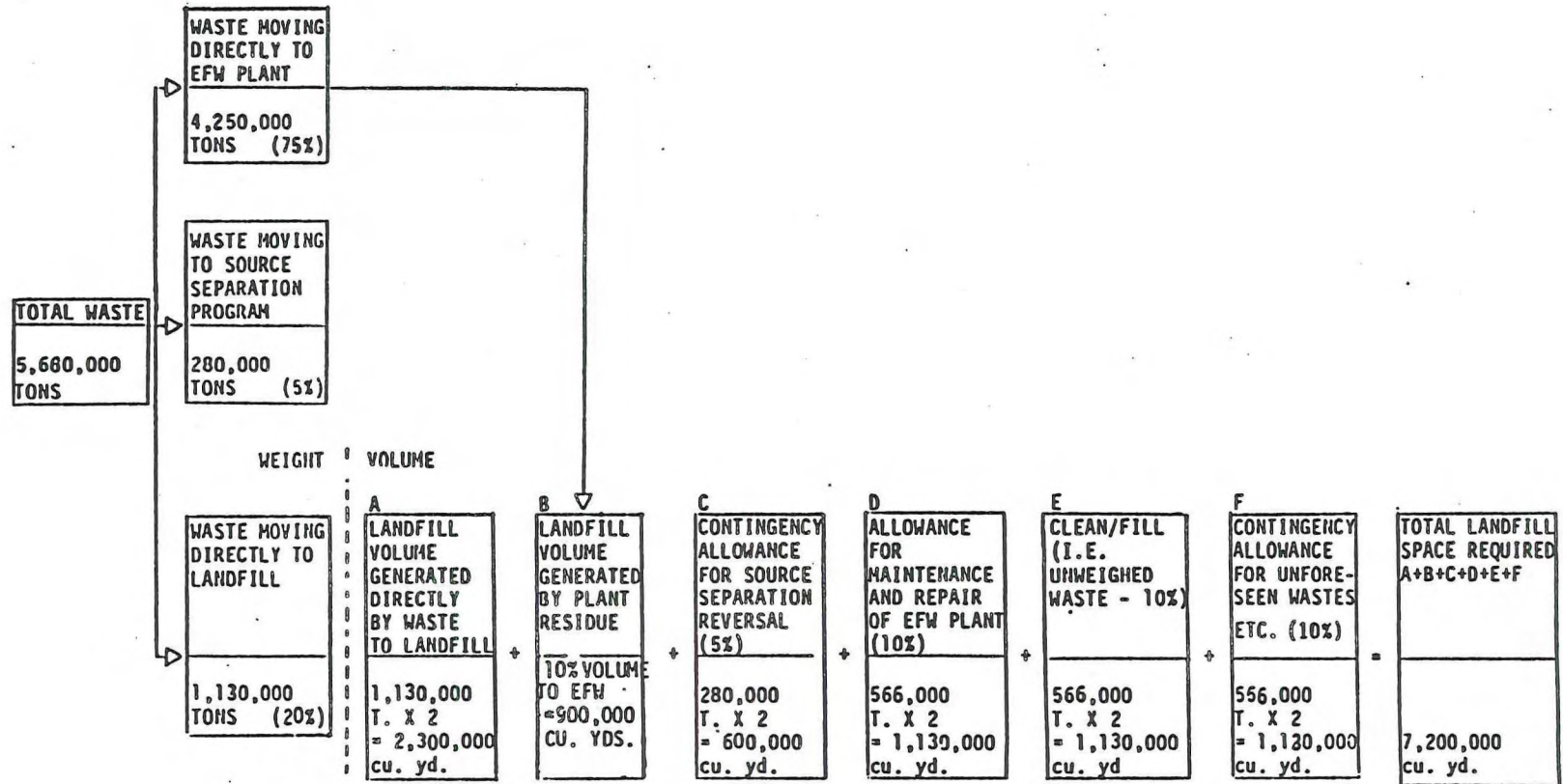
DISCUSSION:

- The actual waste forecast was calculated for five year intervals for the following years: 1986, 1991, 1996, 2001. The population forecast from the Region was only available for those years.
- The waste generation per capita factor had been reasonably stable over the past seven years (1976-1982). For the projection a range of 14% was used between the high and low forecast to accommodate fluctuations in the waste quantities.

*Midpoint between 2001 figure (247,000) and 1982 figure (205,116)

** Midpoint between 2001 figure (360,360) and 1982 figure (205,116)

FIGURE 2: STAGE 1 REPORT LANDFILL SPACE REQUIREMENTS (CHART 18)
SYSTEM 1 - INCINERATION (HIGH FORECAST) 1982-2001

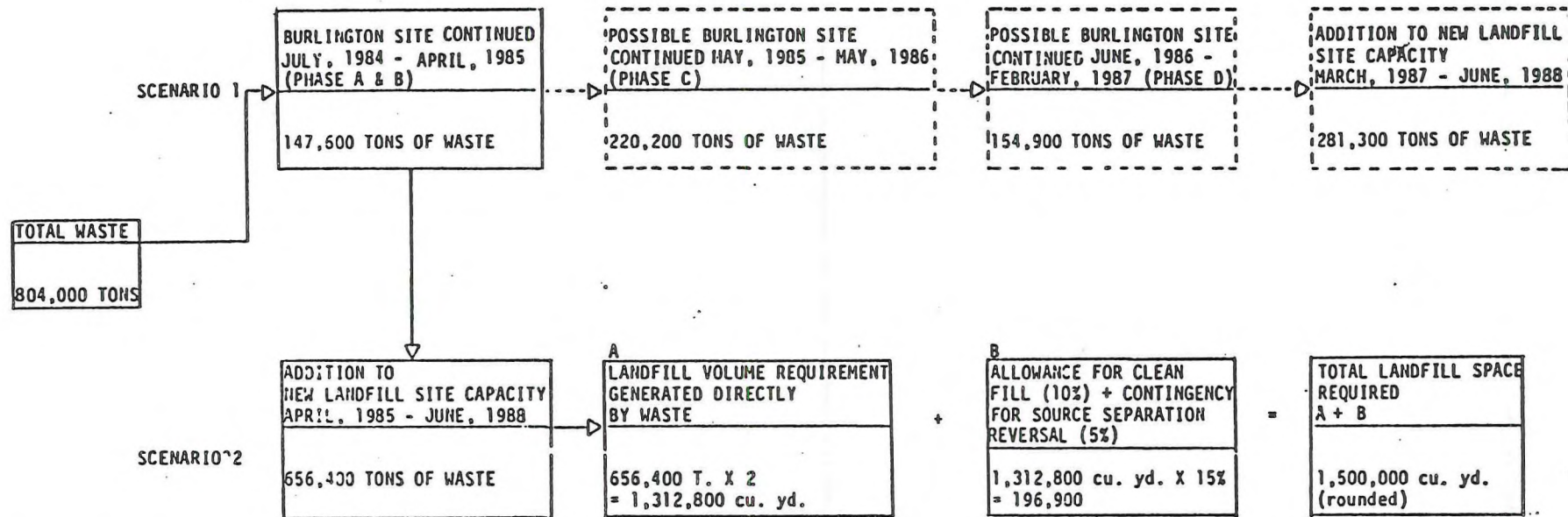


DISCUSSION: One ton of waste occupies two cubic yards of landfill space (not including required cover material)

Volume figures are rounded.

Box B: is calculated as 4,250,000 tons X 2 X 10% = 900,000 cubic yards (rounded)

FIGURE 3: INTERIM WASTE PERIOD JULY, 1984 - JUNE, 1988



DISCUSSION:

- One ton of waste occupies two cubic yards of landfill space (not including required cover material)
- The contingency allowance is considerably reduced from that of the long term forecast (Figure 2). Since the EFW will not be operating during this period, there is no allowance for facility downtime. In addition, because of the short time period, an allowance for unforeseen wastes was not considered to be necessary.
- Scenario 2 is the Region's preferred option with only the Phase A and B expansion of the Burlington site used. However, this has been reassessed in light of the time required to open a new landfill site as discussed in Section 5. Phase C and Phase D are likely to be required.

Figure 3: October, 1983 Update waste forecast for the period 1984-1988 (interim waste period) including separation into the four phases outlined in the Dillon Report, Burlington Landfill Site: Report on Possible Continued Use, October, 1983.

Up until September 5, 1984, the Region had instructed the Environmental Assessment team to locate a landfill site with a maximum capacity of 8.7 million cubic yards (Council Resolutions dated June 22, 1983 and Nov. 9, 1983¹). This was comprised of 7.2 million cubic yards from the long term waste forecast (Figure 2) and 1.5 million cubic yards from the interim waste forecast (Figure 3).

This formed the basis of the analysis for the Stage 2A and 2B reports. However, the Council Resolution of June 22, 1983, also stated that "... before completion of each stage of the Site Selection Procedure and again with the preparation of the Environmental Assessment Document in Phase 3, the Consultant and Staff must review with Council the effects on the process of the size of the landfill component being sought."

1.4 Trends in Halton's Waste Quantities

The quantities of waste landfilled in Halton Region for the years 1982, 1983, and 1984 to date are shown in Table 1. The October, 1983 Update Report forecast that the 1983 waste volume would be significantly lower than the 1982 volume and this, in fact, was the case. Indeed, the Report's 1983 forecast of 185,000 tons was very close to the actual 1983 volume of 184,450 tons as Table 1 shows.

In 1984, waste volumes appear to be returning to more "normal" levels as the Update Report forecast. Over the five-month period between January and

May, Halton waste volumes have closed more than half the gap between the 1982 and 1983 figures (84,270 tons vs. 72,099 tons). The volumes for May

¹Also letter from C.A.O. dated December 28, 1983.

TABLE 1
TONS OF WASTE DISPOSED OF
AT HALTON REGION SITES
1982, 1983 and 1984 TO DATE

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1984 % CHANGE</u>	
				Based on <u>1982</u>	Based on <u>1983</u>
January	12,591	12,314	12,454	- 1.1	+ 1.1
February	15,115	11,328	13,262	-12.3	+17.1
March	15,964	13,831	13,423	-15.9	- 2.9
April	19,283	14,475	17,566	- 8.9	+21.4
May	<u>21,317</u>	<u>20,151</u>	<u>22,447</u>	<u>+ 5.3</u>	<u>+11.4</u>
SUB-TOTAL	84,270	72,099	79,152	- 6.1	+ 9.8
June	20,274	18,400	19,071*	-5.9	+3.6
July	17,127	14,906	17,055*	-0.1	+14.4
August	17,750	17,174	18,287*	+3.0	+ 6.5
September	17,486	16,173			
October	16,426	15,724			
November	17,034	16,650			
December	<u>14,749</u>	<u>13,324</u>			
TOTAL	205,116	184,450	N/A		

SOURCE: Compiled by C.N. Watson & Associates Ltd. from information provided by the Region of Halton.

*Figures for June, July, and August, 1984 became available after the analysis was completed.

and August, 1984, exceeded not only the 1983 figures (by 11.4% and 6.5%), but the 1982 figures as well (by 5.1% and 3.0%). In the most recent months, the trend has continued with the increased waste volumes making up almost two-thirds of the reduction between 1982 and 1983.

Table 2 forecasts 1984 Halton waste quantities based on the 1982 and 1983 situations using a similar technique to that in the Update Report. Projections based on recent months' data show a significant range of annual waste quantities (varying by 4,000-17,000 tons approximately), due largely to the decrease in waste quantities which occurred in the early months of 1983. Halton's forecast 1984 annual waste volume would appear to range from 195,000-200,000 tons.

Table 3 shows the tons of waste disposed of at Halton Region landfills by current major disposers for January-May, 1982, 1983 and 1984. The impact of company acquisitions has not been incorporated into this table and is probably a major reason for shifts in waste volume between operators, particularly to Laidlaw and Industrial (see Update Report pages 12-13). The trend for the small haulers listed under the "all other" category is of particular importance. Between 1982 and 1983, the tonnage hauled by these operators fell by 8,700 tons. This accounted for over 70% of the decline in total tonnage (12,171 tons) over the 5 month period. In the 1983 to 1984 period, the volume of waste from these small haulers increased by over 430 tons. The Update Report identifies reasons why the waste volume of small haulers reduced in 1983, including the use of more convenient landfill sites in Peel, Wellington, etc. and lower volumes of waste.

1.4.1 Factors Responsible for the Decline in Halton's Waste Quantities

The Update Report identified four factors contributing to the decline in waste quantities and an estimated tonnage attributable to each.

Appendix C includes excerpts from the 1983 Update Report regarding the original assumptions on these factors.

TABLE 2

FORECAST OF TONS OF WASTE TO BE LANDFILLED
IN HALTON REGION DURING 1984
BASED ON JANUARY - MAY DATA

	<u>YEAR TO DATE PERCENTAGES</u>		<u>1984 ANNUAL FORECAST</u>	
	<u>1982</u>	<u>1983</u>	<u>1982 Factors</u>	<u>1983 Factors</u>
January	.06138	.06676	202,900	186,549
February	.13507	.12818	190,390	200,624
March	.21290	.20316	183,837	192,651
April	.30691	.28164	184,761	201,339
May	.41084	.39089	192,659	202,492
June *	.50968	.49064	192,715	200,194
July *	.59318	.57145	194,339	201,729
August *	.67972	.66456	196,500	200,983

SOURCE: Calculated from information in Table 1

*Figures for June, July and August became available after the analysis was completed

**1984 Waste Forecast for January

Based on 1982 factors $\frac{12,591 \text{ tons}}{205,116 \text{ tons}} = .06138$

1984 January waste volume $\frac{12454 \text{ tons}}{.06138} = 202,900 \text{ tons}$

(1982, 1983 & 1984 monthly totals show on Table 1)

AT HALTON REGION LANDFILLS
BY CURRENT MAJOR DISPOSERS
FOR JANUARY - MAY, 1982, 1983, 1984

A-11

	<u>1982</u>	<u>1983</u>	<u>1984</u>
Burlington Municipal	1,661	735	387
Ford	2,982	1,039	490
Frank	1,108	591	397
J. & J. Haines	803	449	313
General Electric	933	844	911
Greenspoon	N/A	N/A	394
Halton Region and Board of Education	321	133	161
Industrial	5,116	6,405	9,054
Laidlaw	8,080	9,246	12,114
Leaver	1,324	1,235	916
Leferink	3,213	6,438	8,150
Milton	3,150	3,208	3,505
J. Mitchell	529	497	431
Oakville	11,180	10,524	11,733
Provincial (Burlington)	16,942	15,065	15,891
Roy's	2,149	1,248	158
Select	1,730	1,360	318
Syvret	698	489	282
Tricil Ltd.	N/A	N/A	493
Sub-Total	62,919	59,506	66,098
All others	21,351	12,593	13,054
TOTAL	84,270	72,099	79,152

N/A - not applicable

SOURCE: Compiled by C.N. Watson and Associates Ltd. from
information supplied by the Region of Halton.

N.B. Table 4 (page 10) in the Update Report lists five additional major disposers in 1983. These disposers are no longer listed in the 1984 records. Some firms may have been bought out. In addition, some of the volume changes are due to acquisitions as noted in the Update Report.

The report stressed that these tonnages represented informed judgments only, as no specific data was available. This section comments briefly on more recent trends in each of the factors and estimates the waste quantities which may be expected to return in 1984.

i) Increased Haul Costs and Tipping Fees

The Update Report noted that the closing of the Oakville site at the end of 1982 added significantly to the haul times and costs for haulers from Oakville and Halton Hills. In addition, the Region raised its tipping fee by \$1.00 per ton between 1982 and 1983. The situation with regard to haul times and costs has not changed, although there may be some return of tonnage as operators adjust to the situation and there is a greater opportunity to recoup cost increases. In addition, some landfill sites in surrounding areas appear to be enforcing more stringently their regulations prohibiting disposal by non-residents. The Region, however, has increased its tipping fee by approximately \$1.80 per ton between 1983 and 1984 which will possibly mitigate against the return tonnage lost.

ESTIMATED 1983 TONNAGE DECLINE - 5,000 TONS
ESTIMATED TONNAGE RETURN IN 1984 - 2,000 TONS

ii) Weather Conditions

The hot, dry summer in 1983 was a factor in reducing Halton's waste volumes, although not a major one. Weather conditions to date in 1984 appear to be more normal.

ESTIMATED 1983 TONNAGE DECLINE - 1,000-2,000 TONS
ESTIMATED TONNAGE RETURN IN 1984 - 2,000 TONS

iii) Recycling

Interest in municipal source separation is continuing to grow in Halton. The total amount of municipally source-separated waste in the

*interest in
mun. source
sep continues
to grow
in
Halton*

TABLE 4

UNEMPLOYMENT IN OAKVILLE/MILTON*
JANUARY TO JUNE 1983 and 1984

	<u>1983</u>	<u>1984</u>	<u>% DECLINE</u>
January	9,043	5,328	-41
February	9,001	5,026	-44
March	8,862	4,681	-47
April	8,499	4,461	-48
May	7,611	4,281	-44
June	6,582	4,550	-31

*1982 and 1983 figures for Burlington were included in the Update Report. Comparable figures for 1984 are not available.

SOURCE: Canada Employment Centre, Oakville Office

Region was 3,948 tons in 1983. To the end of May in 1984, a total of approximately 2,100 tons has been processed. At this rate, a projected annual amount exceeding 5,000 tons would be recovered. The increase in waste removed from the landfill waste stream to source separation would, therefore, be 1,000 tons. The 1983 Update Report concluded that recycling (including municipal source separation and commercial and industrial recycling) accounted for a reduction in waste volume of 8,000 tons (1983). Of this total, 6,000 tons would be due to recycling by industries, the major contributor being Ford (page 16).

ESTIMATED 1983 TONNAGE DECLINE - 8,000 TONS
ESTIMATED TONNAGE RETURN IN 1984 - 0 TONS

iv) Economic Conditions

The economy has improved in the early months of 1984 compared to the same months in 1983. Unemployment was the proxy indicator used in the Update Report for industrial/commercial production (since most other figures are national in scope). Table 4 shows that unemployment in Oakville/Milton (the only available figures) was lower in 1984 relative to the same period in 1983, and the increase in the volume of waste transported by small haulers (Table 3) suggests that there has been some improvement in the economy.

ESTIMATED 1983 TONNAGE DECLINE - 5,000-10,000 TONS
ESTIMATED TONNAGE RETURN IN 1984 - 7,000 TONS

1.4.2 1984 Waste Projection

The Interim Waste Forecast projected a Halton waste volume of 193,000 tons for 1984, premised on an estimated return of the lost tonnage amounting to 4,000 tons, population growth of 5,000 persons and a waste per capita figure of .777 tons. The waste per capita ratio of .777 tons per capita was based on the following analysis as set out in the Update Report:

1983 Estimated Tonnage (Section 1)	+ Returned Tonnage	=	1983 "Normal" Waste Quantity	Waste per Capita (on 254,085 Popl.)
185,000	10,000-15,000		195,000- 200,000	0.767 - 0.787 (Average .777)

This analysis assumes no population increase between 1982 and 1983. Therefore, the ratio may be marginally high, if this is not the case.

Based on the changed circumstances noted above, the estimate of the tonnage to be returned in the first year of the 1984 forecast (4,000 tons) is unlikely to be high enough. It now appears that a figure of 11,000 tons may be more likely, based on the following assumptions:

ESTIMATED TONNAGE RETURN
IN 1984

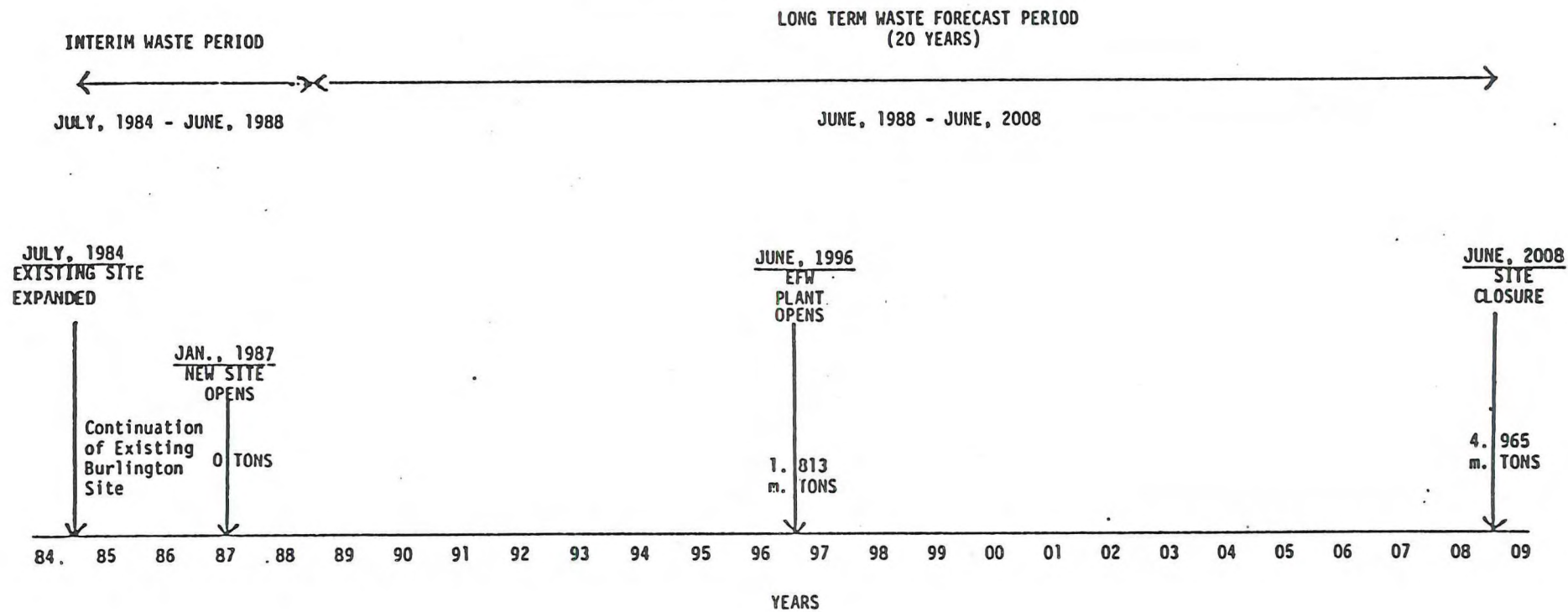
1. Increased Haul Costs and Tipping Fee	2,000
2. Weather Conditions	2,000
3. Recycling	-
4. Economic Conditions	<u>7,000</u>
	11,000 tons

Therefore, the 1984 projected waste volume for Halton is now estimated at 200,000 tons, a 7,000 ton (3.6%) variance from the forecast in the Interim Waste Report.

1.5 Stage 2C Waste Forecast

The development of the revised waste quantities forecast for the Halton landfill requirement is outlined in this section. The timing and the major events in the forecast period are shown on Figure 4. The Region has defined the interim waste forecast period as July 1984 to June 1988 with the long term forecast (20 years) from June 1988 to June 2008.

FIGURE 4: WASTE QUANTITIES FORECAST PERIOD



NOTE: TONAGE FIGURES ARE CUMULATIVE

The Region has recently received Provincial approval for the extension of the existing Burlington landfill site until mid-1987. However, its objective is to commence operations at the new landfill site as soon as possible and to close the existing site. For this analysis, the new site is assumed to open on January 1, 1987, based on consultation with Walker, Wright, Young Associates Limited and Regional Staff (Figure 4). Accordingly, the new site must handle 17 months of 100% of the solid waste generated from the interim waste period (January 1987 - June 1988) in addition to the twenty-year long term waste quantities.

Based on the September 5, 1984, Regional Council Resolution, this forecast assumes that 100% of Regional waste will be landfilled directly during the period from June 1988 to June 1996. In June 1996, an Energy from Waste plant with a capacity to handle 50% of Regional wastes over the period is assumed to commence operations. For the 12 year period between June 1996 and June 2008, the landfill site will be required to handle 50% of the Region's waste quantities (plus ash and residue from the plant).

1.5.1 Approach

In completing the Stage 2C waste forecast, the methodology used in the Stage 1 Report was reviewed and a few revisions were made. The Stage 1 Report and the October 1983 Update Report provide a significant amount of background information. This section in the Stage 2C waste forecast should be read in conjunction with them. A single "most probable" forecast was provided rather than low and high waste quantities projections. With a lower waste quantity, the landfill site(s) would be more than adequate to accommodate the waste. Consequently, there was no need to consider this possibility in the analysis.

However, should a higher waste quantity occur than forecast, a contingency allowance to provide for this has been incorporated into the required landfill volume calculation rather than making a number of separate waste quantity forecasts. This is discussed in Sub-section 1.6.

*no need for
only a
most
likelihood
estimate*

TABLE 5
SOURCE SEPARATED WASTE IN HALTON (TONS)
1982 and 1983

	<u>NEWSPRINT</u>		<u>GLASS</u>		<u>METAL</u>		<u>TOTAL</u>	
	1982	1983	1982	1983	1982	1983	1982	1983
Burlington	1,428	1,700	300*	190	*	1	1,728	1,891
Oakville	191	1,165	0	250	0	0	191	1,415
Milton	144	54	*	2	*	0	144	56
Halton Hills	548	394	121	98	45	34	714	526
Halton Region Containers	<u>**</u>	<u>60</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>60</u>
TOTAL	2,311	3,373	421	540	45	35	2,777	3,948

* Figure includes glass, tin, fine paper and corrugated cardboard from Burlington and Milton.

** Amount is included in municipal figures above.

SOURCE: Halton's Recycled Resources from Halton Region Public Works Department.

In addition, this Stage 2C waste forecast shows a specific reduction attributable to municipal source separation.

1.5.2 Source Separation

source separation continued to expand

Halton's Recycled Resources (H.R.R.), the company handling much of the municipal source separation operation in Halton, has continued to expand its operation in 1983. Residences in Oakville, Milton, and Halton Hills all have curbside pickup for newspapers, glass and tin. The Town of Halton Hills continues to operate its own program for this service ("Divide and Conquer"). Burlington has glass and newspaper pick-up and tin in some cases. The Region continues to operate containers for newspaper at the Burlington Landfill site, the Halton Hills transfer station, and the recently opened container stations in Milton and Oakville. In addition the Region is evaluating the possibility of taking over co-ordination of the source separation program.

NB

The market for recycled materials is currently excellent and H.R.R. indicate that they could sell much more than they currently process.

Table 5 shows the volume of municipal source separated waste in Halton from all programs in 1982 and 1983. The total increased by 42% (approximately 1,200 tons) between 1982 and 1983. This, in part, reflects an increased level of service with curbside pickup commencing in Oakville in mid-1983. Figures for 1984 to the end of May total 2,100 tons with a projected annual amount exceeding 5,000 tons.

Municipal source separated waste as a percent of landfilled waste is as follows:

TABLE 6: MUNICIPAL SOURCE SEPARATED WASTE AS A PERCENT OF HALTON'S LANDFILLED WASTE STREAM (TONS)

	1982	1983	1984 (projected)
Source Separated Waste	2,777	3,948	5,000**
Landfilled Waste Stream	205,116	184,450	200,000
Percent	1.4%*	2.1%	2.5%

* The source separated percentage shown in the Stage 1 Report was 1.7% as per Halton Public Works Report P.W. 51/83. However, this figure contained an allowance for recycling.

** The projection was based on tonnages for the first five months of the year. Since then, there has been an increase and the annual volume will probably be higher.

The Stage 1 Report established a goal of 5% of total waste² for the municipal source separation program. However, in the intervening time period, the tonnage of source separated waste and its proportion of land-filled waste have increased significantly. The success of the program would indicate that a higher target may be attainable. Accordingly, the Stage 2C forecast was based on an ultimate goal of 8% of total waste processed by source separation. This would, however, be achieved gradually over time with the percentage increasing by 0.25% a year based on the 1983 figures to achieve the anticipated level of 8%. *in fact it's now gone 16%*

1.5.3 Landfill Volume in the Base Year (1988)

The volume of waste landfilled in Halton in 1983 was 184,450 tons, virtually identical to the Update Report's forecast of 185,000 tons for that year. The Update Report noted that the 1983 volume was exceptionally low due to a number of temporary factors and unusual conditions which were not expected to prevail in future. The report forecast the "normal" 1983 waste quantity to be 10,000-15,000 tons higher (page 20) based on the returned tonnage. The total 1983 waste quantity (landfilled) in a normal year would, therefore, be 195,000-200,000 tons. The mid-point of the range is 197,500 tons. *why*

²The 5% goal was intended for residential source separation only. Recycling by industrial and commercial enterprises in Halton is occurring and will continue in future. However, no data is available on the quantity of waste involved currently or on the trend.

The base year for the long term waste forecast is 1988. The landfill volume for base year development use in the Stage 2C projection was calculated as follows:

	<u>Tons</u>
1983 waste volume	197,500
1983-1988 increase - 25,000 pop. x .777 tons per capita	<u>19,425</u>
	<u><u>216,925</u></u>

The 1983-1988 increase is based on an annual population increase of 5,000 persons supplied by the Regional Planning Department and the revised waste per capita figure set out in the Update Report.

1.5.4 Long Term Waste Forecast

this most probable forecast is now too high according to latest report

The most probable long term waste forecast (June 1988 - June 2008) is calculated in Table 7. The forecast was based on a set landfill volume for the base year of development (1988) which remains constant during the period. Added to this is the waste generated by the new population (and new non-residential development) calculated by multiplying the population increase by a waste per capita figure. Population information was supplied by the Regional Planning Department (Appendix A). The notes attached to the table explain the assumptions in some detail. The expected increase in source separated waste is shown as a separate column and deducted from the sub-total. It should be noted that, similar to the Stage 1 Report, certain wastes not currently accepted at the Regional landfill site are not included in the projection (hazardous wastes, sludges, etc.). The most probable quantity of waste generated by Halton over the 20 year (long term) period is 4.965 million tons.

*now it's 4.2.
∴ why couldn't the
4.2 figure be kept
too high*

Table 7

Twenty Year Long Term "Most Probable" Waste Forecast for Halton Region
(June, 1988-June, 2008)

Year	Landfill Volume for Base Year (1988) Development (A)	Population Increase	.777 Tons Post 1988	Cumulated Tons from Popula- tion Increase (B)	Subtotal (A)+(B)	Addl. Source Separation Deduction (C)	Total Tons (A)+(B)-(C)
1988					124499		124499
1989	216925	4672	3630	3630	220555	3308	217247
1990	216925	4672	3630	7260	224185	3923	220262
1991	216925	4672	3630	10890	227815	4556	223259
1992	216925	5365	4169	15059	231984	5220	226764
1993	216925	5365	4169	19228	236153	5904	230249
1994	216925	5365	4169	23396	240321	6609	233712
1995	216925	5365	4169	27565	244490	7335	237155
1996	216925	5365	4169	31733	248658	8081	240577
1997	216925	5564	4323	36057	252982	8854	244127
1998	216925	5564	4323	40380	257305	9649	247656
1999	216925	5564	4323	44703	261628	10465	251163
2000	216925	5564	4323	49026	265951	11303	254648
2001	216925	5564	4323	53350	270275	12162	258112
2002	216925	6650	5167	58517	275442	13083	262358
2003	216925	6650	5167	63684	280609	14030	266578
2004	216925	6650	5167	68851	285776	15003	270773
2005	216925	6650	5167	74018	290943	16002	274941
2006	216925	6650	5167	79185	296110	17026	279084
2007	216925	5570	4328	83513	300438	17726	282712
2008	90385	2320	1803	36600	126985	7452	119493
TOTALS		109801		85315	5163103	197733	4965370

Notes:

1. 1988 data was taken from Table B, page 23, Interim Waste Forecast from the October 1983 Update Report. Data is for a seven month period (June-December). It follows a slightly different pattern than the long term forecast.
2. The source of the base year (1988) waste volume is described in the accompanying text.
3. The population increase for the period 1989-2001 was taken from Table 15 in the Stage 1 Report. The population increase for the period 2001-2008 was taken from the "Initial Regional Test Run" completed for the revised population projection currently under preparation by Regional Planning staff (Appendix A). The Region has confirmed that these projections are the most up-to-date figures available.
4. Population increase figures are the mid-point of the range supplied.
5. The most probable waste volume per capita figure was calculated in the Interim Waste Report and Section 4 as follows:

$$197500 \text{ tons} / 254085 \text{ population} = .777 \text{ tons per capita}$$
6. Data for 2008 is for a five month period (January-June).
7. The source separation deduction increases annually from a base figure of 2.1% of the landfilled waste in 1983 by .25% per annum to the target of 8%. Since source separated waste is not considered in the base year waste volume, 2.1% has been netted from the deduction in each year.

1.5.5 Comparison of New Forecast with Stage 1 Report Forecast

The following table illustrates a comparison of the total Halton long term waste quantity projections (tons) for the two forecasts:

	<u>STAGE 1 REPORT</u>	<u>REVISED FORECAST</u>
Low	4,522,617	
High	5,756,682-	
Most Probable (Mid-Point)	5,139,650	4,965,370

Although the two projections cover different twenty year periods (Stage 1 Report 1982-2001 and the Revised Forecast 1988-2008), the "most probable" forecasts are similar (5.140 million tons vs 4.965 million tons). In effect, the higher population growth in the new forecast has been offset by the lower waste per capita figure based on the 1983 information.

1.5.6 Total Waste Quantity Handled by EFW Plant

The Stage 1 Report calculation of landfill space requirements (Chart 18) under the Incineration (EFW) Option 1, was based on an assumption of 75% of the total twenty year waste stream being handled by the EFW plant, with the remainder going directly to the landfill site. The September 5th Regional Council Resolution directed the Landfill Environmental Assessment study team to assume that an EFW handling 50% of the Region's waste for the final twelve years of the planning period would be in place by 1996. The calculation of total waste to be handled by the EFW, and the residue generated, is shown in Table 8. The assumptions concerning plant capacity and start-up date result in the EFW accommodating the following proportion of the total waste stream under the new forecast:

$$\frac{1.576 \text{ million tons}}{4.965 \text{ million tons}} = 32\%$$

TABLE 8

TOTAL WASTE QUANTITY TO BE HANDLED BY EFW PLANT ASSUMING
8 YEARS OF 100% LANDFILL AND 12 YEARS 50% DIRECT TO LANDFILL
AND 50% TO EFW

Waste to EFW	1,575,991	tons
Residue - Non-Combustible	256,887	tons
- Ash	166,999	tons

Notes and Sources:

- (1) Waste to EFW was calculated based on information in Table 7 as follows:

Total Waste Volume	4,965,370	tons
minus June, 1988 - June 1996 Waste	1,813,388	tons
June, 1996 - June 2008 Waste	3,151,982	tons
50% to EFW	1,575,991	tons

- (2) Residue - Non-Combustible was calculated at 16.3% of total waste to the plant based on information from the EFW Study "Financial Report" (pages 14 & 15) and Regional Staff.
- (3) Residue - Ash was calculated at approximately 12.66% of total waste to the plant minus the Non-Combustibles, based on information as cited for the Non-Combustible Component. Ash as a percent of total waste equals 10.6%.

This compares with the 75% of original weighed waste handled by the EFW in the Stage 1 Report.

1.5.7 Interim Waste Period

The long term waste projection encompasses the period from June 1988 to June 2008. However, as Figure 4 illustrates, capacity would be available in the new landfill site in January 1987 in the interim waste period. Based on the interim waste projection included in the Update Report, the new landfill site would therefore require capacity to handle an additional 298,466 tons (waste quantity from January 1987 to June 1988).

1.5.8 Total Waste Quantity to be Handled by New Landfill Site

Table 9 combines waste quantities from EFW residue, the interim waste period and the long term forecast waste "direct to landfill" to generate the total waste required to be handled by the new landfill. The total is 4.112 million tons. Of this total, 3.688 million tons of waste would go directly to the landfill site. In addition, there would be 424,000 tons of residue from the EFW plant which must be landfilled. Finally, the need for contingencies will be considered in Section 6.

1.6 Required Landfill Volume

The required landfill volume established during Stage 1 of the study was based on an assumed "in place" density of 1,000 pounds of waste per cubic yard of landfill space. According to Hydrology Consultants,³ this density conversion factor "is a value commonly used in landfill design today." However, "the figure was arrived at without knowledge of the landfill characteristics The actual capacity of a municipal sanitary landfill is determined by a) the area of the site, b) its general geologic setting, c) fill height constraints, d) characteristics of the refuse

³Letter from Hydrology Consultants to C.N. Watson and Associates Ltd., July 31, 1984.

TABLE 9

TOTAL "MOST PROBABLE" WASTE QUANTITY TO BE HANDLED BY NEW LANDFILL SITE
8 YEARS 100% LANDFILL, 12 YEARS 50% DIRECT TO LANDFILL AND 50% TO EFW

	TONS
Total Most Probable Waste Stream	4965370
Less Waste to EFW	1575991
Waste from Interim Period (January, 1987 to June, 1988)	298466
SUB-TOTAL	3687845
Plus Residue - Ash	166999
- Non-Combustibles	256887
TOTAL	4111731

material, e) the compactive effort applied, and f) the rate of filling (slow fill allows settlement to take place)". Hydrology Consultants indicate that "it may be wise to provide a 10% contingency to compensate for less than the predicted density."

1.6.1 Landfill Volume Requirement

Table 10 shows the calculation of landfill space requirements based on the most probable waste quantities forecast outlined in Section 5. The waste volume generated by the waste moving directly to the landfill site over the 20 year period and the residue from the EFW plant totals 8.22 million cubic yards (assuming 1,000 pounds per cubic yard). This figure represents a realistic forecast based on what is known today of the Region of Halton's most likely landfill requirement over the planning period.

However, there is a very real need for contingency allowances to provide for variations which could occur in the forecast assumptions. The planning period is a long one, extending beyond the turn of the century. The level of uncertainty increases as one moves beyond the short-term. As indicated previously, higher actual volumes of waste present a significant risk to the Region as landfill space would run out before the end of the forecast period and there may be pressure to increase the height of landfill, reduce the buffer widths, etc. in order to reach the 20 year capacity limit. However, it is possible that future circumstances generating the need for every one of the contingencies will not materialize.

1.6.2 Contingencies Used in the Stage 1 Report

Figure 2 outlines clearly the contingency items employed in determining the long term landfill space requirements in Stage 1 for the Incineration (EFW) option. This analysis was prepared at an early stage in the process when only general information, mainly based on experience in other areas, was available. In setting the contingency levels, the study team concluded that it was advantageous to assume on the high side due to the large number of unknowns (including the possibility of additional types of waste being accepted at the landfill site based on the "Blueprint for Waste" report),

TABLE 10

LANDFILL VOLUME REQUIREMENTS BASED ON 8 YEARS 100% LANDFILL,
12 YEARS 50% DIRECT TO LANDFILL AND 50% TO EFW

		CUBIC YARDS (millions)
Waste Direct to Landfill	3.688 m.tons X 2	7.38
Residue - Ash	0.167 m.tons X 2	.33
- Non-Combustibles	0.257 m.tons X 2	.51
SUBTOTAL		8.22
Contingency for Waste Projection		

High Population Projection and High Waste per Capita	4.965 m.tons X 14% X 2	1.39
Contingency for EFW Plant		

Downtime	1.152 m.tons X 10% X 2	.23
SUBTOTAL		9.84
Contingency for Volume Requirement		

To cover possibilities such as a lower landfill density, new wastes (ie. clean fill) being accept- ed at the site, etc.	9.84 m.cu.yd. X 15%	1.48
TOTAL		11.32

SOURCES: Tables 7,8,9

the length of the forecast period, and the possible variability in the waste quantities. Subsequent events have confirmed this approach, as the waste quantities varied significantly in 1983 and the EFW capacity is much smaller than that assumed in the Stage 1 calculations. The Stage 1 Report and the new contingency assumptions for Stage 2C and other adjustments to the base landfill volume are summarized in Table 11.

1.6.3 Contingencies for Stage 2C Forecast

Each of the contingency items included in the Stage 1 forecast has now been reviewed in light of the information now available. Some have been retained while others have been combined. The contingencies used in the Stage 2C forecast⁴ are discussed below:

- Allowance for High Population Projection & High Waste Per Capita Forecast

The most probable waste forecast developed in Table 7 was based on an average of the high and low population projections (mid-point) supplied by the Region and an average of the high and low waste generation per capita figures, as discussed in Section 1.4.1. The projection period now covers the years 1988-2008. The level of uncertainty in such a projection increases significantly in the later years. In addition, an actual increase in the waste per capita figure would represent a risk to the Region as more waste would be generated and more landfill space required. The Stage 1 Report (pages 40-44) describes a number of factors which might increase this figure including: the possibility of unforeseen (non-hazardous) wastes being accepted at the landfill site; shifts from private to public disposal;

⁴This analysis has been based on an EFW plant accepting net waste of 1.2 million tons. It is unlikely that precisely this amount would be taken by the plant. No contingency has been included for a lower amount.

TABLE 11

COMPARISON OF ADJUSTMENTS AND CONTINGENCIES ADDED
TO STAGE 1 WASTE FORECAST AND STAGE 2C WASTE
FORECAST IN DETERMINING LANDFILL CAPACITY
REQUIREMENTS

<u>Contingencies</u>	<u>Stage 1 Forecast</u>	<u>Stage 2C Forecast</u>
EFW Facility Downtime	10% of Total Waste (14% of Waste to Plant)	10% of Net Waste to Plant
Source Separation	5% of Total Waste	Included in High Waste per Capita Contingency
Clean Fill	10% of Total Waste	Included in Volume Contingency
Unforeseen Wastes	10% of Total Waste	Included in Volume Requirements and High Waste Per Capita Contingency
High Population Projection High Waste Per Capita	Separate High Waste Forecast Completed	14 of Most Probable Waste Forecast
Volume Requirements	Included in Clean Fill and Unforeseen Waste Contingency	15% of Landfill Space Requirements of the above Forecast Items
<u>Other Adjustments</u>		
Residue from EFW - Ash	10% of Waste	12.7% of Net Waste to Plant (included in Table 8)
- Non-Combustible	Included with Ash	16% of Waste to Plant (included in Table 8)

SOURCES: Stage 1 Forecast - Chart 18 and population analysis based on Table 15 in the Stage 1 Report.

Stage 2C Forecast - see discussion in text and Table 8

changes in the number of jobs per capita in the Region; reversals in the municipal source separation and other recycling programs,⁵ etc. To provide for the possibility of higher than expected population growth and higher waste generation, a contingency allowance has been included based on the impact on the total waste volume of the Region's high population forecast and high waste per capita. The high waste per capita figure was based on a 10% increase over .777 tons per capita (.855). This figure represents somewhat more than the historical high which the Region has achieved over the past eight years (Table 17 of the Stage 1 Report). The two items result in an increase in the total Regional waste volume of 14%. This contingency was not applied in the Stage 1 forecast since a high waste projection was completed separately.

- Allowance for EFW Downtime

A figure equal to 10% of the net waste processed at the EFW plant (minus ash and non-combustible residues) was incorporated into the landfill volume calculation to allow for repair and maintenance of the EFW. A similar percentage allowance was included in Chart 18 in the Stage 1 report.

- Allowance for Volume Requirement

Hydrology Consultants have indicated that there is a need to provide contingency related to the landfill volume requirement to cover such possibilities as a lower landfill density (other than the 1,000 pounds per cubic yard) being achieved, and new wastes such as clean fill, construction debris, and sludge being accepted at the landfill site,

⁵Note that no separate contingency has been included for this item as in the Stage 1 Report since it is adequately covered by the high waste per capita allowance. The volume of source separation totals 8%, potentially representing over half the 14% contingency allowance included.

etc. Accordingly, 15% has been added to the landfill volume requirements for a combination of these contingency items. It is calculated on the basis of the total volume requirement of 10.34 million cubic yards.

1.6.4. Summary of Stage 2C Landfill Volume Requirement

The landfill volume requirement shown in Table 10 divides into two components:

Region's Most Probable Landfill Requirement	8.22 m.cu.yds.
Contingencies	<u>3.10</u> m.cu.yds.
	11.32 m.cu.yds.

The contingency items represent an additional 38% of the Region's most probable landfill requirement.

A site which can accommodate the full 11.32 million cubic yards ideally should be selected, although a smaller site accommodating part of the contingency should not necessarily be eliminated at the Stage 2B level of detail. However, its greater risks in terms of capacity must be acknowledged in the evaluation process in Stage 2C.

1.6.5 Size of Landfill Site Required⁶

The Stage 2B analysis calculated the acreage of landfill site required to accommodate the total volume being sought at that time (8.7 million cubic yards), using a hypothetical model. This approach was necessary due to the larger number and variety of candidate areas being considered at that time. Allowing for a more site-specific evaluation of the six candidate sites and the required landfill size in Stage 2C, the approximate site size

⁶There is a possibility of some contingency built into the conversion of the landfill volume to the acreage required to accommodate it. To the extent that this is provided, it represents another potential contingency.

based on the new waste forecast is 250-300 acres. The approximate acreage figures apply to till plain sites only. General acreage estimates are not possible for quarry sites due to their unique characteristics. The range in the site size depends on site-specific conditions, such as variability of terrain, site shape and local conditions. These factors will be addressed in detail in Stage 2C, Selection of Preferred Site.

APPENDIX B
OCTOBER, 1983 WASTE QUANTITIES
FORECAST UPDATE
FROM
"REVIEW AND SUPPLEMENT TO
STAGE 2B, SELECTION OF
CANDIDATE SITES" (APPENDIX C)

1. INTRODUCTION

Part I of "Stage 1: Waste Needs and Systems Analysis Consolidation, Environmental Assessment of the Landfill Component of Halton's Solid Waste Management System" presented a forecast of "Waste Needs and Waste Quantities". This forecast was prepared early in 1983 based on 1976-1982 data and an assessment of future trends.

The forecast is shown below as excerpted from page 46 of the above-mentioned document. It was made as a range, with the low population forecast and low waste/capita forecast combined to produce the low waste forecast, and vice versa.

Table 1

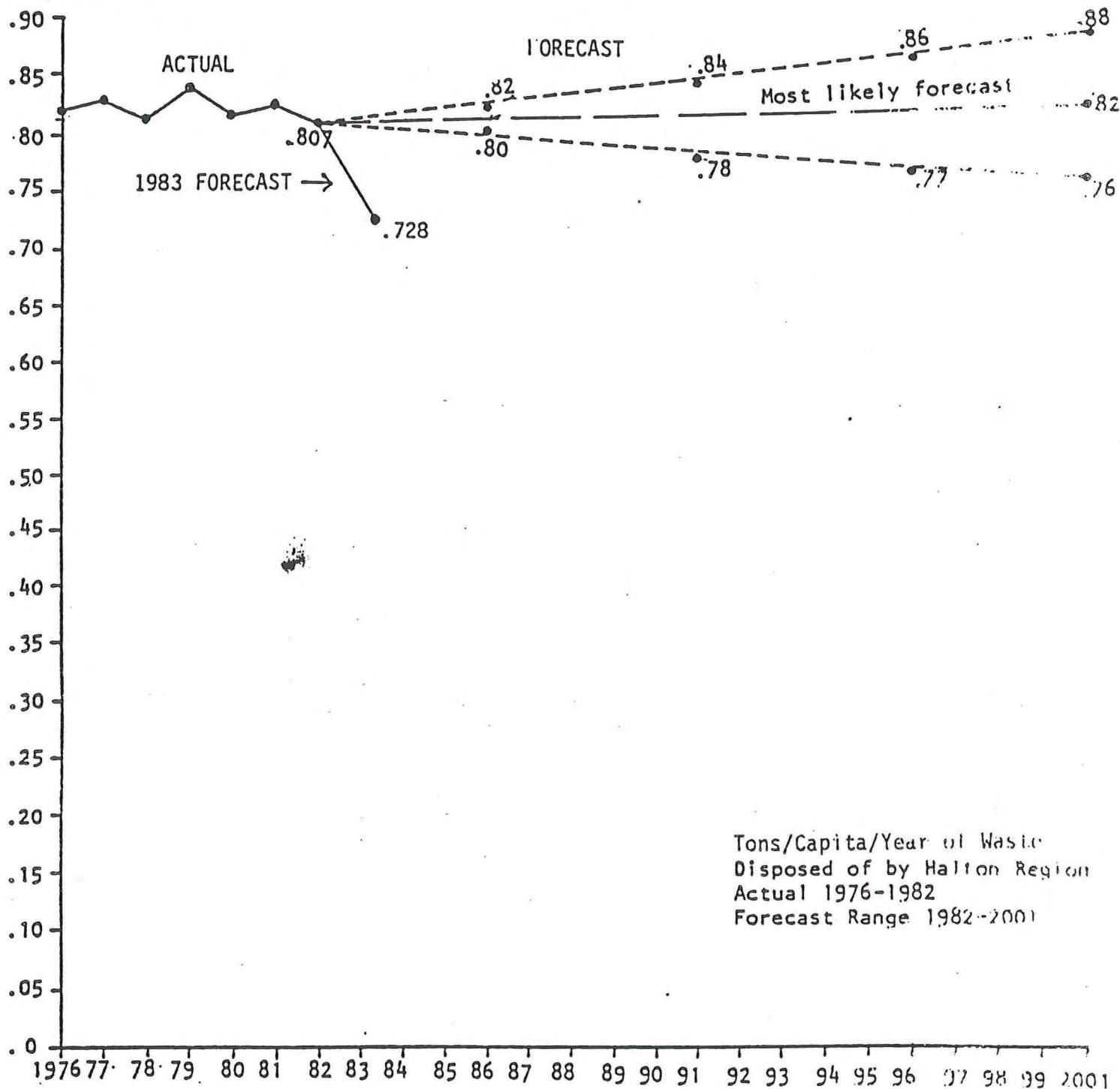
TONS OF WASTE TO BE DISPOSED OF BY HALTON REGION 1982-2001

1982	205,116 Actual			205,116 Actual		
	<u>Low Population</u>	<u>Low Waste/Capita</u>	<u>Low Waste Forecast</u>	<u>High Population</u>	<u>High Waste/Capita</u>	<u>High Waste Forecast</u>
1986	269,398	x .80	= 215,518	309,100	x .82	= 253,462
1991	288,265	x .78	= 224,847	336,954	x .84	= 283,041
1996	305,133	x .77	= 234,952	373,727	x .86	= 321,405
2001	325,000	x .76	= 247,000	409,500	x .88	= 360,360

SOURCE: Excerpted from page 46 of the Stage 1 Report

The Figure on the next page was excerpted from the above-mentioned document and indicates the forecast per capita range which underlies this projection.

Tons/Capita/Year



Tons/Capita/Year of Waste
Disposed of by Halton Region
Actual 1976-1982
Forecast Range 1982-2001

SOURCE: Excerpted from page 45 of the Stage 1 Report

NOTE: 1983 forecast of .728 added in October/83

1. INTRODUCTION (ctd)

Since the preparation of the forecast, the Region has increased its tipping fee from \$14.88 to \$16.00 per tonne (\$13.50 to \$14.51 per ton) and closed its Oakville site, necessitating a lengthier haul to the Burlington site for Oakville and Halton Hills carriers. A transfer station operation has also come into being in Halton Hills. Finally, additional efforts have been made in the area of recycling, with Oakville joining the newspaper and glass recycling program in May 1983.

Volumes of waste landfilled at the Burlington site are now available for the January - September period. These volumes are shown in Table 2 and compared with same month, previous year figures for 1982.

As is apparent, 1983 volumes are significantly lower than 1982 volumes. Table 3 presents a 1983 forecast based on the monthly data as it came available. Continuation of the first nine months level of performance, allowing for seasonal trends, would produce an annual volume in the order of 181,000 tons. Allowing for the growth trend evident between April and September would yield a forecast in the order of 185,000 tons for 1983.¹ When related to the 1982 population of 254,085, this produces a waste/capita ratio of 0.728 (slightly lower if population growth has occurred 1982-83). This ratio is inconsistent with the 1976-1982 pattern, wherein the .807 - .834 range was maintained. The waste quantities shown earlier as Table 1, when interpolated between 1982 and 1986, yield the following 1983 forecast:

$$\text{Low} \quad 0.80 \times (254,085 + \frac{15313}{4}) = 206,330 \text{ tons}$$

$$\text{High} \quad 0.82 \times (254,085 + \frac{55015}{4}) = 219,628 \text{ tons}$$

Thus the current estimate for 1983 is 21,000 - 34,000 tons lower than this forecast.

¹The same month, previous year, comparison in Figure 1 also indicates that a recovery is occurring from the February-April low. Figure 2 indicates the seasonality of the disposal pattern and compares 1981, 1982, and 1983 performance.

Table 2
 TONS¹ OF WASTE DISPOSED OF AT
 HALTON REGION SITES DURING
THE FIRST NINE MONTHS OF 1982/83

	1983	1982	1983 <u>DECLINE</u>	1982 <u>%</u>
January	12,314	12,591	277	2.2
February	11,328	15,115	3,787	25.1
March	13,831	15,964	2,133	13.4
April	14,475	19,283	4,808	24.9
May	20,151	21,317	1,166	5.5
June	18,400	20,274	1,874	9.2
July	14,906	17,127	2,221	13.0
August	17,174	17,750	576	3.2
September	16,173	17,486	1,313	7.5
	<u>138,752</u>	<u>156,907</u>	<u>18,155</u>	<u>11.6</u>

¹N.B. - This report deals in "tons" despite the Region's conversion to metric, in order to relate back to the figures and ratios contained in the Stage 1 report.

Table 3

FORECAST OF TONS OF WASTE TO BE
LANDFILLED IN HALTON REGION DURING
1983, BASED ON JANUARY-SEPTEMBER DATA

1981/82 ACTUAL. YEAR TO DATE PERCENTAGES

	1982	1981
January	.06138	.06772
February	.13507	.13101
March	.21290	.20634
April	.30691	.29684
May	.41084	.39427
June	.50968	.49336
July	.59318	.58328
August	.67972	.67397
September	.76497	.76471

1983 ANNUAL FORECAST USING:

<u>1982 Factors</u>	<u>1981 Factors</u>
200,619	181,837
175,035	180,460
175,552	181,133
168,942	174,673
175,253	182,619
177,368	183,235
177,530	180,543
180,193	181,731
181,382	181,444

of waste tonnage

Figure 1

% OF WASTE LANDFILLED IN HALTON AS
COMPARED TO SAME MONTH, PREVIOUS
YEAR

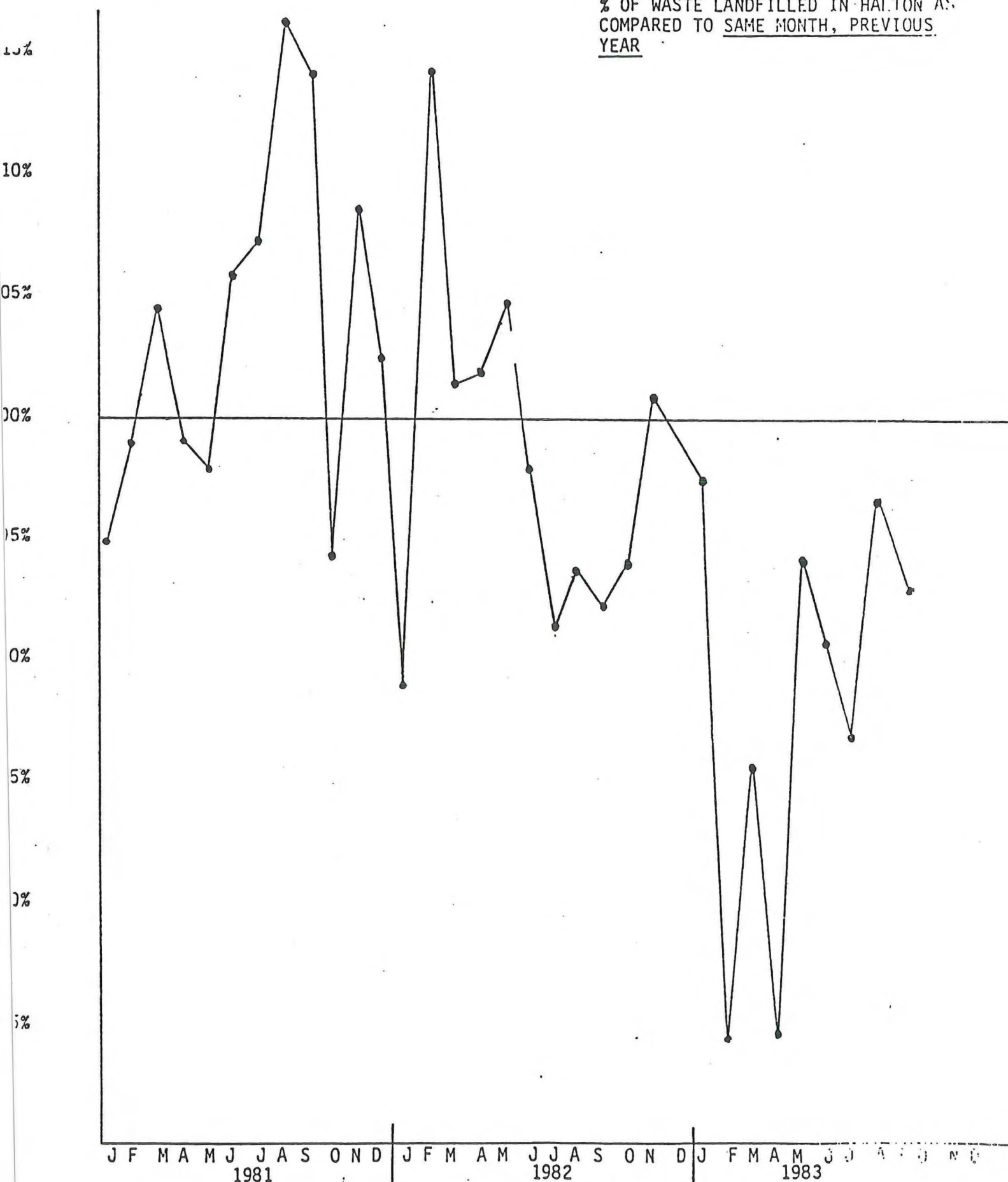
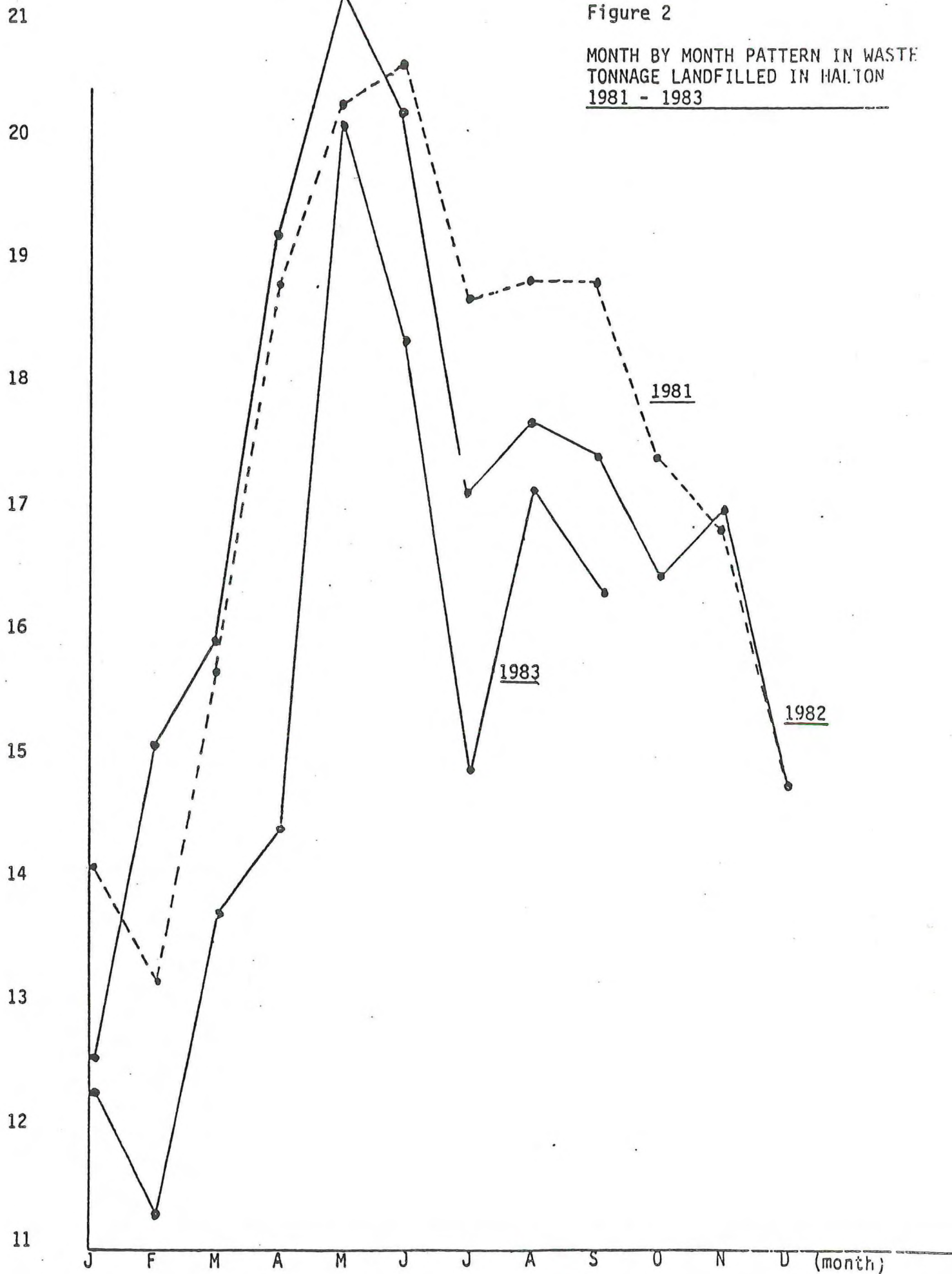


Figure 2

MONTH BY MONTH PATTERN IN WASTE
TONNAGE LANDFILLED IN HALTOW
1981 - 1983



1. INTRODUCTION (ctd)

If no population growth occurs in Halton between 1982 and 1983, the Stage 1 waste forecast would be as follows:

Low 254,085 x .80 = 203,268

High 254,085 x .82 = 208,350

This is 18,268 - 23,350 above the currently anticipated 1983 volume. If population growth does occur in Halton between 1982-83, this discrepancy would increase by 800 - 820 tons per 1000 population increase and is assumed to total 20,000 - 25,000 tons.

The object of this re-examination is to distinguish between short-term variances involving anomalies which can be expected to correct themselves in time and more fundamental shifts in behaviour and performance which could call for realignment of the long-term forecast.

2. WASTE QUANTITIES TRENDS FOR HALTON'S MAJOR DISPOSERS

Table 4 was prepared in order to isolate some of the reasons behind the decline in waste volumes landfilled in 1983. This table compares month by month volumes in 1982 and 1983 for twenty-three of the major haulers in the Region, accounting for more than 85% of total waste landfilled.

A number of these haulers experienced very little change between 1982 and 1983 and were not studied further. i.e.

- General Electric declined by 7.3%
- Leaver declined by 5.9%
- J. Mitchell declined by 3.7%
- Oakville Municipal and Hydro increased by 44 tons
- Curwood declined by 48 tons
- Halton Hills disposed through Leferink
- Town of Milton increased by 3.8%

An attempt was made to establish the underlying reasons for the volume shift in the remaining haulers, with the following results:

- Ford - Volume landfilled has declined by 75% to date in 1983, with the decline accelerating as the year progresses. In the June-August period, 218 tons were landfilled in 1983 vs. 2060 tons in 1982. The total annual decline produced by Ford in 1983 could be in the order to 6000 tons.

The explanation for this phenomenon is that Ford is trucking the vast majority of its waste to Domtar near the QEW and 427. Domtar accepts the waste, because of its high corrugated content, for a \$10/ton tipping fee. Ford is not required to sort out other types of waste or to dispose of any residue or surplus created by Domtar equipment breakdowns. This arrangement is expected to continue for the foreseeable future with Ford responding to both cost and environmental considerations. Domtar is not yet contracting with others in Halton but could, conceivably, in future.

Another reason for the lower waste volumes at Ford this year is the fact that the plant was shut down during the February.

TONS OF WASTE DISPOSED OF AT HALTON REGION LANDFILLS,
BY MAJOR DISPOSER, FIRST EIGHT MONTHS OF 1982 AND 1983

		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	TOTAL
Burlington Municipal incl. Hydro	1983	124	235	95	99	182	306	151	218	1410
	1982	70	26	100	567	898	211	191	222	2285
C.L. Disposal ¹ (Oakville)	1983	-	-	-	-	-	-	-	-	-
	1982	69	96	128	121	119	40	70	102	745
Curwood (Oakville)	1983	83	77	80	73	75	52	39	78	557
	1982	77	83	86	78	71	82	45	83	605
Duvall	1983	177	163	174	182	177	202	209	245	1529
	1982	32	33	16	5	7	21	12	35	161
Ford (Oakville)	1983	87	109	209	262	372	161	57	-	1257
	1982	341	457	647	730	807	931	273	856	5042
Franks (incl. A.J.) (Minority Oakville)	1983	163	114	127	86	101	99	194	231	1115
	1982	156	175	231	302	244	235	257	428	2028
General Electric (Oakville)	1983	173	174	185	153	159	154	111	88	1197
	1982	215	194	212	162	150	147	100	111	1291
J & J Haines (Oakville)	1983	114	46	78	101	110	113	92	120	774
	1982	157	138	174	168	166	200	151	156	1320
Halton Region & Boards (Mixed)	1983	27	6	47	26	27	22	79	5	239
	1982	27	6	17	25	246	81	19	49	470
Halton Hills (Oakville)	1983	388	-	-	-	-	-	-	-	388
	1982	617	504	626	885	919	973	808	789	6121
Industrial (Minority Oakville)	1983	848	1124	1491	1311	1631	1595	1537	1827	11364
	1982	1102	1072	1402	1221	1319	1134	1104	1032	9386
Jet (Mixed)	1983	752	480	188	-	-	-	-	-	1420
	1982	238	275	415	358	289	452	495	473	2995
Laidlaw (was Superior)	1983	1119	1420	2045	2153	2509	2640	2001	2381	16268
	1982	1300	1376	1812	1820	1772	1833	1626	1771	13310
Leaver	1983	256	222	277	210	270	264	243	255	1997
	1982	294	301	269	250	210	254	254	291	2123
Leferink (Oakville)	1983	757	1161	1426	1377	1717	1917	1515	1804	11674
	1982	521	608	624	695	765	677	591	601	5082
Milton	1983	573	503	619	605	908	886	650	806	5550
	1982	494	480	621	680	875	815	640	740	5345
J. Mitchell	1983	97	83	101	101	115	128	114	123	862
	1982	105	88	104	114	118	120	123	123	895
Oakville (Oakville)	1983	1626	1572	1888	2173	3143	2871	2134	2402	17809
	1982	1635	1485	1848	2768	3321	3236	2305	2326	18924

		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL
Oakville Municipal & Hydro (Oakville)	1983	14	9	21	43	35	39	80	42	283
	1982	10	2	24	52	35	48	34	34	21
Provincial (Mix)	1983	2481	2067	2489	2741	5287	3777	2917	3426	25185
	1982	2735	2535	3163	3734	4775	4890	2785	3886	28503
Roy's (Incl. Don Roys) (Majority Oakville)	1983	544	72	282	159	191	199	258	277	1982
	1982	243	325	444	472	665	667	582	597	3995
Select (Majority Oakville)	1983	466	227	261	194	212	198	95	102	1755
	1982	250	191	320	630	339	302	339	315	2684
Syvret	1983	20	102	75	162	130	153	55	89	786
	1982	89	174	132	151	152	165	89	145	1097
All other	1983	1425	1362	1673	2264	2800	2624	2375	2555	17178
	1982	1814	4491	2549	3295	3055	2760	4236	2585	24735
TOTAL TONS	1983	12314	11328	13831	14475	20151	18400	14906	17174	122579
	1982	12591	15115	15964	19283	21317	20274	17127	17750	139421

¹Indicates use of the former Oakville site during 1982.

2. WASTE QUANTITIES TRENDS FOR HALTON'S MAJOR DISPOSERS (ctd)

April period, converting to Topaz production and produced at low volumes for some time thereafter. The company has since returned to near maximum production levels. Shutdowns are normally confined to the July vacation period; hence Ford's waste volumes are unusually low in 1983.

It is possible that Ford's wastes may increase in future in other areas, partially offsetting this decline.

- Laidlaw - They are up 3000 tons so far this year but this volume is more than accounted for by acquisitions. eg; Jet in April/83 which accounts for approximately 400 tons per month and Provincial's front end loader - container operation in November/82, which accounts for about the same volume. This actually suggests that year-to-date volumes in 1983 are down, although the company feels that they are up.
- Various - It would appear that a number of smaller haulers, such as Small C.L. Disposal, and a number of those included in the "all Haulers other column," are no longer hauling to the Burlington site or are dealing in lower volumes. It appears that they are hauling to more convenient locations in Peel, Wellington and elsewhere. The total volume involved is difficult to estimate but is probably in the order of 5000 tons per annum.
- Franks - The Company's volume is reduced by 1000 tons so far in 1983. The explanation is that customers are simply cutting back in response to lower volumes, and increased costs. There is some increased usage of municipal pickup by the smaller operations.
- Leferink - Volumes are up 6600 tons over last year, although 5700 of that number is accounted for by a decline in Halton Hills.

¹ The "all other" category declined by 7600 tons.

2. WASTE QUANTITIES TRENDS FOR HALTON'S MAJOR DISPOSERS (ctd)

(Leferink hauls all Halton Hills waste to the landfill). An additional 500 - 600 tons relates to the decline in J & J Haines, in that this volume was transported by Leferink to the landfill. Volumes are up to some extent, particularly since April.

- Provincial - Volumes are down 5600 tons over last year, although this volume was transferred to Laidlaw at the end of 1982 when it purchased Provincial's front end loader business (Halton School Board schools, apartments and industry). Thus, Provincial, which hauls almost exclusively for the City of Burlington, is relatively unchanged in volume over last year.
- Industrial - Volumes are up 2000 tons over last year although equipment and business was purchased from Roy's, which has declined by 2000 tons. In the past three to four months officials indicate that they have experienced an increase in volume due to the improved economy.
- Oakville - Volumes are down by 1100 tons over last year (5.9%). This is accounted for by an increase in recycling and reduced lawn cuttings etc. caused by a dry summer.

3. FACTORS UNDERLYING THE DECLINE IN HALTON'S WASTE QUANTITIES

The following section identifies the factors involved in the decline in waste quantities and an estimated tonnage attributable to each factor. There is no specific data on this; they represent informed judgement only. The total waste reduction for 1983 (full year) is estimated to be 20,000 - 25,000 tons (Section 1).

Factor 1: Increased Haul Costs and Tipping Fees

With the closing of the Oakville landfill site in 1982, haulers from Oakville and Halton Hills experienced significant increases in cost due to the extra distance involved in travelling to the Burlington site. Haul times from the waste centroid, are estimated to have increased 37% from Oakville (43 minutes vs 59 minutes) and 47% from Halton Hills (89 minutes vs 131 minutes).

This, in turn resulted in cost increases of approximately \$1.40 per ton in Oakville and a greater amount in Halton Hills, depending on how the transfer station costs are included.

In addition, the Region has increased its tipping fee by \$1.00 per ton between 1982 and 1983. (Figure 3)

In to-day's economic climate, these cost increases represent a significant motivation for firms and/or haulers to dispose of waste elsewhere. Comments by small haulers in Section 2 reflect this trend.

Factor 1: ESTIMATED WASTE TONNAGE DECLINE 5,000.

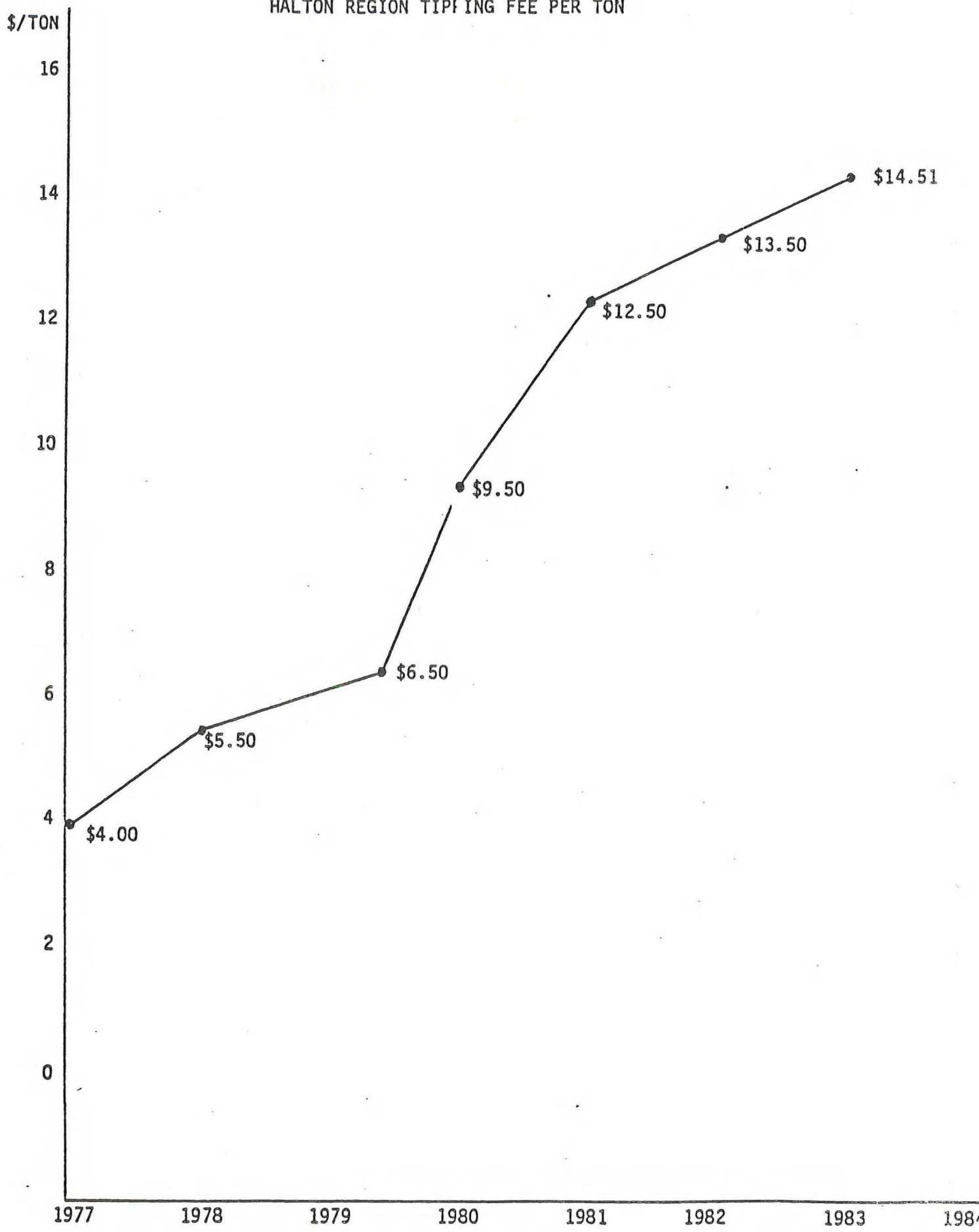
Factor 2: Weather Conditions

The hot, dry summer was a factor in reducing Halton's waste volumes, although not a major one. The reduction in lawn clippings and their lighter weight due to the lack of rain probably accounts for a small portion of the decline.

Factor 2: ESTIMATED WASTE TONNAGE DECLINE 1000-2000

Figure 3

HALTON REGION TIPPING FEE PER TON



3. FACTORS UNDERLYING THE DECLINE IN HALTON'S WASTE QUANTITIES (ctd)

Factor 3: Recycling

Interest in recycling is increasing and, as such, the waste volume handled in this way is also on the upswing. Table 5 shows the volume of newsprint recycled in the first eight months of 1983 compared to 1982. Declines in Halton Hills and Milton have been offset by the introduction of a recycling program in Oakville. Continued growth in Burlington is also anticipated. The recycled residential waste volumes are still a minor factor in the total picture and may account for an estimated reduction of 2000 tons in the Region's overall figures.

The situation at Ford, described in Section 2, will be a major factor. Recycling may account for a reduction in waste volume of 4000 tons from this source in 1983. (The remainder would be due to their production shut down).

Recycling in other industries may cause an estimated reduction in volume of an additional 2000 tons of waste.

Factor 3: ESTIMATED WASTE TONNAGE DECLINE 8000

Factor 4: Economic Conditions

The economy has been steadily improving in 1983 but the first eight months of the year were definitely worse than the same period in 1982. Unemployment is a reasonable proxy for industrial/commercial production (since most other figures are national in scope). Table 6 shows that unemployment was significantly higher in Halton this year than for the comparable period last year.

Increased operating expenditures have forced firms to re-examine their waste disposal costs and seek ways to reduce them through reducing waste volumes, stockpiling waste, recycling, etc. These conditions have resulted in a decrease in industrial/commercial waste at the Halton landfill site. Comments from haulers in Section 2 confirm this situation as well.

Table 5

NEWSPRINT RECYCLED (TONS)
JANUARY - AUGUST

	<u>1983</u>	<u>1982</u>
Milton	33	110
Halton Hills	274	383
Oakville	474	144
Burlington	1005	881
Misc. Drop-off Stations	71	.
HALTON REGION	<u>1857¹</u>	<u>1518</u>

¹plus an additional 400 in glass, metal, fine paper and corrugate and a lesser amount in 1982.

SOURCE: Halton's Recycled Resources Inc.

Table 6

UNEMPLOYMENT IN OAKVILLE/MILTON AND BURLINGTON
MONTH BY MONTH COMPARISON 1982/83

	Oakville and Milton		% increase in 1983	Burlington		% increase in 1983
	<u>1982</u>	<u>1983</u>		<u>1982</u>	<u>1983</u>	
Jan	7149	9943	26%	n.a.	6124	n.a.
Feb	7430	9001	21%	3560	6334	78%
Mar	7319	8862	21%	3776	6049	60%
Apr	6601	8499	29%	3780	5879	56%
May	5594	7611	36%	3961	5743	45%
June	5412	6582	21%	4087	5474	34%
July	5613	6101	9%	4457	5330	20%
Aug	5271	6468	23%	4727	n.a.	n.a.
Sept	6506			4628		
Oct	7767			5004		
Nov	7361			5413		
Dec	7648			5763		

n.a. - not available

SOURCE: Canada Employment Centre, Oakville Office
Canada Employment Centre, Hamilton Office

3. FACTORS UNDERLYING THE DECLINE IN HALTON'S WASTE QUANTITIES (ctd)

Metro Toronto and Peel Region waste quantities information for a similar eight month period does not suggest any widespread trend at work. Metro's volumes are up slightly (3%) while Peel's are somewhat down (5%). Although their industrial bases differ from that of Halton, this data does not imply that a major change in social attitudes or work methods has taken place which is decreasing waste volumes universally.

Waste volumes are expected to increase as the economy improves. Most forecasters are anticipating this occurrence.

The estimated waste tonnage decline for this factor represents the residual of the other three factors.

Factor 4: ESTIMATED WASTE TONNAGE DECLINE 6000-10000

4. LONG TERM IMPLICATIONS

Table 7 shows the estimated waste tonnage decline attributable to each factor (developed in Section 3) and the long term implications. In each case, an assessment has been made concerning whether the conditions which produced the decline can reasonably be expected to continue.

An estimated 10,000 - 15,000 tons of waste lost to the Halton landfill site in 1983 may be expected to return in the long term. This decline is based on temporary factors and unusual conditions which are not expected to prevail in future, although they may reoccur from time to time.

Based on this information, the total 1983 Halton waste volume without these exceptional circumstances would be:

<u>1983 Estimated Tonnage (Section 1)</u>	+	<u>Returned Tonnage</u>	=	<u>1983 "Normal" Waste Quantity</u>	<u>Waste Per Capita (on 254,085 Popl)</u>
185,000		10,000-15,000		195,000 - 200,000	0.767 - 0.797

Table 7

LONG TERM IMPLICATIONS OF FACTORS
PRODUCING HALTON'S 1983 WASTE QUANTITIES DECLINE

<u>Factor</u>	<u>Tonnage Decline (1983)</u>	<u>Future Impact On ¹ Long Term Average</u>	<u>Comments</u>
1. Increased Haul Costs and Tipping Fee	5,000	3,000	This assumes that Halton will have a more convenient site to serve the entire Region in future.
2. Weather Conditions	1,000 - 2,000	1,000 - 2,000	Over a long period, weather conditions will normalize.
3. Recycling	8,000	1,000	Most of the recycled waste volume will probably not return to landfill due to economics.
4. Economic Conditions	6,000 - 10,000	5,000 - 9,000	The economy will recover with some increased efficiencies. Most of this waste will return.
 TOTAL	 20,000 - 25,000	 10,000 - 15,000	

¹ Tonnage which will return to landfill site

SOURCES: Estimated by C.N. Watson and Associates Ltd.

5. INTERIM WASTE FORECAST

The waste forecast made in the Stage 1 Report was a twenty year forecast required to estimate total, long-term requirements. There is an immediate need to establish a short-term forecast on which interim waste management policies can be based. The methodology used in making this 1984 - 1988 forecast is to extrapolate the estimated tonnage for 1983 (185,000 tons) by adding the anticipated .777 tons per capita per year on the cumulated population growth forecast, as well as adding a phased allowance for the tonnage of waste to be returned as the economy gradually improves. This forecast is shown as Table 8.

Table 8
Interim Waste Forecast for Halton Region
 (ons)

	A 1983 Volume Tons ¹	B Amount Returned ² Tons	<u>Pop. Growth</u> ³ x .777 tons	C Cumulated Tons	Total A+B+C Tons
1984	185,000	4,000	5,000	3,885	192,885
1985	185,000	9,000	5,000	7,770	201,770
1986	185,000	9,000	5,000	11,655	205,655
1987	185,000	9,000	5,000	15,540	209,540
1988	185,000	9,000	5,000	19,425	213,425

Notes and Sources:

- (1) Estimated 1983 waste volume of 185,000 tons. (Section 1)
- (2) 6,000 - 11,000 tons/annum to return to site prior to the provision of a more convenient site (or Oakville transfer station which is unlikely). The latter would return approximately 3,000 additional tons as per Table 7.
- (3) Population growth forecast provided by Halton Region Planning and Development Department.

6. CONCLUSION

The 1983 waste quantities disposed of at the Halton landfill site are lower by 20,000 - 25,000 tons than the forecasted total in the Stage 1 report.¹ Analysis of the reasons for this decline indicates that an estimated 10,000 tons of this total will not be recovered over the longer term. The remainder is due to particular anomalies which have occurred or are expected to occur during this year.

The purpose of the waste quantities forecast in the Stage 1 report was to provide an estimate of the Halton's total waste volume over the planning period. The forecast will not necessarily be accurate in any single year as high and low points may occur. In addition, the projection was prepared using a range of waste per capita per annum standards to allow for unforeseen changes in the factors which will affect this ratio in future (Stage 1 report, pages 39-44).

The next stage in this review is an examination of the overall waste quantities forecast for the Environmental Assessment. However, prior to this undertaking, three major components require clarification or analysis:

- Population Projection

Population growth appears to be lower than the Region's current projection. A review of this projection is currently underway by the Planning Department with the results expected in November. Any changes made will have a corresponding impact on the waste quantities forecast.

- Waste per Capita Factor

The analysis in this review indicates that the waste per capita ratio is changing significantly in 1983, after remaining stable for the past seven years (Stage 1 report page 44). Even allowing for the "return" of the waste lost this year to a series of unusual conditions (Section 4), the waste per capita will still be significantly lower than in previous years:

¹ As calculated on page 8.

6. CONCLUSION (ctd)

1983 Waste/Capita Ratio¹
 ("Normal" 1983 year)

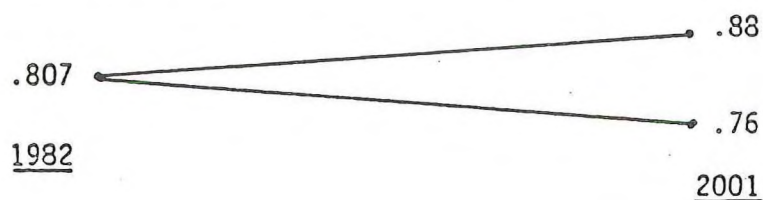
0.777

1976-1982 Waste/Capita Ratio

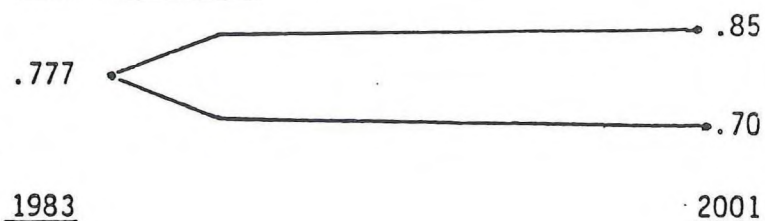
0.807 - 0.834

One of the major findings of this review is the extent to which this ratio can vary over a very short time period. The 1976 - 1982 data would indicate that the waste per capita ratio in Halton was relatively stable, but the 1983 situation shows it is clearly more volatile. Accordingly, a broader range of waste per capita per annum ratios is required and at an earlier stage in the forecast period than is shown in Figure 3 in the Stage 1 report (and included in Section 1 of this review). The Stage 1 waste forecast employed a 5% variance above and below the historical range (.800 - .84 tons per capita per annum) for the 2001 projection. It now appears that a 10% variation is necessary. As noted above, this variation must be incorporated at an earlier stage in the forecast period, illustrated schematically as follows:

Stage 1 Report



Forecast Update



¹ assumes no population increase between 1982 and 1983 (254,085) and waste quantities of 197,500 tons (mid-point of 195,000 - 200,000 ton range on page 20).

6. CONCLUSION (ctd)

• Planning Period

The waste quantities forecast in the Stage 1 report was prepared based on a 20 year planning period from 1982 to 2001. However, there will be an interim period prior to the opening of the new landfill site and, as such, the twenty year planning period must extend beyond 2001. A population projection will be required for this period for the final forecast. The extension of the projection period will provide a partial offset for reductions in waste quantities resulting from the lower waste capita ratios.

THE REGIONAL MUNICIPALITY OF HALTON

Chairman and Members of the Solid Waste
Report to Management Committee

From Dennis Y. Perlin, Chief Administrative Officer

Date 1986 03 24

Report No CAO.141/86

Re: Landfill Component - Halton's Solid Waste Manage-'
ment System - Environmental Mediation and Fact
Finding - Report of the Fact-Finders

RECOMMENDATION:

THAT the letter dated February 24, 1986 from Barry E. Smith, Chairman of the Environmental Assessment Board regarding Fact-Finding by Geoffrey Grenville-Wood and Michel G. Picher with respect to Environmental Mediation for resolution of the Landfill Environmental Assessment for Halton's Waste Management System be received for information.

REPORT:

Members of the previous Council will remember that last year the Environmental Assessment Board, at the request of the Region and with the cooperation of all others involved in the Environmental Assessment process respecting Halton's new landfill component, agreed to having the Board make available to Halton its fact-finding service to determine if Environmental Mediation could be used to resolve the environmental dispute respecting the emplacement of Halton's new landfill component.

The two Fact-Finders appointed were mediators who have had a great deal of experience in labour mediation and who have recently also added environmental mediation to their areas of involvement. The two gentlemen were Geoffrey Grenville-Wood and Michel G. Picher.

After a series of meetings over a series of months, the Fact-Finders have now filed their report with the Chairman of the Environmental Assessment Board and he has sent a copy of that report to Halton which arrived here on March 3rd.

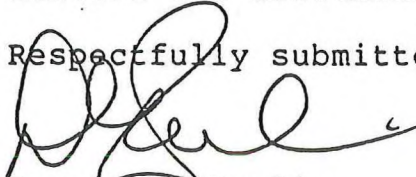
The letter of the Chairman of the Environmental Assessment Board, Mr. Smith, dated February 24th is attached and it has attached to it the letter from Mr. Picher and Mr. Grenville-Wood on the results of their "Fact-Finding" exercise dated February 10th, 1986.

I agree with the findings of the Chairman of the Board that any formalized Environmental Mediation at this stage would be premature but I also agree with the Environmental Fact-Finders, Mr. Grenville-Wood and Mr. Picher, and would strongly urge Council as well as all of the other participants in the Landfill Approvals process to use Environmental Mediation when the time is right; namely,

"We therefore recommend that following the completion of the Environmental Assessment Document, but sufficiently in advance of the scheduled Hearing, mediation of a limited scope should be embarked upon in an attempt to narrow the issues between the participants and reach agreement on as much of the essential facts and scientific information as possible."

I would suggest that the Region, at the preliminary meeting of any Consolidated Hearing Board, should a public Hearing be requested and authorized, to make Environmental Mediation available between the date of the preliminary meeting and the start of the formal Hearing and ask the parties to please cooperate with the Environmental Mediator(s) in attempting to achieve the abovementioned Recommendation.

Respectfully submitted,



Dennis Y. Perlin
Chief Administrative Officer

DYP*pm
attach.



RECEIVED

Environmental
Assessment
Board

(416)965-2531

1 St. Clair Avenue West

Toronto, Ontario

M4V 1K7

February 24, 1986

Mr. Dennis Y. Perlin
Chief Administration Officer
The Regional Municipality of Halton
P.O. Box 7000
1151 Bronte Road
Oakville, Ontario
L6J 6E1

Dear Mr. Perlin:

Re: Region of Halton Waste Management System

The fact-finders have submitted their report dated February 10, 1986, a copy of which is enclosed herewith.

I have considered their findings and concluded that any formalized mediation at this stage is premature. If it appears that further negotiation would be beneficial while this undertaking progresses through the assessment process, consideration will be given to environmental mediation.

If you have any questions relating to the fact-finding process, please contact this office.

Yours very truly,

Barry E. Smith
Chairman

encl.

ADJUDICATION SERVICES LIMITED

SUITE 202
2281 YONGE STREET
TORONTO, ONT. M4P 2C6
TEL. (416) 483-6442

RECEIVED
ENVIRONMENTAL
ASSESSMENT BOARD

FEB 17 1986

February 10, 1986

CHAIRMAN

Mr. B. E. Smith, Chairman
Environmental Assessment Board
1 St. Clair Ave. West
Toronto, Ontario
M4V 1K7

Dear Sir:

Re: Fact-finding - Halton Region
Your file No. EH-02-03

This letter is to inform you that our fact-finding is at the stage where a report to you with our recommendations regarding the Halton Region Solid-Waste Disposal Site is necessary and appropriate.

Attached to this report is a list of those whom we have contacted in the course of our work. Please note that we have met with most of the participants on several occasions in public and privately. In the course of those meetings, and in order to further our work, we felt it was necessary to undertake that our report would not attempt to describe or characterize any individual meetings or discussions. We also agreed that our report would assess whether mediation would be useful or not without indicating whether any particular named participants were in favour of such an approach or not.

In light of the above we wish to report that, in our view, our role to date has provided useful opportunities for all concerned to examine the issues raised by the siting process and their positions in relation thereto in new ways. We feel that raising the possibility of mediation has, of itself, been useful and may well assist the final resolution of the question. However, it is unfortunately not possible for us to make a final recommendation, at this stage, that mediation itself will assist the Board and the participants in achieving a settlement of the main issues. It appears that the time may not yet be ripe for making such a determination. This is especially so in light of the fact that detailed environmental assessments are still being prepared respecting some of the proposed sites.

On the other hand, we believe that mediation can assist in obtaining agreements or consents on certain of the scientific and other facts that would otherwise need to be proved before the Board, at a hearing. It may also be that there are other issues between the potential parties to a hearing that could be narrowed or agreed once the mediation process has been embarked upon. This process may extend also to the establishment of an agreed set of criteria relating to one or more aspects of the environmental assessment. It seems to us that this could have the beneficial effect of requiring all the parties to reduce the number of contentious issues to those that would require an adjudication by the Board.

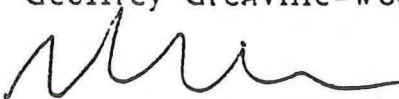
It is also possible, although as we state above not possible to assess at this time, that embarking on such a limited scope process could lead to mediation of the main issues once the initial stages that are now underway have been completed. We are not able to make that assessment and even attempting to do so would be premature. However, it is our estimate that it would be useful and beneficial to embark upon such a limited mediation, at the appropriate time. We therefore recommend that following the completion of the Environmental Assessment document, but sufficiently in advance of the scheduled hearing, mediation of a limited scope should be embarked upon in an attempt to narrow the issues between the participants and reach agreement on as much of the essential facts and scientific information as possible.

Should you wish to discuss the above, we would be pleased to meet with you at your convenience.

Yours truly,



Geoffrey Greenville-Wood



Michel G. Picher

Memo referred to on page 4 of
"EPA Review of Waste Quantities Projection" (Feb. 1986)

FILE

McCleary
Watson
Population
Forecast
revision

THE REGIONAL MUNICIPALITY OF HALTON

INTEROFFICE MEMORANDUM

TO: J. Rinaldo
Regional Treasurer

FROM: P. Attack
Senior Planner

DATE 85 12 02

=====

RE: Population Forecasts/Landfill EPA Study - File: SD07A

In response to C.N. Watson's letter to you dated November 12, 1985, on population forecasts, the Halton Planning Department has considered in detail the points expressed in the letter. The memo attached from D. McCleary describes our response and is self explanatory. A new forecast was prepared.

← do we have this letter

If C.N. Watson has any technical questions they should contact D. McCleary directly.



Paul Attack
Senior Planner

PA/jig

cc: D. Y. Perlin, C.A.O.
D. Birkett, Finance
C. N. Watson, and Associates Ltd.
R. Mohammed, Director of Planning and Development
J. McKay, Public Works
P. Walker, Wright Young Associates Ltd
D. Hodgson, Osler Hoskin & Harcourt

THE REGIONAL MUNICIPALITY OF HALTON

INTEROFFICE MEMORANDUM

TO: P. Attack
Senior Planner

FROM: D. R. McCleary
Policy Division

DATE 85 12 02

=====

RE: Update of Landfill Population Forecasts
File: SD01A

On October 31, 1985, we responded to the correspondence from C.N. Watson dated October 15, 1985, regarding the current status of the population projections used in the waste quantity forecasts. In addition, the Director of Finance expressed concern that the population forecasts should be updated as a result of the most recent (September 1985) Ministry of Revenue Assessment population count.

In Staff's response of October 31, 1985 it was indicated that the chief impact of updating the forecasts would be on the short-term (1986 - 1991) and that the long term forecasts would continue to fall within the forecast range submitted to the consultant in November 1984. In addition, staff pointed out that independent forecasts prepared by Metro Toronto's Planning Department, (February 1984) and the Ministry of Treasury and Economics (August 1985) tended to confirm the forecast range in use at that time.

do we have? ①
②
what mean? { An additional concern that has emerged is that the high end forecast was creating an overly large contingency factor in the waste quantity forecasts.

In order to address these issues and concerns, as well as to take advantage of the recent Ministry of Revenue population counts and the opportunity to update the Landfill population forecasts, an update of the population forecasts has been undertaken:

Update Methodology

It has not been possible, due to time constraints, to update and re-run the cohort survival model population forecasts completed in November 1984, using Metro Toronto's computer model. The approach that has been taken was to update the short-term forecast period (1986-1991) using a short-term growth forecasting package that Halton Staff have developed and is available on our in-house computer facilities.

A total of 6 different methodologies are used for short-term growth forecasting purposes:

- Method A: Average Annual Growth
- Method B: Compound Growth
- Method C: Linear Trend
- Method D: Exponential Trend
- Method E: Component (Simplified cohort)
- Method F: Shares of Ontario

In addition to the 6 different methodologies 2 forecasts are made within each approach, one based on a 7 year historical data base and one based on a 13 year period. The most recent population growth data (1985 Ministry of Revenue Assessment Data) was utilized as a basis for these forecasts. With these forecasts completed, staff analyzed these short-term forecasts and determined the "best fit" with the 9 different forecasts completed in November 1984 with the cohort survival model.

On October 17, 1985, I had a telephone discussion with C. Kilgour of C.N. Watson Associates to provide an update on our work progress at which time staff were requested to provide the year by year forecasts on an Area Municipality basis in addition to the totals for Halton.

Most Probable Forecast

In past submissions staff have submitted a forecast range for each of the horizon or target years. The rationale behind submitting a forecast range is simply to acknowledge that there are a number of factors which influence population growth. As a result, factors such as migration, the location of employment concentrations, housing prices, marketing programs and transportation improvements will have an impact on growth. Both Metro Toronto and the Ministry of Treasury and Economics have both produced forecast ranges not only for the individual municipalities but for the Greater Toronto Area (G.T.A.) and the Province as a whole.

In Halton, there are a number of factors which make it very difficult to forecast population growth and require that development scenarios be considered as part of the

forecast range given in the past

yes in Halton difficult to do. ie forecast population growth

forecasting process. These considerations are in addition to the factors which were mentioned earlier and are unique to Halton.

Oakville

The 1979 Cabinet Decision related to Oakville's Official Plan created a Phase 1 area and Phase 2 area for development. Growth in the Phase 2 area could not proceed until 75 percent of the Phase 1 envelope had been developed.

In addition, as a result of the Cabinet Decision, Halton identified over \$100 million dollars of sewer and water works required to service the Phase 1 and 2 areas. In order to finance these improvements Halton has adopted a frontending policy.

Therefore, during the mid 1990s it is expected that development will proceed simultaneously in the Phase 1 and Phase 2 Areas, with the Phase 2 Area nearly three times as large as Phase 1. This possibility combined with a substantial financial commitment by the various frontending developers may have an impact on the amount of growth that may occur within the planning period. As a result, the possibility of this scenario occurring must be taken into account.

*ie:
greater
pop growth
possible.*

Milton

Because most population forecasts take into account to one degree or another historical trends, Milton presents somewhat of a problem. The Milton Urban Area is constrained by the capacity of its sewage treatment plant. Presently, capacity is established by the Ministry of the Environment which places water quality requirements on the receiving stream into which the treated effluent is placed. For all intents and purposes the Milton Urban Area is at capacity both from a sewage treatment and residential development perspective. The most recent Assessment population counts indicate that growth in Milton is slowing down dramatically as a result of these factors, however, short-term growth forecasts continue to project substantial growth.

As part of the cohort survival model runs completed in November 1984, staff created a series of scenarios which reflected various time frames in which the issue of new growth for Milton had been addressed and servicing solutions put into place. Because the amount of expansion to the Urban Area has not been addressed along with the nature, extent and cost of servicing solutions it is imperative to consider a range of development scenarios.

*Milton's
growth
slowing
down; short
term
growth fore-
casts cont.
to project
substantial
growth*

Halton Hills

Growth in the Acton and Georgetown Urban Areas has been somewhat limited over the past 5-10 years due to servicing limitations and the need to expand these urban areas. At this point in time the majority of the "planning" work has been completed with expansions to the sewer and water systems expected to be completed in the next 3-5 years. At that point in time the rate of growth in these areas will be dependent on the various factors articulated earlier in this memo. Therefore, the development scenarios or forecasts must attempt to reflect these factors.

Burlington

The results of the recent Assessment data indicate that growth in Burlington has slowed down considerably over the past 5 years. While in part this slowdown has been due to the severe recession in 1982, housing starts in 1983, 1984 and 1985 appear to have regained pre-recession levels. As a result the lack of growth between September 1982 and September 1985 is somewhat perplexing. However, growth in three communities, Maple, Headon and Rose combined with substantial infill development will soon be able to proceed simultaneously, with growth in the Headon and Rose Communities possibly constrained due to the need to expand the Zone 3 water supply system. This improvement should be in place within the next 3-5 years as part of a Master Servicing and Financing Scheme similar to that in place for the Town of Oakville.

Conclusions

It is very difficult given these extenuating circumstances to pick one number and identify it as the preferred forecast. However, in our opinion the updated forecasts have been substantially refined over even the November 1984 submission. In addition to the refinement of the forecasts the width of the forecast range has been narrowed substantially.

very difficult to pick one # & call it the preferred forecast.

The attached table (Table 1) provides a year by year summary of population by scenario and municipality. It should be noted that growth on a year to year basis may vary slightly due to rounding, merging of the short and long term forecasts and the addition of individual municipal forecasts to create the Halton total.

It may also be beneficial at this point in time to provide a summary comparison of these updated forecasts for Halton with the independent forecasts prepared by Metro Toronto and Ministry of Treasury and Economics. This comparison is attached as Table 2.

It is our intention to prepare a report to Council to adopt the short-term forecasts (1986-1991) for Capital Budget purposes early in the New Year. These forecasts will then be circulated to the various Agencies, Boards and Commissions in Halton along with the Area Municipalities as part of a Statistical Bulletin. Lastly, the long-term forecasts will be incorporated into the Official Plan Review and final report on the long-term population forecasts.

I trust this information meets your requirements.

D.R. McCleary

D.R. McCleary
Planner

cc: R. Mohammed, Director of Planning and Development
H. Wong, Manager of Policy
F. Rinaldo, Treasurer
J. MacKay, Public Works

DRM/jig

PFR85/VC
1128--DISK06A
>N64

MILTON

YEAR	HIGH POP	MEDIUM POP	LOW POP
1986	29300	29300	29300
1987	29700	29600	29600
1988	30100	29800	29800
1989	30500	30100	30100
1990	30800	30300	30300
1991	31200	30500	30500
1992	31900	30800	30800
1993	32500	31100	31100
1994	33200	31300	31300
1995	33800	31600	31600
1996	34500	31900	31900
1997	35400	32600	32600
1998	36400	33400	33400
1999	37300	34200	34200
2000	38300	35000	35000
2001	39200	35800	35800
2002	40500	36500	36500
2003	41800	37200	37200
2004	43100	38000	38000
2005	44400	38700	38700
2006	45700	39400	39400
2007	48300	40100	40100
2008	49600	40800	40800
2009	50900	41500	41500
2010	52200	42200	42200
2011	53500	42900	42900

OAKVILLE

1986	85600	85300	84200
1987	87800	87100	85600
1988	90200	88900	87100
1989	92600	90800	88500
1990	95200	92600	90100
1991	97700	94800	91500
1992	101200	97000	92400
1993	103500	99100	94000
1994	105700	101200	95500
1995	108000	103400	96900
1996	110200	105500	98300
1997	112900	107500	100000
1998	115600	109600	101500
1999	118300	111600	103100
2000	120900	113600	104700
2001	123500	115500	106200
2002	126100	117500	107800
2003	128700	119300	109400
2004	131300	121200	110900
2005	133800	123100	112400
2006	136400	125000	114000
2007	139000	126900	115600
2008	141600	128800	117200
2009	144200	130700	118800
2010	146800	132600	120400
2011	149400	134500	122000

BURLINGTON

YEAR	HIGH POP	MEDIUM POP	LOW POP
1986	119300	117000	117000
1987	121000	118500	118300
1988	122600	119900	119600
1989	124600	121300	121000
1990	125900	122800	122300
1991	127600	124200	123600
1992	129900	126300	125600
1993	132500	128300	127600
1994	135000	130300	129600
1995	137400	132300	131500
1996	139900	134200	133400
1997	142400	136300	135200
1998	144900	138400	137100
1999	147400	140500	138900
2000	149800	142500	140600
2001	152300	144500	142300
2002	154700	146600	144300
2003	157000	148600	146200
2004	159500	150700	148100
2005	161900	152700	149900
2006	164200	154700	151700
2007	166500	156600	153600
2008	168800	158500	155600
2009	171100	160300	157400
2010	173400	162100	159300
2011	175600	163900	161100

HALTON HILLS

1986	35700	35700	35700
1987	36000	35900	35900
1988	36800	36200	36200
1989	37600	36300	36300
1990	38400	36900	36900
1991	39300	37100	37100
1992	40100	37900	37900
1993	40900	38500	38500
1994	41700	39100	39100
1995	42600	39700	39700
1996	43400	40200	40200
1997	44200	40800	40800
1998	45100	41400	41400
1999	45900	41900	41900
2000	46700	42500	42500
2001	47600	43000	43000
2002	48800	43500	43500
2003	50100	44000	44000
2004	51400	44500	44500
2005	52600	45000	45000
2006	53900	45500	45500
2007	55100	46000	46000
2008	56300	46400	46400
2009	57500	46800	46800
2010	58700	47300	47300
2011	59900	47700	47700

HALTON TOTAL

YEAR	HIGH POP	MEDIUM POP	LOW POP
1986	269900	267300	266200
1987	274500	271100	269400
1988	279700	274800	272700
1989	285300	278500	275900
1990	290300	282600	279600
1991	295800	286600	282700
1992	303100	292000	286700
1993	309400	297000	291200
1994	315600	301900	295500
1995	321800	307000	299700
1996	328000	311800	303800
1997	334900	317200	308600
1998	342000	322800	313400
1999	348900	328200	318100
2000	355700	333600	322800
2001	362600	338800	327300
2002	370100	344100	332100
2003	377600	349100	336800
2004	385300	354400	341500
2005	392700	359500	346000
2006	400200	364600	350600
2007	408900	369600	355300
2008	416300	374500	360000
2009	423700	379300	364500
2010	431100	384200	369200
2011	438400	389000	373700

TABLE 2

COMPARISON OF CURRENT POPULATION

FORECASTS

FORECAST/TIME PERIOD		HALTON NOV 85	METRO NOV 84	TREASURY & ECONOMICS AUG 85
High	1991	295,800	312,400	306,700
	1996	328,000	342,800 *	329,900
	2001	362,600	373,200	350,300
	2006	400,200	409,500 *	367,600
		419,300		
Med	1991	286,600	312,300	304,900
	1996	311,800	331,500 *	325,500
	2001	338,000	354,000	342,500
	2006	364,600	377,150 *	355,400
		376,000		
Low	1991	282,700	310,100	303,700
	1996	303,800	324,700 *	322,100
	2001	327,300	339,300	336,200
	2006	350,600	353,350 *	346,000
		361,600		

* Interpolated