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GASSIM MODELLING OF THE FORMER LANDFILL SITE LOCATED IN CARRIGEEN, CLANE, CO. KILDARE

PREFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF KILDARE COUNTY COUNCIL

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ATTENTION:	Ms. Ciara Corrigan
LICENCE NUMBER:	--
LICENCE HOLDER:	Kildare County Council
FACILITY NAME:	Carrigeen Former landfill site
DATE	01st March 2013 – updated 19th June 2013
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NAME AND ADDRESS OF MONITORING ORGANISATION:	Odour Monitoring Ireland, Unit 32 DeGranville Court, Dublin Road, Trim, Co. Meath
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TABLE OF CONTENTS

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Signing sheet

Brian Sheridan Ph.D Eng

For and on behalf of Odour Monitoring Ireland

1. Introduction

Odour Monitoring Ireland has been commissioned by Kildare County Council to assess the potential impact of landfill gas emissions through vertical and lateral migration from the former waste disposal site (ca. 1 hectare in size) located at Carrigeen, Clane, Co. Kildare.

Landfill gas modelling was completed utilising landfill characteristics and GasSim 2 risk assessment model.

This report assesses the potential for landfill gas generation at the Site, the associated air quality impact and risks to the environment and surrounding receptors. Odour Monitoring Ireland has not independently verified any of the information supplied to support this risk assessment (input to the GasSim 2.0 model).

2. Report methodology

GasSim V2.0 (GasSim2) (Environment Agency, 2006) is a computer software tool developed by Golder for the Environment Agency, has been used to carry out a Tier 1 screening assessment to 'screen' emissions from the former landfill and to identify the significance of risk associated with the former landfill on nearby receptors. The model input data has been based on Site-specific data where possible. Appropriate assumptions have been made and published data including GasSim2 default values have been used where Site-specific data were not available.

2.1 Background and setting

2.1.1 Site background

The Site at Carrigeen, Clane Co. Kildare was a former quarry (understood to be limestone) which spanned the four land parcels under investigation (i.e. the waste ground, the eastern paddock, the southern paddock and private residence and gardens) (see Tier II assessment report Figure 01). From the Tier 1 report, it is understood that the worked out quarry void was leased by Kildare County Council between August 1977 and June 1980 for the landfilling of waste, including municipal and construction waste. Once the void was filled, the land was capped with approximately 450 mm soil / gravel and the Site was returned to the original owner. Subsequently the western portion of the Site was developed into paddocks and a private residence.

A tier 2 assessment was performed which identified a number of key site characteristics to include typical waste depths and characteristics, typical degradable content (%), landfill gas characteristics and details of a geophysical survey.

2.1.2 Waste Intake

The size of the site is approximately 1 ha in size (i.e. 10,000 m^2) and the thickness of the waste varies between 1.0 m and >4.5 m across the waste body footprint. This would indicate that the volume of waste within the site is approximately 40,000 m^3. Further, it was assumed that of this amount 30% is biodegradable – the amount of gas generating waste is approximately 10,000 m^3. Moreover according to EPA guidance (Landfill Design Manual, EPA 2000) each tonne of waste will generate approximately 10 m^3 of landfill gas during its lifetime – i.e. the Site would generate approximately 150,000 m^3 of landfill gas (i.e. 10,000 m^3 x 1.5t/m^3 = 15,000 tonnes biodegradable waste x 10m^3 gas per tonne) (ref: Report 10507190201.500/A.0).

2.2 Conceptual site model

2.2.1 Justification of the Model

GasSim V2.0 (GasSim2) (Environment Agency, 2006) is a computer software tool developed by Golder for the Environment Agency, has been used to carry out a Tier 1 screening assessment to 'screen' emissions from the former landfill and to identify the significance of risk associated with the former landfill on nearby receptors. The model input data has been based on Site-specific data where possible. Appropriate assumptions have been made and published data including GasSim2 default values have been used where Site-specific data were not available. GasSim2 uses statistical distributions or probability density functions (PDFs) to characterise most of the input parameters. Each time a calculation is carried out, one value from the defined input distributions is chosen by the computer code and, for example, a concentration at the receptor is calculated. Each result is stored such that after repeating the same calculation many times, an output distribution for the concentration at the receptor is obtained.

The distribution output is given in terms of percentiles. These percentiles specify the probability with which a certain value (e.g. gas production rate) will not be exceeded. For instance, if the 95%ile of a gas production rate distribution is given as 100 m³/hour, there is a 95% chance that the actual production rate will be below or equal to 100 m³/hour. It follows that there is also a 5% chance that the actual production rate will be above this.

GasSim2 is an industry standard gas generation modelling tool based on well-established scientific principles that have been validated and independently reviewed.

2.3 Assessment Scenario

2.3.1 Waste Input and Characteristics

GasSim2 requires that the waste tonnages, waste breakdown and the composition of individual waste streams are defined. This waste has to be related to a specific waste breakdown to enable GasSim2 to calculate the gas generation capability of the waste.

Waste information detailing the tonnes of waste for each waste stream, has been estimated on a worst case basis based on information provided in waste intake section. This is incorporated into GasSim2. This is the maximum waste assumed to be accepted by the Site.

2.3.2 Phases/Cells

The Site was assessed as one cell / phase filled over the period 1978 to 1980. The phase / cell was capped with a clay / gravel material with a layer thickness of 450 mm although this varies across the site.

2.3.3 Waste Breakdown

The Site was assumed to accept 40,000 m^3 of waste and it was assumed that this waste had a typical worst case density of 1.5 t/m^3 thereby providing 60,000 tonne total fill over a period of between 1978 and 1980. The waste was assumed to comprise domestic, commercial and inert waste with a % amount ratio broken into 30% domestic, 5% commercial and 65% inert, thereby providing for a typical biodegradable content of approx 30%.

2.3.4 Waste Composition

The waste composition data used within the model is a combination of default GasSim2 waste composition data for England 2000 to 2010 waste stream.

2.4 Landfill Characteristics

General characteristics of the Site that have been incorporated within the models are detailed in the Tier 1 and Tier 2 assessment reports performed by Golder Associates. The Site is assumed to be a 'wet' site in terms of the waste moisture content.

The capping layer is of very poor quality across the site and varies in thickness and composition. There is no impermeable clay layer or geo-synthetic liner at any location throughout the capping layer. The thickness of the capping layer varies from 0.30 to 1.60 metres but is typically just 0.45 metres. The capping material used at the Site varied from a gravelly silty sand layer in the waste ground to a brown silty sand containing clay over the remainder of the Site. This material is free draining and will permit surface water to penetrate into the waste body. It will also provide a flow path for LFG to vent to the atmosphere. The capping layer is assumed to have a hydraulic conductivity of between 1 x 10-5 m/s to 1 x 10-7 m/s.

2.5 Landfill Gas Plant

There is no operational landfill gas extraction and combustion system operational at the site.

The landfill gas produced is assumed to consist of 50% Methane and 50% CO_2.

2.6 Sensitive receptors

Figure 2.1 illustrates the location of the site, the landfill footprint and the approximate location of two sensitive receptors that are in close proximity to the waste body extent. Receptor 1 is located within 7.5 to 8m from the waste body extent while Receptor 2 is located within 42 m of the waste body extent.

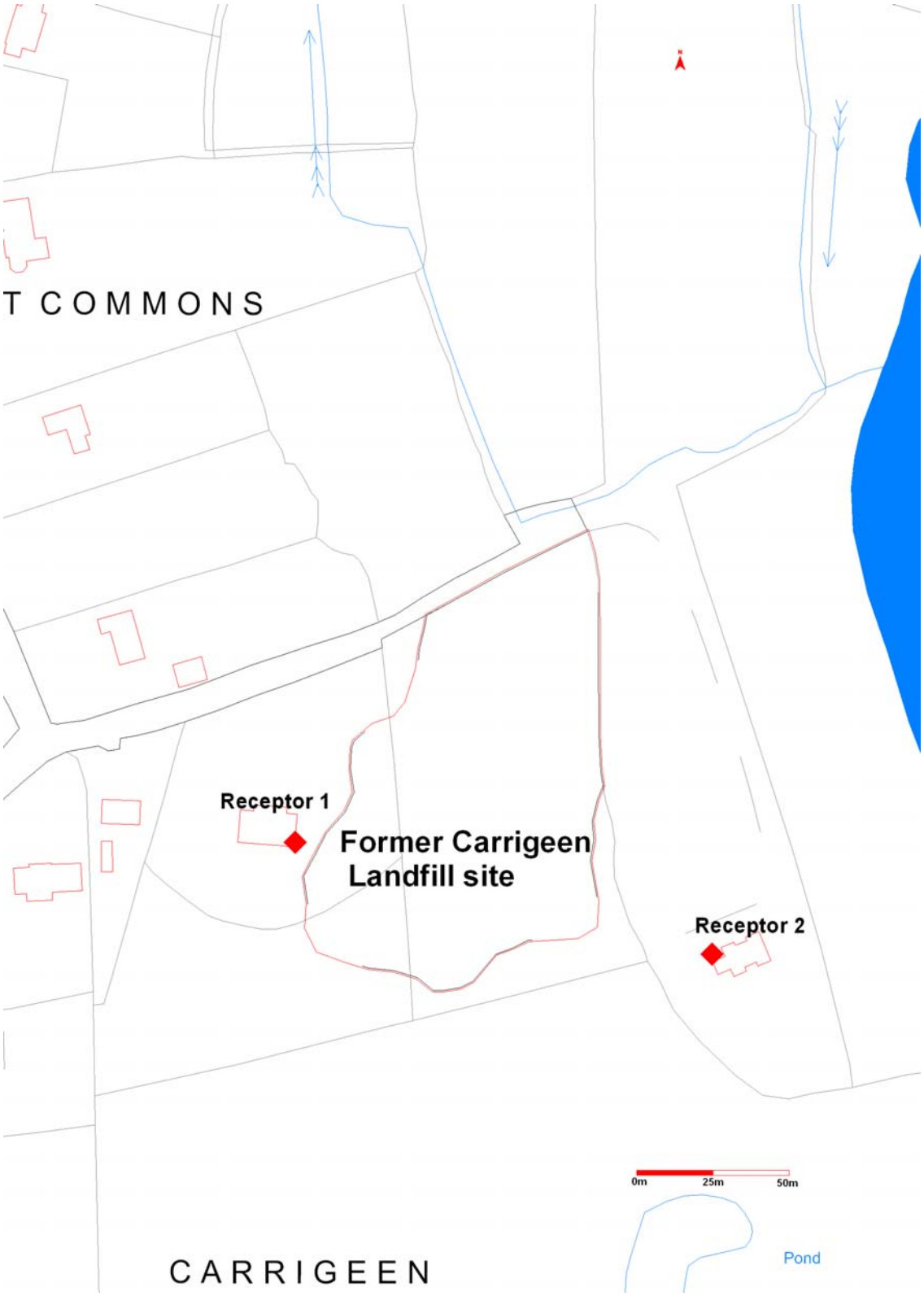

Figure 2.1. Carrigeen landfill site and relative location of receptor 1 and 2

3. Landfill gas emission and generation

3.1 Landfill Gas Generation

The peak landfill gas generation rate has been modeled by GasSim2 to be 31 m^3/hr occurring in 1980 (95 %ile) shown in *Figure 6.1 and Table 7.1 – Appendix I*, based on the input data described in this report. In addition, the quantities of Methane and Carbon dioxide are also presented in *Figures 6.2 to 6.3*. Surface based emission predictions are also presented in *Figure 6.4*. The overall raw data is presented in *Table 7.1*. The actual quantities of landfill gas to be generated will be dependent on the actual waste inputs to the Site.

3.2 Subsurface Migration: Modeled Lateral Migration

Lateral emissions from the Site have also been assessed by considering the outputs from GasSim2. The lateral migration module within GasSim2 has been used for the quantification of lateral emissions. Lateral emissions of landfill gas are assumed to derive from the perimeter sidewall surface of the phases adjacent to the boundary. The results indicate that there are modeled lateral emissions predicted for the phase / cell and also at the nearest sensitive receptor. *Figure 6.5* and *Table 7.2* presents the bulk lateral emissions of landfill gas, Methane and Carbon dioxide for the site. In addition, individual predictions were performed for both Receptor 1 and 2. The results of this modelling exercise are presented in *Figures 6.6 to 6.8* for Receptor 1 and *Figures 6.9 to 6.11* for Receptor 2.

As can be observed, the predicted lateral methane emissions at the near by sensitive receptors 1 and 2 for year 2012 could be up to 1.60 X 10^4 mg/m^3 and < 1.0 mg/m^3, respectively.

This suggests that there is a risk of bulk landfill gas, methane and carbon dioxide impact at Receptor 1. A maximum methane and carbon dioxide level of up to 2.2% and 0.81% respectively could be detected at the receptor location. This is above the recommended upper trigger level value of 1% for methane but below the trigger level of 1.50% for CO_2.

3.3 Global Atmospheric Impact

An assessment of the global impact of the Site in terms of Global Warming Potential (GWP) and Ozone Depletion Potential (ODP) has been made using GasSim2. The model results for the total of all years of gas production at the Site are presented in *Table 8.1*.

It can be seen from *Table 8.1* that the total GWP of the site could be 25,100 tonne of CO_2 eqv. over the 100 year simulation period.

4. Conclusions

GasSim2, a computer software tool, has been used to model the potential landfill gas generation from the former Landfill Site located in Carrigeen, Clane, Co. Kildare. The calculated emissions were based are derived from the predicted waste inputs to the Site as taken from information provided in the Tier 1 and 2 assessments provided by Golder Associates.

The peak landfill gas generation rate has been modeled by GasSim2 to be 31 m^3/hr occurring in 1980 (95 %ile) based on the input data described in this report.

Lateral emissions from the Site have also been assessed by considering the outputs from GasSim2. The lateral migration module within GasSim2 has been used for the quantification of lateral emissions. Lateral emissions of landfill gas are assumed to derive from the perimeter sidewall surface of the phases adjacent to the boundary. The results indicate that there are modeled lateral emissions predicted for the phase / cell and also at the nearest sensitive receptor. As can be observed, the predicted lateral methane emissions at the near by sensitive receptors 1 and 2 for year 2012 could be up to 1.60 X 10^4 mg/m^3 and < 1.0 mg/m^3, respectively.

This suggests that there is a risk of bulk landfill gas, methane and carbon dioxide impact at Receptor 1. A maximum methane and carbon dioxide level of up to 2.2% and 0.81% respectively could be detected at the receptor location. This is above the recommended upper trigger level value of 1% for methane but below the trigger level of 1.5% for CO_2.

An assessment of the global impact of the Site in terms of Global Warming Potential (GWP) and Ozone Depletion Potential (ODP) has been made using GasSim2. As can be observed, the total GWP of the site could be 25,100 tonne of CO_2 eqv. over the 100 year simulation period.

This landfill gas risk assessment should be revisited regularly to review the management of landfill gas at the Site. In addition, if any alterations occur to the site or surrounds, the implication of same should be considered in the model and how this would affect any lateral emissions in the vicinity of the site. Any future re-assessment should consider all up-to-date information available, such gas field, monitoring information obtained, pump tests, and any new technology as appropriate.

5. References

1. Environment Agency (2003). Horizontal Guidance Notes IPPC H1. Integrated Pollution Prevention and Control. Environmental Assessment and Appraisal of BAT. Version 6, July 2003;
2. Environment Agency (2004a). Guidance on the Management of Landfill Gas, September 2004;
3. Environment Agency (2006). GasSim2 Manual;
4. Golder Associates, Carrigeen Tier 1 and 2 assessment documents source Kildare County Council.
5. Ireland Environmental Protection Agency website http://www.epa.ie/environment/air.

6. *Appendix I* – Output data from GasSim model

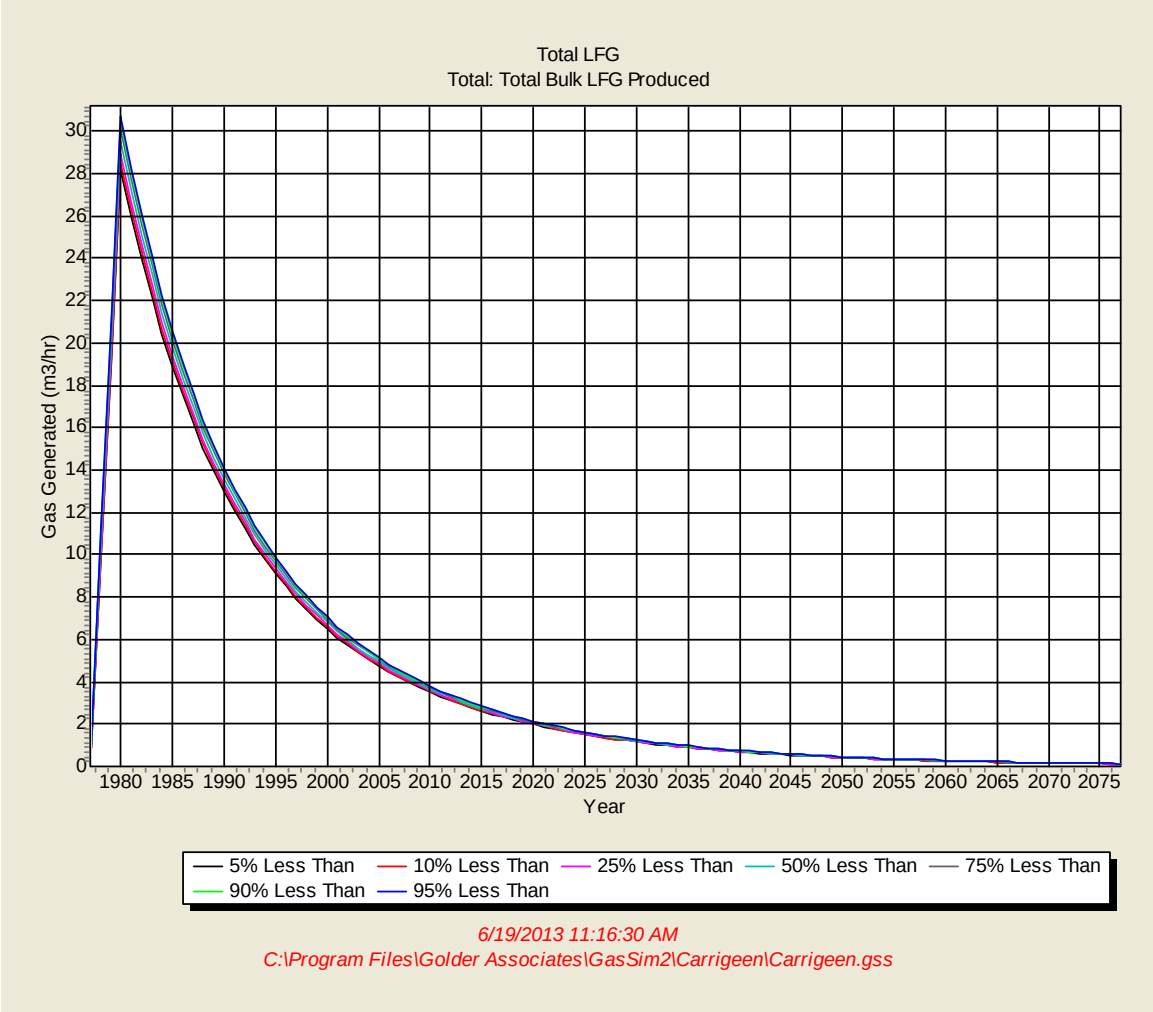

Figure 6.1. Total bulk landfill gas produced by the site over the 100 yr simulation event.

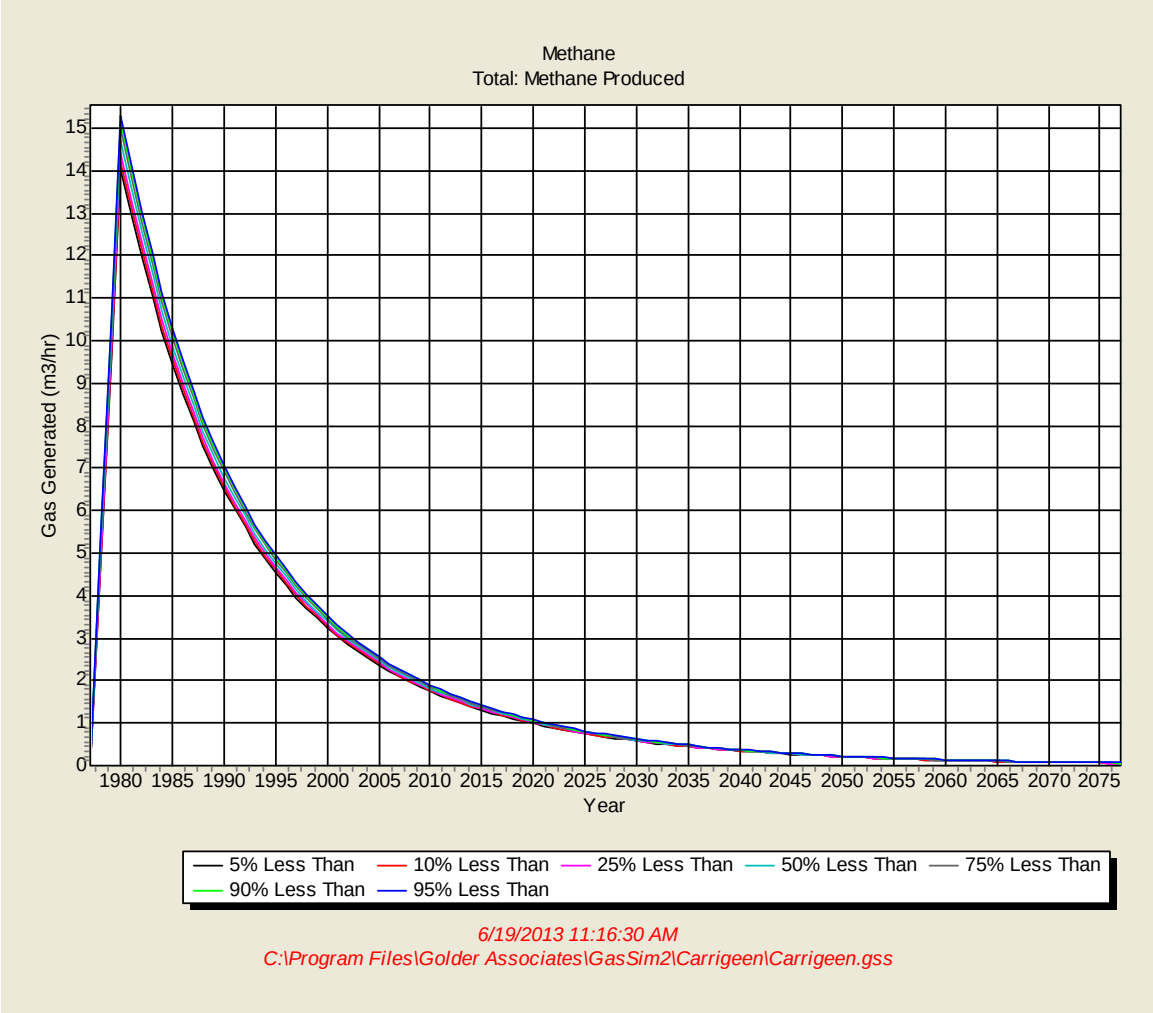

Figure 6.2. Total methane produced by the site over the 100 yr simulation event.

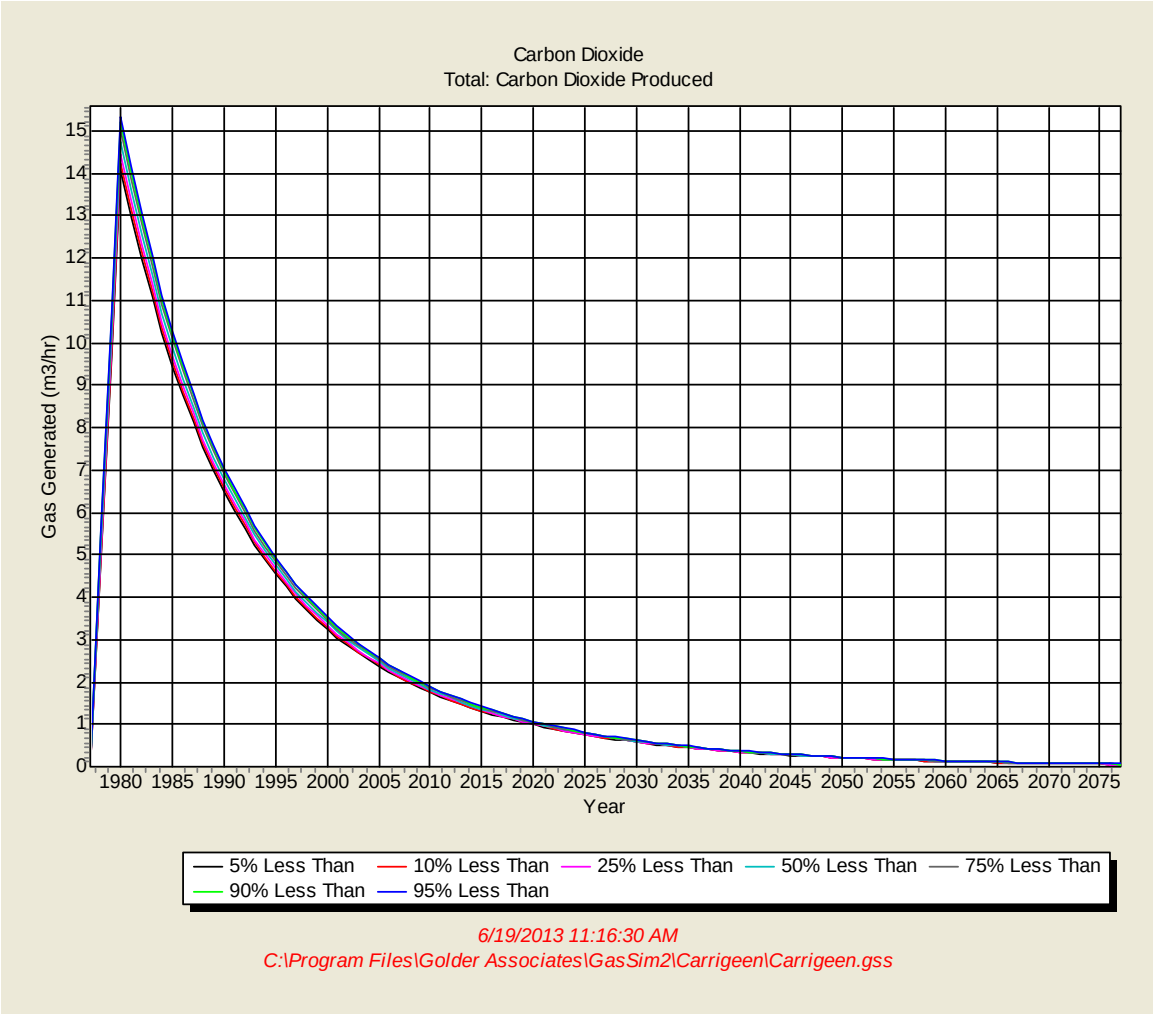

Figure 6.3. Total Carbon dioxide produced by the site over the 100 yr simulation event.

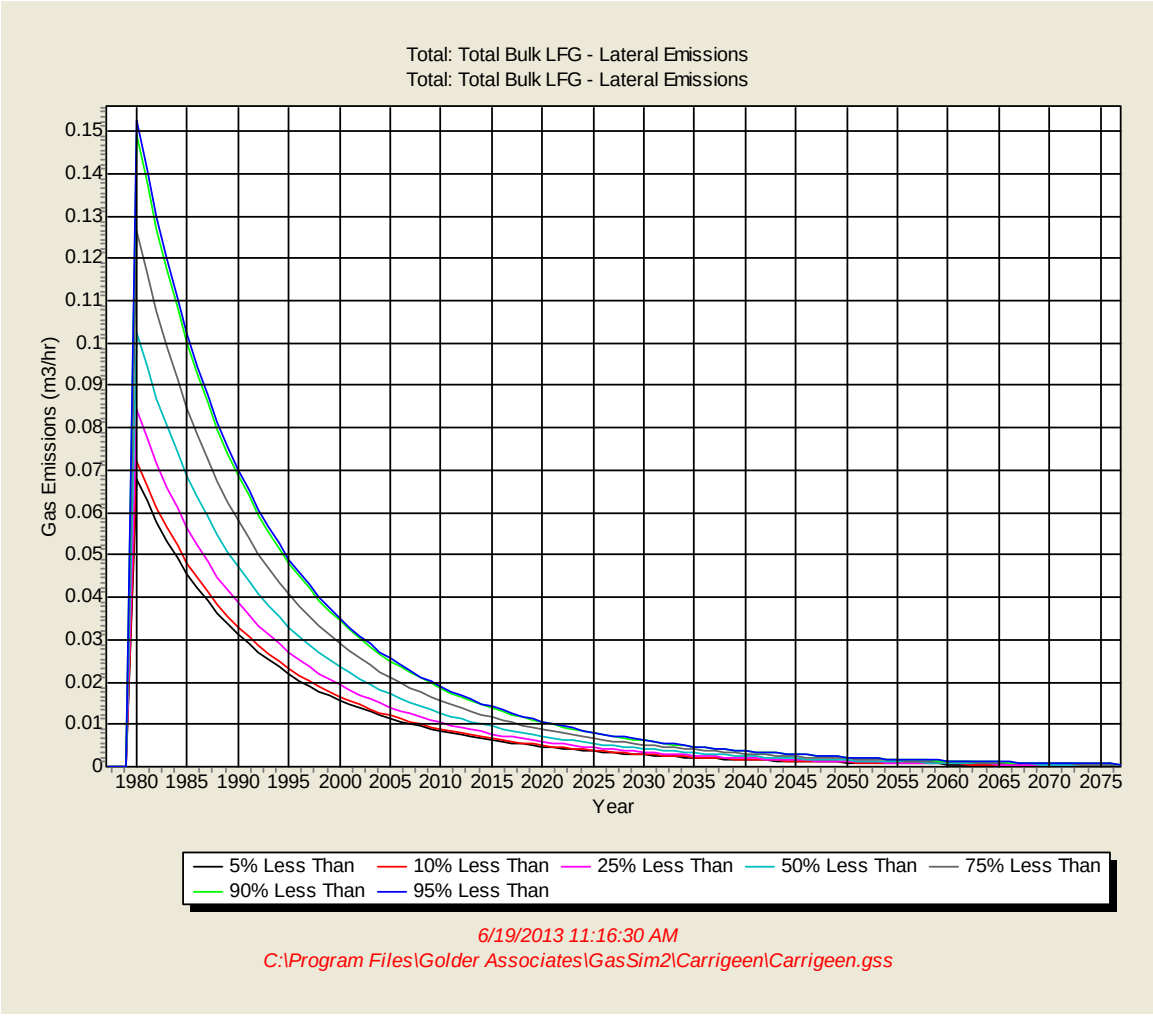

Figure 6.4. Total bulk landfill gas lateral emissions by the site over the 100 yr simulation event.

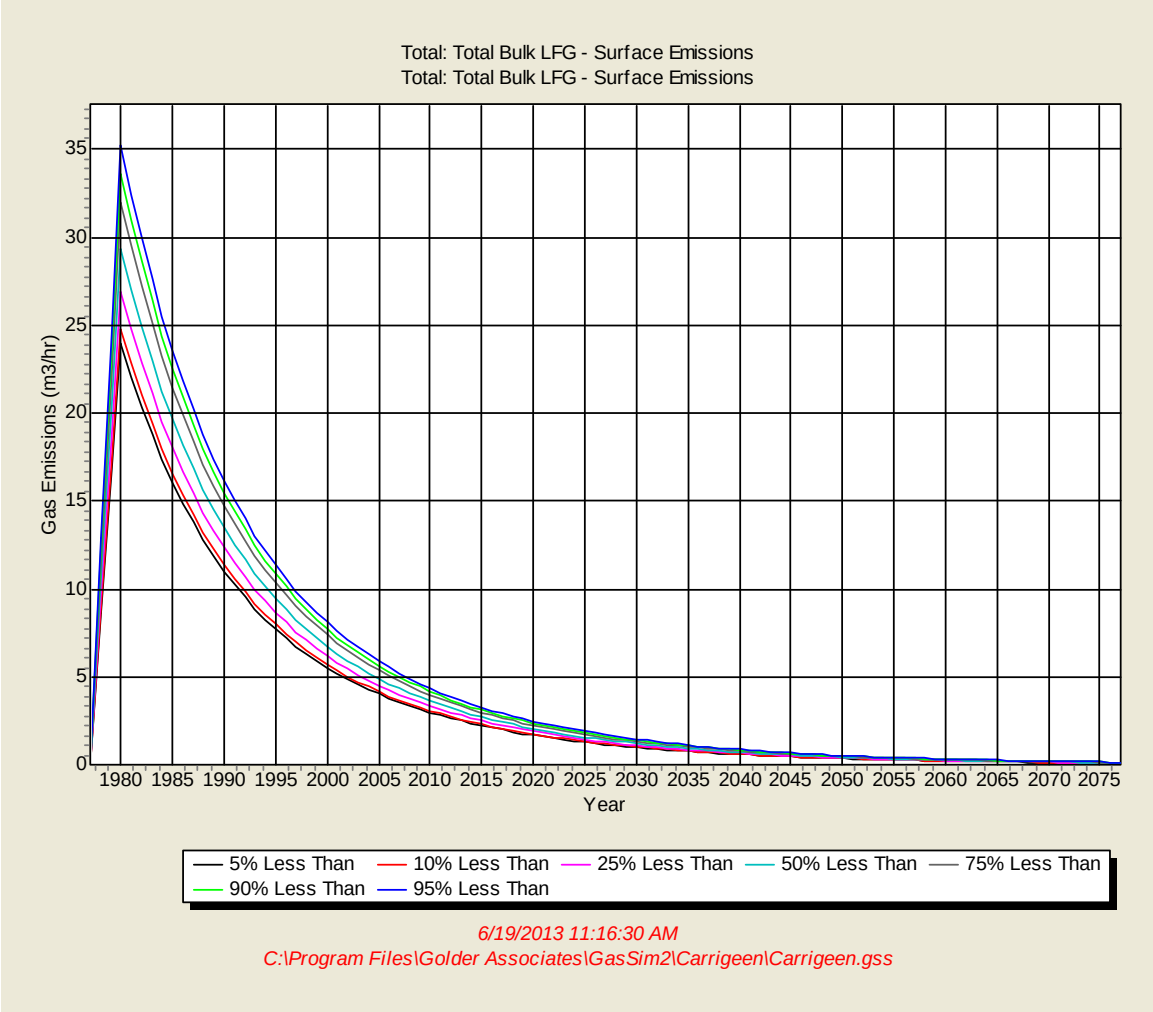

Figure 6.5. Total bulk landfill gas surface emissions by the site over the 100 yr simulation event.

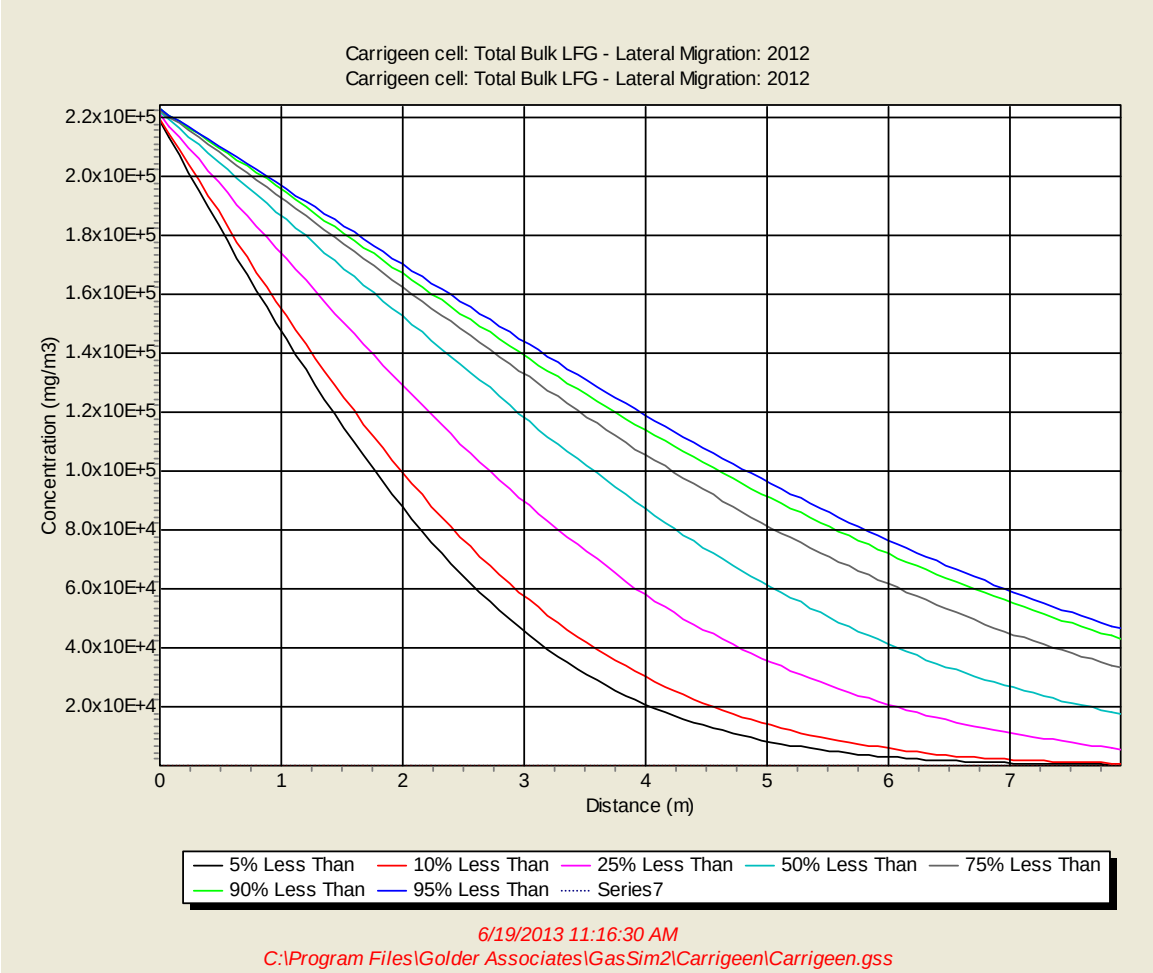

Figure 6.6. Total bulk landfill gas lateral migration by the site over the 100 yr simulation event for Receptor 1.

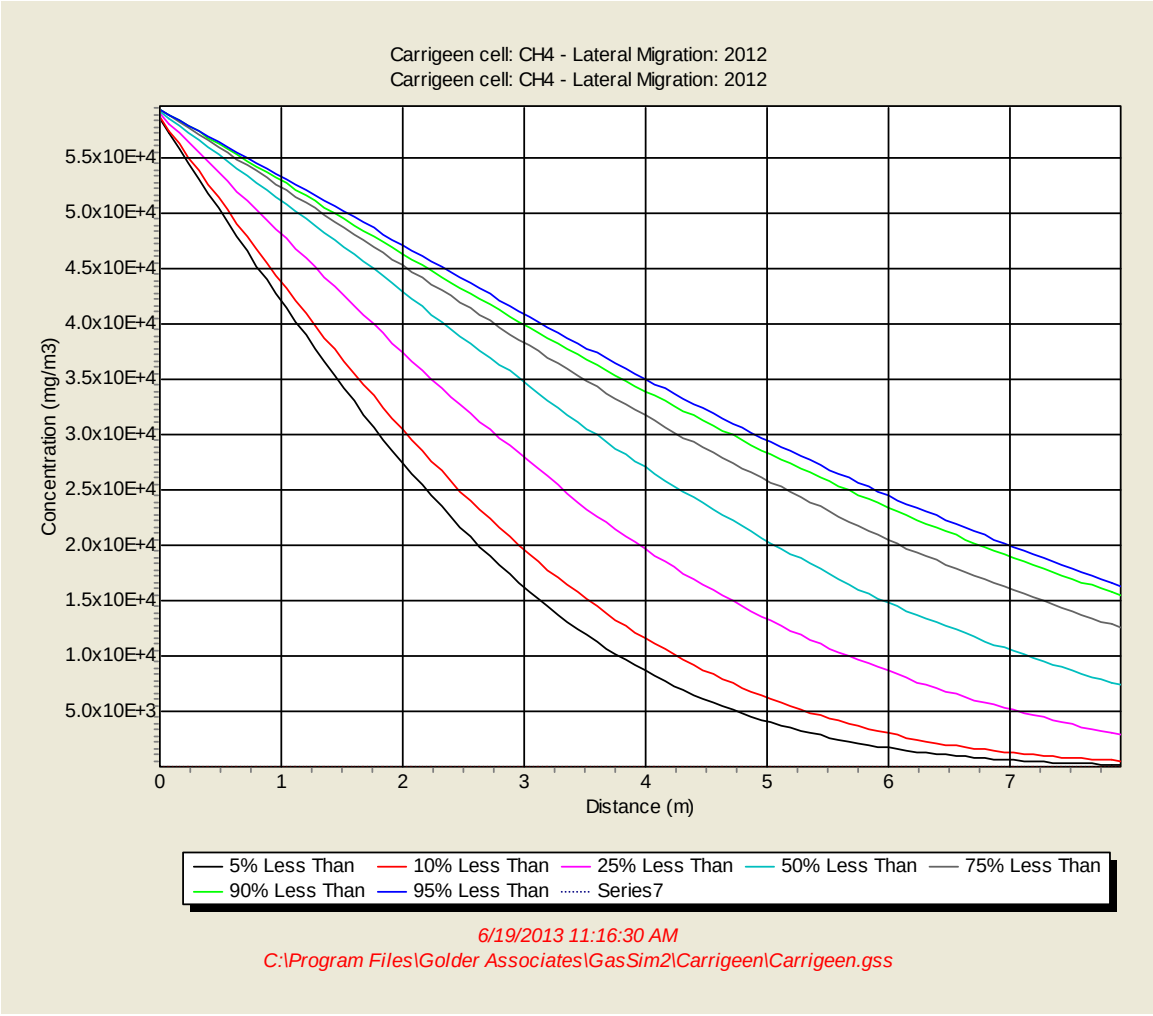

Figure 6.7. Total methane lateral migration by the site over the 100 yr simulation event for Receptor 1.

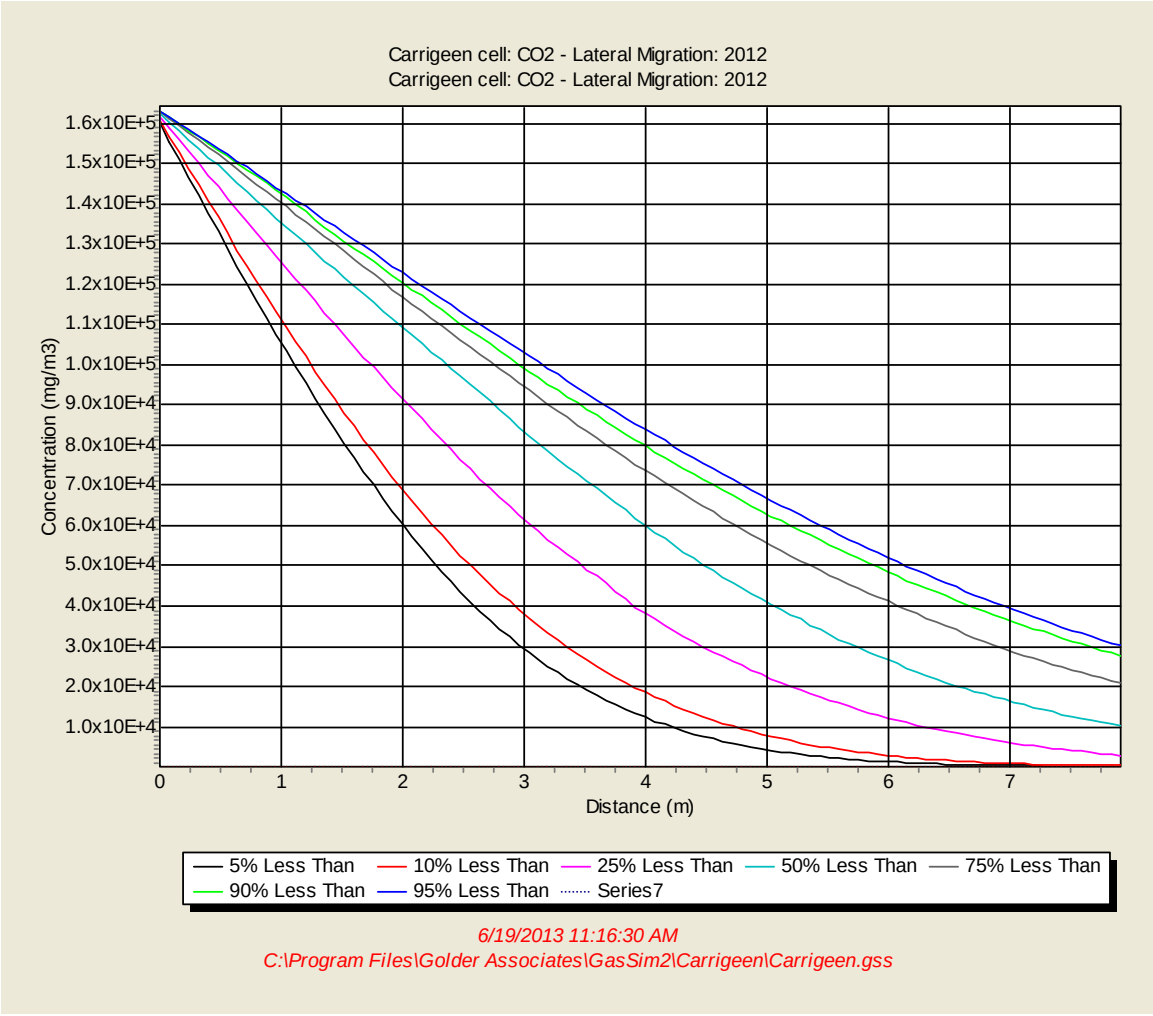

Figure 6.8. Total carbon dioxide lateral migration by the site over the 100 yr simulation event for Receptor 1.

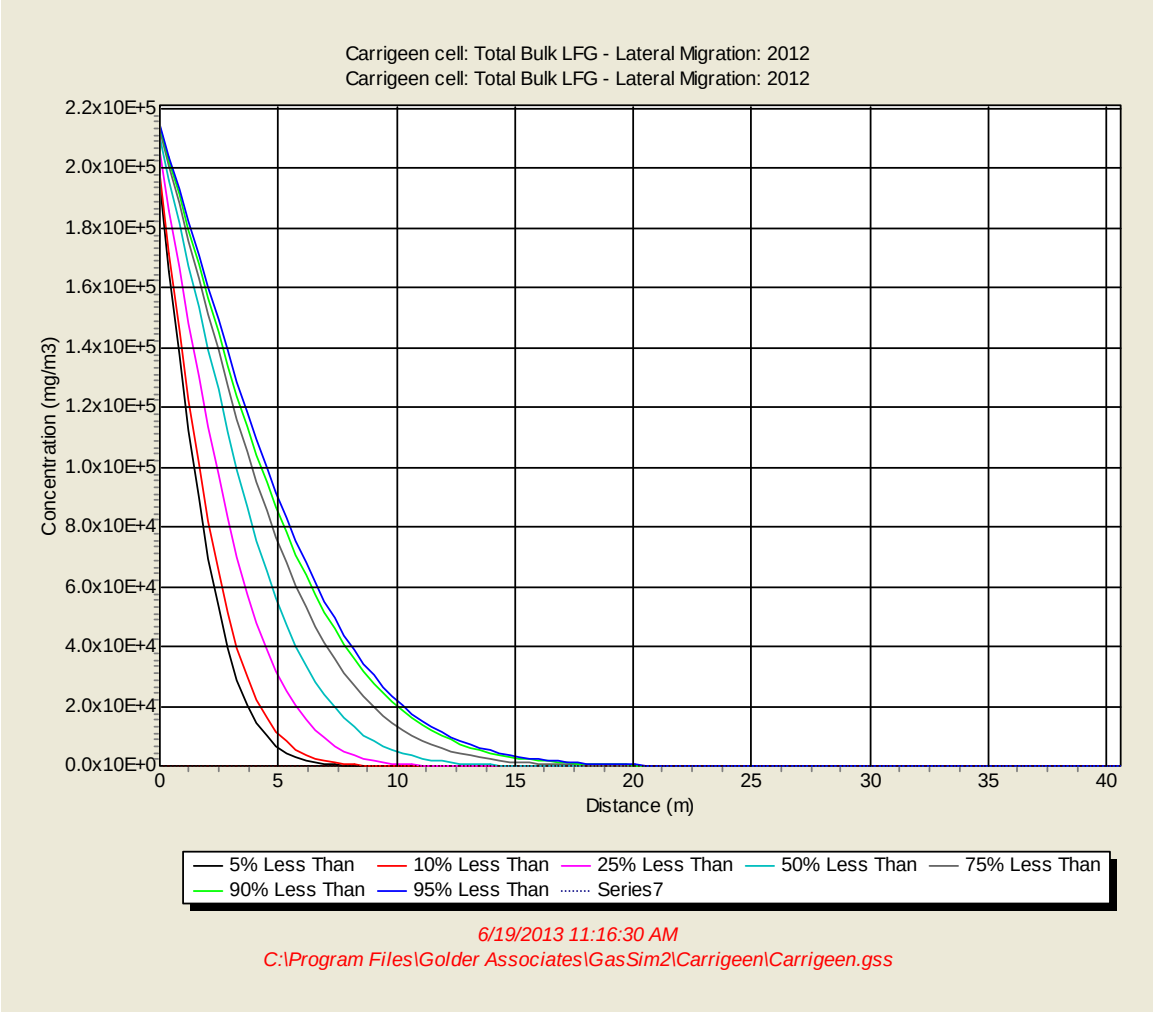

Figure 6.9. Total bulk landfill gas lateral migration by the site over the 100 yr simulation event for Receptor 2.

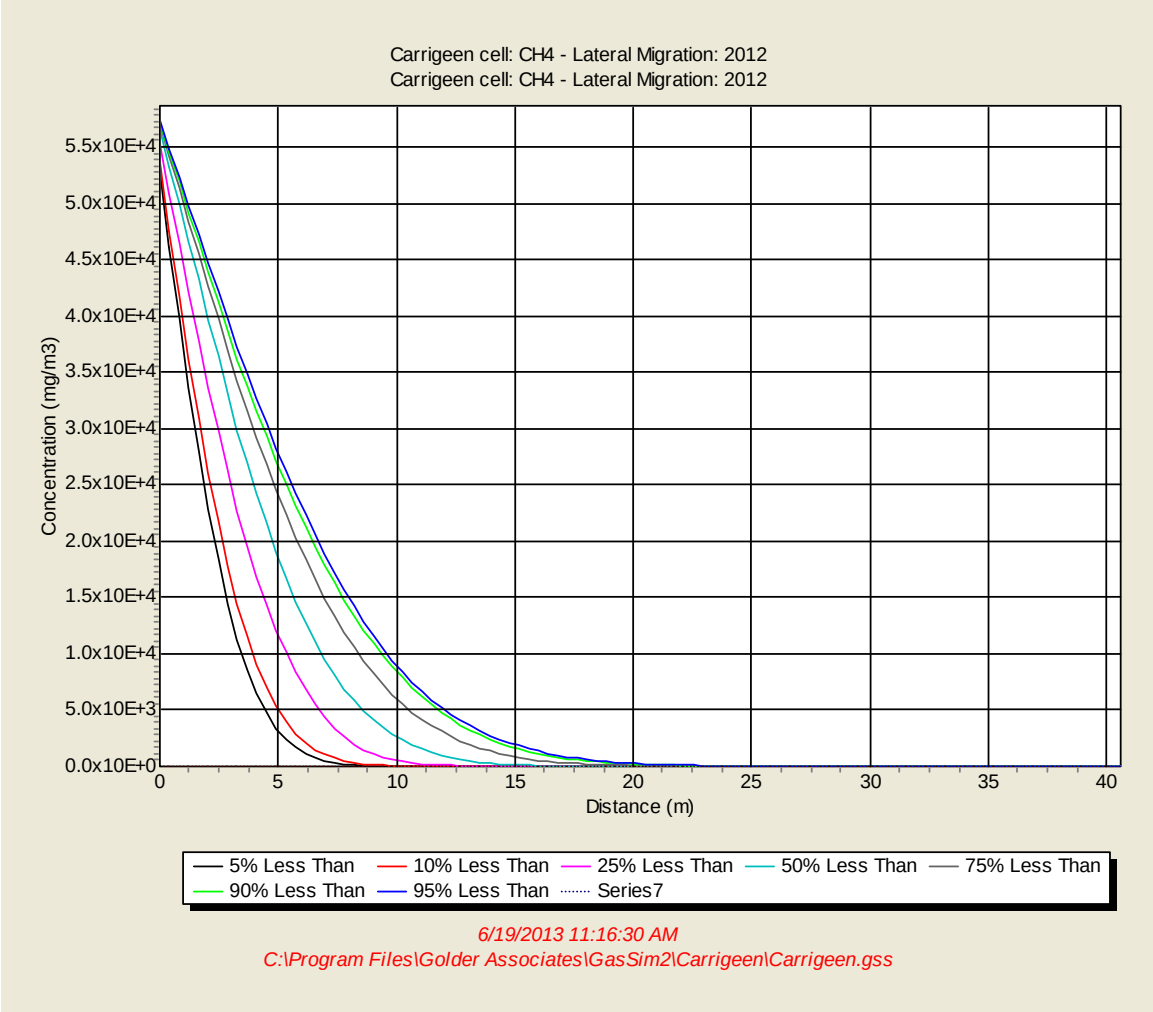

Figure 6.10. Total Methane lateral migration by the site over the 100 yr simulation event for Receptor 2.

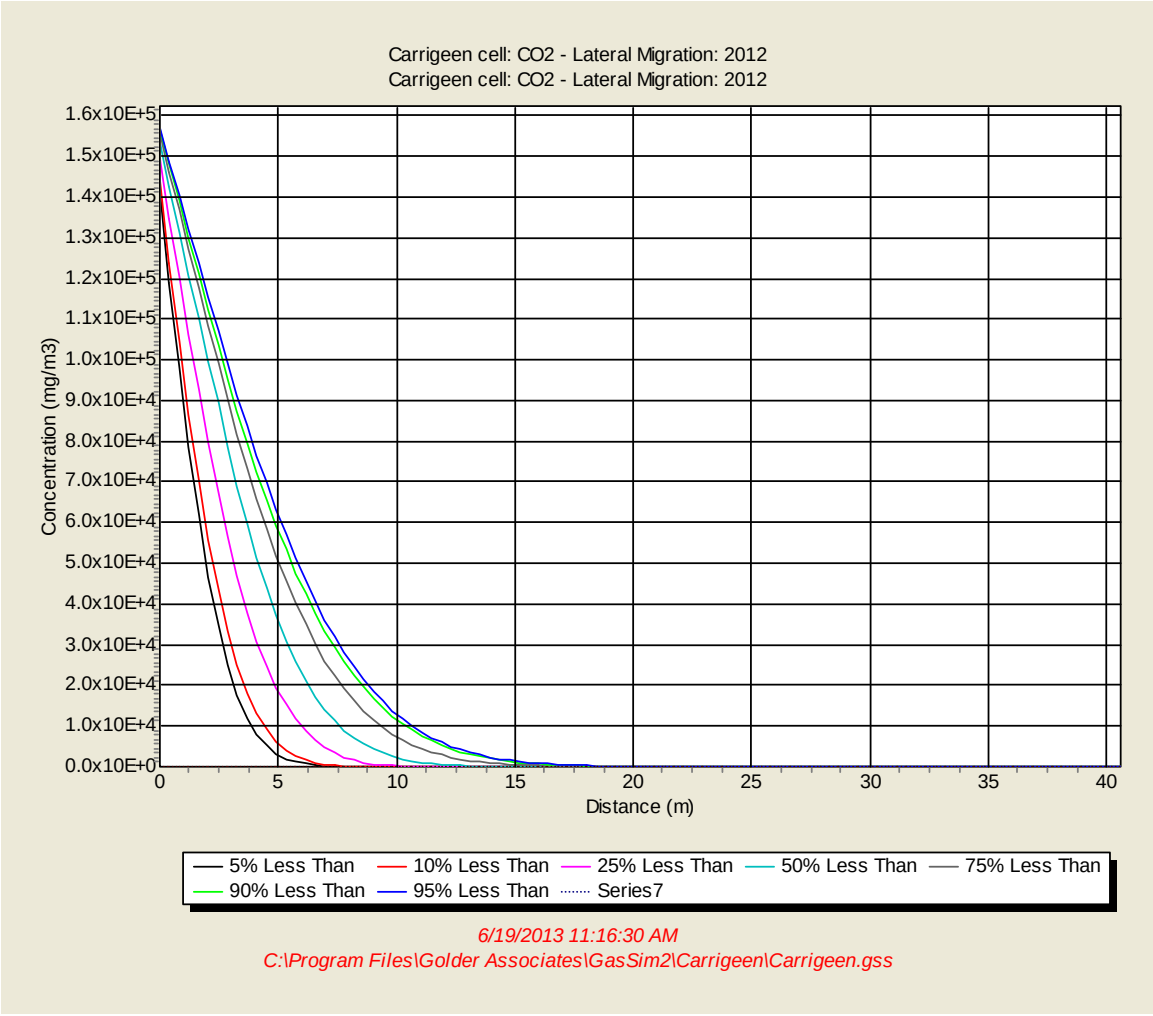

Figure 6.11. Total carbon dioxide lateral migration by the site over the 100 yr simulation event for Receptor 2.

7. *Appendix II* – Tabulated output data from GasSim model

Table 7.1. Total bulk landfill gas, methane and carbon dioxide produced by the site over the simulation period of 100 years.

Year	Total: Total Bulk LFG Produced at 95%ile (m^3/hr)	Total: Methane Produced at 95%ile (m^3/hr)	Total: Carbon Dioxide Produced at 95%ile (m^3/hr)
1977	0	0	0
1978	11.32	5.60	5.64
1979	21.41	10.65	10.68
1980	30.71	15.30	15.34
1981	28.29	14.15	14.15
1982	26.09	13.04	13.04
1983	24.08	12.04	12.04
1984	22.25	11.12	11.12
1985	20.57	10.29	10.29
1986	19.04	9.52	9.52
1987	17.64	8.82	8.82
1988	16.36	8.18	8.18
1989	15.18	7.59	7.59
1990	14.10	7.05	7.05
1991	13.11	6.55	6.55
1992	12.20	6.10	6.10
1993	11.36	5.68	5.68
1994	10.59	5.29	5.29
1995	9.88	4.94	4.94
1996	9.22	4.61	4.61
1997	8.62	4.31	4.31
1998	8.06	4.03	4.03
1999	7.54	3.77	3.77
2000	7.06	3.53	3.53
2001	6.62	3.31	3.31
2002	6.20	3.10	3.10
2003	5.82	2.91	2.91
2004	5.47	2.73	2.73
2005	5.14	2.57	2.57
2006	4.83	2.41	2.41
2007	4.54	2.27	2.27
2008	4.28	2.14	2.14
2009	4.03	2.01	2.01
2010	3.79	1.90	1.90
2011	3.58	1.79	1.79
2012	3.37	1.69	1.69
2013	3.18	1.59	1.59
2014	3.01	1.50	1.50
2015	2.84	1.42	1.42
2016	2.68	1.34	1.34
2017	2.54	1.27	1.27
2018	2.40	1.20	1.20

2019	2.27	1.13	1.13
2020	2.15	1.07	1.07
2021	2.03	1.02	1.02
2022	1.93	0.96	0.96
2023	1.82	0.91	0.91
2024	1.73	0.86	0.86
2025	1.64	0.82	0.82
2026	1.55	0.78	0.78
2027	1.47	0.74	0.74
2028	1.40	0.70	0.70
2029	1.33	0.66	0.66
2030	1.26	0.63	0.63
2031	1.20	0.60	0.60
2032	1.14	0.57	0.57
2033	1.08	0.54	0.54
2034	1.02	0.51	0.51
2035	0.97	0.49	0.49
2036	0.93	0.46	0.46
2037	0.88	0.44	0.44
2038	0.84	0.42	0.42
2039	0.79	0.40	0.40
2040	0.76	0.38	0.38
2041	0.72	0.36	0.36
2042	0.68	0.34	0.34
2043	0.65	0.33	0.33
2044	0.62	0.31	0.31
2045	0.59	0.29	0.29
2046	0.56	0.28	0.28
2047	0.53	0.27	0.27
2048	0.51	0.25	0.25
2049	0.48	0.24	0.24
2050	0.46	0.23	0.23
2051	0.44	0.22	0.22
2052	0.42	0.21	0.21
2053	0.40	0.20	0.20
2054	0.38	0.19	0.19
2055	0.36	0.18	0.18
2056	0.34	0.17	0.17
2057	0.33	0.16	0.16
2058	0.31	0.16	0.16
2059	0.30	0.15	0.15
2060	0.28	0.14	0.14
2061	0.27	0.14	0.14
2062	0.26	0.13	0.13
2063	0.25	0.12	0.12
2064	0.23	0.12	0.12
2065	0.22	0.11	0.11
2066	0.21	0.11	0.11

2067	0.20	0.10	0.10
2068	0.19	0.10	0.10
2069	0.18	0.09	0.09
2070	0.18	0.09	0.09
2071	0.17	0.08	0.08
2072	0.16	0.08	0.08
2073	0.15	0.08	0.08
2074	0.15	0.07	0.07
2075	0.14	0.07	0.07
2076	0.13	0.07	0.07
2077	0.13	0.06	0.06

Table 7.2. Total bulk landfill gas, methane and carbon dioxide lateral emissions produced by the site over the simulation period of 100 years.

Year	Total: Total Bulk LFG - Lateral Emissions at 95%ile (m^3/hr)	Total: CH_4 - Lateral Emissions at 95%ile (m^3/hr)	Total: CO_2 - Lateral Emissions at 95%ile (m^3/hr)
1977	0	0	0
1978	0	0	0
1979	0	0	0
1980	0.1526	0.0760	0.0762
1981	0.1406	0.0703	0.0703
1982	0.1296	0.0648	0.0648
1983	0.1197	0.0598	0.0598
1984	0.1105	0.0553	0.0553
1985	0.1022	0.0511	0.0511
1986	0.0946	0.0473	0.0473
1987	0.0876	0.0438	0.0438
1988	0.0813	0.0406	0.0406
1989	0.0754	0.0377	0.0377
1990	0.0701	0.0350	0.0350
1991	0.0651	0.0326	0.0326
1992	0.0606	0.0303	0.0303
1993	0.0564	0.0282	0.0282
1994	0.0526	0.0263	0.0263
1995	0.0491	0.0245	0.0245
1996	0.0458	0.0229	0.0229
1997	0.0428	0.0214	0.0214
1998	0.0400	0.0200	0.0200
1999	0.0375	0.0187	0.0187
2000	0.0351	0.0175	0.0175
2001	0.0329	0.0164	0.0164
2002	0.0308	0.0154	0.0154
2003	0.0289	0.0145	0.0145
2004	0.0272	0.0136	0.0136
2005	0.0255	0.0128	0.0128
2006	0.0240	0.0120	0.0120
2007	0.0226	0.0113	0.0113
2008	0.0213	0.0106	0.0106
2009	0.0200	0.0100	0.0100
2010	0.0189	0.0094	0.0094
2011	0.0178	0.0089	0.0089
2012	0.0168	0.0084	0.0084
2013	0.0158	0.0079	0.0079
2014	0.0150	0.0075	0.0075
2015	0.0141	0.0071	0.0071
2016	0.0133	0.0067	0.0067
2017	0.0126	0.0063	0.0063
2018	0.0119	0.0060	0.0060
2019	0.0113	0.0056	0.0056
2020	0.0107	0.0053	0.0053

2021	0.0101	0.0051	0.0051
2022	0.0096	0.0048	0.0048
2023	0.0091	0.0045	0.0045
2024	0.0086	0.0043	0.0043
2025	0.0082	0.0041	0.0041
2026	0.0077	0.0039	0.0039
2027	0.0073	0.0037	0.0037
2028	0.0070	0.0035	0.0035
2029	0.0066	0.0033	0.0033
2030	0.0063	0.0031	0.0031
2031	0.0059	0.0030	0.0030
2032	0.0056	0.0028	0.0028
2033	0.0054	0.0027	0.0027
2034	0.0051	0.0025	0.0025
2035	0.0048	0.0024	0.0024
2036	0.0046	0.0023	0.0023
2037	0.0044	0.0022	0.0022
2038	0.0042	0.0021	0.0021
2039	0.0040	0.0020	0.0020
2040	0.0038	0.0019	0.0019
2041	0.0036	0.0018	0.0018
2042	0.0034	0.0017	0.0017
2043	0.0032	0.0016	0.0016
2044	0.0031	0.0015	0.0015
2045	0.0029	0.0015	0.0015
2046	0.0028	0.0014	0.0014
2047	0.0027	0.0013	0.0013
2048	0.0025	0.0013	0.0013
2049	0.0024	0.0012	0.0012
2050	0.0023	0.0011	0.0011
2051	0.0022	0.0011	0.0011
2052	0.0021	0.0010	0.0010
2053	0.0020	0.0010	0.0010
2054	0.0019	0.0009	0.0009
2055	0.0018	0.0009	0.0009
2056	0.0017	0.0009	0.0009
2057	0.0016	0.0008	0.0008
2058	0.0016	0.0008	0.0008
2059	0.0015	0.0007	0.0007
2060	0.0014	0.0007	0.0007
2061	0.0013	0.0007	0.0007
2062	0.0013	0.0006	0.0006
2063	0.0012	0.0006	0.0006
2064	0.0012	0.0006	0.0006
2065	0.0011	0.0006	0.0006
2066	0.0011	0.0005	0.0005
2067	0.0010	0.0005	0.0005
2068	0.0010	0.0005	0.0005

2069	0.0009	0.0005	0.0005
2070	0.0009	0.0004	0.0004
2071	0.0008	0.0004	0.0004
2072	0.0008	0.0004	0.0004
2073	0.0008	0.0004	0.0004
2074	0.0007	0.0004	0.0004
2075	0.0007	0.0003	0.0003
2076	0.0007	0.0003	0.0003
2077	0.0006	0.0003	0.0003

8. *Appendix III* – Global impact results

Table 8.1. GWP of the site located in Carrigeen, Clane, Co. Kildare

GasSim Version 2.00
Project Name : Carrigeen
Client Name : Kildare County Council

Global Impact Results: 50th percentile [Sum of all years]			
Species	Gas released (tonnes)	Global warming potential (tonnes of Carbon Dioxide)	Ozone depletion potential (tonnes of trichlorofluoromethane)
Methane - 'Surface'	774	19300	0
Methane - 'Engine'	0	0	0
Methane - 'Flare'	0	0	0
Carbon Dioxide - 'Surface'	5740	5740	0
Carbon Dioxide - 'Engine'	0	0	0
Carbon Dioxide - 'Flare'	0	0	0
Hydrogen	0.166	0	0
1,1-Dichloroethane	0.00027	0	0
1,1-Dichloroethene	0.00129	0	0
1-butanethiol	5.34E-19	0	0
2-butoxy ethanol	2.39E-19	0	0
Acetalehyde (ethanal)	0.000453	0.000589	0
Arsenic	0.00000655	0	0
Benzene	0.0154	0	0
Butadiene (modelled as 1,3-Butadiene)	1.16E-18	0	0
Butyric acid	0.000000000000308	0	0
Carbon disulphide	0.0114	0	0
Carbon tetrachloride (tetrachloromethane)	3.53E-20	4.95E-17	2.58E-20
Chloroethane	8.48E-19	0	0
Dimethyl disulphide	0.000288	0	0
Dimethyl sulphide	0.000948	0	0
Ethanethiol (ethyl mercaptan)	2.31E-18	0	0
Ethyl butyrate	0.00435	0	0
Formaldehyde (methanal)	0.0000737	0	0
Furan	0.000571	0	0
Hydrogen sulphide	0.0437	0	0
Methanethiol (methyl mercaptan)	2.38E-18	0	0
Pentene (all isomers)	0.00214	0	0
Propanethiol	4.14E-19	0	0
t-1,2-Dichloroethene	0.000235	0	0
Trichloroethylene (trichloroethene)	0.0025	0	0
Vinyl chloride (chloroethene, chloroethylene)	0.0262	0	0
Total CH4	774	19300	0
Total CO2	5740	5740	0
Trace Gases	0.202	0.000694	2.58E-20
Total	6540	25100	2.58E-20
	Engines	Flares	Total
CH4 Burned (t)	0	0	0
GWP Reduction (t CO2)	0	0	0
Bulk LFG CH4 percentage	50		
Bulk LFG CO2 percentage	50		
Lo (t CH4)	1450		

File Name : C:\Program Files\Golder Associates\GasSim2\Carrigeen\Carrigeen.gss **Date : 6/19/2013 11:45:44 AM**

9. *Appendix IV* – GasSim Model build file

Compositions	[Default]	Default Value
Carrigeen cell		
Infiltration	[Changed]	Not Justified
Waste Input - Tonnages	[Changed]	Not Justified
Waste Breakdown	[Default]	Default Value
Trace Gases		
Trace Gas Concentration	[Default]	Default Value
VOC Halflife	[Default]	Default Value
Moisture Content	[Default]	Default Value
Waste Density	[Changed]	Not Justified
Leachate Head	[Changed]	Not Justified
Hydraulic Conductivity	[Default]	Default Value
Cap	[Changed]	Not Justified
Cap Thickness	[Changed]	Not Justified
Cap Hydraulic Conductivity	[Changed]	Not Justified
Liner	[Default]	Default Value
Liner Thickness	[Changed]	Not Justified
Liner Hydraulic Conductivity	[Changed]	Not Justified
Biological Methane Oxidation	[Changed]	Not Justified
Methane Oxidation %	[Changed]	Not Justified
Site Characteristics		
Proportion to CO2 [%]	[Default]	Default Value
Proportion to CH4 [%]	[Default]	Default Value
Degradation Rates	[Default]	Default Value
Gas Plant		
Engine/Flare Order	[Changed]	Not Justified
Trace Gas Utilisation	[Changed]	Not Justified
Global Warming Potential	[Default]	Default Value
Ozone Depletion Potential	[Default]	Default Value
Lateral Migration Air Diffusion	[Changed]	Not Justified
Lateral Migration Geosphere	[Changed]	Not Justified
Lateral Migration Trace Gas Diffusio	[Default]	Default Value
Exposure	[Changed]	Not Justified

ProjectDetails

Project Name	Carrigeen
Client	Kildare County Council
Model	C:\Program Files\Golder Associates\GasSim2\Carrigeen\Carrigeen.gss
Model Date	6/19/2013 11:16:30 AM
Comments	
Start Year	1977
Operation Period	3
Simulation Period	100
Iterations	300

Confined Migration Pathway

Waste Composition

Year	Composition
1977	England 2000-2010 waste streams
Newspapers	
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(48.5)
Hemi-Cellulose (%)	SINGLE(9.0)
Decomposition (%)	SINGLE(35.0)
Magazines	
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(42.3)
Hemi-Cellulose (%)	SINGLE(9.4)
Decomposition (%)	SINGLE(46.0)
Other paper	
Domestic	SINGLE(19.8)
Civic Amenity	SINGLE(3.3)
Commercial	SINGLE(28.8)
Industrial	SINGLE(8.8)
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(87.4)
Hemi-Cellulose (%)	SINGLE(8.4)
Decomposition (%)	SINGLE(98.0)
Liquid cartons	
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(57.3)
Hemi-Cellulose (%)	SINGLE(9.9)
Decomposition (%)	SINGLE(64.0)
Card packaging	
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(57.3)
Hemi-Cellulose (%)	SINGLE(9.9)
Decomposition (%)	SINGLE(64.0)
Other card	
Water (%)	SINGLE(30.0)
Cellulose (%)	SINGLE(57.3)
Hemi-Cellulose (%)	SINGLE(9.9)
Decomposition (%)	SINGLE(64.0)
Wood	
Domestic	SINGLE(3.0)
Civic Amenity	SINGLE(11.2)
Commercial	SINGLE(3.3)
Industrial	SINGLE(5.0)
Water (%)	SINGLE(20.0)
Cellulose (%)	SINGLE(21.0)
Hemi-Cellulose (%)	SINGLE(11.0)
Decomposition (%)	SINGLE(75.0)
Textiles	
Domestic	SINGLE(3.3)
Civic Amenity	SINGLE(2.3)
Commercial	SINGLE(1.1)
Industrial	SINGLE(0.3)
Water (%)	SINGLE(25.0)
Cellulose (%)	SINGLE(20.0)
Hemi-Cellulose (%)	SINGLE(20.0)
Decomposition (%)	SINGLE(50.0)
Disposable nappies	
Domestic	SINGLE(3.3)
Civic Amenity	SINGLE(2.9)
Water (%)	SINGLE(20.0)
Cellulose (%)	SINGLE(25.0)
Hemi-Cellulose (%)	SINGLE(25.0)
Decomposition (%)	SINGLE(50.0)
Other misc. combustibles	
Domestic	SINGLE(0.3)
Civic Amenity	SINGLE(4.2)
Commercial	SINGLE(10.4)
Industrial	SINGLE(17.7)
Water (%)	SINGLE(20.0)
Cellulose (%)	SINGLE(25.0)
Hemi-Cellulose (%)	SINGLE(25.0)
Decomposition (%)	SINGLE(50.0)

Garden waste		
Domestic		SINGLE(16.0)
Civic Amenity		SINGLE(32.1)
Commercial		SINGLE(9.8)
Industrial		SINGLE(4.7)
Water (%)		SINGLE(65.0)
Cellulose (%)		SINGLE(25.7)
Hemi-Cellulose (%)		SINGLE(13.0)
Decomposition (%)		SINGLE(62.0)
Other putrescible		
Domestic		SINGLE(25.6)
Civic Amenity		SINGLE(14.8)
Commercial		SINGLE(10.4)
Industrial		SINGLE(6.8)
Water (%)		SINGLE(65.0)
Cellulose (%)		SINGLE(55.4)
Hemi-Cellulose (%)		SINGLE(7.2)
Decomposition (%)		SINGLE(76.0)
10mm fines		
Domestic		SINGLE(4.1)
Civic Amenity		SINGLE(1.2)
Commercial		SINGLE(1.9)
Industrial		SINGLE(0.5)
Water (%)		SINGLE(40.0)
Cellulose (%)		SINGLE(25.0)
Hemi-Cellulose (%)		SINGLE(25.0)
Decomposition (%)		SINGLE(50.0)
Sewage sludge		
Sewage Sludge		SINGLE(100.0)
Water (%)		SINGLE(70.0)
Cellulose (%)		SINGLE(14.0)
Hemi-Cellulose (%)		SINGLE(14.0)
Decomposition (%)		SINGLE(75.0)
Composted organic material		
Composted Organic Material		SINGLE(100.0)
Water (%)		SINGLE(30.0)
Cellulose (%)		UNIFORM(7.47, 9.59)
Hemi-Cellulose (%)		UNIFORM(7.47, 9.59)
Decomposition (%)		SINGLE(57.0)
Incinerator ash		
Commercial		SINGLE(0.2)
Industrial		SINGLE(25.5)
Incinerator Ash		SINGLE(100.0)
Water (%)		SINGLE(30.0)
Cellulose (%)		TRIANGULAR(0.5, 0.7, 1.5)
Hemi-Cellulose (%)		TRIANGULAR(0.5, 0.7, 1.5)
Decomposition (%)		SINGLE(57.0)
Non degradable		
Domestic		SINGLE(24.6)
Civic Amenity		SINGLE(28.0)
Commercial		SINGLE(34.1)
Industrial		SINGLE(30.7)
Inert		SINGLE(100.0)
Water (%)		SINGLE(0.0)
Cellulose (%)		SINGLE(0.0)
Hemi-Cellulose (%)		SINGLE(0.0)
Decomposition (%)		SINGLE(0.0)
Calcium Sulphate (%)		
Domestic		TRIANGULAR(0.2, 0.35, 2.3)
Civic Amenity		TRIANGULAR(0.2, 0.35, 2.3)
Composted Organic Material		TRIANGULAR(0.2, 0.35, 2.3)
Incinerator Ash		TRIANGULAR(0.2, 0.35, 2.3)
Residues from MRF		TRIANGULAR(0.2, 0.35, 2.3)
Recycling Schemes		TRIANGULAR(0.2, 0.35, 2.3)
Chemical Sludge		TRIANGULAR(0.2, 0.35, 2.3)
Industrial Liquid Waste		TRIANGULAR(0.2, 0.35, 2.3)
Iron (%)		
Domestic		TRIANGULAR(0.3, 4.8, 8.2)
Civic Amenity		TRIANGULAR(0.3, 4.8, 8.2)
Commercial		TRIANGULAR(0.3, 4.8, 8.2)
Industrial		TRIANGULAR(0.3, 4.8, 8.2)
Inert		TRIANGULAR(0.3, 4.8, 8.2)
Liquid Inert		TRIANGULAR(0.3, 4.8, 8.2)
Sewage Sludge		TRIANGULAR(0.3, 4.8, 8.2)
Composted Organic Material		TRIANGULAR(0.3, 4.8, 8.2)
Incinerator Ash		TRIANGULAR(0.3, 4.8, 8.2)
Residues from MRF		TRIANGULAR(0.3, 4.8, 8.2)
Recycling Schemes		TRIANGULAR(0.3, 4.8, 8.2)
Chemical Sludge		TRIANGULAR(0.3, 4.8, 8.2)
Industrial Liquid Waste		TRIANGULAR(0.3, 4.8, 8.2)
User Defined 1		TRIANGULAR(0.3, 4.8, 8.2)
User Defined 2		TRIANGULAR(0.3, 4.8, 8.2)
User Defined 3		TRIANGULAR(0.3, 4.8, 8.2)
1978		England 2000-2010 waste streams
1979		England 2000-2010 waste streams
Justification:	[Default]	Default Value

Trace Gases

No Combustion Products Selected

Carrigeen cell

Infiltration		TRIANGULAR(700.0, 800.0, 1000.0)
Justification:	[Changed]	Not Justified

Waste Input

Year		AmountDepositied (t)
1977		SINGLE(2.00E+04)
1978		SINGLE(2.00E+04)
1979		SINGLE(2.00E+04)
Justification:	[Changed]	Not Justified

Waste Breakdown

1977

Domestic		UNIFORM(30.0, 40.0)
Commercial		SINGLE(5.0)
Inert		SINGLE(65.0)

1978

Domestic		UNIFORM(30.0, 40.0)
Commercial		SINGLE(5.0)
Inert		SINGLE(65.0)

1979

Domestic		UNIFORM(30.0, 40.0)
Commercial		SINGLE(5.0)
Inert		SINGLE(65.0)
Justification:	[Default]	Default Value

Trace Gases

Source Gases		Concentration [mg/m3]
1,1-Dichloroethane		LOGTRIANGULAR(0.02, 0.28, 3.9)
1,1-Dichloroethene		LOGTRIANGULAR(0.03, 2.8, 19.0)
1-butanethiol		LOGUNIFORM(1.00E-30, 8.00E-02)
2-butoxy ethanol		LOGUNIFORM(1.00E-30, 5.00E-02)
Acetalehyde (ethanal)		LOGUNIFORM(0.075, 2.546)
Arsenic		LOGTRIANGULAR(1.00E-04, 7.40E-03, 4.30E-01)
Benzene		LOGTRIANGULAR(3.1, 15.0, 73.0)
Butadiene (modelled as 1,3-Butadiene)		LOGUNIFORM(1.00E-30, 2.00E-02)
Butyric acid		LOGTRIANGULAR(1.00E-30, 1.00E-01, 1.75E+01)
Carbon disulphide		LOGUNIFORM(0.9, 170.0)
Carbon tetrachloride (tetrachloromethane		LOGUNIFORM(1.00E-30, 2.00E-02)
Chloroethane		LOGUNIFORM(1.00E-30, 5.30E+00)
Dimethyl disulphide		LOGTRIANGULAR(0.03, 0.17, 12.0)
Dimethyl sulphide		LOGTRIANGULAR(0.03, 0.73, 24.3)
Ethanethiol (ethyl mercaptan)		LOGUNIFORM(1.00E-30, 8.00E-02)
Ethyl butyrate		LOGUNIFORM(0.41, 42.0)
Formaldehyde (methanal)		LOGTRIANGULAR(0.026, 0.068, 0.188)
Furan		LOGTRIANGULAR(0.02, 0.82, 6.2)
Hydrogen sulphide		LOGTRIANGULAR(2.4, 53.0, 580.0)
Methanethiol (methyl mercaptan)		LOGUNIFORM(1.00E-30, 3.00E-01)
Pentene (all isomers)		LOGTRIANGULAR(0.24, 3.5, 12.0)
Propanethiol		LOGUNIFORM(1.00E-30, 9.00E-02)
t-1,2-Dichloroethene		LOGTRIANGULAR(0.02, 0.24, 2.6)
Trichloroethylene (trichloroethene)		LOGTRIANGULAR(0.25, 1.65, 88.0)
Vinyl chloride (chloroethene, chloroethylene)		LOGTRIANGULAR(1.1, 31.0, 730.0)
Justification:	[Default]	Default Value
VOC Halflife		NORMAL(4.11, 1.56)
Justification:	[Default]	Default Value

Waste Moisture Content

Moisture Content		Average
Justification:	[Default]	Default Value
Waste Density		UNIFORM(0.8, 1.5)
Justification:	[Changed]	Not Justified
Leachate Head		UNIFORM(0.5, 2.0)
Justification:	[Changed]	Not Justified
Hydraulic Conductivity		LOGUNIFORM(1.00E-09, 1.00E-05)
Justification:	[Default]	Default Value

Engineered Controls

Cap		None
Justifications		
Cap	[Changed]	Not Justified
Cap Thickness	[Changed]	Not Justified
Cap Hydraulic Conductivity	[Changed]	Not Justified
liner		None
Justifications		
Liner	[Default]	Default Value
Liner Thickness	[Changed]	Not Justified
Liner Hydraulic Conductivit	[Changed]	Not Justified
Justification:	[Changed]	Not Justified
Methane Oxidation %		TRIANGULAR(10.0, 25.0, 46.0)
Justification:	[Changed]	Not Justified
Soil Depth		UNIFORM(400.0, 600.0)
% Fissures		UNIFORM(1.0, 4.0)
Land Raise Depth		#UNDEFINED?

Geosphere

Ground Surface (mAOD)	71
Water Table (mAOD)	65
Geosphere Moisture Content	UNIFORM(2.0, 8.0)
Geosphere Porosity	UNIFORM(14.0, 49.0)

Site Characteristics

Proportion to CO2 [%]		SINGLE(50.0)
Justification:	[Default]	Default Value
Proportion to CH4 [%]		SINGLE(50.0)
Justification:	[Default]	Default Value

Cellulose Decay Rates

		Dry	Average	Wet
Slow		SINGLE(0.013)	SINGLE(0.046)	SINGLE(0.076)
Moderate		SINGLE(0.046)	SINGLE(0.076)	SINGLE(0.116)
Fast		SINGLE(0.076)	SINGLE(0.116)	SINGLE(0.694)
Justification:	[Default]	Default Value		

Gas Plant

		No Flares/Engines in use
Engine/Flare Order	[Changed]	Not Justified

Trace Gas Plant

1,1-Dichloroethane		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
1,1-Dichloroethene		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
1-butanethiol		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
2-butoxy ethanol		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Acetalehyde (ethanal)		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Arsenic		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Benzene		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Butadiene (modelled as 1,3-Butadiene)		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Butyric acid		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Carbon disulphide		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Carbon tetrachloride (tetrachloromethane)		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Chloroethane		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)
Dual Fuel Engine:	non-combustion products	SINGLE(99.0)
Other Engine:	non-combustion products	SINGLE(99.0)
Flare:	non-combustion products	SINGLE(99.0)
Dimethyl disulphide		
Spark Ignition Engine:	non-combustion products	SINGLE(99.0)

Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Dimethyl sulphide			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Ethanethiol (ethyl mercaptan)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Ethyl butyrate			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Formaldehyde (methanal)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Furan			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Hydrogen sulphide			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Methanethiol (methyl mercaptan)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Pentene (all isomers)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Propanethiol			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
t-1,2-Dichloroethene			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Trichloroethylene (trichloroethene)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Vinyl chloride (chloroethene, chloroethylene)			
Spark Ignition Engine:		non-combustion products	SINGLE(99.0)
Dual Fuel Engine:		non-combustion products	SINGLE(99.0)
Other Engine:		non-combustion products	SINGLE(99.0)
Flare:		non-combustion products	SINGLE(99.0)
Justification:	[Changed]	Not Justified	

Global Impact

Bulk Gases

Global Warming Potential		
Carbon Dioxide [t]:		1
Methane [t carbon dioxoide]:		25
Hydrogen [t carbon dioxide]:		0
Justification:	[Default]	Default Value
Ozone Depletion Potential		
Carbon Dioxide [t trichlorofluoromethane]		0
Methane [t trichlorofluoromethane]:		0
Hydrogen [t trichlorofluoromethane]:		0
Justification:	[Default]	Default Value

Trace Gases

Gas	Global Warming Potential	
1,1-Dichloroethane	0	0
1,1-Dichloroethene	0	0
1-butanethiol	0	0
2-butoxy ethanol	0	0
Acetalehyde (ethanal)	1.3	0
Arsenic	0	0
Benzene	0	0

Butadiene (modelled as 1,3-Butadiene)	0	0
Butyric acid	0	0
Carbon disulphide	0	0
Carbon tetrachloride (tetrachloromethane	1400	0.73
Chloroethane	0	0
Dimethyl disulphide	0	0
Dimethyl sulphide	0	0
Ethanethiol (ethyl mercaptan)	0	0
Ethyl butyrate	0	0
Formaldehyde (methanal)	0	0
Furan	0	0
Hydrogen sulphide	0	0
Methanethiol (methyl mercaptan)	0	0
Pentene (all isomers)	0	0
Propanethiol	0	0
t-1,2-Dichloroethene	0	0
Trichloroethylene (trichloroethene)	0	0
Vinyl chloride (chloroethene, chloroethylene)	0	0

Lateral Migration

Bulk Gases

Air Diffusion Coefficients		
CO2 Dispersivity		SINGLE(0.1613)
CH4 Dispersivity		SINGLE(0.2192)
H2 Dispersivity		#UNDEFINED?
Justification:	[Changed]	Not Justified

Geosphere

Cell		Carrigeen cell
Geosphere Moisture Content		UNIFORM(2.0, 8.0)
Geosphere Porosity		UNIFORM(14.0, 49.0)
Justification:	[Changed]	Not Justified

Trace Gases

Gas	Air Diffusion Coefficient
1,1-Dichloroethane	SINGLE(0.0742)
1,1-Dichloroethene	#UNDEFINED?
1-butanethiol	#UNDEFINED?
2-butoxy ethanol	#UNDEFINED?
Acetalehyde (ethanal)	SINGLE(0.1235)
Arsenic	#UNDEFINED?
Benzene	SINGLE(0.088)
Butadiene (modelled as 1,3-Butadiene)	SINGLE(0.102)
Butyric acid	#UNDEFINED?
Carbon disulphide	SINGLE(0.108)
Carbon tetrachloride (tetrachloromethane	SINGLE(0.078)
Chloroethane	SINGLE(0.1085)
Dimethyl disulphide	SINGLE(0.0898)
Dimethyl sulphide	SINGLE(0.0898)
Ethanethiol (ethyl mercaptan)	#UNDEFINED?
Ethyl butyrate	#UNDEFINED?
Formaldehyde (methanal)	SINGLE(0.1591)
Furan	#UNDEFINED?
Hydrogen sulphide	SINGLE(0.1623)
Methanethiol (methyl mercaptan)	#UNDEFINED?
Pentene (all isomers)	SINGLE(0.1999)
Propanethiol	#UNDEFINED?
t-1,2-Dichloroethene	#UNDEFINED?
Trichloroethylene (trichloroethene)	SINGLE(0.079)
Vinyl chloride (chloroethene, chloroethylene)	SINGLE(0.1126)
Justification: [Default]	Default Value

Exposure

Scenario:	Allotment
Year:	1977
Distance from boundary [m]:	0
Direction:	North East
Emissions to model:	1,1,1,2-Tetrafluorochloroethane
Gas Viscosity [N.hr/m2]:	0.000000005
Henry's law constant:	0
Soil Type:	Clay
Soil Organic Matter [%]:	5
Wind speed above ground surface in ambient mixing zone [cm/s]:	12
Depth below ground to contaminated source zone [cm]:	1
Building Characteristics	
Area of walls in living space [m2]:	186
Area of windows [m2]:	20
Area of floor [m2]:	74.1
Height of Living space [m]:	5.4
Air exchange rate (total exchanges per hour)	1
Perimeter of building [m]:	34.4
Air pressure inside house [Pa]:	101321.5
Area of house walls in cellar [m2]:	6.88

Height of subfloor void [m]:	0.5	
Air pressure inside subfloor void [Pa]:	101325	
Temperature inside house [C]:	565	
Floor resistance [NH/m3]:	27.8	
Average height of all openings [m]:	2	

Building Materials

Material	Total Porosity [cm3/cm3]	Air-filled porosity [cm3/cm3]	Thickness [m]
Hardcore	0.5	0.25	0.1
Blinding Sand	0.5	0.5	0.05
Concrete	0.068	0.034	0.1
Insulating layer (floors)	0.9	0.9	0.05
Brick (external walls)	0.5	0.25	0.1
Lightweight block (walls)	0.068	0.068	0.1
Insulating layer (walls)	0.9	0.9	0.055
Plasterboard (ceiling)	0.068	0.068	0.0125
Insulating layer (roof)	0.9	0.9	0.1
Screed (over beam/block floor)	0.068	0.068	0.05
Suspended timber floor	0.2	0.2	0.03

Justification:	[Changed]	Not Justified