



The Corporation of the
City of Burlington

EVALUATION OF HALTON REGION'S WASTE QUANTITY PROJECTIONS

March 1988
Ref. No. 1354-10

CONESTOGA-ROVERS & ASSOCIATES

March 1, 1988

Reference No. 1354-10

Mr. C. J. Tzekas
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2 First Canadian Place
P.O. Box 480
Toronto, Ontario
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Dear Chris:

Re: Waste Quantity Projection and Site Capacity Requirement
Halton Environmental Assessment

Enclosed is a copy of our report entitled "Evaluation of Halton Region Waste Quantity Projection". This report was prepared on behalf of the City of Burlington. The purpose of this report is to provide a review of the waste quantity calculation undertaken by C.N. Watson and Associates, as well as to provide an independent estimate of future waste quantities and the resulting site capacity requirements.

If you have any questions or comments, please contact our office.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES



Timothy J. Mereu, P. Eng.

TJM/ec
Encl.

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1.0 INTRODUCTION

As part of the on-going Environmental Assessment (EA) process to secure a new landfill site, the Regional Municipality of Halton (Halton) retained the services of C.N. Watson and Associates Ltd. (Watson) to provide a waste quantity projection for a 20 year planning period, 1988 to 2008. The objective of this projection, presented in the 1986 report entitled, "EPA Review of Waste Quantities Projection" (Watson EPA Review Report, Exhibit H-15), was to assess the site capacity requirements for the proposed landfill site.

Subsequent to the release of the Watson EPA Review Report (Exhibit H-15), the City of Burlington (Burlington) directed Conestoga-Rovers & Associates (CRA) and G.M. Stamm Economic Research Associates (Stamm), to provide an independent assessment of the site capacity requirements, as well as a review of the Watson EPA Review Report (Exhibit H-15). Stamm provided the population projection for Halton during the 1988-2008 planning period, and provided an evaluation of a representative per capita waste generation rate for the same period. The population and waste generation calculations completed by Stamm are presented in two separate reports, entitled "Halton Landfill Environmental Assessment - Waste Generation Report, March 1988" (Stamm Waste Report) and "Halton Landfill Environmental Assessment

- Population Projections for Halton Region, March 1988"
(Stamm Population Report).

The report presented herein is a summary of the work undertaken by CRA. The report first presents the study rationale used by Watson and by CRA. Presentation of the study rationale is followed by a review of the Watson approach, a discussion of the factors affecting waste disposal quantities, and finally an independent assessment of the site capacity requirements of the proposed Halton site.

2.0 STUDY APPROACH AND STUDY RATIONALE

The contributing factors in estimating the total waste tonnage requiring landfilling during the planning period are:

- i) population and population growth rate,
- ii) per capita waste generation rate,
- iii) waste reduction through source separation,
- iv) waste reduction through incineration (Energy from Waste - EFW), and
- v) contingency allowance.

Both CRA and Watson separately addressed the above five factors, and then combined them to project expected waste quantities to be landfilled over the planning period.

A summary of the Watson EPA Review Report (Exhibit H-15) is presented in Section 3.0. Briefly, the approach was to determine a most probable refuse tonnage, using the following factors:

- i) A population projection based on the 1985 medium Halton projection,

- ii) An EFW facility activated 8 years into the 20 year study period which would process approximately 50 percent of the generated waste stream, (Exhibit H-12, pg. 12), and
- iii) Source separation increasing from 9 percent in 1988 to 15.9 percent in 2008, (Exhibit H-15, pg. 23).

Using these factors, Watson then estimated the expected per capita waste generation rate over the 20 year planning period, included a contingency to allow for higher than expected refuse generation. Watson then proceeded to calculate the required landfill site capacity.

Details of the CRA approach are provided in Sections 4.0 and 5.0. Briefly, the approach was to incorporate the population projection and per capita waste generation rate from the Stamm Population Report and the Stamm Waste Report, independently assess the remaining three factors, and then combine all factors to arrive at an estimate of the waste disposal quantities and the required site capacity. The approach employed by CRA was to consider each factor, such that in combination they provided an estimate of a required site capacity which would have a high probability of lasting at least 20 years. This approach took into account the fact that projecting waste generation over a 20 year period involves forecasting based on a limited data base, and that it is preferable to design a site which will

remain in operation beyond the planning period, rather than designing one which would be filled prematurely.

As noted, CRA premised waste projections on the need to have a site which would have a high probability of having a 20 year service life. This premise was partly based on the fact that the approval and start-up time for a municipal landfill site is very lengthy. It was also based on a comparison of planning studies underway elsewhere in southern Ontario. For example the Regional Municipality of Peel's Waste Master Plan (Waste Management Master Plan Update for the Regional Municipality of Peel - Stage 3, Preliminary Report, December 1986), considers a 40 year study period. The Region of Waterloo Waste Management Master Plan (The Waste Management Master Plan, Regional Municipality of Waterloo) considers a twenty year study period (1986 - 2005), although the objective is to secure a landfill which would extend beyond the 20 year planning period.

3.0 WATSON REPORT

3.1 APPROACH

The Watson EPA Review Report (Exhibit H-15) estimates the total tonnage of refuse to be received by the proposed landfill over the 20 year study period. This projection is based on the forecasted annual Halton population, the estimated annual per capita waste generation rate, the forecasted percentage of source separation, and the construction of an EFW facility.

The Halton population forecast used by Watson is based on the December 1985 population forecast of the Halton Planning Department (pg. 100, Watson EPA Review Report, Exhibit H-15). The Watson population figures (pg. 25 Watson EPA Review Report, Exhibit H-15) are slightly higher than the Halton 1985 medium population forecast for 1988 to 1995 but are equal to the medium population forecast for 1996 to 2008. Table 3.1 (page 7) presents a comparison of the Watson and Halton medium population forecasts.

The per capita waste generation rate used by Watson was based on a review of the measured generation rates for the period 1976 to 1985 inclusive. The year 1985 was selected as a typical year and assumed to apply to the 1988 to 2008 planning horizon (Exhibit H-15, pg. 21). In 1985,

TABLE 3.1

WATSON POPULATION FORECAST

	Watson Report ⁽¹⁾	Halton 1985 Medium ⁽²⁾
1988	276,200	274,800
1989	279,700	278,500
1990	283,700	282,600
1991	287,600	286,600
1992	292,800	292,000
1993	297,600	297,000
1994	302,300	301,900
1995	307,200	307,000
1996	311,800	311,800
1997	317,200	317,200
1998	322,800	322,800
1999	328,200	328,200
2000	333,600	333,600
2001	338,800	338,800
2002	344,100	344,100
2003	349,100	349,100
2004	354,400	354,400
2005	359,500	359,500
2006	364,600	364,600
2007	369,600	369,600
2008	374,500	374,500

Notes:

- 1) EPA Review of Waste Quantities Projections, C.N Watson and Associates Ltd., 1985, pg. 25, Exhibit H-15.
- 2) Halton Interoffice Memo, Update of Landfill Population Forecast, 1985 pg. 100, Exhibit H-15.

Halton had a per capita waste generation of 0.832 imperial tons/capita prior to source separation and approximately 0.8 imperial tons/capita after accounting for source separation. The selected annual waste generation rate of 0.8 tons/capita assumes a base source separation of 4.6 percent of Halton's landfill and export waste stream (Exhibit H-15, pg. 22). Thus, the Watson EPA Review Report (Exhibit H-15) effectively uses an annual waste generation rate of 0.832 imperial tons/capita.

The source separation component of the Watson EPA Review Report (Exhibit H-15, pg. 23) is based on the Halton Public Works Department 1985 to 1990 forecast, with continued growth in source separation from 1991 to 2008. The assumed source separation forecast for 1988 to 2008, as a percentage of the landfilled refuse was as follows:

- 9% in 1988, 10% in 1989 and 12% in 1990
- a 0.5% per annum increase from 1991 to 1993 (12.5% to 13.5%)
- a 0.25% per annum increase from 1994 to 1999 (13.75% to 15%)
- a 0.10% per annum increase from 2000 to 2008 (15.1% to 15.9%)

The forecast leads to the assumption that by the year 2008, the total waste separated at the source will represent 15.9%

of the landfilled waste. This projection represents the lowest of three projections formulated by the Halton Public Works Department Exhibit H-15, pg. 23).

As directed by the Halton Regional Council (September 5, 1984), the calculation in the Watson EPA Review Report (Exhibit H-15) assumes that the Halton EFW facility will be operational by September 1996, 8 years into the study period. The Watson EPA Review Report (Exhibit H-15, pg. 12) assumes that the EFW facility would process 50% of the annual waste stream between September 1996 and August 2008. This corresponds to 114,300 imperial tons in 1997 and 131,300 imperial tons in 2007.

The Watson EPA Review Report (Exhibit H-15) includes contingencies for the annual tonnage of waste generated and for the EFW facility. The annual tonnage contingency is 11% and accounts for a higher population forecast and a high waste generation rate. The EFW contingency of 10% accounts for the facility having a 10% downtime per annum (Exhibit H-15, pg. 28).

3.2 METHOD

To understand the specifics of the Watson approach, the waste quantities predicted by the Watson EPA

Review Report (Exhibit H-15) for Halton over the 20 year planning period were reproduced by CRA by using the data included in the Watson EPA Review Report (Exhibit H-15). Following an understanding of the Watson approach, CRA completed the following:

- a) the base annual generated waste quantity was calculated by multiplying the Watson annual population forecast by the waste generation rate of 0.8 tons/capita/yr. The 0.8 generation rate excludes the 4.6% base source separation component.
- b) the additional source separation was calculated by multiplying the annual generated waste quantity (a) by the additional source separation percentage. (Source separation percent minus base source separation of 4.6%).
- c) the annual waste quantity requiring disposal was then calculated by subtracting the source separated waste (b) from the base annual generated waste quantity (a).
- d) the quantity of waste received by the EFW facility is 50% of the landfillable waste stream (c) starting in September 1996.

- e) the amount of ash and non-combustibles produced by the EFW facility and subsequently returned for landfilling is 12.78% and 12.7% respectively of the waste received by the EFW facility (d).
- f) the contingency allowance for the EFW facility is 10% of the waste received by the facility after the ash and non-combustible tonnage has been subtracted. This material is then added to the landfill total.
- g) the contingency of the projected annual waste quantities is 11% of the annual waste quantity (c).
- h) the total tonnage of landfillable waste is then the annual waste quantity (c) minus the waste to the EFW plant (d) plus the quantity of ash (e), non-combustibles (e) and the two contingencies (f and g).

The partial years encountered during the projected planning period were accounted for by using 0.33 and 0.67 for waste in 1988 and 2008 respectively. The EFW facility correction used only 0.33 of the generated waste in 1996.

3.3 FORECAST

The waste quantity forecast presented by the Watson EPA Review Report, (Exhibit H-15) for the 20-year period as duplicated by CRA is shown in Table 3.2 (page 13). The precise methodology employed by Watson in deriving the data shown in Table 3.2 (page 13) was specific to the waste generation and source separation rates employed by Watson, and did not lend itself for consideration of alternative input data. Consequently, CRA developed an alternative methodology which lent itself to consideration of alternative population, waste generation and source separation rates. This alternative waste quantity forecast is presented in Table 3.3 (page 14). A comparison of the Watson forecast (Table 3.2) and the CRA forecast (Table 3.3) illustrates that the CRA alternative results in a marginal decrease in the total waste to be landfilled over the 20 year planning period, from 4.21 million tons to 4.15 million tons. This difference was not considered significant, but it did allow CRA to consider alternative scenarios as described in Section 5.0 of this report.

The primary difference between the Watson and CRA methodologies were:

- 1) Watson used an initial (1985) waste generation rate of 0.8 tons/capita/yr, which included a degree of source,

TABLE 3.2
REPLICATION OF C.N.WATSON WASTE QUANTITY FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
YEAR	POPULATION FORECAST	WASTE GENERATED	SOURCE SEPARATION	ADDITIONAL SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	TOTAL WASTE LANDFILLED
		TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
		.8X(2)		(A)	(3)-(5)	(6)x.11	(6)+(7)	(B)	(C)	(D)	(E)	(F)	(8)+(13)
1988	276200	72917	0.09	3208	69708	7668	77376	0	0	0	0	0	77376
1989	279700	223760	0.1	12083	211677	23284	234961	0	0	0	0	0	234961
1990	283700	226960	0.12	16795	210165	23118	233283	0	0	0	0	0	233283
1991	287600	230080	0.125	18176	211904	23309	235213	0	0	0	0	0	235213
1992	292800	234240	0.13	19676	214564	23602	238166	0	0	0	0	0	238166
1993	297600	238080	0.135	21189	216891	23858	240749	0	0	0	0	0	240749
1994	302300	241840	0.1375	22128	219712	24168	243880	0	0	0	0	0	243880
1995	307200	245760	0.14	23101	222659	24492	247151	0	0	0	0	0	247151
1996	311800	249440	0.1425	24071	225369	24791	250160	37186	4752	4723	2771	12246	225220
1997	317200	253760	0.145	25122	228638	25150	253788	114319	14610	14518	8519	37647	177117
1998	322800	258240	0.1475	26211	232029	25523	257552	116014	14827	14734	8645	38206	179743
1999	328200	262560	0.15	27306	235254	25878	261132	117627	15033	14939	8766	38737	182242
2000	333600	266880	0.151	28022	238858	26274	265132	119429	15263	15167	8900	39330	185033
2001	338800	271040	0.152	28730	242310	26654	268964	121155	15484	15387	9028	39899	187708
2002	344100	275280	0.153	29455	245825	27041	272866	122913	15708	15610	9159	40478	190431
2003	349100	279280	0.154	30162	249118	27403	276521	124559	15919	15819	9282	41020	192982
2004	354400	283520	0.155	30904	252616	27788	280404	126308	16142	16041	9412	41596	195692
2005	359500	287600	0.156	31636	255964	28156	284120	127982	16356	16254	9537	42147	198285
2006	364600	291680	0.157	32376	259304	28523	287827	129652	16569	16466	9662	42697	200872
2007	369600	295680	0.158	33116	262564	28882	291446	131282	16778	16673	9783	43234	203398
2008	374500	200732	0.159	22683	178049	19585	197635	89025	11377	11306	6634	29318	137928
		5189329		506153	4683175	515149	5198325	1477450	188818	187636	110100	486554	4207429

NOTES

A) - The additional source separation is calculated as follows; { (3) X [(4) - 0.046] }

B) - The EFW waste component is 50 percent of the landfill component (6).

C) - The EFW ash component is 12.78 percent of the EFW component

D) - The EFW non-combustible component is 12.7 percent of the EFW component

E) - The EFW contingency component is 10 percent of the following; { (9) - (10) - (11) }

F) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (10) + (11) + (12) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE 3.3
CRA ALTERNATIVE WASTE QUANTITY FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.832	232710	0.1	23271	209439	23038	232478	0	0	0	0	0	232478
1990	283700	0.832	236038	0.12	28325	207714	22849	230562	0	0	0	0	0	230562
1991	287600	0.832	239283	0.125	29910	209373	23031	232404	0	0	0	0	0	232404
1992	292800	0.832	243610	0.13	31669	211940	23313	235254	0	0	0	0	0	235254
1993	297600	0.832	247603	0.135	33426	214177	23559	237736	0	0	0	0	0	237736
1994	302300	0.832	251514	0.1375	34583	216930	23862	240793	0	0	0	0	0	240793
1995	307200	0.832	255590	0.14	35783	219808	24179	243987	0	0	0	0	0	243987
1996	311800	0.832	259418	0.1425	36967	222451	24470	246920	36704	4691	4661	2735	12087	222303
1997	317200	0.832	263910	0.145	38267	225643	24821	250464	112822	14419	14328	8407	37154	174797
1998	322800	0.832	268570	0.1475	39614	228956	25185	254141	114478	14630	14539	8531	37700	177363
1999	328200	0.832	273062	0.15	40959	232103	25531	257634	116052	14831	14739	8648	38218	179801
2000	333600	0.832	277555	0.151	41911	235644	25921	261565	117822	15058	14963	8780	38801	182544
2001	338800	0.832	281882	0.152	42846	239036	26294	265330	119518	15274	15179	8906	39360	185171
2002	344100	0.832	286291	0.153	43803	242489	26674	269162	121244	15495	15398	9035	39928	187846
2003	349100	0.832	290451	0.154	44729	245722	27029	272751	122861	15702	15603	9156	40461	190351
2004	354400	0.832	294861	0.155	45703	249157	27407	276565	124579	15921	15821	9284	41026	193012
2005	359500	0.832	299104	0.156	46660	252444	27769	280213	126222	16131	16030	9406	41567	195558
2006	364600	0.832	303347	0.157	47626	255722	28129	283851	127861	16341	16238	9528	42107	198097
2007	369600	0.832	307507	0.158	48586	258921	28481	287402	129461	16545	16441	9647	42634	200576
2008	374500	0.832	208761	0.159	33193	175568	19313	194881	87784	11219	11149	6542	28909	136006
			5396902		774657	4622245	508447	5130692	1457407	186257	185091	108606	479953	4153238

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

and then considered incremental source separation during the 1988 to 2008 forecast period.

- 2) CRA used a total waste generation rate of 0.832 tons/capita/yr, and then subtracted source separation from the this total.

4.0 FACTORS AFFECTING WASTE QUANTITY FORECAST

4.1 GENERAL

The purpose of this section of the report is to review the waste generation assumptions incorporated in the Watson EPA Review Report (Exhibit H-15), as well as summarize additional available information. The information presented in this section will then serve as a basis for the waste quantity and site capacity requirement calculations completed by CRA and presented in Section 5.

To summarize, two factors affect the annual waste forecast presented in the Watson EPA Review Report (Exhibit H-15); the annual per capita waste generation rates and the population forecast. To determine the landfill requirement, the annual waste forecast is then reduced by the source separation component and the utilization of an EFW facility. A contingency is then applied to the annual waste tonnage to reflect uncertainty in the annual waste projections.

4.2 POPULATION

The population forecast utilized by the Watson EPA Review Report (Exhibit H-15) is based on a

variation of the Halton 1985 medium forecast. Various population growth scenarios have been presented throughout the Halton Environmental Assessment process. Several of the population scenarios are presented in summary form in Table 4.1 (page 18). The fourth scenario was prepared for the City of Burlington by G.M. Stamm Economic Research Associates Ltd., and were presented in the report entitled "Halton Landfill Environmental Assessment - Population Projections for Halton Region, March 1988" (Stamm Population Report).

The four sets of population forecasts vary considerably over the 25 years of forecast presented. The general trend between the Halton predictions has been the narrowing of the population envelope and a higher medium population forecast. The Watson EPA Review Report (Exhibit H-15) uses a slightly higher estimate than provided by the 1985 Halton projection. The population forecast has a direct affect on the site life of the landfill since it is one of the two initial variables used for calculating waste generation rates.

4.3 PER CAPITA GENERATION RATE

The per capita generation rate is a primary variable in the annual waste generation projections. Future generation scenarios representing, low, medium and high

TABLE 4.1

POPULATION FORECASTS

		POPULATION					
		1986	1991	1996	2001	2006	2011
HALTON (1.)	LOW	266,200	282,700	303,800	327,300	350,600	373,700
	MEDIUM	267,300	286,600	311,800	338,800	364,600	389,000
	HIGH	269,900	295,800	328,000	362,600	400,200	438,400
HALTON (2.) (1987)	LOW	270,291	287,000	311,000	336,600	361,600	386,200
	MEDIUM	270,291	290,500	316,500	346,800	376,000	403,900
	HIGH	270,291	309,800	342,800	380,100	419,300	459,000
WATSON (3.)		---	287,600	311,800	338,800	364,600	---
STAMM (4.)	LOW	271,387	302,160	335,342	361,184	383,025	404,807
	MEDIUM	271,387	318,983	354,039	391,839	417,569	444,317
	HIGH	271,387	330,257	369,926	406,753	448,815	492,000

NOTES:

- 1.) Halton Interoffice Memorandum, "Update of Landfill Population Forecast", 1985/12/02, (Exhibit H-15, page 100).
- 2.) Halton Regional Infrastructure Report, 1987.
- 3.) EPA Review of Waste Quantity Projections, C.N. Watson and Associated Ltd, (Exhibit H-15, page 25).
- 4.) Stamm Projections, "Halton Landfill Environmental Assessment - Population Projections for Halton Region", G.M. Stamm Economic Research Associates, March 1988 (Tables 3.1, 3.2, 3.3).

projections were calculated by Stamm in the report entitled, "Halton Landfill Environmental Assessment - Waste Generation Report, March 1988" (Stamm Waste Report), and are presented in Table 4.2.

As shown in the Table 4.2, Stamm assumes an initial waste generation rate of 0.9 tons/capita/yr. This is increased by 0.01 tons/capita/yr for the first ten years to account for changes in Halton's industrial and commercial base. An additional waste production growth rate is also applied for each year of the 20 year planning period to account for economic growth. This ranges from 0.5 percent/capita/yr for the "low" scenario to 1.0 percent/capita/yr for the "high" scenario.

4.4 SOURCE SEPARATION

Source separation is a relatively new undertaking for Ontario municipalities. To date, few communities have implemented a curb-side program, although many are in the planning stage.

The measurement of source separated waste for Halton probably represent the best estimate of one of the more successful existing source separation programs. This is

TABLE 4.2

PER CAPITA WASTE GENERATION RATES

<u>Recommended</u>	<u>1988 Waste Generation Rate (tons/capita/yr)</u>	Annual ⁽¹⁾ Geographic Waste Growth Rate (tons) <u>(tons/capita/yr)</u>	(2) Annual Economic Waste Growth Rate (%)
Low	0.9		
Medium	0.9	0.01	0.75
High	0.9	0.01	1.0
Region ⁽³⁾	0.832	0.0	0.0

Notes:

- (1) Geographic waste growth rate of 0.01 tons/capita/yr continues for the first ten years only.
- (2) Economic waste growth rate applies to all years of the 20 year planning period.
- (3) "Region" refers to the waste generation rate used by Watson in the EPA Review Report (Exhibit H-15).

Source: Halton Landfill Environmental Assessment - Waste Generation report
Stamm Economic Research, March 1988, Table 4.1.

Factors affecting the extent of source separation include; the degree of public participation, the fraction of the waste stream which lends itself to separation, and available end markets for the separation waste. It is the difficulty in measuring and predicting these three factors, which leads to uncertainties in projecting the effect which source separation will have on reducing the fraction of the waste stream to be landfilled.

4.5 EFW FACILITY

Halton has instructed its Landfill Consultants to assume that an EFW facility would be active 8 years in to the 20 year study period and that the facility would process approximately 50% of the generated waste stream (Exhibit H-15, pg. 12).

The construction of an EFW facility(s) within the prescribed 8 year time frame is a possibility but is not a certainty. At the present time, various levels of government are studying the EFW issue from the economic, environmental and political view point. Existing EFW facilities are expensive to operate, can produce airborne contamination and produce an ash that requires landfilling.

4.6 CONTINGENCY ALLOWANCE

The 11 percent contingency allowance used in the Watson calculation allowed for uncertainties in predicting waste generation rates over the planning period. Specifically, the contingency allowed for an additional waste generation rate 0.034 tons/capita and the additional population growth rate reflected in the high Halton (1985) population projection.

Contingency allowances typically allow for a number of unquantifiable factors which may increase waste generation rates. Factors to consider include; higher than expected population growth or waste generation rates; acceptance of waste from neighbouring communities and uncertainties in the existing data base.

5.0 REVISED WASTE QUANTITY PROJECTION - CRA

5.1 METHODOLOGY

As listed in Section 2.0, the contributing factors in estimating the capacity requirements for the proposed landfill site included; the per capita waste generation rate, the population and population growth rate, waste reduction through source separation, waste reduction through incineration at an EFW plant, and the contingency allowance.

The approach employed by CRA, and as presented herein was to address each of these factors then combine them to derive the waste generation rates and the resulting site capacity requirements for the proposed landfill site. The approach was based on the following considerations.

- i) For the reasons included in Section 2 (Pages 4 and 5), the estimated site capacity should have a high probability of lasting at least 20 years.
- ii) To determine the significance of existing uncertainty, a sensitivity analysis should be carried out to determine the importance of each factor. The sensitivity analysis

should be based on the range of data presented earlier in sections of this Report.

- iii) Use the results of the Watson study, the results of the sensitivity analysis, and the information included in the previous sections of this report, to arrive at a revised projection of the expected waste quantities and the resulting site capacity requirement for the proposed landfill site.

5.2 SENSITIVITY ANALYSIS

The sensitivity analysis was performed using the waste tonnages predicted by the Watson EPA Review Report (Exhibit H-15) as the base case. The analysis was performed by considering a number of alternative waste generation forecasts, a number of alternative population forecasts, source separation increasing from 9.0 percent in 1988 to a maximum ranging from 10 to 15.9 percent, the existence/absence of the EFW facility, and alternative contingency factors. The objective was to determine the relative importance of the uncertainty associated with each variable.

A total of fourteen sensitivity analysis calculations were made with only one parameter varied for

each calculation. Six of the scenarios address the waste generation rate, three address population, two address the percent source separation, two address the EFW facility, while one addresses the contingency factor.

Tables 5.1 to 5.5 (pages 27 to 31) respectively summarize the impact of varying the waste generation rate and the population growth rate, varying the source separation percentage, delaying the EFW facility, and varying the contingency allowance. In each table, values listed under "Site Life" represent how the variation of each factor would impact on the site life given the design capacity of 4.2 million tons calculated in the Watson EPA Review Report (Exhibit H-15). Values listed under "Refuse to be Landfilled" represent how the variation of each factor would impact on the required site capacity, given that a 20 year site is required.

As illustrated in Table 5.1 (Page 27), starting from the base case the waste generation rate was varied in three ways:

- 1) It was increased by either 0.5 or 1.0 percent per year starting from the initial value of 0.832 tons/year/capita.
- 2) It started at an initial value of 0.9 tons/year/capita and was increased by 0.01 tons/year/capita for the first

TABLE 5.1
GENERATION RATE SUMMARY

Scenario		1988 Generation Rate	(1) Geographic Growth Rate	Economic ⁽²⁾ Growth Rate %	Site Life		Refuse to be Landfilled	
					Actual (yrs)	Incremental Change wrt Base Scenario (%)	Required Capacity (tons)	Incremental Change wrt Base Scenario (%)
Base	Watson EPA Review Report (Exhibit H-15)	0.832	-	0	20	0	4,207,000	0.0
1	0.5% Annual Increase	0.832	-	0.5	19.3	-3.4	4,361,000	3.7
2	1.0% Annual Increase	0.832	-	1.0	18.5	-7.7	4,583,000	8.9
3	0.9% tons/yr/capita +.01 tons/yr for 10 years	0.9	0.01	0.50	16.6	-17.0	5,097,000	21.2
4	0.9% tons/yr/capita +.01 tons/yr for 10 years	0.9	0.01	0.75	16.3	-18.6	5,223,000	24.2
5	0.9% tons/yr/capita +.01 tons/yr for 10 years	0.9	0.01	1.00	16.0	-20.1	5,353,000	27.2
6	1.0 tons/yr/capita	1.0	-	0	16.7	-16.4	4,992,000	18.6

(1) "Geographic Growth Rate" of 0.01 tons/capita/yr continues for the first ten years only.

(2) "Economic Growth Rate" applies to all years of the 20 year planning period.

TABLE 5.2

POPULATION SUMMARY

<u>Scenario</u>	<u>Population (1000's)</u>		<u>Site Life</u>		<u>Refuse to be Landfilled</u>	
	<u>1988</u>	<u>2008</u>	<u>Actual (yrs)</u>	<u>Incremental Change wrt Base Scenario (%)</u>	<u>Required Capacity (tons)</u>	<u>Incremental Change wrt Base Scenario (%)</u>
Base Watson EPA Review Report (Exhibit H-15)	276.2	374.5	20	0	4,207,000	0.0
7 Stamm Medium Projection	290.4	428.3	17.9	-10.6	4,693,000	11.6
8 Stamm High Projection	294.9	466.1	17.0	-15.0	4,913,000	16.8
9 Stamm Low Projection 	283.7	391.7	19.1	-4.4	4,395,000	4.5

TABLE 5.3

SOURCE SEPARATION SUMMARY

<u>Scenario</u>		<u>1988 %</u>	<u>1989 %</u>	<u>2008 %</u>	<u>Site Life</u>		<u>Refuse to be Landfilled</u>	
					<u>Absolute Years</u>	<u>Incremental Change wrt Base Scenario (%)</u>	<u>Required Capacity (tons)</u>	<u>Incremental Change wrt Base Scenario (%)</u>
Base	Watson EPA Review Report (Exhibit H-15)	9	10	15.9	20	0	4,207,000	0.0
10	10% Source Separation	9	10	10	19.3	-3.4	4,354,000	3.5
11	12% Source Separation	9	10	12	19.6	-2.0	4,264,000	1.4

TABLE 5.4

EFW FACILITY SUMMARY

<u>Scenario</u>		<u>Startup Date</u>	<u>Site Life</u>		<u>Refuse to be Landfilled</u>	
			<u>Actual Years</u>	<u>Incremental Change wrt Base Scenario (%)</u>	<u>Required Capacity (tons)</u>	<u>Incremental Change wrt Base Scenario (%)</u>
Base	Watson EPA Review Report (Exhibit H-15)	Sept. 1986	20	0	4,207,000	0.0
12	EFW Facility Delayed	Jan. 2001	19.0	4.8	4,487,000	8.1
13	No EFW Facility	---	16.8	-16.2	5,131,000	23.6

TABLE 5.5
CONTINGENCY SUMMARY

<u>Scenario</u>		<u>Contingency %</u>	<u>Site Life</u>		<u>Refuse to be Landfilled</u>	
			<u>Actual Years</u>	<u>Incremental Change wrt Base Scenario (%)</u>	<u>Required Capacity (tons)</u>	<u>Incremental Change wrt Base Scenario (%)</u>
Base	Watson EPA Review Report (Exhibit H-15)	11	20	0	4,207,000	0.0
14	-----	5	20.9	4.4	4,207,000	0.0

ten years. Additionally, it was increased by 0.5, 0.75 or 1.0 percent per year for each year of the study period.

- 3) It was held constant at 1.0 tons/year/capita. Scenarios 1, 4 and 5 represent the low/recommended/high scenarios proposed in the Stamm Waste Report. The additional scenarios have been provided for information purposes. The results of the six sensitivity scenarios are presented in Appendix A (page 43), Tables A.1 to A.6 (pages 44 to 49).

In general, the results reported in Table 5.1 (page 27) show that over the 20 year forecast period the alternative waste generation scenarios would decrease the life of the site by up to 4 years. Or alternatively, the site capacity would have to increase by as much as 27.2 percent (to 5.35 million tons) in order to maintain a site life of 20 years.

As summarized in Table 5.2 (Page 28), the influence of the population forecast on the site life was analyzed by simulating three different forecasts in addition to the scenario presented in the Watson EPA Review Report (Exhibit H-15). The different population forecasts represent the Stamm Medium, Stamm High and Stamm Low forecasts summarized on Table 4.1 (page 18). The simulation results

are presented in Appendix A, Table A.7 to A.9 (pages 50 to 52). The results presented in Table 5.2 (page 28) show that over the 20 year forecast period the alternative population forecast scenarios would decrease the life of the site by up to three years. Alternatively, the site capacity would have to increase by as much as 16.8 percent (to 4.91 million tons) in order to maintain site life of 20 years.

As summarized in Table 5.3 (page 29), the influence of a source separation percentage was studied by increasing the source separation rate from 9 percent in 1988 to a maximum of 10 and 12 percent by 1989 and 1990, respectively. These were considered as alternatives to the steadily increasing rate (to 15.9 percent in 2008) provided in the Watson EPA Review Report (Exhibit H-15). The results of the sensitivity analyses are presented in Table A.10 and A.11 of Appendix A (pages 53 and 54).

The source separation variable accounts for approximately thirteen percent of the refuse generated in Halton during the 20 year forecast period as simulated by the Watson report, while the alternative sensitivity scenarios account for 10 and 12 percent, respectively. The alternative scenarios would result in a decreased site life of up to one year. Thus the range of variation considered for source separation has a small influence on the landfill's site life.

The EFW facility is a major component of the study period in the latter 12 years. The sensitivity of changes to the EFW facility on the landfillable tonnages are summarized in Table 5.4 (Page 30). The detailed sensitivity analysis results are presented in Table A.12 and A.13 of Appendix A (pages 55 and 56).

Two options were considered with regards to the EFW facility; completion of the EFW facility was delayed for 4 and 1/3 years until January 2001, and secondly the facility would not be completed during the study period. The delay in the EFW facility resulted in a reduction in the landfill site life of one year, while not constructing the EFW facility would reduce the site life approximately three years. Alternatively, the site capacity for the alternative EFW scenario would have to be increased by approximately eight percent and 24 percent, respectively, in order to maintain a site life of 20 years.

The impact on site life and/or site capacity caused by decreasing the landfill contingency to 5 percent, rather than the 11 percent included in the Watson EPA Review Report (Exhibit H-15), is summarized in Table 5.5 (page 31). The effect would be to increase the site life by slightly more than one year, or alternatively, to decrease the 20 year site capacity requirement by approximately eight percent. The calculation table for this alternative is included in Appendix A as Table A.14 (page 57).

5.3 REVISED PROJECTION

Based on the discussion of Section 4.0 and the sensitivity analysis of Section 5.2, recommended, low and high waste disposal scenarios were developed. These are summarized in Table 5.6 (page 36). The detailed forecast tables for the three scenarios are included as Table 5.7 (page 37), Table 5.8 (page 38) and Table 5.9 (page 39), respectively.

The rationale for selecting the recommended scenario is as follows:

- population projections provided in the Stamm Population Report are independent assessments which reflect the most recent information,
- waste generation rates provided in the Stamm Waste Report represent a best estimate based on existing information,
- source separation will likely increase beyond its present level but a projection of a steady increase may be too speculative given the lack of historical data,
- given the number of uncertainties, an EFW plant should not be considered for planning purposes. However, if constructed it would serve to extend site life beyond 20 years.

TABLE 5.6

ALTERNATIVE WASTE QUANTITY SCENARIOS

	<u>Recommendation</u>	<u>Scenario Range</u>	
		<u>Low</u>	<u>High</u>
Population	Stamm Medium	Stamm Low	Stamm High
Waste Generation Rate (tons/capita)	0.9 + 0.75%/yr +0.01 tons/yr for ten years	0.9 + 0.5%/yr +0.01 tons/yr for ten years	0.9 + 1.0%/yr +0.01 tons/yr for ten years
Source Separation (%)	12.0	per Watson	10.0
EFW	No EFW	per Watson	no EFW
Contingency (%)	5.0	5.0	5.0
Site Life for 4.2 million tons	13.0	16.8	12.2
Site Capacity for 20 yr life (million tons)	7.2	5.0	8.0
(million tonnes)	6.6	4.5	7.2

TABLE 5.7

RECOMMENDED WASTE QUANTITY FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 5%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	290425	0.900	86256	0.09	7763	78493	3925	82418	0	0	0	0	0	82418
1989	299945	0.917	274997	0.10	27500	247497	12375	259872	0	0	0	0	0	259872
1990	309469	0.934	288975	0.12	34677	254298	12715	267013	0	0	0	0	0	267013
1991	318983	0.951	303306	0.12	36397	266910	13345	280255	0	0	0	0	0	280255
1992	325994	0.968	315582	0.12	37870	277712	13886	291598	0	0	0	0	0	291598
1993	333005	0.985	328142	0.12	39377	288765	14438	303203	0	0	0	0	0	303203
1994	340017	1.003	340990	0.12	40919	300071	15004	315075	0	0	0	0	0	315075
1995	347028	1.020	354128	0.12	42495	311632	15582	327214	0	0	0	0	0	327214
1996	354039	1.038	367559	0.12	44107	323452	16173	339624	0	0	0	0	0	339624
1997	361599	1.056	381866	0.12	45824	336042	16802	352844	0	0	0	0	0	352844
1998	369159	1.074	396493	0.12	47579	348914	17446	366359	0	0	0	0	0	366359
1999	376719	1.082	407647	0.12	48918	358730	17936	376666	0	0	0	0	0	376666
2000	384279	1.090	418947	0.12	50274	368673	18434	387107	0	0	0	0	0	387107
2001	391839	1.098	430393	0.12	51647	378745	18937	397683	0	0	0	0	0	397683
2002	396985	1.107	439315	0.12	52718	386597	19330	405927	0	0	0	0	0	405927
2003	402131	1.115	448347	0.12	53802	394546	19727	414273	0	0	0	0	0	414273
2004	407277	1.123	457491	0.12	54899	402592	20130	422721	0	0	0	0	0	422721
2005	412423	1.132	466745	0.12	56009	410736	20537	431273	0	0	0	0	0	431273
2006	417569	1.140	476114	0.12	57134	418980	20949	439929	0	0	0	0	0	439929
2007	422919	1.149	485830	0.12	58300	427531	21377	448907	0	0	0	0	0	448907
2008	428268	1.157	332095	0.12	39851	292244	14612	306856	0	0	0	0	0	306856
			7801218		928058	6873159	343658	7216817	0	0	0	0	0	7216817

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE 5.8
LOW SCENARIO WASTE QUANTITY FORECAST

(1)	2	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 5%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.05	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	283696	0.900	84258	0.09	7583	76675	3834	80508	0	0	0	0	0	80508
1989	289851	0.915	265083	0.1	26508	238575	11929	250503	0	0	0	0	0	250503
1990	296005	0.929	275040	0.12	33005	242035	12102	254137	0	0	0	0	0	254137
1991	302160	0.944	285199	0.125	35650	249549	12477	262027	0	0	0	0	0	262027
1992	308796	0.959	296024	0.13	38483	257541	12877	270418	0	0	0	0	0	270418
1993	315433	0.973	307068	0.135	41454	265614	13281	278894	0	0	0	0	0	278894
1994	322069	0.988	318333	0.1375	43771	274562	13728	288290	0	0	0	0	0	288290
1995	328706	1.003	329820	0.14	46175	283645	14182	297828	0	0	0	0	0	297828
1996	335342	1.018	341532	0.1425	48668	292863	14643	307506	48322	6176	6137	3601	15914	275098
1997	340510	1.034	351951	0.145	51033	300919	15046	315964	150459	19229	19108	11212	49549	215054
1998	345679	1.049	362554	0.1475	53477	309077	15454	324531	154539	19750	19626	11516	50893	220885
1999	350847	1.054	369815	0.15	55472	314342	15717	330060	157171	20086	19961	11712	51760	224648
2000	356016	1.059	377139	0.151	56948	320191	16010	336200	160095	20460	20332	11930	52723	228828
2001	361184	1.065	384527	0.152	58448	326079	16304	342383	163039	20836	20706	12150	53692	233035
2002	365552	1.070	391123	0.153	59842	331281	16564	347846	165641	21169	21036	12344	54549	236754
2003	369920	1.075	397776	0.154	61258	336519	16826	353344	168259	21504	21369	12539	55411	240496
2004	374289	1.081	404486	0.155	62695	341790	17090	358880	170895	21840	21704	12735	56279	244264
2005	378657	1.086	411252	0.156	64155	347097	17355	364452	173548	22179	22041	12933	57153	248056
2006	383025	1.092	418076	0.157	65638	352438	17622	370060	176219	22521	22380	13132	58033	251674
2007	387381	1.097	424946	0.158	67141	357804	17890	375694	178902	22864	22721	13332	58916	255708
2008	391738	1.102	289355	0.159	46007	243348	12167	255515	121674	15550	15453	9067	40070	173911
			7085357		1023412	6061944	303097	6365042	1988765	254164	252573	148203	654940	5031217

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE 5.9
HIGH SCENARIO WASTE QUANTITY FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 5%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	294935	0.900	87596	0.09	7884	79712	3986	83698	0	0	0	0	0	83698
1989	306709	0.919	281896	0.10	28190	253707	12685	266392	0	0	0	0	0	266392
1990	318483	0.938	298862	0.10	29886	268975	13449	282424	0	0	0	0	0	282424
1991	330257	0.958	316345	0.10	31634	284710	14236	298946	0	0	0	0	0	298946
1992	338191	0.978	330600	0.10	33060	297540	14877	312417	0	0	0	0	0	312417
1993	346125	0.997	345235	0.10	34524	310712	15536	326247	0	0	0	0	0	326247
1994	354058	1.018	360255	0.10	36026	324230	16211	340441	0	0	0	0	0	340441
1995	361992	1.038	375668	0.10	37567	338101	16905	355006	0	0	0	0	0	355006
1996	369926	1.058	391477	0.10	39148	352329	17616	369945	0	0	0	0	0	369945
1997	377291	1.079	407074	0.10	40707	366367	18318	384685	0	0	0	0	0	384685
1998	384657	1.100	423057	0.10	42306	380751	19038	399789	0	0	0	0	0	399789
1999	392022	1.111	435468	0.10	43547	391922	19596	411518	0	0	0	0	0	411518
2000	399388	1.122	448087	0.10	44809	403279	20164	423442	0	0	0	0	0	423442
2001	406753	1.133	460914	0.10	46091	414822	20741	435564	0	0	0	0	0	435564
2002	415165	1.144	475150	0.10	47515	427635	21382	449017	0	0	0	0	0	449017
2003	423578	1.156	489627	0.10	48963	440664	22033	462697	0	0	0	0	0	462697
2004	431990	1.167	504344	0.10	50434	453910	22695	476605	0	0	0	0	0	476605
2005	440403	1.179	519308	0.10	51931	467377	23369	490746	0	0	0	0	0	490746
2006	448815	1.191	534519	0.10	53452	481067	24053	505121	0	0	0	0	0	505121
2007	457452	1.203	550253	0.10	55025	495228	24761	519990	0	0	0	0	0	519990
2008	466089	1.215	379387	0.10	37939	341448	17072	358521	0	0	0	0	0	358521
			8415121		840636	7574485	378724	7953209	0	0	0	0	0	7953209

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

- given the population and waste generation rates used, a five percent contingency is adequate.

Based on the recommended scenario a site capacity of 7.2 million tons (6.6 million tonnes) would be required to ensure a site life of 20 years. This represents more than a 70 percent increase over the presently proposed capacity of 4.2 million tons (3.8 million tonnes).

Alternatively, based on the recommended scenario, a site with a capacity of 4.2 million tons would be filled in approximately 13 years.

Based on the information included in this report, the low and high scenarios of Table 5.6 (Page 36) provide a reasonable range for estimating the site capacity.

- the low and high population projection provided by Stamm,
- the low and high waste generation rate projection provided by Stamm,
- source separation as per Watson for the low scenario and limited to a maximum projection of 10 percent for the high scenario,
- EFW facility as per Watson for the low scenario, and no EFW facility for the high scenario,

- 5 percent contingency.

Design to the lower projection would result in a site capacity requirement of 5.0 million tons (4.6 million tonnes) to ensure a site life of 20 years. Alternatively, a site with a capacity of 4.2 million tons would be filled in approximately 17 years.

Designing to the upper projection would result in a site capacity requirement of 8.0 million tons (7.2 million tonnes) to ensure a site life of 20 years. Alternatively a site with a capacity of 4.2 million tons would be filled in approximately 12 years.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings presented in this report, it is concluded that:

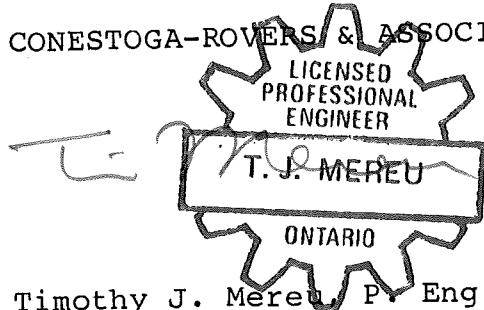
- 1) Methods for projecting waste quantities over a 20 year period involve forecasting based on a limited data base and contain a degree of uncertainty.
- 2) For planning purposes an initial report generation rate of 0.9 tons/capita, increasing by 0.1 tons/yr for ten years as well as increasing by 0.75 percent/yr for all years, should be assumed; provision for an EFW facility should not be considered in selecting the site capacity; and a source separation rate increasing to 12 percent by 1990 should be assumed.
- 3) The landfilling requirement over the 1988 to 2008 planning period is projected to be between 5.0 million tons and 8.0 million tons.
- 4) The 20 year site capacity calculated by Watson is 0.8 million tons below the lower end of the range presented herein.

Based on the findings of this report and the supporting documentation, it is recommended that the proposed

landfill site be selected and designed for an ultimate capacity of 7.2 million tons (6.6 million tonnes). There is a high probability that a site of this size will remain active for at least 20 years.

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES



Timothy J. Mereu, P. Eng.

APPENDIX A

SENSITIVITY SCENARIOS

TABLE A.1

SCENARIO 1 - 0.5 PERCENT ANNUAL WASTE GENERATION RATE INCREASE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.836	233874	0.1	23387	210487	23154	233640	0	0	0	0	0	233640
1990	283700	0.840	238405	0.12	28609	209796	23078	232874	0	0	0	0	0	232874
1991	287600	0.845	242890	0.125	30361	212529	23378	235907	0	0	0	0	0	235907
1992	292800	0.849	248518	0.13	32307	216211	23783	239994	0	0	0	0	0	239994
1993	297600	0.853	253855	0.135	34270	219585	24154	243739	0	0	0	0	0	243739
1994	302300	0.857	259154	0.1375	35634	223520	24587	248108	0	0	0	0	0	248108
1995	307200	0.862	264671	0.14	37054	227617	25038	252655	0	0	0	0	0	252655
1996	311800	0.866	269978	0.1425	38472	231506	25466	256972	38198	4882	4851	2847	12580	231353
1997	317200	0.870	276027	0.145	40024	236003	25960	261963	118001	15081	14986	8793	38860	182822
1998	322800	0.875	282304	0.1475	41640	240664	26473	267137	120332	15378	15282	8967	39628	186433
1999	328200	0.879	288462	0.15	43269	245193	26971	272164	122596	15668	15570	9136	40373	189941
2000	333600	0.883	294674	0.151	44496	250178	27520	277698	125089	15986	15886	9322	41194	193803
2001	338800	0.888	300764	0.152	45716	255048	28055	283103	127524	16298	16196	9503	41996	197575
2002	344100	0.892	306996	0.153	46970	260026	28603	288629	130013	16616	16512	9689	42816	201432
2003	349100	0.897	313014	0.154	48204	264810	29129	293939	132405	16921	16815	9867	43604	205138
2004	354400	0.901	319355	0.155	49500	269855	29684	299539	134928	17244	17136	10055	44434	209046
2005	359500	0.906	325571	0.156	50789	274782	30226	305008	137391	17559	17449	10238	45246	212862
2006	364600	0.910	331840	0.157	52099	279741	30772	310513	139871	17875	17764	10423	46062	216704
2007	369600	0.915	338073	0.158	53416	284657	31312	315970	142329	18190	18076	10606	46872	220513
2008	374500	0.919	230659	0.159	36675	193985	21338	215323	96992	12396	12318	7228	31941	150272
			5694919		819718	4875202	536272	5411474	1565669	200093	198840	116674	515606	4361411

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.2

SCENARIO 2 - 1.0 PERCENT ANNUAL WASTE GENERATION RATE INCREASE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.840	235038	0.1	23504	211534	23269	234802	0	0	0	0	0	234802
1990	283700	0.849	240783	0.12	28894	211889	23308	235197	0	0	0	0	0	235197
1991	287600	0.857	246534	0.125	30817	215717	23729	239446	0	0	0	0	0	239446
1992	292800	0.866	253501	0.13	32955	220546	24260	244806	0	0	0	0	0	244806
1993	297600	0.874	260233	0.135	35132	225102	24761	249863	0	0	0	0	0	249863
1994	302300	0.883	266987	0.1375	36711	230276	25330	255606	0	0	0	0	0	255606
1995	307200	0.892	274028	0.14	38364	235664	25923	261587	0	0	0	0	0	261587
1996	311800	0.901	280912	0.1425	40030	240882	26497	267379	39746	5079	5048	2962	13089	240723
1997	317200	0.910	288635	0.145	41852	246783	27146	273929	123391	15769	15671	9195	40635	191173
1998	322800	0.919	296668	0.1475	43759	252909	27820	280729	126455	16161	16060	9423	41644	195919
1999	328200	0.928	304647	0.15	45697	258950	28485	287435	129475	16547	16443	9648	42639	200598
2000	333600	0.938	312756	0.151	47226	265530	29208	294738	132765	16967	16861	9894	43722	205695
2001	338800	0.947	320808	0.152	48763	272045	29925	301970	136022	17384	17275	10136	44795	210742
2002	344100	0.956	329084	0.153	50350	278734	30661	309395	139367	17811	17700	10386	45896	215924
2003	349100	0.966	337205	0.154	51930	285275	31380	316656	142638	18229	18115	10629	46973	220991
2004	354400	0.976	345747	0.155	53591	292157	32137	324294	146078	18669	18552	10886	48107	226322
2005	359500	0.985	354230	0.156	55260	298970	32887	331857	149485	19104	18985	11140	49228	231600
2006	364600	0.995	362848	0.157	56967	305881	33647	339528	152940	19546	19423	11397	50366	236954
2007	369600	1.005	371502	0.158	58697	312805	34409	347213	156402	19988	19863	11655	51506	242317
2008	374500	1.015	254728	0.159	40502	214227	23565	237792	107113	13689	13603	7982	35275	165953
			6012707		867824	5144884	565937	5710821	1681879	214944	213599	125334	553876	4582819

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.3
SCENARIO 3

0.9 TONS/CAPITA/YR GENERATION RATE
0.01 TONS/CAPITA/YEAR INCREASE FOR TEN YEARS
0.5 PERCENT INCREASE PER YEAR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.900	82031	0.09	7383	74649	8211	82860	0	0	0	0	0	82860
1989	279700	0.915	255800	0.1	25580	230220	25324	255544	0	0	0	0	0	255544
1990	283700	0.929	263606	0.12	31633	231974	25517	257491	0	0	0	0	0	257491
1991	287600	0.944	271457	0.125	33932	237525	26128	263652	0	0	0	0	0	263652
1992	292800	0.959	280689	0.13	36490	244200	26862	271062	0	0	0	0	0	271062
1993	297600	0.973	289708	0.135	39111	250597	27566	278163	0	0	0	0	0	278163
1994	302300	0.988	298793	0.1375	41084	257709	28348	286057	0	0	0	0	0	286057
1995	307200	1.003	308242	0.14	43154	265088	29160	294247	0	0	0	0	0	294247
1996	311800	1.018	317555	0.1425	45252	272303	29953	302257	44930	5742	5706	3348	14796	272123
1997	317200	1.034	327858	0.145	47539	280318	30835	311153	140159	17912	17800	10445	46157	217152
1998	322800	1.049	338558	0.1475	49937	288621	31748	320369	144311	18443	18327	10754	47524	223583
1999	328200	1.054	345943	0.15	51891	294052	32346	326397	147026	18790	18672	10956	48419	227790
2000	333600	1.059	353393	0.151	53362	300031	33003	333034	150015	19172	19052	11179	49403	232422
2001	338800	1.065	360696	0.152	54826	305870	33646	339516	152935	19545	19423	11397	50365	236946
2002	344100	1.070	368170	0.153	56330	311840	34302	346143	155920	19927	19802	11619	51348	241570
2003	349100	1.075	375388	0.154	57810	317578	34934	352512	158789	20293	20166	11833	52292	246015
2004	354400	1.081	382992	0.155	59364	323629	35599	359228	161814	20680	20550	12058	53289	250702
2005	359500	1.086	390446	0.156	60910	329537	36249	365786	164768	21057	20926	12279	54262	255279
2006	364600	1.092	397965	0.157	62481	335485	36903	372388	167742	21437	21303	12500	55241	259887
2007	369600	1.097	405440	0.158	64060	341380	37552	378932	170690	21814	21678	12720	56212	264454
2008	374500	1.102	276622	0.159	43983	232639	25590	258230	116320	14866	14773	8668	38306	180216
			6691354		966110	5725244	629777	6355021	1875420	239679	238178	139756	617613	5097214

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.4
SCENARIO 4

0.9 TONS/CAPITA/YR GENERATION RATE
0.01 TONS/CAPITA/YR INCREASE FOR TEN YEARS
0.75 PERCENT INCREASE PER YEAR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.900	82031	0.09	7383	74649	8211	82860	0	0	0	0	0	82860
1989	279700	0.917	256436	0.1	25644	230792	25387	256180	0	0	0	0	0	256180
1990	283700	0.934	264912	0.12	31789	233123	25644	258766	0	0	0	0	0	258766
1991	287600	0.951	273466	0.125	34183	239283	26321	265604	0	0	0	0	0	265604
1992	292800	0.968	283448	0.13	36848	246600	27126	273726	0	0	0	0	0	273726
1993	297600	0.985	293254	0.135	39589	253665	27903	281568	0	0	0	0	0	281568
1994	302300	1.003	303165	0.1375	41685	261480	28763	290243	0	0	0	0	0	290243
1995	307200	1.020	313485	0.14	43888	269597	29656	299253	0	0	0	0	0	299253
1996	311800	1.038	323707	0.1425	46128	277578	30534	308112	45800	5853	5817	3413	15083	277395
1997	317200	1.056	334978	0.145	48572	286407	31505	317911	143203	18301	18187	10672	47160	221868
1998	322800	1.074	346701	0.1475	51138	295563	32512	328075	147781	18886	18768	11013	48667	228961
1999	328200	1.082	355145	0.15	53272	301873	33206	335079	150937	19290	19169	11248	49706	233849
2000	333600	1.090	363696	0.151	54918	308778	33966	342743	154389	19731	19607	11505	50843	239198
2001	338800	1.098	372135	0.152	56565	315570	34713	350283	157785	20165	20039	11758	51962	244460
2002	344100	1.107	380791	0.153	58261	322530	35478	358008	161265	20610	20481	12017	53108	249851
2003	349100	1.115	389222	0.154	59940	329282	36221	365502	164641	21041	20909	12269	54219	255081
2004	354400	1.123	398094	0.155	61705	336390	37003	373393	168195	21495	21361	12534	55390	260588
2005	359500	1.132	406852	0.156	63469	343383	37772	381155	171691	21942	21805	12794	56541	266005
2006	364600	1.140	415718	0.157	65268	350450	38550	389000	175225	22394	22254	13058	57705	271480
2007	369600	1.149	424580	0.158	67084	357496	39325	396821	178748	22844	22701	13320	58865	276938
2008	374500	1.157	290402	0.159	46174	244228	26865	271093	122114	15606	15508	9100	40215	189193
			6872218		993502	5878715	646659	6525374	1941775	248159	246605	144701	639465	5223064

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.5
SCENARIO 5

0.9 TONS/CAPITA/YR GENERATION RATE
0.01 TONS/CAPITA/YR INCREASE FOR TEN YEARS
1.0 PERCENT INCREASE PER YEARS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.900	82031	0.09	7383	74649	8211	82860	0	0	0	0	0	82860
1989	279700	0.919	257072	0.1	25707	231365	25450	256815	0	0	0	0	0	256815
1990	283700	0.938	266222	0.12	31947	234275	25770	260045	0	0	0	0	0	260045
1991	287600	0.958	275485	0.125	34436	241049	26515	267565	0	0	0	0	0	267565
1992	292800	0.978	286228	0.13	37210	249018	27392	276410	0	0	0	0	0	276410
1993	297600	0.997	296835	0.135	40073	256762	28244	285006	0	0	0	0	0	285006
1994	302300	1.018	307591	0.1375	42294	265297	29183	294480	0	0	0	0	0	294480
1995	307200	1.038	318806	0.14	44633	274173	30159	304332	0	0	0	0	0	304332
1996	311800	1.058	329964	0.1425	47020	282944	31124	314068	46686	5966	5929	3479	15375	282757
1997	317200	1.079	342239	0.145	49625	292615	32188	324802	146307	18698	18581	10903	48182	226677
1998	322800	1.100	355025	0.1475	52366	302658	33292	335951	151329	19340	19219	11277	49836	234457
1999	328200	1.111	364573	0.15	54686	309887	34088	343975	154944	19802	19678	11546	51026	240057
2000	333600	1.122	374277	0.151	56516	317762	34954	352715	158881	20305	20178	11840	52323	246157
2001	338800	1.133	383913	0.152	58355	325558	35811	361369	162779	20803	20673	12130	53606	252197
2002	344100	1.144	393818	0.153	60254	333563	36692	370255	166782	21315	21181	12429	54925	258398
2003	349100	1.156	403535	0.154	62144	341391	37553	378944	170695	21815	21678	12720	56213	264462
2004	354400	1.167	413758	0.155	64133	349626	38459	388085	174813	22341	22201	13027	57569	270841
2005	359500	1.179	423910	0.156	66130	357780	39356	397136	178890	22862	22719	13331	58912	277158
2006	364600	1.191	434223	0.157	68173	366050	40265	406315	183025	23391	23244	13639	60274	283564
2007	369600	1.203	444579	0.158	70244	374336	41177	415513	187168	23920	23770	13948	61638	289983
2008	374500	1.215	304835	0.159	48469	256366	28200	284567	128183	16382	16279	9552	42213	198597
			7058919		1021795	6037125	664084	6701208	2010482	256940	255331	149821	662092	5352818

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.6

SCENARIO 6 - 1.0 TONS/CAPITA/YR GENERATION RATE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	1.000	91146	0.09	8203	82943	9124	92067	0	0	0	0	0	92067
1989	279700	1.000	279700	0.1	27970	251730	27690	279420	0	0	0	0	0	279420
1990	283700	1.000	283700	0.12	34044	249656	27462	277118	0	0	0	0	0	277118
1991	287600	1.000	287600	0.125	35950	251650	27682	279332	0	0	0	0	0	279332
1992	292800	1.000	292800	0.13	38064	254736	28021	282757	0	0	0	0	0	282757
1993	297600	1.000	297600	0.135	40176	257424	28317	285741	0	0	0	0	0	285741
1994	302300	1.000	302300	0.1375	41566	260734	28681	289414	0	0	0	0	0	289414
1995	307200	1.000	307200	0.14	43008	264192	29061	293253	0	0	0	0	0	293253
1996	311800	1.000	311800	0.1425	44432	267369	29411	296779	44116	5638	5603	3288	14528	267191
1997	317200	1.000	317200	0.145	45994	271206	29833	301039	135603	17330	17222	10105	44657	210092
1998	322800	1.000	322800	0.1475	47613	275187	30271	305458	137594	17584	17474	10253	45312	213176
1999	328200	1.000	328200	0.15	49230	278970	30687	309657	139485	17826	17715	10394	45935	216107
2000	333600	1.000	333600	0.151	50374	283226	31155	314381	141613	18098	17985	10553	46636	219404
2001	338800	1.000	338800	0.152	51498	287302	31603	318906	143651	18359	18244	10705	47307	222562
2002	344100	1.000	344100	0.153	52647	291453	32060	323512	145726	18624	18507	10860	47991	225777
2003	349100	1.000	349100	0.154	53761	295339	32487	327826	147669	18872	18754	11004	48630	228787
2004	354400	1.000	354400	0.155	54932	299468	32941	332409	149734	19136	19016	11158	49310	231986
2005	359500	1.000	359500	0.156	56082	303418	33376	336794	151709	19388	19267	11305	49961	235046
2006	364600	1.000	364600	0.157	57242	307358	33809	341167	153679	19640	19517	11452	50610	238098
2007	369600	1.000	369600	0.158	58397	311203	34232	345436	155602	19886	19761	11595	51243	241077
2008	374500	1.000	250915	0.159	39895	211020	23212	234232	105510	13484	13400	7863	34746	163468
			6486661		931078	5555583	611114	6166697	1751691	223866	222465	130536	576867	4991873

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.7

SCENARIO 7 - STAMM MEDIUM POPULATION FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EPW COMPONENT	EPW ASH	EPW NON-COMB.	EPW CONTINGENCY	EPW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	290425	0.832	79739	0.09	7177	72563	7982	80544	0	0	0	0	0	80544
1989	299945	0.832	249554	0.1	24955	224599	24706	249305	0	0	0	0	0	249305
1990	309469	0.832	257478	0.12	30897	226581	24924	251505	0	0	0	0	0	251505
1991	318983	0.832	265394	0.125	33174	232220	25544	257764	0	0	0	0	0	257764
1992	325994	0.832	271227	0.13	35260	235967	25956	261924	0	0	0	0	0	261924
1993	333005	0.832	277060	0.135	37403	239657	26362	266019	0	0	0	0	0	266019
1994	340017	0.832	282894	0.1375	38898	243996	26840	270836	0	0	0	0	0	270836
1995	347028	0.832	288727	0.14	40422	248305	27314	275619	0	0	0	0	0	275619
1996	354039	0.832	294560	0.1425	41975	252586	27784	280370	41677	5326	5293	3106	13725	252418
1997	361599	0.832	300850	0.145	43623	257227	28295	285522	128614	16437	16334	9584	42355	199264
1998	369159	0.832	307140	0.1475	45303	261837	28802	290639	130919	16731	16627	9756	43114	202835
1999	376719	0.832	313430	0.15	47015	266416	29306	295721	133208	17024	16917	9927	43868	206382
2000	384279	0.832	319720	0.151	48278	271442	29859	301301	135721	17345	17237	10114	44696	210276
2001	391839	0.832	326010	0.152	49554	276457	30410	306867	138228	17666	17555	10301	45521	214160
2002	396985	0.832	330292	0.153	50535	279757	30773	310530	139878	17876	17765	10424	46065	216716
2003	402131	0.832	334573	0.154	51524	283049	31135	314184	141524	18087	17974	10546	46607	219267
2004	407277	0.832	338854	0.155	52522	286332	31497	317829	143166	18297	18182	10669	47147	221810
2005	412423	0.832	343136	0.156	53529	289607	31857	321463	144803	18506	18390	10791	47687	224347
2006	417569	0.832	347417	0.157	54545	292873	32216	325089	146436	18715	18597	10912	48224	226877
2007	422919	0.832	351869	0.158	55595	296273	32590	328863	148137	18932	18813	11039	48784	229511
2008	428268	0.832	238734	0.159	37959	200775	22085	222860	100388	12830	12749	7481	33060	155532
			6118660		880142	5238518	576237	5814755	1672699	213771	212433	124650	550853	4692909

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.8

SCENARIO 8 - STAMM HIGH POPULATION FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	294935	0.832	80977	0.09	7288	73689	8106	81795	0	0	0	0	0	81795
1989	306709	0.832	255182	0.1	25518	229664	25263	254927	0	0	0	0	0	254927
1990	318483	0.832	264978	0.12	31797	233181	25650	258830	0	0	0	0	0	258830
1991	330257	0.832	274774	0.125	34347	240427	26447	266874	0	0	0	0	0	266874
1992	338191	0.832	281375	0.13	36579	244796	26928	271724	0	0	0	0	0	271724
1993	346125	0.832	287976	0.135	38877	249099	27401	276500	0	0	0	0	0	276500
1994	354058	0.832	294576	0.1375	40504	254072	27948	282020	0	0	0	0	0	282020
1995	361992	0.832	301177	0.14	42165	259013	28491	287504	0	0	0	0	0	287504
1996	369926	0.832	307778	0.1425	43858	263920	29031	292951	43547	5565	5530	3245	14341	263745
1997	377291	0.832	313906	0.145	45516	268390	29523	297913	134195	17150	17043	10000	44193	207911
1998	384657	0.832	320035	0.1475	47205	272830	30011	302841	136415	17434	17325	10166	44924	211350
1999	392022	0.832	326162	0.15	48924	277238	30496	307734	138619	17716	17605	10330	45650	214765
2000	399388	0.832	332291	0.151	50176	282115	31033	313148	141057	18027	17914	10512	46453	218543
2001	406753	0.832	338418	0.152	51440	286979	31568	318547	143489	18338	18223	10693	47254	222311
2002	415165	0.832	345417	0.153	52849	292568	32183	324751	146284	18695	18578	10901	48174	226641
2003	423578	0.832	352417	0.154	54272	298145	32796	330941	149072	19051	18932	11109	49093	230961
2004	431990	0.832	359416	0.155	55709	303706	33408	337114	151853	19407	19285	11316	50008	235269
2005	440403	0.832	366415	0.156	57161	309255	34018	343273	154627	19761	19638	11523	50922	239567
2006	448815	0.832	373414	0.157	58626	314788	34627	349415	157394	20115	19989	11729	51833	243854
2007	457452	0.832	380600	0.158	60135	320465	35251	355716	160233	20478	20350	11941	52768	248252
2008	466089	0.832	259817	0.159	41311	218506	24036	242541	109253	13963	13875	8142	35979	169268
			6417102		924258	5492845	604213	6097058	1766039	225700	224287	131605	581592	4912611

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.9

SCENARIO 9 - STAMM LOW POPULATION FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	283696	0.832	77892	0.09	7010	70881	7797	78678	0	0	0	0	0	78678
1989	289851	0.832	241156	0.1	24116	217040	23874	240915	0	0	0	0	0	240915
1990	296005	0.832	246276	0.12	29553	216723	23840	240563	0	0	0	0	0	240563
1991	302160	0.832	251397	0.125	31425	219972	24197	244169	0	0	0	0	0	244169
1992	308796	0.832	256919	0.13	33399	223519	24587	248106	0	0	0	0	0	248106
1993	315433	0.832	262440	0.135	35429	227011	24971	251982	0	0	0	0	0	251982
1994	322069	0.832	267962	0.1375	36845	231117	25423	256540	0	0	0	0	0	256540
1995	328706	0.832	273483	0.14	38288	235195	25871	261067	0	0	0	0	0	261067
1996	335342	0.832	279005	0.1425	39758	239246	26317	265564	39476	5045	5013	2942	13000	239088
1997	340510	0.832	283305	0.145	41079	242225	26645	268870	121113	15478	15381	9025	39885	187642
1998	345679	0.832	287605	0.1475	42422	245183	26970	272153	122592	15667	15569	9136	40372	189934
1999	350847	0.832	291905	0.15	43786	248119	27293	275412	124060	15855	15756	9245	40855	192208
2000	356016	0.832	296205	0.151	44727	251478	27663	279141	125739	16069	15969	9370	41408	194810
2001	361184	0.832	300505	0.152	45677	254828	28031	282859	127414	16284	16182	9495	41960	197405
2002	365552	0.832	304139	0.153	46533	257606	28337	285943	128803	16461	16358	9598	42417	199557
2003	369920	0.832	307774	0.154	47397	260377	28641	289018	130188	16638	16534	9702	42874	201703
2004	374289	0.832	311408	0.155	48268	263140	28945	292085	131570	16815	16709	9805	43329	203844
2005	378657	0.832	315042	0.156	49147	265896	29249	295144	132948	16991	16884	9907	43782	205979
2006	383025	0.832	318677	0.157	50032	268645	29551	298195	134322	17166	17059	10010	44235	208108
2007	387381	0.832	322301	0.158	50924	271378	29852	301229	135689	17341	17232	10112	44685	210225
2008	391738	0.832	218370	0.159	34721	183649	20201	203851	91825	11735	11662	6843	30240	142266
			5713766		820535	4893230	538255	5431485	1545738	197545	196309	115188	509042	4394790

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.10

SCENARIO 10 - 10 PERCENT SOURCE SEPARATION 1989 TO 2008

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.832	232710	0.1	23271	209439	23038	232478	0	0	0	0	0	232478
1990	283700	0.832	236038	0.1	23604	212435	23368	235802	0	0	0	0	0	235802
1991	287600	0.832	239283	0.1	23928	215355	23689	239044	0	0	0	0	0	239044
1992	292800	0.832	243610	0.1	24361	219249	24117	243366	0	0	0	0	0	243366
1993	297600	0.832	247603	0.1	24760	222843	24513	247356	0	0	0	0	0	247356
1994	302300	0.832	251514	0.1	25151	226362	24900	251262	0	0	0	0	0	251262
1995	307200	0.832	255590	0.1	25559	230031	25303	255335	0	0	0	0	0	255335
1996	311800	0.832	259418	0.1	25942	233476	25682	259158	38524	4923	4892	2871	12687	233321
1997	317200	0.832	263910	0.1	26391	237519	26127	263646	118760	15177	15082	8850	39110	183997
1998	322800	0.832	268570	0.1	26857	241713	26588	268301	120856	15445	15349	9006	39800	187245
1999	328200	0.832	273062	0.1	27306	245756	27033	272789	122878	15704	15606	9157	40466	190377
2000	333600	0.832	277555	0.1	27756	249800	27478	277278	124900	15962	15862	9308	41132	193510
2001	338800	0.832	281882	0.1	28188	253693	27906	281600	126847	16211	16110	9453	41773	196526
2002	344100	0.832	286291	0.1	28629	257662	28343	286005	128831	16465	16362	9600	42427	199601
2003	349100	0.832	290451	0.1	29045	261406	28755	290161	130703	16704	16599	9740	43043	202501
2004	354400	0.832	294861	0.1	29486	265375	29191	294566	132687	16957	16851	9888	43697	205575
2005	359500	0.832	299104	0.1	29910	269194	29611	298805	134597	17201	17094	10030	44325	208534
2006	364600	0.832	303347	0.1	30335	273012	30031	303044	136506	17445	17336	10172	44954	211492
2007	369600	0.832	307507	0.1	30751	276756	30443	307200	138378	17685	17574	10312	45571	214392
2008	374500	0.832	208761	0.1	20876	187885	20667	208553	93943	12006	11931	7001	30937	145547
			5396902		538932	4857970	534377	5392347	1548409	197887	196648	115387	509922	4353860

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.11
SCENARIO 11 - 12 PERCENT SOURCE SEPARATION 1990 TO 2008

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.832	232710	0.1	23271	209439	23038	232478	0	0	0	0	0	232478
1990	283700	0.832	236038	0.12	28325	207714	22849	230562	0	0	0	0	0	230562
1991	287600	0.832	239283	0.12	28714	210569	23163	233732	0	0	0	0	0	233732
1992	292800	0.832	243610	0.12	29233	214376	23581	237958	0	0	0	0	0	237958
1993	297600	0.832	247603	0.12	29712	217891	23968	241859	0	0	0	0	0	241859
1994	302300	0.832	251514	0.12	30182	221332	24347	245678	0	0	0	0	0	245678
1995	307200	0.832	255590	0.12	30671	224920	24741	249661	0	0	0	0	0	249661
1996	311800	0.832	259418	0.12	31130	228287	25112	253399	37667	4814	4784	2807	12405	228136
1997	317200	0.832	263910	0.12	31669	232241	25547	257788	116121	14840	14747	8653	38241	179908
1998	322800	0.832	268570	0.12	32228	236341	25998	262339	118171	15102	15008	8806	38916	183084
1999	328200	0.832	273062	0.12	32767	240295	26432	266727	120147	15355	15259	8953	39567	186147
2000	333600	0.832	277555	0.12	33307	244249	26867	271116	122124	15607	15510	9101	40218	189210
2001	338800	0.832	281882	0.12	33826	248056	27286	275342	124028	15851	15752	9243	40845	192159
2002	344100	0.832	286291	0.12	34355	251936	27713	279649	125968	16099	15998	9387	41484	195165
2003	349100	0.832	290451	0.12	34854	255597	28116	283713	127799	16333	16230	9524	42087	198001
2004	354400	0.832	294861	0.12	35383	259478	28543	288020	129739	16581	16477	9668	42726	201007
2005	359500	0.832	299104	0.12	35892	263212	28953	292165	131606	16819	16714	9807	43340	203899
2006	364600	0.832	303347	0.12	36402	266946	29364	296310	133473	17058	16951	9946	43955	206792
2007	369600	0.832	307507	0.12	36901	270606	29767	300373	135303	17292	17184	10083	44558	209628
2008	374500	0.832	208761	0.12	25051	183710	20208	203918	91855	11739	11666	6845	30250	142313
			5396902		640699	4756203	523182	5279385	1514000	193489	192278	112823	498591	4263975

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.12

SCENARIO 12 - ENERGY FROM WASTE FACILITY DELAYED UNTILL JAN. 2001

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.832	232710	0.1	23271	209439	23038	232478	0	0	0	0	0	232478
1990	283700	0.832	236038	0.12	28325	207714	22849	230562	0	0	0	0	0	230562
1991	287600	0.832	239283	0.125	29910	209373	23031	232404	0	0	0	0	0	232404
1992	292800	0.832	243610	0.13	31669	211940	23313	235254	0	0	0	0	0	235254
1993	297600	0.832	247603	0.135	33426	214177	23559	237736	0	0	0	0	0	237736
1994	302300	0.832	251514	0.1375	34583	216930	23862	240793	0	0	0	0	0	240793
1995	307200	0.832	255590	0.14	35783	219808	24179	243987	0	0	0	0	0	243987
1996	311800	0.832	259418	0.1425	36967	222451	24470	246920	0	0	0	0	0	246920
1997	317200	0.832	263910	0.145	38267	225643	24821	250464	0	0	0	0	0	250464
1998	322800	0.832	268570	0.1475	39614	228956	25185	254141	0	0	0	0	0	254141
1999	328200	0.832	273062	0.15	40959	232103	25531	257634	0	0	0	0	0	257634
2000	333600	0.832	277555	0.151	41911	235644	25921	261565	0	0	0	0	0	261565
2001	338800	0.832	281882	0.152	42846	239036	26294	265330	119518	15274	15179	8906	39360	185171
2002	344100	0.832	286291	0.153	43803	242489	26674	269162	121244	15495	15398	9035	39928	187846
2003	349100	0.832	290451	0.154	44729	245722	27029	272751	122861	15702	15603	9156	40461	190351
2004	354400	0.832	294861	0.155	45703	249157	27407	276565	124579	15921	15821	9284	41026	193012
2005	359500	0.832	299104	0.156	46660	252444	27769	280213	126222	16131	16030	9406	41567	195558
2006	364600	0.832	303347	0.157	47626	255722	28129	283851	127861	16341	16238	9528	42107	198097
2007	369600	0.832	307507	0.158	48586	258921	28481	287402	129461	16545	16441	9647	42634	200576
2008	374500	0.832	208761	0.159	33193	175568	19313	194881	87784	11219	11149	6542	28909	136006
			5396902		774657	4622245	508447	5130692	959529	122628	121860	71504	315992	4487155

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.13

SCENARIO 13- NO ENERGY FROM WASTE FACILITY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 11%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	7591	76599	0	0	0	0	0	76599
1989	279700	0.832	232710	0.1	23271	209439	23038	232478	0	0	0	0	0	232478
1990	283700	0.832	236038	0.12	28325	207714	22849	230562	0	0	0	0	0	230562
1991	287600	0.832	239283	0.125	29910	209373	23031	232404	0	0	0	0	0	232404
1992	292800	0.832	243610	0.13	31669	211940	23313	235254	0	0	0	0	0	235254
1993	297600	0.832	247603	0.135	33426	214177	23559	237736	0	0	0	0	0	237736
1994	302300	0.832	251514	0.1375	34583	216930	23862	240793	0	0	0	0	0	240793
1995	307200	0.832	255590	0.14	35783	219808	24179	243987	0	0	0	0	0	243987
1996	311800	0.832	259418	0.1425	36967	222451	24470	246920	0	0	0	0	0	246920
1997	317200	0.832	263910	0.145	38267	225643	24821	250464	0	0	0	0	0	250464
1998	322800	0.832	268570	0.1475	39614	228956	25185	254141	0	0	0	0	0	254141
1999	328200	0.832	273062	0.15	40959	232103	25531	257634	0	0	0	0	0	257634
2000	333600	0.832	277555	0.151	41911	235644	25921	261565	0	0	0	0	0	261565
2001	338800	0.832	281882	0.152	42846	239036	26294	265330	0	0	0	0	0	265330
2002	344100	0.832	286291	0.153	43803	242489	26674	269162	0	0	0	0	0	269162
2003	349100	0.832	290451	0.154	44729	245722	27029	272751	0	0	0	0	0	272751
2004	354400	0.832	294861	0.155	45703	249157	27407	276565	0	0	0	0	0	276565
2005	359500	0.832	299104	0.156	46660	252444	27769	280213	0	0	0	0	0	280213
2006	364600	0.832	303347	0.157	47626	255722	28129	283851	0	0	0	0	0	283851
2007	369600	0.832	307507	0.158	48586	258921	28481	287402	0	0	0	0	0	287402
2008	374500	0.832	208761	0.159	33193	175568	19313	194881	0	0	0	0	0	194881
			5396902		774657	4622245	508447	5130692	0	0	0	0	0	5130692

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following: { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

TABLE A.14

SCENARIO 14-5 PERCENT CONTINGENCY ALLOWANCE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	POPULATION FORECAST	GENERATION RATE	WASTE GENERATED	SOURCE SEPARATION	SOURCE SEPARATION	DISPOSABLE WASTE	CONTINGENCY 5%	DISPOSABLE WASTE FORECAST	EFW COMPONENT	EFW ASH	EFW NON-COMB.	EFW CONTINGENCY	EFW LANDFILL	LANDFILLED WASTE
		TONS/CAP/YR	TONS	%	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS	TONS
			(2)X(3)		(4)X(5)	(6)-(4)	(7)X.11	(7)+(8)	(A)	(B)	(C)	(D)	(E)	(9)+(14)
1988	276200	0.832	75833	0.09	6825	69008	3450	72459	0	0	0	0	0	72459
1989	279700	0.832	232710	0.1	23271	209439	10472	219911	0	0	0	0	0	219911
1990	283700	0.832	236038	0.12	28325	207714	10386	218099	0	0	0	0	0	218099
1991	287600	0.832	239283	0.125	29910	209373	10469	219841	0	0	0	0	0	219841
1992	292800	0.832	243610	0.13	31669	211940	10597	222537	0	0	0	0	0	222537
1993	297600	0.832	247603	0.135	33426	214177	10709	224886	0	0	0	0	0	224886
1994	302300	0.832	251514	0.1375	34583	216930	10847	227777	0	0	0	0	0	227777
1995	307200	0.832	255590	0.14	35783	219808	10990	230798	0	0	0	0	0	230798
1996	311800	0.832	259418	0.1425	36967	222451	11123	233573	36704	4691	4661	2735	12087	208956
1997	317200	0.832	263910	0.145	38267	225643	11282	236926	112822	14419	14328	8407	37154	161258
1998	322800	0.832	268570	0.1475	39614	228956	11448	240403	114478	14630	14539	8531	37700	163625
1999	328200	0.832	273062	0.15	40959	232103	11605	243708	116052	14831	14739	8648	38218	165875
2000	333600	0.832	277555	0.151	41911	235644	11782	247427	117822	15058	14963	8780	38801	168406
2001	338800	0.832	281882	0.152	42846	239036	11952	250987	119518	15274	15179	8906	39360	170829
2002	344100	0.832	286291	0.153	43803	242489	12124	254613	121244	15495	15398	9035	39928	173297
2003	349100	0.832	290451	0.154	44729	245722	12286	258008	122861	15702	15603	9156	40461	175607
2004	354400	0.832	294861	0.155	45703	249157	12458	261615	124579	15921	15821	9284	41026	178063
2005	359500	0.832	299104	0.156	46660	252444	12622	265066	126222	16131	16030	9406	41567	180411
2006	364600	0.832	303347	0.157	47626	255722	12786	268508	127861	16341	16238	9528	42107	182754
2007	369600	0.832	307507	0.158	48586	258921	12946	271867	129461	16545	16441	9647	42634	185041
2008	374500	0.832	208761	0.159	33193	175568	8778	184347	87784	11219	11149	6542	28909	125472
			5396902		774657	4622245	231112	4853357	1457407	186257	185091	108606	479953	3875904

NOTES:

A) - The EFW waste component is 50 percent of the landfill component (7).

B) - The EFW ash component is 12.78 percent of the EFW component

C) - The EFW non-combustible component is 12.7 percent of the EFW component

D) - The EFW contingency component is 10 percent of the following; { (10) - (11) - (12) }

E) - The EFW landfill component is the sum of the EFW ash, non-combustible and contingency values; { (11) + (12) + (13) }

DISPOSABLE WASTE represents the amount of waste generated prior to the contingency and after source separation.

DISPOSABLE WASTE FORECAST represents the amount of waste generated after the contingency and the source separation components have been applied.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100