Hartland Landfill – Landfill Gas Monitoring

2021 Report

Capital Regional District | Parks & Environmental Services, Environmental Protection

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HARTLAND LANDFILL – LANDFILL GAS MONITORING
2021 REPORT

EXECUTIVE SUMMARY

Hartland Landfill provides solid waste disposal services for the Capital Regional District (CRD). The landfill is a multi-purpose facility providing collection services for recyclable materials, household hazardous waste, items covered by product stewardship, and disposal of municipal solid waste (MSW) and controlled waste. The site operates pursuant to an operational certificate under the *Environmental Management Act*, issued by the BC Ministry of Environment and Climate Change Strategy (ENV); and follows an operating plan required under the operational certificate.

The landfill footprint (Phase 1 + Phase 2) occupies 42.9 Ha with an estimated 7.3 M tonnes of municipal solid waste in place as of the end of September 2021. When the landfill reaches planned final filling elevations in Phase 2, 3 and 4 by 2114, it is estimated to occupy approximately 15,201,185 m^3 of municipal solid waste. This report fulfills annual reporting requirements set out in the BC *Operational Certificate 12659* and the BC *Landfill Gas Management Regulation*. Landfill gas (LFG) collection/management at Hartland (described below) includes collection and utilization infrastructure, generation modelling and monitoring (utilization, perimeter gas probes, hotspot monitoring and speciation).

LFG collection and/or management at Hartland includes the following components:

- **Gas collection infrastructure**, including cover systems, collection pipes, wells and blowers to facilitate gas collection and utilization.
- **LFG utilization facility** that generates electricity for the BC Hydro grid.
- **LFG monitoring system**, including collection system, hotspot and subsurface monitoring programs.
- **Methane production and gas generation modelling** rates given landfill waste volumes and decomposition rates.

GAS GENERATION, COLLECTION AND UTILIZATION

In 2021, the gas collection system consisted of 58 vertical wells and 84 horizontal wells, 6 leachate horizontal gas wells for a total of 148 wells. Four non-productive wells were removed from service, six horizontal wells were connected to the system and activated in completed lifts in Phase 2, Cell 3. The well field was balanced monthly in 2021, as recommended by the BC *Landfill Gas Management Facilities Design Guidelines*.

A fugitive emissions, gas generation project was completed in 2020. The data were used to complete a comprehensive landfill gas mass balance for the site using three different landfill gas generation models. Report findings confirm that the current ENV model overestimates landfill gas generation and fugitive emissions at Hartland, while an alternative model (UBCi) more accurately estimates gas generation. Therefore, this model was used again in 2021, alongside the ENV model and the results indicated that the existing landfill gas collection system is collecting a higher proportion of total landfill gas: 78%, whereas this number is 69% for the same period using the required ENV model. According to the UBCi model (which is supported by empirical mass balance data), Hartland Landfill is meeting and exceeding the 75% collection efficiency requirement set out in the *Landfill Gas Management Regulation*.

Table ES1 Modelled Methane Generation and Collection Efficiency 2021

Year	Modelled Annual Methane Generated ENV[1] (scfm)	Modelled Annual Methane Generated UBCi (scfm)	Measured Annual Gas Capture (scfm)	Collection Efficiency (%) ENV Model	Collection Efficiency (%) UBCi Model [1]
2021	1,679	1,469	1,150	69%	78%

MONITORING

Hartland Landfill has several monitoring programs to assess the effectiveness of the LFG collection infrastructure. The following summarizes the components of the program:

1. **Collection and utilization system monitoring** to evaluate changes in gas quality over time and to document data for gas collection and gas utilization to assess collection efficiency and total emissions from the landfill.

2. **Monitoring of subsurface perimeter and building foundation probes** to assess the potential for subsurface LFG migration at the eastern landfill boundary and at on-site buildings for compliance with BC *Landfill Criteria*, and for worker and public health and safety.

3. **Surface emissions and hotspot monitoring** to verify the effectiveness of cover and the LFG collection system in order to identify health and safety risks associated with fugitive LFG emissions.

4. **LFG Speciation** to assess the composition of gas, including volatile organic compounds, sulphur gases and typical LFGs, in order to calculate ambient dilution concentrations for health and safety, and infrastructure integrity purposes.

COMPLIANCE SUMMARY

Table ES2 has been prepared to summarize the results of LFG monitoring programs, whether the results comply with requirements, actions taken to address non-compliance, and recommendations.

Table ES2 LFG Compliance Summary 2021

Program	Compliance Location	Criteria	Findings	Mitigation/Actions	Recommendations
Perimeter Probe Monitoring	Probes GP-1A, 1B, 2A, 2B, 3A, 3B, 11A, 11B, 12A and 12B	Methane must not exceed 5% in subsurface soils (BC *Landfill Criteria for Municipal Solid Waste* & BC *Landfill Gas Management Facilities Design Guidelines*)	No exceedances Low risk of sub-surface gas migration to adjacent properties	None	Continue quarterly monitoring.
Building Foundation Probe Monitoring	Probes GP- 4A, 5A, 6A, 6B, 7A, 7B, 8A, 9A, 13A, 14A, 17A, 18A	Maximum 1% methane in any on-site facility (BC *Landfill Criteria for Municipal Solid Waste* & BC *Landfill Gas Management Facilities Design Guidelines*)	No exceedances Low risk of subsurface gas migration to adjacent building	None	Continue quarterly monitoring.
Ambient Grid Monitoring	N/A	100 ppm total hydrocarbon (THC), as methane (CRD internal guideline)	18 grid locations >100 ppm No cover system failures suspected in the closed area of Phase 1	Investigated hot spots and mitigated, where possible.	Continue annual monitoring.
Hot Spot Monitoring	N/A	1,000 ppm THC (CRD internal guideline)	Three new hot spots (z-points) >1,000 ppm Currently 26 locations for hot spot investigation	Added new locations of hot spots to the monitoring program.	Continue annual monitoring. Investigate mitigation options.
Well Field Monitoring and Balancing	N/A	Monitor monthly. Oxygen 2.5% - gas optimization and reduction of fire potential *(BC Landfill Gas Management Facilities Design Guidelines)*	Monitoring completed monthly; Oxygen did not exceed 2.5%	None	Continue monthly monitoring at minimum.
Gas Collection	N/A	75% gas collection efficiency target by the end of 2016, as per *Landfill Gas Management Plan*	Gas collection efficiency was estimated at 69%, based on the ENV gas generation model. Collection efficiency using an alternative model (UBCi) and empirical data was estimated at 78%.	*Landfill Gas Management Plan* submitted to ENV.	Continue to implement the gas management plan and optimize methane and nitrogen, oxygen levels in the well field

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1.0 INTRODUCTION

Hartland Landfill provides solid waste disposal services for the Capital Regional District (CRD). The landfill is a multi-purpose facility providing collection services for recyclable materials, household hazardous waste, extended producer responsibility products, salvageable items, as well as disposal services for municipal solid waste and controlled waste. Landfill operations are guided by the *Hartland Landfill Design, Operations and Closure Plan – Update*, the BC *Operational Certificate 12659* issued by the BC Ministry of Environment and Climate Change Strategy (ENV), and the CRD's *Solid Waste Management Plan*.

Landfill gas (LFG) is primarily composed of methane, carbon dioxide and nitrogen, with small amounts of water vapour, oxygen, and trace gases. Trace gases include hydrogen sulphide, ammonia, nitrous oxide, volatile organic compounds and chlorofluorocarbons. Risks associated with LFG include asphyxiation, flammability (between 5% and 15% methane by volume), toxicity, odour and greenhouse gas (GHG) emissions.

The objective of an LFG collection system is to reduce GHGs through the destruction of collected methane, mitigate fugitive emissions, and reduce the potential for subsurface, lateral gas migration. Ongoing monitoring is conducted at the landfill to assess the effectiveness of these controls, and includes gas generation modelling, gas capture assessment, and ambient and subsurface monitoring.

This report is prepared to assess operational needs and performance, meet regulatory reporting requirements and to inform the public regarding LFG management at Hartland. This report meets the reporting requirements specified in the BC *Operational Certificate 12659* and the BC *Landfill Gas Management Regulation* for annual reporting of gas collection and management.

2.0 SITE DESCRIPTION

The Hartland Landfill is situated on 320 hectares within the District of Saanich. Mount Work Regional Park is located to the west, parkland and the Heal's Rifle Range lies to the north, residential properties lie to the east, and undeveloped CRD property is located to the south.

The climate in the area is classified as "Cool Mediterranean" due to warm, dry summers and cool, wet winters. Annual precipitation is around 800-1,000 mm per year. The site is surrounded by bedrock; discontinuous bedrock fractures have been identified.

The CRD took over operation of the landfill site in 1985. Prior to that, it was privately owned and operated. The landfill footprint (Phase 1 + Phase 2) occupies 42.9 Ha with an estimated 7.3 M tonnes of MSW in place as of the end of September 2021. The average annual disposal rate for the last five years is approximately 165,670 tonnes which comprises residential, commercial and industrial wastes.

The landfill has two operational areas: Phase 1 was operational between the 1950s and 1997, and has final cover. Phase 2 comprises the current active area of the landfill, which began in 1997. Phase 1 is unlined and covered with a combination geomembrane/clay cap. Phase 2 was constructed within a former lake basin (now referred to as the Phase 2 basin); it is partially lined and relies on hydraulic gradients to contain leachate. Development of the Hartland Landfill is guided conceptually by the cell development and filling plan, updated in 2022.

3.0 REGULATORY FRAMEWORK

There are a number of provincial and federal regulations that apply to LFG management, emissions management and reporting. Key regulations are listed below.

3.1 LFG Management Regulation

The BC *Landfill Gas Management Regulation* requires landfills that produce 1,000 tonnes of methane per year have a qualified professional prepare an LFG management plan. According to the regulation, the *Landfill Gas Management Plan* must be prepared in accordance with the BC *Landfill Gas Management Facilities Design Guidelines*, 2010 ('*the Guidelines*') and include:

- a description of existing or planned methods or maintenance practices and processes for LFG management on the site;
- a plan for installation, operation and maintenance of LFG management facilities (including contingencies for planned or emergency shutdowns); and
- recommendations for optimizing LFG collection to meet a 75% collection efficiency target four years after implementation.

The Guidelines specify a set of design and performance objectives/standards regarding LFG management and operations, including gas collection and composition; extraction and destruction infrastructure; and gas migration and assessment.

3.2 WorkSafeBC

Many of the compounds in LFG, particularly methane, hydrogen sulphide and individual volatile organic compounds, have worker exposure limits set out within WorkSafeBC regulations. The Hartland Landfill must comply with these limits.

3.3 BC Landfill Criteria for Municipal Solid Waste

The BC *Landfill Criteria for Municipal Solid Waste* (2016) stipulates compliance with the *Landfill Gas Management Regulation* and the Guidelines described above. As well, the landfill must be managed to ensure there is no public threat or nuisance/odour. Annual reporting and compliance review is a requirement under Hartland Landfill's *Operational Certificate 12659.* A full compliance report for all Operational Certificate requirements is provided in the Hartland Operations Report, 2021.

4.0 HEALTH AND SAFETY

LFG is flammable, toxic and poses an asphyxiation risk to landfill employees and contractors on site. Specifically:

- LFG can accumulate in confined spaces or low-lying area with poor air circulation, which can pose an asphyxiation risk due to the displacement of oxygen.
- Both trace gases and major gas constituents can result in acute toxicity if exposure occurs at high enough concentrations.
- Trace gases, usually associated with sulphur compounds, can create odours.
- Methane is explosive at concentrations between 5 and 15%. It is also a GHG with 25 times the global warming potential of carbon dioxide.

There is also potential for gas to laterally migrate off site. When gas pressure builds up in the landfill, gas migrates via cracks, soil pores, and/or fractures to equalize with the surrounding atmosphere. This includes migrating through permeable cover systems or subsurface migration toward adjacent properties. The main objective of an LFG collection system is to mitigate the above risks and reduce the potential for subsurface, lateral gas migration. However, while lateral movement can be mitigated with LFG collection and control, there will still be fugitive LFG emissions on site. A number of factors influence this, such as atmospheric pressure, groundwater level, gas pressure in the refuse mass, and permeability of cover systems. Gas collection system operation and utilization is discussed in sections 6.0 and 7.0, and monitoring programs are discussed in Section 9.0.

5.0 LFG GENERATION

Decomposition of refuse creates LFG; the composition and amount of gas generated varies based on factors, such as amount, type and age of waste, as well as environmental conditions, such as temperature and moisture content. LFG composition and generation rates are discussed in sections 6.0, 7.0 and 9.0.

Peak gas generation occurs during the first one to three years after disposal. Initially, decomposition of waste is an aerobic process and produces mainly carbon dioxide. As oxygen is depleted, the decomposition occurs under anaerobic conditions. The total waste input and waste composition affects overall gas generation rates. For clarity, it is important to note that gas production is the total amount of gas predicted to be produced by the landfill given waste composition, volume of existing waste in place and site-specific meteorological conditions.

5.1 Waste Quantity

The quantity of LFG production is dependent on the amount and type of waste received. In 2021, the Hartland Landfill received 190,210 tonnes of waste, which included 166,156 tonnes of general refuse, 19,920 tonnes of controlled waste and 4,134 tonnes of asbestos.

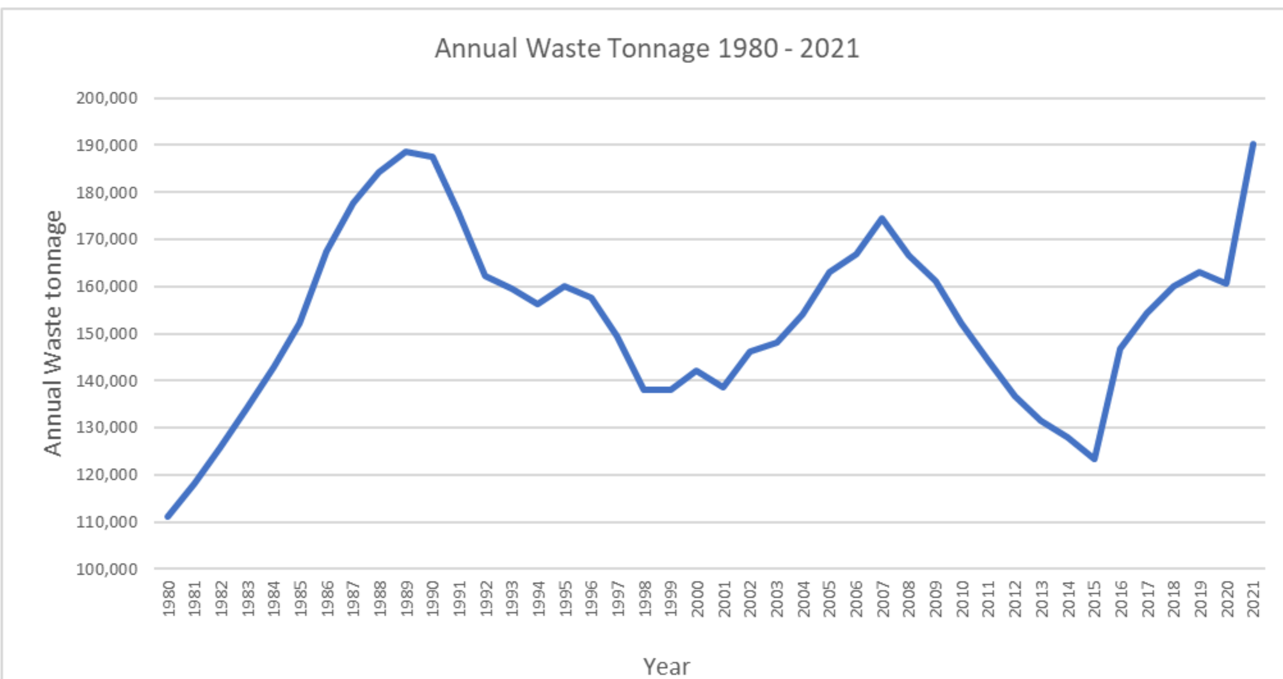


Figure 1 Annual Waste Tonnages Received or Estimated for Hartland Landfill from 1980-2021

5.2 Waste Composition

Waste composition is used to calculate methane generation rates in order to estimate overall LFG generation. Waste composition study results are included in Table 1 and with the gas generation data in Appendix A, including methane generation potential, a summary of waste sources and diversion, as required under the BC *Landfill Gas Management Regulation*.

The Waste composition study conducted by Tetratech (2016) does not quantify controlled waste. Controlled waste is classified by the CRD as wastes that due to environmental or health and safety considerations require special handling. Controlled waste deposited at the site is measured by scale and classified by type. In the previous annual reports, controlled waste was assumed to be mostly composed of relatively inert material. For the 2021 report, controlled waste data that is categorized based on different types of waste for three consecutive years (2019 through 2021) was used to determine the waste composition for controlled waste. The controlled waste composition was assumed to be consistent from 2014 to 2019, and the data for 2020 was considered separately due to the considerable (~30,000 tonnes) increase from 2020 to 2021. The reasons for the tonnage increase from 2020 to 2021 are summarized below:

- Tervita landfill was shut down in 2021
- Decrease in beneficial use at Hartland Landfill in 2021
- Increase in the received tonnage of wastewater treatment plant sludge at Hartland Landfill

For the purpose of this report, and on consultant's recommendation, the following assumptions were applied to categorize controlled waste decomposability:

- All asbestos and demolition wastes are relatively inert.
- Anything with a rock/sand nature or contaminated soil is relatively inert.
- Anything with unknown composition is categorized as Miscellaneous (50% moderately decomposable and 50% relatively inert).
- Waste sludge and pumping from sewage treatment are decomposable.

Controlled waste composition is attributed to each of the waste composition categories (relatively inert, moderately decomposable and decomposable waste) in the models. Table 1 indicates the waste composition used since 1980.

Table 1 Waste Composition 1980 to Present

Date Range	Relatively Inert	Moderately Decomposable	Decomposable
1980 to 1995	33.7%	24.9%	41.4%
1996 to 2000	33.9%	40.5%	25.6%
2001 to 2004	26.6%	39.6%	33.8%
2005 to 2009	33.2%	37.0%	29.9%
2010 to 2013	31.5%	39.1%	29.4%
2014 to 2019	36.5%	41.3%	22.2%
2020	36.8%	42.1%	21.1%
2021	36.8%	42.1%	21.1%

Note: The waste composition for 2020 is considered separately due to the considerable (~30,000 tonnes) increase from 2020 to 2021.

5.3 Waste Diversion

An organics (kitchen scraps) diversion program and ban was implemented on January 1, 2015. Diversion of a portion of highly decomposable waste from the landfill will result in a decrease in overall gas production. The 2016 waste composition study indicated organic material now comprises 21.1% of the waste stream, compared to 30% prior to the kitchen scraps ban. The Hartland Landfill *Gas Management Plan* predicted a decrease in gas production within the first one to three years, following the implementation of the diversion program. The Diversion program at Hartland accounted for a total of approximately 15,260 tonnes including 11,772 tonnes of kitchen scraps. This number doesn't account for all organic waste diverted in the CRD, as the material is received at other transfer or composting facilities on the island.

5.4 Gas Generation Modelling

LFG generation rates are estimated using the ENV model stipulated by the BC *Landfill Gas Management Regulation*. Additional modelling was completed in 2020 after a comprehensive landfill gas quantification project supported the use of the UBCi model as a more accurate representation of gas generation for Hartland Landfill Details on modelling inputs and methodology for the ENV model and UBCi model and the landfill gas quantification project are included in Appendix A1 through 7.

The following section summarizes only the required ENV model inputs, assumptions and results. Protocols require the model to be run from 1980 to present. The Scholl-Canyon model requires input of site-specific data, which is discussed below. The model is run annually to produce current gas generation rates and uses updated waste quantity and composition data. The following input data are required to run the ENV LFG generation model:

- historical tonnage back to 1980
- waste quantity
- waste composition (ratio of relatively inert, moderately decomposable and decomposable wastes in place)
- methane generation rate factor
- methane generation potential factor
- water addition factor
- annual rainfall

The methane generation rates and estimates were calculated by using the annual tonnage amounts and the waste composition data from studies completed in 1990, 1996, 2001, 2005, 2010 and 2016, as well as the most recent quantifiable kitchen scraps diversion data/estimates. Detailed waste composition information is provided in appendices A2a, A2b and A4 and percentages of relatively inert, moderately decomposable and decomposable wastes were estimated in accordance with ENV guidance. Prescribed methane generation potentials are shown in Table 2.

Table 2 Methane Generation Potential and Rate Factors Used for the ENV LFG Generation Model

Waste Type	Methane Generation Potential L_0 (m^3 methane/tonne)	Methane Generation Rate (k) Values
Relatively Inert	20	0.02
Moderately Decomposable	120	0.04
Decomposable	160	0.09

Table 2 shows the estimated annual methane production for Hartland Landfill since 2000 when LFG collection commenced.

Table 3 Estimated Methane Generation by Year at Hartland Landfill

Year	Annual Methane[1] Generation (tonnes/yr)
2000	7,112
2001	7,127
2002	7,229
2003	7,360
2004	7,493
2005	7,645
2006	7,760
2007	7,885
2008	8,034
2009	8,145
2010	8,230
2011	8,277
2012	8,293
2013	8,282
2014	8,106
2015	8,032
2016	7,979
2017	7,957
2018	7,909
2019	7,915
2020	7,934
2021	8,192

Notes: [1]Estimates generated using the ENV model

6.0 LFG COLLECTION AND MONITORING INFRASTRUCTURE

Systems to control and monitor fugitive LFG emissions have been implemented at Hartland Landfill. The objective of these controls is to:

- protect employee and public health and safety
- prevent migration of gas off-property or into on-site buildings
- reduce GHG
- capture gas for energy recovery
- control odour

The original LFG management system was installed in 1990 and upgraded in 1996. Under these early LFG systems, collected methane was destroyed via candlestick flare. Since 2004, LFG has been used to generate electricity. The current LFG management system consists of:

- An extraction well network, including vertical and horizontal wells.
- A collection system incorporating branch, lateral and header pipes to convey the collected LFG from the extraction network to the LFG utilization facility or flares.
- A LFG destruction facility with moisture separators, centrifugal blowers, flares, piping and electrical service.
- A 1.6-MW generator for LFG utilization.
- A LFG monitoring program.
- A subsurface gas migration monitoring network that includes gas monitoring probes located adjacent to the eastern property boundary and the perimeter of on-site building foundations.

6.1 Gas Extraction Wells

Table 4 shows the number and type of gas wells installed and operating in 2021. A complete summary of all gas wells, including installation and deactivation dates, is included in Appendix B. In 2021, no new wells were installed. The following wells were permanently decommissioned:

- VLGW042S and VLGW043S – Decommissioned due to engineering departments request to increase storage area for wood pile and crushed rock.
- VLGW047S and VLGW057 – Decommissioned as no longer producing a viable amount of methane.

Other than the decommissioned wells, all wells were read to monitor gas concentrations at some point during 2021.

Table 4 Number and Type of Gas Wells Installed or Operating (2015-2021)

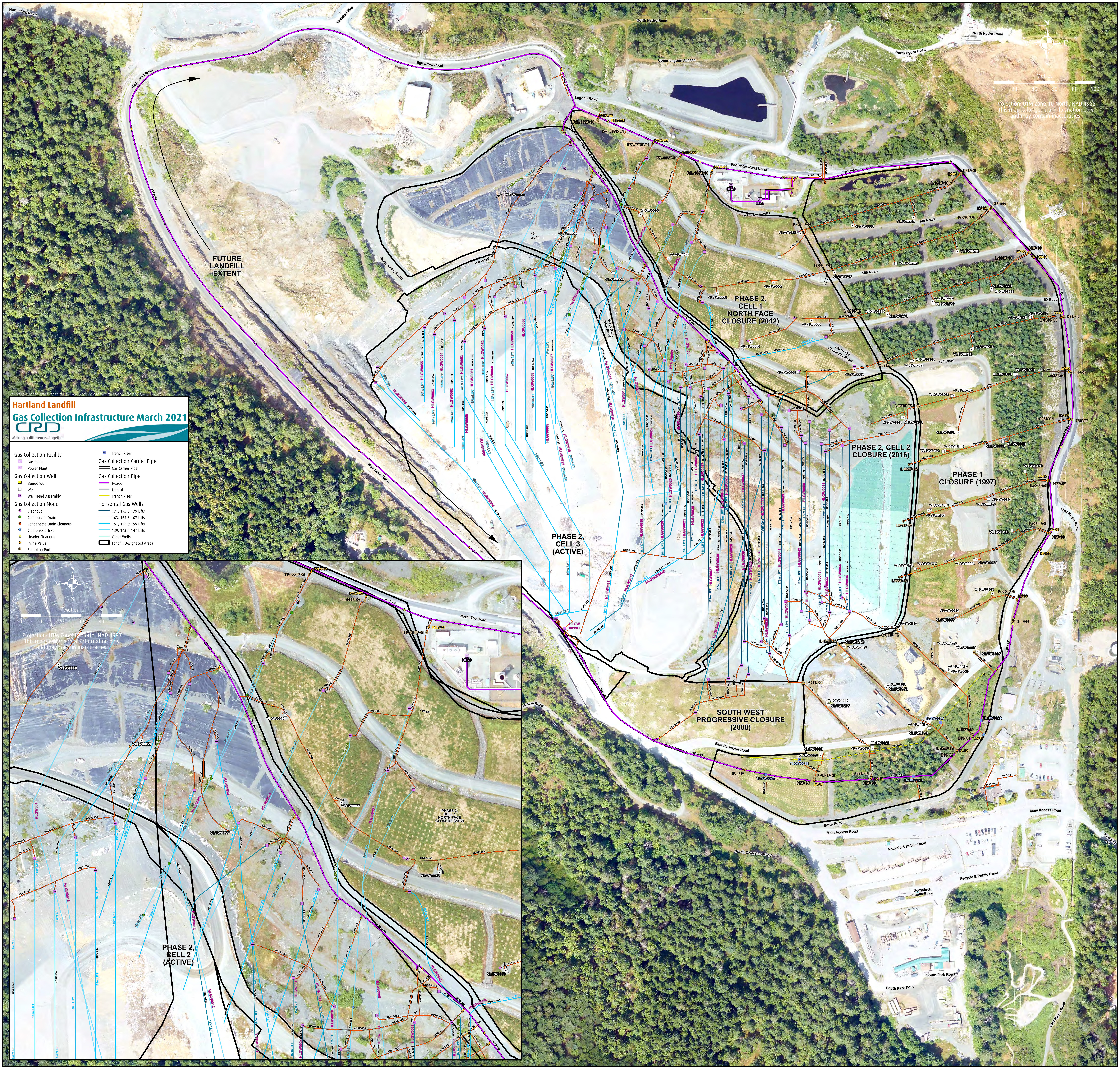
Type of Gas Well	2016	2017	2018	2019	2020	2021
Vertical gas wells operating	74	67	63	60	60	58
Horizontal gas wells operating	40	62	69	78	78	84
Leachate horizontal gas wells operating	12	12	9	8	6	6
Leachate gas trench operating	5	0	0	0	0	0
Wells installed, but not connected[1]	12	5	15	7	15	7
Total	**131**	**141**	**141**	**146**	**144**	**148**

Notes:
[1] number of wells installed, but not connected are not included in the final total.

See Figure 2 for the general location and layout of the LFG infrastructure.

Since 2011, the density of horizontal wells has increased from 45-50 m to 20 m on centre. Wells are placed on each vertical lift, approximately every 4 m, with each offset from the lower trench alignment. All new horizontal wells over 150 m in length are connected to laterals at both ends (where feasible). By the end of 2021, six new horizontal wells were activated (in Cell 3).

Current vertical well design includes dual zone shallow and deep wells extending approximately 16 m and 30 m into the waste, respectively. Vertical well saturation with leachate has complicated gas extraction and, as a result, no further vertical wells have been installed since the 2012 implementation of the *Landfill Gas Management Plan*. No vertical wells were installed in 2021. Installation and operation of vertical wells is continually reviewed.


CRD - Facilities Management & Engineering Services - Mar 10, 2021 - Technologist: jpbezeau - Map Document: HLGasWellIDs.mxd
Hartland Landfill
Gas Collection Infrastructure March 2021
CRD
Making a difference...together
Gas Collection Facility
Gas Plant
Power Plant
Gas Collection Well
Buried Well
Well
Well Head Assembly
Gas Collection Node
Cleanout
Condensate Drain
Condensate Drain Cleanout
Condensate Trap
Header Cleanout
Inline Valve
Sampling Port
Trench Riser
Gas Collection Carrier Pipe
Gas Carrier Pipe
Gas Collection Pipe
Header
Lateral
Trench Riser
Horizontal Gas Wells
171, 175 & 179 Lifts
163, 165 & 167 Lifts
151, 155 & 159 Lifts
139, 143 & 147 Lifts
Other Wells
Landfill Designated Areas
FUTURE LANDFILL EXTENT
PHASE 2, CELL 1 NORTH FACE CLOSURE (2012)
PHASE 2, CELL 2 CLOSURE (2016)
PHASE 1 CLOSURE (1997)
PHASE 2, CELL 3 (ACTIVE)
SOUTH WEST PROGRESSIVE CLOSURE (2008)
PHASE 2, CELL 2 (ACTIVE)
High Level Road
North Hydro Road
Lagoon Road
Perimeter Road North
160 Road
East Perimeter Road
East Hydro Road
Main Access Road
Recycle & Public Road
South Park Road
North Toe Road

6.2 Gas Well Field Operation and Monitoring

CRD staff monitor gas wells for methane, carbon dioxide, carbon monoxide, oxygen, balance gas, static pressure, differential pressure, temperature and flow on a monthly basis. The well field must be measured and balanced at least once per month and more often if there are changes in gas composition, or if there are fluctuations in the system vacuum. There are many factors that impact gas generation, so frequent well adjustments are critical to minimize oxygen, and optimize flow and methane content. Ideally, constant vacuum is applied at a well so that gas is drawn at approximately the same rate that it is being generated (a target of >40% methane and <2.5% oxygen is desirable). A comprehensive summary of gas concentration by well is provided in Appendix C. For 2021, on average, the LFG at the gas plant was comprised of 52.8% methane and 0.6% oxygen.

Data from the well field, including individual well gas flows, is provided in appendices B2 and B3. The well field was balanced 12 times in 2021 on a monthly basis (specific wells are checked more often to optimize gas extraction), as recommended by the BC *Landfill Gas Management Facilities Design Guidelines*

Table 5 shows that the six most productive wells contribute approximately 37% of the total gas volume. Figure 3 depicts gas collection by well as it contributes to the total gas collected.

Table 5 Gas Wells with the Highest Collection 2021

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Methane Annual Flow (scf)	Methane Flow (m^3)	Well Production (% of Total)	Cumulative Total (%)
HLGW016B	163	2012	54.7	182.4	52,371,925	1,483,016	16%	16%
HLGW066B	159 (3)	2018	53.7	75.5	19,517,939	552,689	6%	22%
HLGW028A	171	2017	53.4	59.7	16,741,615	474,072	5%	27%
HLGW0057	155(3)	2019	53.1	62.2	15,904,665	450,372	5%	32%
HLGW065B	159 (3)	2018	52.3	40.7	10,263,515	290,632	3%	35%
HLGW021B	165	2013	56.2	36.0	9,749,817	276,086	3%	38%

If a gas well does not produce enough methane, the valve is often turned down or off. Well production is reviewed monthly during well field balancing events. Wells with poor quality or no gas may be monitored over time for improvements before being removed from the program. It is recommended that older, non-producing wells be removed from the monitoring program and labelled as ‘inactive’ after 18 months.

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7.0 LFG UTILIZATION AND COLLECTION EFFICIENCY

The volume of collected LFG is measured by flow meters at the LFG plant and recorded on the CRD SCADA system. The data is compiled to determine collection and utilization rates, and then compared to the generation model to estimate the collection efficiency of the system. LFG collection refers to all gas drawn into the gas plant, while LFG utilization refers only to the gas used to generate electricity. Table 6 shows a summary of gas collection, utilization and overall collection efficiency. Figures in the following section illustrate the collection efficiency for the last several years (2010-2021) and the full set of data is provided in Appendix C1.

The LFG utilization facility shown in Figure 4 consists of six major components:

1. **Conditioning Skid:** Receives the LFG from the CRD collection/blower system. The conditioning skid cools the gas and reduces moisture, which drains into the condensate collection system. It also reduces the amount of siloxane, which increases wear and tear on generator components.
2. **Refrigeration Plant:** Provides coolant to the conditioning skid by circulating it, as required, to maintain the LFG at 2°C.
3. **Engine:** 20-cylinder, 2,200-HP Caterpillar. The engine runs a direct drive 1,200-rpm, 1.6-MW generator. Electricity produced is fed into the BC Hydro grid.
4. **Transformer:** The unit converts 600 V to 25 kV.
5. **Switch Gear:** Monitors stability of the line input to the BC Hydro grid.
6. **Master Control Building:** Houses the controls that interconnect the utilization facility with the collection system. It also provides system operation controls, such as continuous quality, flow rate and pressure monitoring. The CRD has upgraded its system controls to communicate with the utilization facility.

Gas is drawn into the facility by the blowers and passed through the conditioning skid. An automated valve maintains the required gas pressure for the generator, while excess gas is fed back to the candlestick flare. Gas is only directed to the groundflare during extended periods of generator downtime, during times of generator maintenance or BC Hydro power outages.

Figure 4 Hartland LFG Plant

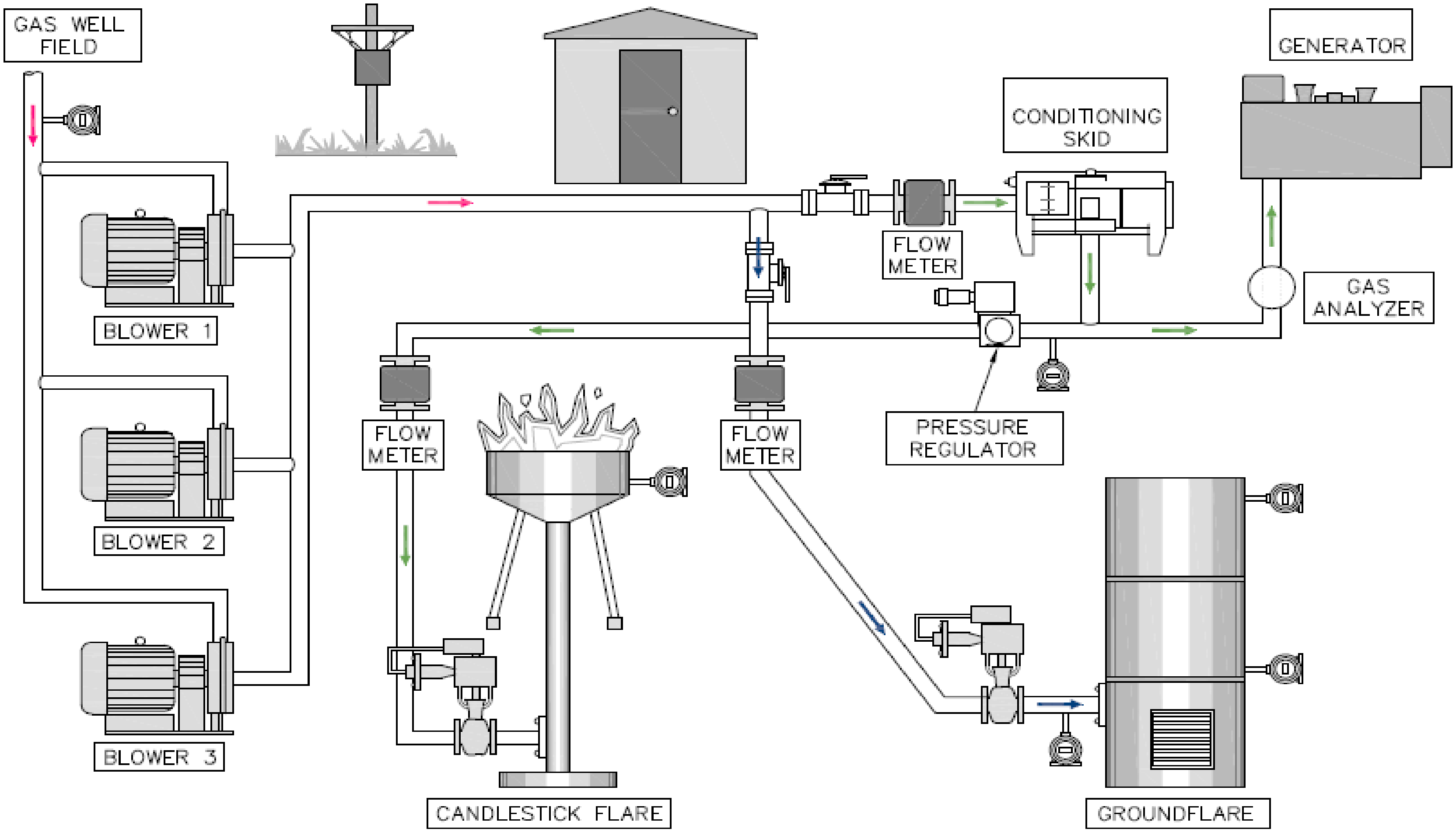


Table 6 LFG System Collection Efficiency 2010-2021 ENV Model

Year	Modelled Annual[1] Methane Generated ENV Model (scfm)[2]	Measured Annual Gas Capture (scfm)[2]	Collection Efficiency (%) ENV Model	GHG Emission (tonnes/year CO2e)	GHG Emission (tonnes/year CO2e)[3] with biological oxidation
2010	1,687	546	32	139,133	104,391
2011	1,696	581	34	136,052	102,013
2012	1,700	829	49	106,201	79,689
2013	1,697	987	58	86,624	64,941
2014	1,671	942	56	89,474	66,706
2015	1,646	1,085	66	69,330	51,283
2016	1,632	1,009	62	75,939	56,999
2017	1,627	1,102	67	64,173	48,055
2018	1,621	1,037	64	71,219	53,422
2019	1,622	1,062	65	68,451	51,235
2020	1,626	1,084	67	66,237	49,588
2021	1,679	1,150	69	64,522	48,391

Notes: [1] Generated using the ENV model; [2] Normalized to 50% methane; [3]Assuming 25% biological Oxidation

Table 7 LFG Collection System Efficiency 2015-2021 UBCi Model

Year	Modelled Annual[1] Methane Generated UBCi Model (scfm)	Measured Annual Gas Capture (scfm)[1]	Collection Efficiency (%) UBCi Model	GHG Emission (tonnes/year CO2e)	GHG Emission (tonnes/year CO2e)[3] with biological oxidation
2015	1,409	1,085	77	39,488	29,643
2016	1,382	1,009	73	45,459	34,126
2017	1,322	1,102	80	26,813	20,128
2018	1,346	1,037	76	37,659	28,271
2019	1,363	1,062	78	36,684	27,539
2020	1362	1,084	81[2]	33,881	25,435
2021	1,469	1,150	78	38,880	29,160

Notes: [1] Normalized to 50% methane; [2] calculated in June and October based on empirical study; [3]Assuming 25% biological Oxidation

The data above present collection efficiency using the ENV gas generation model (Table 6), as stipulated in the *Landfill Gas Management Facilities Design Guidelines*, and the UBCi model (Table 7). In 2020, landfill gas emissions were measured across the site and a methane mass balance was completed. Data was compared to three landfill gas generation models (including the required ENV model) and collection efficiency was calculated. Gas generation results from the UBCi model correlate closely with the methane mass balance and result in a higher collection efficiency. The UBCi model was used to retroactively calculate collection efficiency back to 2014. More detail on this project is provided in the next section (7.1.1).

In 2021, collection efficiency using the ENV model and UBCi model was calculated at 69% and 78%, with total uncollected (fugitive) GHG emissions estimated at 49,600 and 29,800 tonnes CO_2e, respectively (Figure 5). Gas collection varies as a result of refuse age, well installation/operation, and well balancing activity.

Overall, the following observations can be made regarding gas production and collection at Hartland:

- Phase 1 gas production is depleting. Waste in this area of the landfill has been in place for more than 30 years and a decline in gas production is expected.
- There is decreased gas production in some high producing wells in Phase 2, which is expected due to age of refuse and advanced methanogenic processes.
- Activation of gas wells in Cell 3 required sufficient refuse in place to prevent oxygen intrusion. Wells in Cell 3 are now producing sufficient gas. More wells will be brought online in 2022.

**Figure 5	Fugitive GHG Emission at Hartland Landfill 2004-2021 (ENV model)**

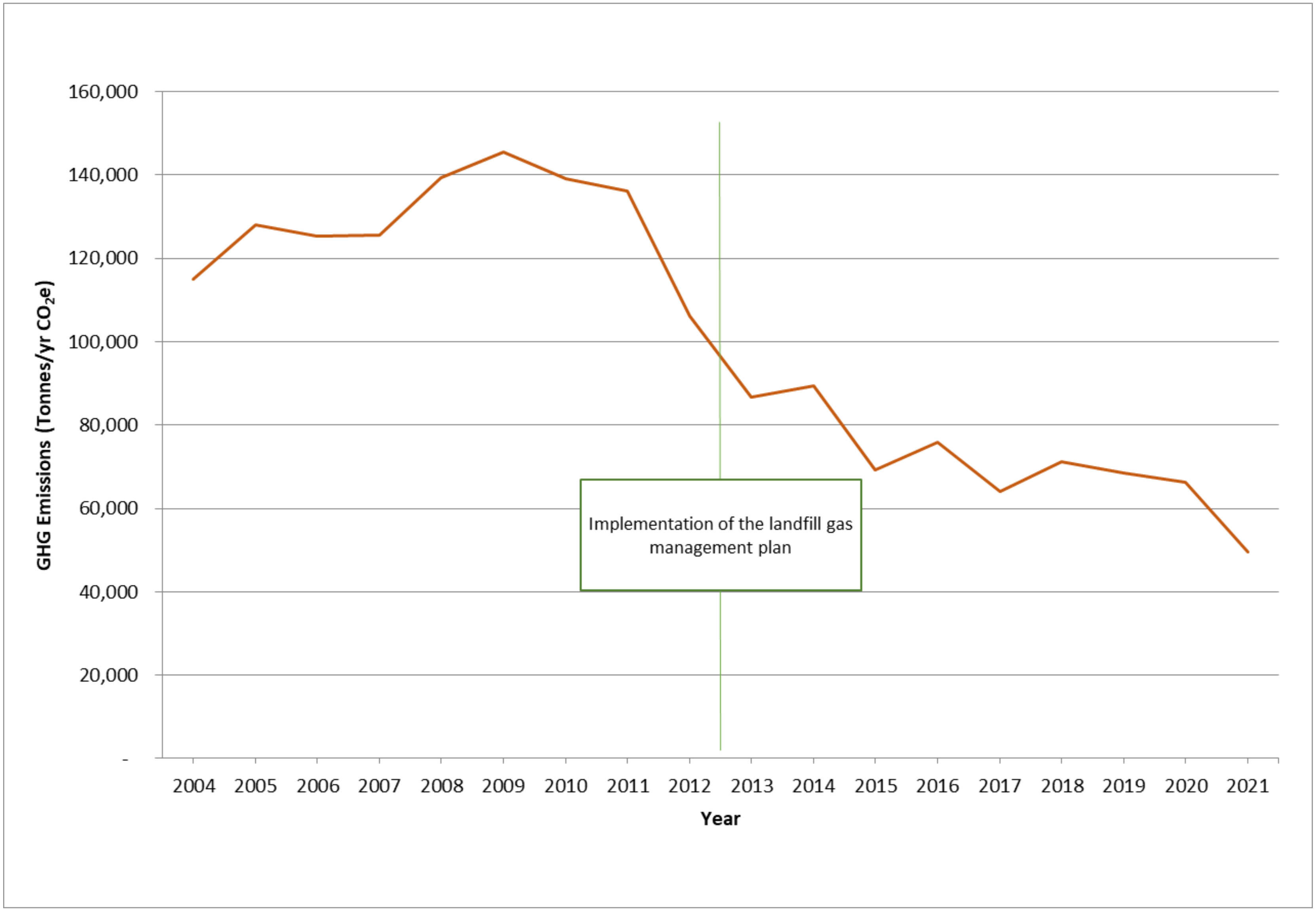
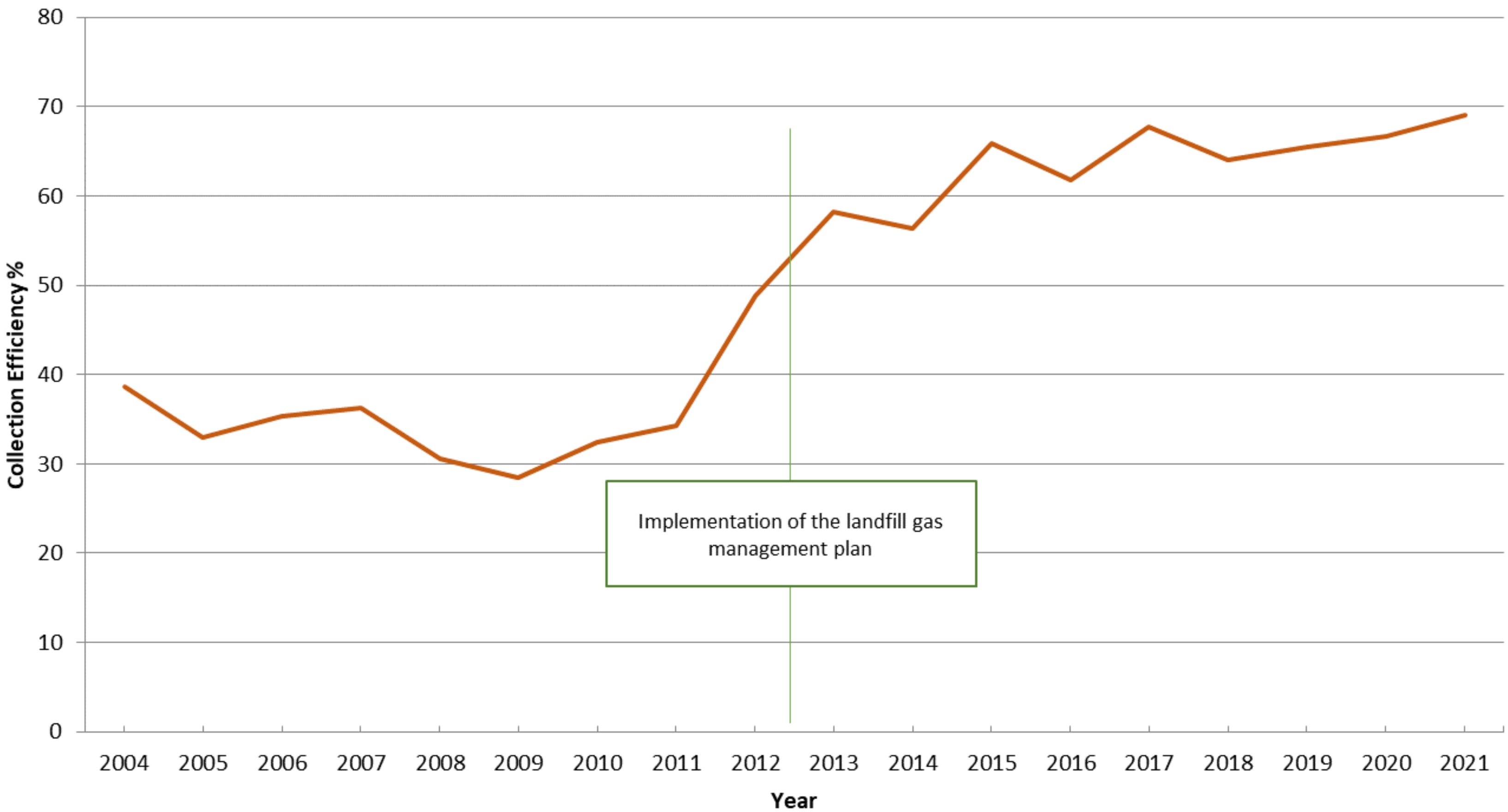


Figure 6 Collection Efficiency Estimates 2004-2021 (ENV Model)



7.1.1 Gas Generation, Quantification and Modelling Study

Over the past few years, the CRD has been completing a number of long-term LFG recovery and alternatives assessments in response to aging infrastructure and LFG production exceeding the capacity of the generator. Based on these assessments, the CRD is planning to upgrade LFG to renewable natural gas (RNG) for sale to the FortisBC natural gas network.

In 2020, to better understand LFG generation at Hartland, and to support the RNG project, CRD staff commissioned a study to:

- quantify fugitive landfill gas emissions across the landfill;
- assess the current landfill gas collection efficiency against modelled landfill gas generation; and
- identify and propose mitigation strategies for major emission hot spots.

Fugitive emissions at Hartland were empirically measured during two field events in 2020 (June and October). The data were used to complete a comprehensive landfill gas mass balance for the site across three different landfill gas generation models. Report findings confirm that the current ENV model overestimates landfill gas generation and fugitive emissions at Hartland, while the UBCi model more accurately estimates gas generation. Consequently, the calculated gas collection efficiency is higher for the UBCi model. According to the UBCi model, which is supported by empirical, mass balance data, Hartland Landfill is meeting and exceeding the 75% collection efficiency requirement set out in the *Landfill Gas Management Regulation*. The full report is provided in Appendix A. The analysis also found that current landfill cover systems were estimated to biologically oxidize 29% of the total fugitive emissions in 2020. For the 2021 report, based on the advice of our consultant, we are assuming 25% biological oxidation through the landfill cover based on the US EPA Oxidation Table (Appendix A).

The report also identified additional strategies that can be taken by CRD to increase collection efficiency and biological oxidization, including enhancements to the existing landfill gas collection system and application of an engineered biocover system on both closed and operational phases of the landfill.

One area was specifically targeted for enhanced collection in 2020 as empirical data estimated that it accounted for 17% of the total fugitive emissions at the landfill. This hotspot, located at the interface between bedrock and refuse presents gas collection challenges due to oxygen intrusion. Staff worked with a consultant to develop a specialized gas collector design and two rock wells were installed to capture the gas production in this zone: RWHGW01A and RWHGW01B. The gas capture for these wells in 2021, did not constitute a major portion of the overall gas production. CRD staff and the consultant will be working on improving or designing alternative ways to address this hotspot.

7.1.2 Destruction Devices and Usage

Table 8 shows the average gas collected from 2014-2021 and flows through destruction devices (generator, candlestick or groundflare). Flaring of gas occurs when gas collection exceeds generator capacity or during generator downtime. The generator was down for maintenance in February, March, May and July for approximately 75 days in total. During this time, the groundflare was operational.

The BC *Landfill Gas Management Facilities Design Guidelines* specify that a candlestick flare should not be used as a primary combustion device but can be utilized as a backup combustion device when flows exceed the capacity of other approved devices. As a result, 50% or more of the total LFG collected should be directed through high efficiency destruction devices (groundflare or generator). Since 2009, the generator and groundflare have been the primary destruction devices. In 2021, 58.4% of the gas was directed through approved destruction devices.

Table 8 LFG Flows to Destruction Devices (2015-2021)

Annual Average	Year						
	2015	2016	2017	2018	2019	2020	2021
Gas Collected (scfm)*	1085.5	1003.3	1101.8	1037.1	1062.2	1084.0	1150.1
Gas Burned by Generator (scfm)*	318.9	263.9	467.2	534.6	439.3	439.3	443.4
Gas Burned by Candlestick Flare (scfm)*	304.0	313.6	461.1	469.5	394.6	394.6	520.2
Gas Burned by Groundflare (scfm)*	464.1	430.0	176.6	33.0	228.3	228.3	127.6
Total Gas Flared	70.8%	74.1%	57.9%	48.5%	58.6%	57.5%	56.3%
% Through candlestick	28.01%	31.26%	41.85%	45.27%	37.15%	37.15%	45.23%

Notes: *Normalized to 50% methane

7.1.3 LFG Management Plan Implementation Status

The CRD has implemented the conceptual design in the *Landfill Gas Management Plan*. However, since the plan was prepared, some operational changes have occurred, which are summarized below:

2012	Per the *Landfill Gas Management Plan*, alignment of horizontal wells changed from east-west to north-south due to the master fill plan cell phasing and progression.
2012/2013	Relocation and reconfiguration of controlled waste disposal areas. Controlled waste, initially landfilled in clay-lined cells, is now trenched into refuse. Landfilling was conducted over the controlled waste area expanding the available footprint for Cell 2. This benefits overall collection in that it allows gas wells to be installed in controlled waste areas that would otherwise be inappropriate due to clay.
2014	Installation of vertical gas wells has been delayed pending further review of efficacy due to leachate inundation or minimal gas production. Vertical gas wells installed in recent closed areas (2012) were not productive due to density of horizontal wells and overlapping areas-of-influence.
2014	Since implementation of the *Landfill Gas Management Plan*, horizontal well installation depths have been reduced (made shallower). The proposed deeper wells were intended to accelerate activation; however, this was not actualized, and the deeper wells triggered odour and safety issues during installation. As a result, this part of the *Landfill Gas Management Plan* was revised to allow for shallow wells. The shallow wells have fewer health and safety considerations, are less expensive to install, and can be activated in the same timeframe, as deeper wells specified in the plan.
2015/2016	Filling plan sequencing has changed since the plan was prepared. These changes represent schedule variations rather than whole scale deviations from *the Landfill Gas Management Plan*. Changes include: • Phase 2, Cell 2 vertical extension by two lifts to allow time for completion of the cliff quarry and construction of Cell 3.
2017	A bypass line valve was opened at the gas plant to reduce backpressure on the well field and increase gas flows to the plant. As a result, flows increased by 50-100 scfm.
2018	No significant changes to the system were made in 2018.
2019	No significant changes to the system were made, but additional Cell 3 wells are now coming online, which is consistent with the *Landfill Gas Management Plan* prediction that Cell 3 well activation may take up to five years.
2020	No significant changes to the system were made. LFG generation and emissions study was completed to confirm the effectiveness of the current collection infrastructure and well field balancing programs. Additional well field optimization projects are planned for 2021.
2021	CRD staff will continue the well balancing efforts several times a month[1] to optimize the methane generation in each well and subsequently improve the well field gas production (i.e. reducing nitrogen and oxygen content and increasing the methane production)

[1] The gas wells will be monitored and adjusted several times a month, however, the results will be reported once a month.

8.0 OPERATIONAL PERFORMANCE

Detailed landfill operational updates and changes are outlined in the *Hartland Landfill 2021 Operations Report*. There were no significant changes to the operation of the LFG system in 2021. The gas collection system operates continuously, except when there is a power failure or alarms that result in system shutdown. Table 9 summarizes collection system downtime (i.e., no vacuum applied on the collection system), approximately five days. All downtime can be attributed to power outages and planned/unplanned maintenance. In August 2020, a generator was installed to provide backup power to the gas plant blowers to ensure well field operation/vacuum in the event of a power outage.

Table 10 summarizes the 2021 generator performance, including electricity production, which compares actual operating hours to available operating hours for each month. Average energy production for 2021 was 75%, an increase from 2020 at 70%.

Table 9 Summary of 2021 Blower Downtime by Month

Month	Downtime (hours)
January	18.7
February	1.4
March	9.5
April	0.5
May	2.5
June	4.9
July	4.6
August	1.2
September	0
October	1.5
November	1.3
December	0.5
Total	**46.6 (1.9 days)**

Table 10 Generator Performance 2021

Month	Engine Run Hours	Electricity Generated (MW-hour)[1]	Production (%)
January	615	738.8	62%
February	546	712.2	66%
March	409	520.4	44%
April	689	1038.2	90%
May	674	1034.2	87%
June	661	958.9	83%
July	613	886.4	74%
August	608	848.3	71%
September	715	1024.0	89%
October	531	736.3	62%
November	580	884.0	77%
December	705	1064.2	89%
Average	612	870.5	75%

Notes: [1] Reported by BC Hydro

9.0 MONITORING PROGRAMS

Annual monitoring is conducted to evaluate LFG collection and control system performance. Monitoring includes both operational monitoring, e.g., generator performance monitoring and environmental monitoring (e.g., gas quality in surface probes). This section and Table 11 summarize the LFG monitoring activities.

Table 11 Summary of LFG Monitoring Programs

Task & Objectives	Frequency	Primary Parameters	Criteria	Action if Criteria Exceeded	Monitoring By
1. Perimeter subsurface probe monitoring					
To detect potential subsurface LFG migrating off site	Quarterly at perimeter probes	CH_4, CO_2, O_2, pressure and/or vacuum	LEL for methane (5.0%)	Increase sampling frequency. Initiate off-site sampling (see Task 7 below). Evaluate effectiveness of remedial measures.	EPro Staff
2. Building foundation probes					
To detect potential subsurface LFG migration into on-site building foundations	Quarterly at foundation probes	CH_4, CO_2, O_2, pressure and/or vacuum	20% of LEL 10% of LEL – CRD internal standard	Initiate appropriate remedial action.	EPro Staff
3. On-site ambient grid sampling					
To assess on-site LFG concentrations at known grid locations across the landfill surface	Once per year	THC as methane and H_2S	100 ppm as THC (methane)	Initiate investigation of remedial measures. Identify locations >100 ppm THC for Task 4.	EPro Staff
4. On-site ambient hotspot monitoring					
To identify localized sources of LFG, or releases that could create potential health, safety, environmental or operational problems	Once per year	THC as methane and H_2S	12,500 ppm/1.25% THC (25% of the LEL) 5 ppm H_2S	Initiate investigation of remedial measures. Identify locations with THC >1,000 ppm or H_2S >5 ppm as Z points (hotspots). Personal gas detectors required in high-risk areas.	EPro Staff

Task & Objectives	Frequency	Primary Parameters	Criteria	Action if Criteria Exceeded	Monitoring By
5. Gas well field monitoring					
Monitor the concentrations and gas flows from all the wells connected to the gas collection system	Minimum of monthly	Temperature, vacuum, flow rate, CH_4, CO_2, O_2	Maintain gas flow and methane content, control oxygen intake	Adjust wellhead vacuum.	Hartland Staff
6. Blower, flare and generator station monitoring					
Monitor the performance of the moisture separators, blowers and flare and/or generation station	Continuous	Temperature, pressure, gas flow rate, CH_4, O_2	Operational	Adjust well field if outside operational criteria.	Hartland Staff
7. Off-site properties					
To measure concentrations of gases in the event of LFG migrating off site	Task 1 exceedance	THC and H_2S	Detectable above air quality guidelines and WorkSafeBC criteria	Initiate appropriate remedial action.	Hartland Staff
8. On-site building gas monitoring					
To monitor methane and H_2S levels to protect workers in on-site buildings	Task 2 exceedance	Methane and H_2S	20% of the LEL (1% CH_4) – the Guidelines 10 ppm H_2S – WorkSafeBC	Initiate appropriate remedial action.	Hartland Staff
9. LFG speciation					
To measure concentrations of compounds in the LFG at the inlet to the gas conditioning skid and power generation station	Once every two years	VOC and H_2S	WorkSafeBC criteria for individual compounds in ambient air	Initiate Task 10 if calculated ambient concentrations exceed WorkSafeBC limits.	EPro Staff
10. On-site ambient air quality measurement					
Measure ambient VOC	Task 9 exceedance	VOC and H_2S	WorkSafeBC criteria for individual compounds in ambient air	Initiate remedial action.	EPro Staff
11. Generator performance evaluation					
Monitor the performance of the groundflare (stack test emissions)	Annual	Various	ENV Air Quality Objectives and WorkSafeBC criteria	Initiate remedial action.	EPro Staff

Notes:
EPro staff = Environmental Protection staff
LEL = lower explosive limit
VOC = volatile organic content

9.1 Subsurface Gas Monitoring – Perimeter and Foundation Probes

Perimeter probes and foundation/trench probes have been used at Hartland Landfill to monitor for subsurface gas migration since 1996. Perimeter and foundation probes are required in the BC *Landfill Criteria for Municipal Solid Waste* (2016). Quarterly monitoring is conducted in five eastern perimeter monitoring probes and 12 foundation monitoring probes (Figure 7). Through long-term improvements to the LFG collection system, LFG migration potential has been mitigated and there is no indication of gas migration off site. Although the risk is minimal, ongoing monitoring is required to meet regulatory requirements and to confirm worker and public health and safety. A complete monitoring methodology, probe locations, details, and data from the perimeter and building foundation probes are provided in Appendix D.

9.1.1 Perimeter Probes

All probes were monitored according to the standard operating procedures four times in 2021; data is presented in Table 12 and Table 14, maximum values are shown in Table 13. There was no detectable methane recorded in 2021. Consistent with historical data, CO_2 levels are slightly higher in the shallower ‘B’ probes than the deeper ‘A’ probes. Elevated carbon dioxide levels may give an early indication of the presence of LFG; however, no unusually high CO_2 levels were observed. Ongoing monitoring will continue to determine if any trends develop.

9.1.2 Foundation Probes

Foundation probes were monitored four times in 2021, which is in compliance with ENV requirements (Table 14 and

Table 15). Carbon dioxide levels were similar to previous years. There were no recorded exceedances of the ENV limit of 1.0% methane during the reporting period. Monitoring will continue to satisfy regulatory requirements and to determine if any trends develop.

Perimeter and foundation probe monitoring results for 2021 were in compliance with the ENV requirements. Methane was not detected. The data indicates minimal risk of subsurface methane migration to adjacent properties or buildings. Quarterly monitoring should continue, to meet regulatory requirements and to evaluate health and safety risks.

Table 12 Average Gas Concentrations in Subsurface Perimeter Probes 2015-2021

Probe	CH_4 (%)							Probe	CO_2 (%)							Probe	O_2 (%)						
	2015	2016	2017	2018	2019	2020	2021		2015	2016	2017	2018	2019	2020	2021		2015	2016	2017	2018	2019	2020	2021
GP-1A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-1A	0.0	0.1	0.0	0.0	0.0	0.0	0.1	GP-1A	20.6	20.6	20.3	20.3	20.8	20.8	21.5
GP-1B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-1B	2.0	1.5	0.9	0.8	1.5	2.5	3.0	GP-1B	18.7	18.9	19.3	19.4	19.1	19.1	16.1
GP-2A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-2A	0.0	0.1	0.0	0.0	0.0	0.0	0.1	GP-2A	20.6	20.4	20.4	20.2	20.6	20.8	21.6
GP-2B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-2B	2.9	3.8	1.6	3.1	3.8	4.3	2.2	GP-2B	15.2	13.2	15.6	13.9	12.5	15.7	16.8
GP-3A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-3A	1.7	1.8	1.8	1.4	1.9	1.5	1.9	GP-3A	13.5	14.6	12.8	14.7	13.8	15.5	18.5
GP-3B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-3B	4.2	4.3	3.9	3.9	5.9	6.1	5.0	GP-3B	14.8	15.0	16.2	15.4	15.5	15.3	14.9
GP-11A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-11A	0.1	0.1	0.1	0.0	0.0	0.0	0.1	GP-11A	20.3	20.6	20.3	20.3	20.8	20.9	21.5
GP-11B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-11B	0.4	0.8	1.4	1.1	1.4	2.1	2.0	GP-11B	19.7	19.9	19.2	19.5	19.8	18.6	19.5
GP-12A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-12A	1.2	1.2	2.0	2.0	1.3	2.3	1.8	GP-12A	18.1	15.9	13.4	13.6	16.4	13.5	15.3
GP-12B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GP-12B	4.5	6.1	4.8	4.9	7.3	7.0	5.2	GP-12B	11.4	11.3	12.9	12.9	9.0	10.5	12.9

Table 13 Maximum Gas Concentrations in Perimeter Probes 2014-2021

Probe	CH_4 (%)	CO_2 (%)
GP-1A	0.00	0.10
GP-1B	0.00	3.10
GP-2A	0.00	0.10
GP-2B	0.00	5.50
GP-3A	0.00	2.20
GP-3B	0.00	8.40
GP-11A	0.00	0.10
GP-11B	0.00	2.40
GP-12A	0.00	5.40
GP-12B	0.00	9.00

Figure 7 Location of Gas Probes

Table 14 Average Gas Concentrations in Subsurface Foundation Probes 2015-2021

Probe	CH_4 (%)							Probe	CO_2 (%)							Probe	O_2 (%)						
	2015	2016	2017	2018	2019	2020	2021		2015	2016	2017	2018	2019	2020	2021		2015	2016	2017	2018	2019	2020	2021
GP-4A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-4A	1.35	1.70	2.07	0.05	0.00	2.90	1.1	GP-4A	19.23	18.40	19.37	20.75	20.98	18.33	20.8
GP-5A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-5A	1.00	0.80	0.73	0.65	0.58	0.83	0.8	GP-5A	19.70	19.90	19.80	19.68	20.18	19.90	21.0
GP-6A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-6A	0.58	0.50	1.03	1.00	0.78	0.75	1.3	GP-6A	20.00	19.80	19.13	19.35	20.03	19.95	20.3
GP-6B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-6B	0.63	0.80	0.68	0.68	0.53	0.85	1.5	GP-6B	19.78	19.60	19.55	19.63	20.33	19.75	20.2
GP-7A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-7A	0.30	0.20	0.18	0.30	0.25	0.23	0.5	GP-7A	20.45	20.50	20.13	20.08	20.63	20.60	16.8
GP-7B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-7B	0.23	0.10	0.08	0.13	0.15	0.15	0.3	GP-7B	20.50	20.60	20.30	20.33	20.73	20.70	21.6
GP-8A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-8A	0.23	0.20	0.15	0.13	0.20	0.15	0.3	GP-8A	20.53	20.50	20.25	20.35	20.63	20.70	21.7
GP-9A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-9A	0.23	0.20	0.20	0.10	0.18	0.15	0.2	GP-9A	20.50	20.40	20.13	20.33	20.73	20.73	21.7
GP-13A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-13A	3.90	2.00	3.30	2.77	2.43	2.78	2.4	GP-13A	17.03	18.10	16.80	17.27	18.48	17.63	19.0
GP-14A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-14A	3.28	0.90	1.13	0.48	0.83	0.60	0.7	GP-14A	17.80	19.60	19.10	19.95	20.38	19.93	20.3
GP-17A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-17A	0.23	0.10	0.73	0.20	0.05	0.15	0.2	GP-17A	20.43	20.30	19.63	20.00	20.58	20.65	21.7
GP-18A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	GP-18A	0.33	0.20	0.28	0.33	0.25	0.18	0.2	GP-18A	19.80	19.70	19.40	19.20	20.03	20.23	21.0

Table 15 Maximum Gas Concentrations in Foundation Probes 2015-2021

Probe	CH_4 (%)	CO_2 (%)
GP-4A	0.00	3.80
GP-5A	0.00	1.30
GP-6A	0.00	1.30
GP-6B	0.00	1.60
GP-7A	0.00	0.40
GP-7B	0.00	0.30
GP-8A	0.00	0.20
GP-9A	0.00	0.30
GP-13A	0.00	6.00
GP-14A	0.00	1.00
GP-17A	0.00	0.40
GP-18A	0.00	0.30

9.2 Surface Emissions and Hotspot Sampling

Fugitive emissions can occur from advection and/or diffusion via soil pores, gaps and defective cover materials and are monitored routinely through surface monitoring. This monitoring assesses landfill closure integrity, supports worker health and safety, informs operational or capital planning, and supports optimal LFG collection. This monitoring is a simple and low cost means to assess methane and non-methane emissions. Although hotspot (also known as Z-points) locations change over time, they are usually located at breaks or seams of cover systems and near side slopes in Phase 2, where gas collection is a challenge. The locations of all grid points and hotspots, as of July 2021, are shown in Figure 8. A summary of the results is shown in Table 16 and Table 17.

A historical summary of all Z-points is provided in Appendix E. At the end of 2021, there was a total of 26 Z-points identified. There were no elevated hydrogen sulphide concentrations. The absence of hotspots in Phase 1 indicates that the cover and gas collection system in the permanent closure is functioning. Annual monitoring should continue. Hotspots have decreased significantly since the implementation of the *Landfill Gas Management Plan* in 2012.

Table 16 Summary of Grid Sampling Results 2021

Survey date	July
Grid points Monitored	185
#Grid points >100 ppm THC	17
Maximum THC as methane (ppm)	150

Notes:

[1] Does not include discontinued, and grid points in Active Face and Controlled Waste areas, where the waypoints could not be accessed at the time of the survey

Table 17 Summary of Hotspot Results 2021

Survey date	July
Total # hotspots[1]	26
New hotspots at end of survey	3
Hotspots discontinued[2]	10
Maximum CH_4 (ppm)	75,000

Notes:

[1] Total number of hotspots at the end of the survey date

[2] Hotspots discontinued at the end of the survey date

	13-16 July, 2021	
WAYPOINT	Methane	H2S
	ppm	ppm
Z88	311	0.007
Z94	2	0.002
Z104	65	0.002
Z106	5,007	0.006
Z109	59	0.002
Z111	2	0.002
Z112	1	0.002
Z113	38	0.002
Z114	40	0.002
Z118	2	0.003
Z119	2,400	0.004
Z120	6	0.001
Z122	1,077	0.004
Z123	0	0.002
Z124	693	0.001
Z125	700	0.006
Z126	456	0.004
Z127	75,000	0.016
Z128	2,120	0.077
Z129	2,670	0.002
Z130	1,111	0.002
Z131	1,905	0.002
Z132	391	0.002
Z133	3,000	3.200
Z134	14,000	0.150
Z135	2,200	0.004

CRD
Making a difference...together

Metres
0 20 40 60 80 100

Projection: UTM ZONE 10N NAD 83

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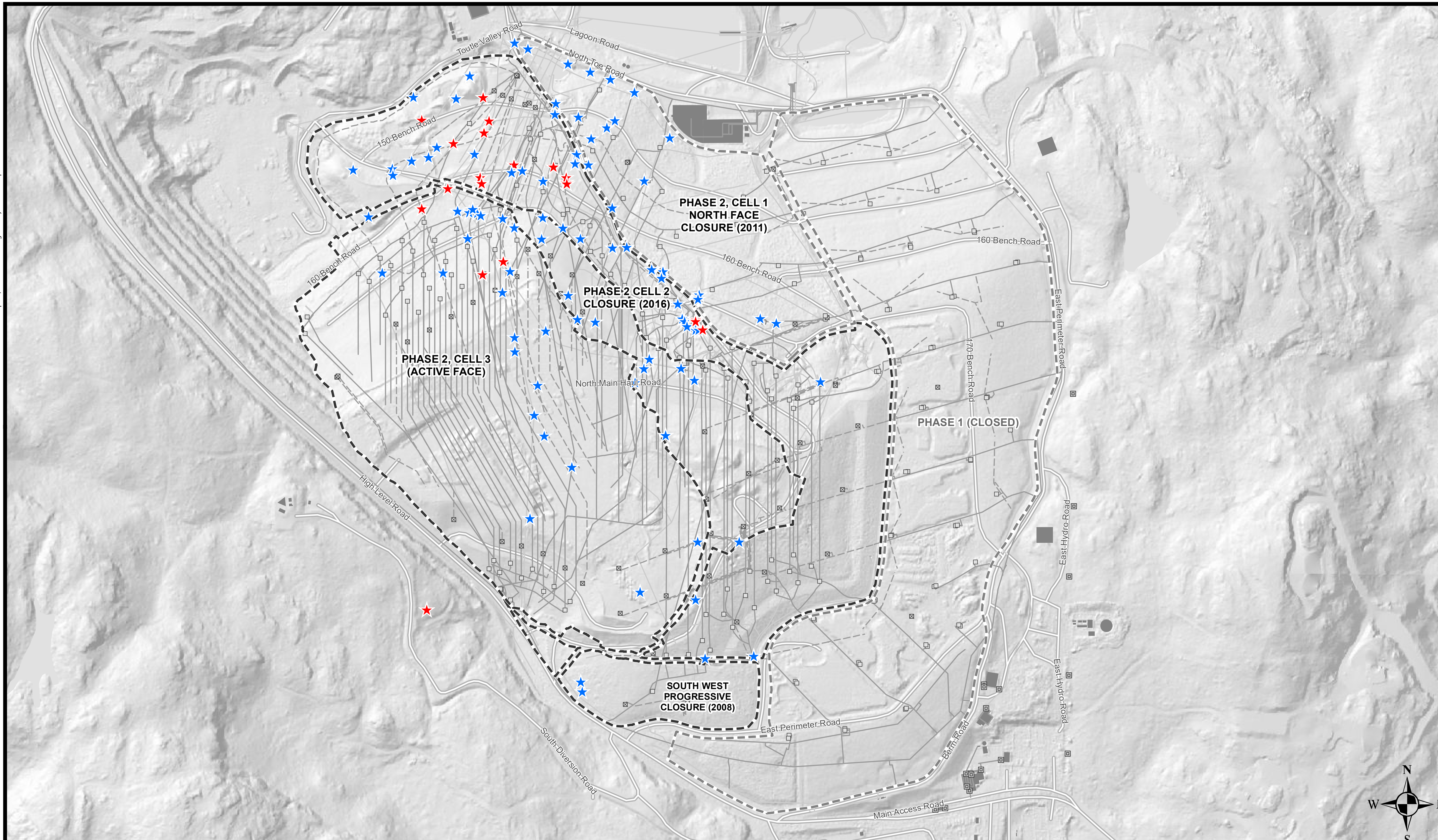
Combustible Gas Result
(parts per million)
- 0-99 ppm
- 100-999 ppm
- 1,000-12,499 ppm
- >12,500 ppm

- Gas Probes
- Active Gas Wells
- Abandoned or Inactive Gas Wells
- Active Gas Lines
- Abandoned or Inactive Gas Lines
- Leachate Collection Lines
- Roads
- Final Closure Areas
- Progressive Closure Areas
- Structures
- Parking Lots
- Water Bodies

HARTLAND LANDFILL AMBIENT AIR MONITORING RESULTS - JULY 2021

CRD - Parks & Environmental Services - Sep 20, 2022 - Technologist: sruljancich - Map Document: HartlandGasHistoricalZLocations2022.mxd



CRD

Making a difference...together

Metres

0 20 40 60 80 100

Projection: UTM ZONE 10N NAD 83

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- Historical Z-Spot Locations (Active)
- Historical Z-Spot Locations (Inactive)
- Gas Probes
- Active Gas Wells
- Abandoned or Inactive Gas Wells
- Active Gas Lines
- Abandoned or Inactive Gas Lines
- Leachate Collection Lines
- Roads
- Final Closure Areas
- Progressive Closure Areas
- Structures
- Water Bodies

HISTORICAL Z-POINT LOCATIONS

9.3 LFG Speciation

A comprehensive LFG gas speciation program that was initiated in 2019 to support LFG management and capital planning for beneficial use alternatives was extended into 2020 and 2021. Raw, unconditioned gas samples were collected once per month in 2021. A short summary of results is provided below.

9.3.1 Health and Safety

LFG speciation data from January to December 2021 indicated that undiluted LFG exceeded the WorkSafeBC limits for carbon dioxide, hydrogen sulfide, and vinyl chloride. Methane concentrations were similar to historical levels; however, the limit was removed in 2018 so no exceedances are flagged for 2020. Ethylbenzene and n-hexane exceeded WorkSafeBC thresholds in October for the first time. October results reported anomalously high concentrations for numerous gases but passed laboratory QA procedures.

Exposure to undiluted LFG is unlikely, as fugitive emissions mix quickly with air. Ambient air sampling conducted in 1999 and 2001 indicated an average dilution factor greater than 100:1. To further protect worker health and safety, personal multi-gas detectors are set to alarm at levels consistent with 100:1 dilution factor (0.5% or 5,000 ppm methane or 10% of the LEL). In addition, any areas with increased concentrations of LFG are flagged and access by staff is restricted or prohibited.

9.3.2 LFG Composition and Trends

The comprehensive landfill gas sampling program that ran from April 2019 to March 2020 resumed again in December 2020 and continued through 2021 to satisfy additional data requirements for the RNG biogas upgrading scoping/design project. LFG composition is highly variable and is influenced by numerous factors, including waste composition/quantity, ambient temperature, barometric pressure and precipitation. Data show that ambient temperature has a significant impact on LFG flux and collection rates, with gas flows increasing with increased ambient temperatures. Conversely, low temperatures, high barometric pressure and extreme levels of precipitation all result in decreased LFG flux, and ultimately result in decreased collection. Outside of extreme precipitation events, the overall wet climate at Hartland (~800 mm of precipitation per year) results in increased LFG generation, when compared to more arid landfill sites.

Key LFG constituents from the sampling program are presented in Table 18 and summarizes data spanning January to December 2021. Methane, nitrogen, carbon dioxide and oxygen concentrations were adjusted for sample air intrusion using field data. Nitrogen concentrations are elevated above the expected range of <10%, according to the Guidelines. Additional optimization efforts will be undertaken in 2022 to reduce nitrogen concentrations.

Table 18 Concentrations of Key LFG Parameters in Hartland LFG 2021

Property/Contaminant	Average	Max	Min
Methane	49%	53%	36%
Nitrogen	13%	31%	8%
Carbon Dioxide	35%	40%	27%
Oxygen	1%	6%	0%
Carbon Monoxide	Below Detection Limit	Below Detection Limit	Below Detection Limit
Ammonia	0.34 ppm	0.71 ppm	0.07 ppm
Hydrogen Sulphide	15 ppm	37ppm	0 ppm
Vinyl Chloride	1.25 ppm	1.49 ppm	0.71 ppm
Total Siloxane	0.25 ppm	0.44 ppm	0.09 ppm

The following table summarizes LFG monitoring results, compliance, mitigation actions, and recommendations.

Table 19 LFG Compliance Summary 2021

Program	Compliance Location	Criteria	Findings	Mitigation/Actions	Recommendations
Perimeter Probe Monitoring	Probes GP-1A, 1B, 2A, 2B, 3A, 3B, 11A, 11B, 12A and 12B	Methane must not exceed 5% in subsurface soils (BC *Landfill Criteria for Municipal Solid Waste* & BC *Landfill Gas Management Facilities Design Guidelines*)	No exceedances Low risk of sub-surface gas migration to adjacent properties	None	Continue quarterly monitoring.
Building Foundation Probe Monitoring	Probes GP- 4A, 5A, 6A, 6B, 7A, 7B, 8A, 9A, 13A, 14A, 17A, 18A	Maximum 1% methane in any on-site facility (BC *Landfill Criteria for Municipal Solid Waste* & BC *Landfill Gas Management Facilities Design Guidelines*)	No exceedances Low risk of subsurface gas migration to adjacent building	None	Continue quarterly monitoring.
Ambient Grid Monitoring	N/A	100 ppm total hydrocarbon (THC), as methane (CRD internal guideline)	18 grid locations >100 ppm No cover system failures suspected in the closed area of Phase 1	Investigated hot spots and mitigated, where possible.	Continue annual monitoring.
Hot Spot Monitoring	N/A	1,000 ppm THC (CRD internal guideline)	Three new hot spots (z-points) >1,000 ppm Currently 26 locations for hot spot investigation	Added new locations of hot spots to the monitoring program.	Continue annual monitoring. Investigate mitigation options.
Well Field Monitoring and Balancing	N/A	Monitor monthly. Oxygen 2.5% - gas optimization and reduction of fire potential *(BC Landfill Gas Management Facilities Design Guidelines)*	Monitoring completed monthly; Oxygen did not exceed 2.5%	None	Continue monthly monitoring at minimum.
Gas Collection	N/A	75% gas collection efficiency target by the end of 2016, as per *Landfill Gas Management Plan*	Gas collection efficiency was estimated at 69%, based on the ENV gas generation model. Collection efficiency using an alternative model (UBCi) and empirical data was estimated at 78%.	*Landfill Gas Management Plan* submitted to ENV.	Continue to implement the gas management plan and optimize methane and nitrogen, oxygen levels in the well field

10.0 CONCLUSIONS AND RECOMMENDATIONS

The following section presents the key findings and recommendations developed from the 2021 LFG monitoring programs at the Hartland Landfill.

GAS GENERATION

Hartland Landfill generates greater than 1,000 tonnes of methane per year and is subject to the BC *Landfill Gas Management Regulation*. In 2021, according to the ENV model the Hartland Landfill is estimated to have generated 8,192 or the equivalent of approximately 204,818 tonnes CO_2e. Of this total, 64,522 tonnes of CO_2e were uncaptured (fugitive emissions). Though not recognized under the regulation, alternative gas modeling using the UBCi model, shows CO_2e emissions (38,792 tonnes CO_2e) to be substantially less than the ENV model.

GAS GENERATION, COLLECTION AND UTILIZATION

In 2021, the gas extraction network consisted of 148 wells that captured an average of 1150 scfm of LFG. In 2021, six new wells were activated. Well field balancing was completed at least monthly to optimize collection. Well field monitoring and balancing should continue at least monthly, as recommended by the BC *Landfill Gas Management Facilities Design Guidelines*.

At the end of 2021, the efficiency was 69% according to the ENV model. Empirical data and methane mass balance indicates that an alternative gas generation (UBCi) more accurately estimates overall gas production for Hartland. Using this model, collection efficiency in 2021 is estimated to be 78%. The CRD continues to follow the *Landfill Gas Management Plan* design specifications for reaching 75% collection efficiency. Staff continue to monitor and adjust the well field to maximize collection and optimize key gas constituents (methane and nitrogen) in accordance with the Guidelines.

OPERATIONAL PERFORMANCE

The gas plant experienced 1.9 days' worth of downtime (i.e., no vacuum applied to the well field) due to power outages and unforeseen events. A back-up generator was installed in August 2020 to minimize blower downtime, and ensure continuous destruction of landfill gas.

MONITORING

No methane concentrations were observed during foundation and perimeter probe monitoring and, as a result, there is little risk of lateral LFG migration. This monitoring is a regulatory requirement and should continue on a quarterly schedule.

During the 2021 grid monitoring, 26 hotspots with methane concentrations exceeding 1000 ppm were identified which included three new hotspots, in addition to 17 unique grid points that were found to exceed 100 ppm THC. It is recommended that grid monitoring and hotspot monitoring be conducted annually and that hotspots be mitigated where possible.

11.0 REFERENCES

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12.0 REPORT SIGNOFF

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APPENDIX A

Hartland Landfill Gas Generation Model Inputs

A1	Inputs for Generating Methane Capture Efficiency Models
A2-a	All 2019 Controlled Waste Data
A2-b	Summary of 2019 Controlled Waste Data
A2-c	All 2020 Controlled Waste Data
A2-d	Summary of 2020 Controlled Waste Data
A2-e	All 2021 Controlled Waste Data
A2-f	Summary of 2021 Controlled Waste Data
A2-g	Controlled Waste Composition Used in 2022 Modelling
A3-a	Waste composition input to ENV Model
A3-b	Waste composition input to UBCi Model
A4-a	Summary of the inputs to ENV model
A4-b	Results of the ENV Model
A5	Results of the UBCi Model
A6	Advanced Landfill Gas Generation Assessment For Hartland Landfill Report by Sterling Hansen
A7	US EPA Oxidation Table Reference for Cover System Capture

Appendix A   Hartland Landfill Gas Generation Model Inputs

A1 Inputs for Generating Methane Capture Efficiency Models

Variables		Relatively Inert	Moderately Decomposable	Decomposable
Gas Production potential (m^3 CH4/tonne), Lo =		20	120	160
Waste Composition, 1980 to	1995	0.336	0.248	0.414
Waste Composition, 1996 to	2000	0.338	0.405	0.256
Waste Composition, 2001 to	2004	0.266	0.396	0.337
Waste Composition, 2005 to	2009	0.331	0.369	0.298
Waste Composition, 2010 to	2013	0.314	0.391	0.294
Waste Composition, 2014 to	future	0.327	0.427	0.201
Lag time before start of gas production, lag =	1	Years		
Historical Data Used (years)	38			
1st Year of Historical Data Used	1980			
4 Years after reporting year	2024			
methane (by volume)	0.5			
carbon dioxide (by volume)	0.5			
methane (density)	0.6557	kg/m^3	(25°C,1ATM)	
carbon dioxide (density)	1.7988	kg/m^3	(25°C,1ATM)	

Appendix A Continued

Appendix A2-a All 2019 Controlled Waste Data

Type	Tonnes	Classification	Misc	Liquid Waste	Screenings	Soil	Asbestos
out of region asbestos	9.170	Inert					9.170
spoiled food	2,264.110	Decomposable	2,264.110				
contaminated drywall	0.650	Inert	0.650				
contaminated soils	28.490	Inert				28.490	
dead animals	48.680	Decomposable	48.680				
fibre optic cable	14.300	Inert	14.300				
food processing waste	58.840	Decomposable	58.840				
health hazard waste	166.920	Miscellaneous	166.920				
miscellaneous controlled waste	90.420	Miscellaneous	90.420				
pumpings	22.470	Moderately Decomposable		22.470			
pumpings (sewage)	503.450	Moderately Decomposable		503.450			
pumpings (drainage sumps)	838.980	Moderately Decomposable		838.980			
vehicle washing facility waste	16.300	Inert		16.300			
sewage screenings	1,053.630	Moderately Decomposable			1,053.630		
spent charcoal	87.780	Moderately Decomposable	87.780				
waste asbestos	3,804.270	Inert					3,804.270
sewage sludge	6,084.980	Moderately Decomposable			6,084.980		
animal fecal waste	33.380	Decomposable	33.380				
surface coating waste	197.740	Inert	197.740				
knotweed	0.700	Decomposable	0.700				
	15,325.260		**2,963.520**	**1,381.200**	**7,138.610**	**28.490**	**3,813.440**

Appendix A2-b Summary of 2019 Controlled Waste Data

	Sum of Tonnes
Decomposable	**2,405.71**
animal fecal waste	33.38
dead animals	48.68
food processing waste	58.84
knotweed	0.7
spoiled food	2,264.11
Inert	**4,070.92**
contaminated drywall	0.65
contaminated soils	28.49
fibre optic cable	14.3
out of region asbestos	9.17
surface coating waste	197.74
vehicle washing facility waste	16.3
waste asbestos	3,804.27
Miscellaneous	**257.34**
health hazard waste	166.92
miscellaneous controlled waste	90.42
Moderately Decomposable	**8,591.29**
pumpings	22.47
pumpings (drainage sumps)	838.98
pumpings (sewage)	503.45
sewage screenings	1,053.63
sewage sludge	6,084.98
spent charcoal	87.78
Grand Total	**15,325.26**

Appendix A, continued

Appendix A2-c All 2020 Controlled Waste Data

Type	Tonnes	Classification	Misc	Liquid Waste	Screenings	Soil	Asbestos
sewage screenings	7.710	Moderately decomposable	7.710				
out of region asbestos	30.860	Inert					30.860
spoiled food	43.340	Decomposable	43.340				
contaminated drywall	0.140	Inert	0.140				
contaminated soils	27.310	Inert				27.310	
dead animals	52.240	Decomposable	52.240				
fibre optic cable	17.640	Inert	17.640				
food processing waste	65.360	Decomposable	65.360				
health hazard waste	87.660	Miscellaneous	87.660				
miscellaneous controlled waste	496.850	Miscellaneous	496.850				
pumpings (sewage)	285.400	Moderately decomposable		285.400			
pumpings residual sludge		Moderately decomposable		0.000			
pumpings (drainage sumps)	735.380	Moderately decomposable		735.380			
sewage screenings	1,033.100	Moderately decomposable			1,033.100		
spent charcoal	27.070	Decomposable	27.070				
waste asbestos	3,061.690	Inert					3,061.690
sewage sludge	10,199.640	Moderately decomposable			10,199.640		
animal fecal waste	30.710	Decomposable	30.710				
surface coating waste	67.290	Inert	67.290				
knotweed	11.860	Decomposable	11.860				
nonasbvermiculite	0.260	Decomposable	0.260				
international waste	17.910	Miscellaneous	17.910				
	16,299.420		**926.040**	**1,020.780**	**11,232.740**	**27.310**	**3,092.550**

Appendix A2-d Summary of 2020 Controlled Waste Data

	Sum of Tonnes
Decomposable	**230.84**
animal fecal waste	30.71
dead animals	52.24
food processing waste	65.36
knotweed	11.86
nonasbvermiculite	0.26
spent charcoal	27.07
spoiled food	43.34
Inert	**3,204.93**
contaminated drywall	0.14
contaminated soils	27.31
fibre optic cable	17.64
out of region asbestos	30.86
surface coating waste	67.29
waste asbestos	3,061.69
Miscellaneous	**602.42**
health hazard waste	87.66
international waste	17.91
miscellaneous controlled waste	496.85
Moderately decomposable	**12,261.23**
pumpings (drainage sumps)	735.38
pumpings (sewage)	285.4
pumpings residual sludge	
sewage screenings	1,040.81
sewage sludge	10,199.64
Grand Total	**16,299.42**

Appendix A, continued

Appendix A2-e All 2021 Controlled Waste Data

Type	Tonnes	Classification	Misc	Liquid Waste	Screenings	Soil	Asbestos
out of region asbestos	64.320	Inert					64.320
film plastic out		Inert					
mattress recycle		Inert					
spoiled food	72.570	Decomposable	72.570				
contaminated drywall	0.540	Inert	0.540				
contaminated soils	27.620	Inert				27.620	
dead animals	76.850	Decomposable	76.850				
fibre optic cable	44.900	Inert	44.900				
food processing waste	25.590	Decomposable	25.590				
health hazard waste	67.660	Miscellaneous	67.660				
miscellaneous controlled waste	127.540	Miscellaneous	127.540				
pumpings	40.660	Moderate Decomposable		40.660			
pumpings (sewage)	3,040.190	Moderate Decomposable		3,040.190			
pumpings residual sludge		Moderate Decomposable		0.000			
pumpings (drainage sumps)	830.750	Moderate Decomposable		830.750			
Vehicle washing facility waste		Inert		0.000			
sewage screenings	1,913.300	Moderate Decomposable			1,913.300		
sharps	-	Inert	0.000				
soot	1.640	Decomposable	1.640				
spent charcoal	31.190	Decomposable	31.190				
waste asbestos	4,069.300	Inert					4,069.300
sewage sludge	13,414.890	Moderate Decomposable		13,414.890			
animal fecal waste	39.360	Decomposable	39.360				
surface coating waste	116.750	Inert	116.750				
knotweed	25.920	Decomposable	25.920				
nonasbvermiculite	0.210	Inert	0.210				
international waste	22.010	Miscellaneous	22.010				
Totals	**24,053.760**		**652.730**	**17,326.490**	**1,913.300**	**27.620**	**4,133.620**

Appendix A2-f Summary of 2021 Controlled Waste Data

	Sum of Tonnes
Decomposable	**273.12**
animal fecal waste	39.36
dead animals	76.85
food processing waste	25.59
knotweed	25.92
soot	1.64
spent charcoal	31.19
spoiled food	72.57
Inert	**4,323.64**
contaminated drywall	0.54
contaminated soils	27.62
fibre optic cable	44.9
film plastic out	
mattress recycle	
nonasbvermiculite	0.21
out of region asbestos	64.32
sharps	0
surface coating waste	116.75
Vehicle washing facility waste	
waste asbestos	4069.3
Miscellaneous	**217.21**
health hazard waste	67.66
international waste	22.01
miscellaneous controlled waste	127.54
Moderate Decomposable	**19,239.79**
pumpings	40.66
pumpings (drainage sumps)	830.75
pumpings (sewage)	3,040.19
pumpings residual sludge	
sewage screenings	1,913.3
sewage sludge	13,414.89
Grand Total	**24,053.76**

Appendix A2-g Controlled Waste Composition Used in 2022 Modelling

Year	Controlled Waste Composition		
	Relatively Inert	Moderately Decomposable	Decomposable
2014 to 2019	27.4%	56.9%	15.7%
2020	21.5%	77.1%	1.4%
2021	18.43%	80.43%	1.14%

Appendix A3a – Waste Composition Input to ENV Model

Year	Total Annual Tonnage	Annual Controlled Waste Tonnage	Annual Tonnage w/o Controlled Waste	MSW Composition			Controlled Waste Composition			Combined Waste Composition			Waste Tonnage for ENV AR Model		
				Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable
1980	111,037		111,037	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	38,974	41,306	30,757
1981	118,254		118,254	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	41,507	43,990	32,756
1982	125,941		125,941	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	44,205	46,850	34,886
1983	134,127		134,127	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	47,079	49,895	37,153
1984	142,845		142,845	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	50,139	53,138	39,568
1985	152,130		152,130	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	53,398	56,592	42,140
1986	167,472		167,472	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	58,783	62,300	46,390
1987	177,686		177,686	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	62,368	66,099	49,219
1988	184,193		184,193	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	64,652	68,520	51,021
1989	188,750		188,750	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	66,251	70,215	52,284
1990	187,476		187,476	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	65,804	69,741	51,931
1991	175,956		175,956	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	61,761	65,456	48,740
1992	162,329	-	162,329	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	56,977	60,386	44,965
1993	159,431	-	159,431	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	55,960	59,308	44,162
1994	156,285	-	156,285	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	54,856	58,138	43,291
1995	159,993	-	159,993	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	56,158	59,517	44,318
1996	157,528	-	157,528	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	55,292	58,600	43,635
1997	149,429	-	149,429	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	52,450	55,588	41,392
1998	138,081	-	138,081	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	48,466	51,366	38,248
1999	138,174	-	138,174	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	48,499	51,401	38,274
2000	142,239	-	142,239	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	49,926	52,913	39,400
2001	138,533	-	138,533	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	48,625	51,534	38,374
2002	146,324	-	146,324	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	51,360	54,433	40,532
2003	148,225	-	148,225	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	52,027	55,140	41,058
2004	154,113	-	154,113	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	54,094	57,330	42,689
2005	163,040	-	163,040	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	57,227	60,651	45,162
2006	166,820	-	166,820	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	58,554	62,057	46,209
2007	174,537	-	174,537	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	61,262	64,928	48,347
2008	166,722	-	166,722	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	58,519	62,021	46,182
2009	161,194	-	161,194	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	56,579	59,964	44,651
2010	152,062	-	152,062	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	53,374	56,567	42,121
2011	144,179	-	144,179	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	50,607	53,635	39,938
2012	136,763	-	136,763	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	48,004	50,876	37,883
2013	131,418	-	131,418	35.1%	37.2%	27.7%				35.1%	37.2%	27.7%	46,128	48,887	36,403
2014	128,045	7,890	120,155	35.8%	39.8%	24.4%	27.4%	56.9%	15.7%	35.3%	40.9%	23.9%	45,177	52,311	30,557
2015	123,381	10,939	112,442	35.8%	39.8%	24.4%	27.4%	56.9%	15.7%	35.1%	41.3%	23.6%	43,252	50,976	29,153
2016	146,704	12,537	134,167	36.8%	42.1%	21.1%	27.4%	56.9%	15.7%	36.0%	43.4%	20.6%	52,809	63,618	30,278

Year	Total Annual Tonnage	Annual Controlled Waste Tonnage	Annual Tonnage w/o Controlled Waste	MSW Composition			Controlled Waste Composition			Combined Waste Composition			Waste Tonnage for ENV AR Model		
				Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable	Relatively Inert	Moderately Decomposable	Decomposable
2017	154,472	13,340	141,132	36.8%	42.1%	21.1%	27.4%	56.9%	15.7%	36.0%	43.4%	20.6%	55,592	67,007	31,873
2018	159,942	13,511	146,431	36.8%	42.1%	21.1%	27.4%	56.9%	15.7%	36.0%	43.4%	20.6%	57,589	69,335	33,018
2019	163,001	15,325	147,676	36.8%	42.1%	21.1%	27.4%	56.9%	15.7%	35.9%	43.5%	20.6%	58,544	70,892	33,566
2020	160,727	16,299	144,428	36.8%	42.1%	21.1%	21.5%	77.1%	1.4%	35.2%	45.6%	19.1%	56,654	73,371	30,702
2021	190,210	24,054	166,156	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.5%	46.9%	18.6%	65,578	89,299	35,332
2022	192,302	24,054	168,249	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.5%	46.9%	18.6%	66,348	90,180	35,774
2023	194,418	24,054	170,364	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.5%	46.8%	18.6%	67,126	91,071	36,220
2024	196,556	24,054	172,502	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.6%	46.8%	18.7%	67,913	91,971	36,671
2025	198,718	24,054	174,665	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.6%	46.7%	18.7%	68,709	92,881	37,127
2026	200,904	24,054	176,850	36.8%	42.1%	21.1%	18.4%	80.4%	1.1%	34.6%	46.7%	18.7%	69,513	93,802	37,589

Waste Characterization Summary: For “current condition” scenario, using the 2010 and 2016 waste compositions report by Tetra Tech in their 2016 report, three different compositions were developed grouping the waste components into the categories required by the ENV Model. In calculation of each category’s percentages we made the following assumptions based on the details provided in Tetra Tech’s report.

- Moderately Decomposable: Including wood waste, paper, textile, 20% of “composite products”, and 50% of “other” (to account for diapers),
- Decomposable: Including food waste and yard waste.

Appendix A, continued

Appendix A3b – Waste Composition Input to UBCi Model

		UBCi Model - Input DOC used for Hartland Advanced LFG Modeling (MSW Only)							
		Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
MSW	Up to 2013	21.7%	6.0%	15.5%	12.5%	5.6%	3.9%	34.9%	100.00%
	2014 & 2015	20.6%	3.8%	15.5%	14.9%	5.9%	3.8%	35.5%	100.00%
	2016 to future	19.5%	1.6%	15.4%	17.4%	6.3%	3.7%	36.1%	100.00%

		Controlled Waste							
		Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
Controlled Waste	2014 - 2019	15.7%	0.0%	0.0%	0.0%	0.0%	56.9%	27.4%	100.00%
	2020	1.4%	0.0%	0.0%	0.0%	0.0%	77.1%	21.5%	100.00%
	2021 - Future	1.1%	0.0%	0.0%	0.0%	0.0%	80.4%	18.4%	100.00%

				UBCi Model - Input DOC used for Hartland Advanced LFG Modeling (Combined MSW & Controlled - PRJ22032)							
	Total	Controlled W.	MSW	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
2012	136,763	-	136,763	21.7%	6.0%	15.5%	12.5%	5.6%	3.9%	34.9%	100.00%
2013	131,418	-	131,418	21.7%	6.0%	15.5%	12.5%	5.6%	3.9%	34.9%	100.00%
2014	128,045	7,890	120,155	20.3%	3.6%	14.5%	14.0%	5.6%	7.1%	35.0%	100.00%
2015	123,381	10,939	112,442	20.2%	3.5%	14.1%	13.6%	5.4%	8.5%	34.8%	100.00%
2016	146,704	12,537	134,167	19.2%	1.5%	14.1%	15.9%	5.8%	8.2%	35.4%	100.00%
2017	154,472	13,340	141,132	19.2%	1.5%	14.1%	15.9%	5.8%	8.2%	35.4%	100.00%
2018	159,942	13,511	146,431	19.2%	1.5%	14.1%	15.9%	5.8%	8.1%	35.4%	100.00%
2019	163,001	15,325	147,676	19.1%	1.4%	14.0%	15.8%	5.7%	8.7%	35.3%	100.00%
2020	160,727	16,299	144,428	17.7%	1.4%	13.8%	15.7%	5.7%	11.1%	34.6%	100.00%

Appendix A, continued

				UBCi Model - Input DOC used for Hartland Advanced LFG Modeling (Combined MSW & Controlled - PRJ22032)							
	Total	Controlled W.	MSW	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
2021	190,210	24,054	166,156	17.2%	1.4%	13.5%	15.2%	5.5%	13.4%	33.9%	100.00%
2022	192,302	24,054	168,249	17.2%	1.4%	13.5%	15.2%	5.5%	13.3%	33.9%	100.00%
2023	194,418	24,054	170,364	17.2%	1.4%	13.5%	15.3%	5.5%	13.1%	33.9%	100.00%
2024	196,556	24,054	172,502	17.3%	1.4%	13.5%	15.3%	5.5%	13.0%	33.9%	100.00%
2025	198,718	24,054	174,665	17.3%	1.4%	13.5%	15.3%	5.6%	12.9%	34.0%	100.00%
2026	200,904	24,054	176,850	17.3%	1.4%	13.6%	15.3%	5.6%	12.8%	34.0%	100.00%
2027	203,114	24,054	179,060	17.3%	1.4%	13.6%	15.4%	5.6%	12.7%	34.0%	100.00%
2028	205,348	24,054	181,295	17.3%	1.4%	13.6%	15.4%	5.6%	12.6%	34.0%	100.00%
2029	207,607	24,054	183,554	17.4%	1.4%	13.6%	15.4%	5.6%	12.5%	34.1%	100.00%
2030	209,891	24,054	185,837	17.4%	1.4%	13.6%	15.4%	5.6%	12.4%	34.1%	100.00%
2031	212,200	24,054	188,146	17.4%	1.4%	13.7%	15.4%	5.6%	12.4%	34.1%	100.00%
2032	214,534	24,054	190,480	17.4%	1.4%	13.7%	15.5%	5.6%	12.3%	34.1%	100.00%
2033	216,894	24,054	192,840	17.5%	1.4%	13.7%	15.5%	5.6%	12.2%	34.1%	100.00%
2034	219,280	24,054	195,226	17.5%	1.4%	13.7%	15.5%	5.6%	12.1%	34.2%	100.00%
2035	221,692	24,054	197,638	17.5%	1.4%	13.7%	15.5%	5.6%	12.0%	34.2%	100.00%
2036	224,130	24,054	200,077	17.5%	1.4%	13.7%	15.6%	5.6%	11.9%	34.2%	100.00%
2037	226,596	24,054	202,542	17.6%	1.4%	13.8%	15.6%	5.6%	11.8%	34.2%	100.00%
2038	229,088	24,054	205,035	17.6%	1.4%	13.8%	15.6%	5.7%	11.7%	34.3%	100.00%
2039	231,608	24,054	207,555	17.6%	1.4%	13.8%	15.6%	5.7%	11.6%	34.3%	100.00%
2040	234,156	24,054	210,102	17.6%	1.4%	13.8%	15.6%	5.7%	11.5%	34.3%	100.00%
2041	236,732	24,054	212,678	17.6%	1.4%	13.8%	15.6%	5.7%	11.5%	34.3%	100.00%
2042	239,336	24,054	215,282	17.7%	1.4%	13.9%	15.7%	5.7%	11.4%	34.3%	100.00%
2043	241,968	24,054	217,915	17.7%	1.4%	13.9%	15.7%	5.7%	11.3%	34.4%	100.00%
2044	244,630	24,054	220,576	17.7%	1.4%	13.9%	15.7%	5.7%	11.2%	34.4%	100.00%
2045	247,321	24,054	223,267	17.7%	1.4%	13.9%	15.7%	5.7%	11.1%	34.4%	100.00%
2046	250,042	24,054	225,988	17.7%	1.4%	13.9%	15.7%	5.7%	11.0%	34.4%	100.00%

Appendix A, continued

				UBCi Model - Input DOC used for Hartland Advanced LFG Modeling (Combined MSW & Controlled - PRJ22032)							
	Total	Controlled W.	MSW	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
2047	252,792	24,054	228,738	17.8%	1.4%	13.9%	15.8%	5.7%	11.0%	34.4%	100.00%
2048	255,573	24,054	231,519	17.8%	1.4%	14.0%	15.8%	5.7%	10.9%	34.4%	100.00%
2049	258,384	24,054	234,330	17.8%	1.5%	14.0%	15.8%	5.7%	10.8%	34.5%	100.00%
2050	261,226	24,054	237,173	17.8%	1.5%	14.0%	15.8%	5.7%	10.7%	34.5%	100.00%
2051	264,100	24,054	240,046	17.8%	1.5%	14.0%	15.8%	5.7%	10.6%	34.5%	100.00%
2052	267,005	24,054	242,951	17.8%	1.5%	14.0%	15.9%	5.8%	10.6%	34.5%	100.00%
2053	269,942	24,054	245,888	17.9%	1.5%	14.0%	15.9%	5.8%	10.5%	34.5%	100.00%
2054	272,911	24,054	248,858	17.9%	1.5%	14.0%	15.9%	5.8%	10.4%	34.6%	100.00%
2055	275,913	24,054	251,860	17.9%	1.5%	14.1%	15.9%	5.8%	10.3%	34.6%	100.00%
2056	278,948	24,054	254,895	17.9%	1.5%	14.1%	15.9%	5.8%	10.3%	34.6%	100.00%
2057	282,017	24,054	257,963	17.9%	1.5%	14.1%	15.9%	5.8%	10.2%	34.6%	100.00%
2058	285,119	24,054	261,065	18.0%	1.5%	14.1%	16.0%	5.8%	10.1%	34.6%	100.00%
2059	288,255	24,054	264,202	18.0%	1.5%	14.1%	16.0%	5.8%	10.1%	34.6%	100.00%
2060	291,426	24,054	267,372	18.0%	1.5%	14.1%	16.0%	5.8%	10.0%	34.7%	100.00%

Appendix A, continued

Appendix A4-a - Summary of the Inputs to ENV Model

Year of Report	2021	
Annual Tonnage in Preceding Year	160,727	(tonnes/year)
Total waste in Place in the Preceding Year	6,249,560	(tonnes/year)
Methane generation in the Preceding Year	8,157	(tonnes CH4/year)
Next Five Years	Waste Tonnage (tonnes)	Methane Generation (tonnes CH4/year)
2021	190,209	8,192
2022	192,302	8,325
2023	194,417	8,460
2024	196,555	8,598
2025	198,717	8,737

Appendix A4-b Results of the ENV Model

Year	Year Number	Annual Tonnage (tonnes)	Cumulative Waste-in-place (tonnes)	Waste Tonnage: Relatively Inert (tonnes)	Waste Tonnage: Moderately Decomposable (tonnes)	Waste Tonnage: Decomposable (tonnes)	Methane Generation Rate, k: Relatively Inert ($year^{-1}$)	Methane Generation Rate, k: Moderately Decomposable ($year^{-1}$)	Methane Generation Rate, k: Decomposable ($year^{-1}$)	Annual Methane Production (tonnes/yr)	Annual Landfill Gas Production (m^3/hr)
1980	1	111,037	111,037	38,974	41,306	30,757	0.02	0.04	0.09	0	-
1981	2	118,253	229,290	41,507	43,990	32,756	0.02	0.04	0.09	431	150
1982	3	125,941	355,231	44,205	46,850	34,886	0.02	0.04	0.09	859	299
1983	4	134,127	489,358	47,079	49,895	37,153	0.02	0.04	0.09	1,287	448
1984	5	142,845	632,203	50,139	53,138	39,568	0.02	0.04	0.09	1,717	598
1985	6	152,130	784,333	53,398	56,592	42,140	0.02	0.04	0.09	2,152	749
1986	7	167,473	951,806	58,783	62,300	46,390	0.02	0.04	0.09	2,593	903
1987	8	177,686	1,129,492	62,368	66,099	49,219	0.02	0.04	0.09	3,063	1,067
1988	9	184,193	1,313,685	64,652	68,520	51,021	0.02	0.04	0.09	3,541	1,233
1989	10	188,750	1,502,435	66,251	70,215	52,284	0.02	0.04	0.09	4,012	1,397
1990	11	187,476	1,689,911	65,804	69,741	51,931	0.02	0.04	0.09	4,469	1,556
1991	12	175,957	1,865,868	61,761	65,456	48,740	0.02	0.04	0.09	4,891	1,703
1992	13	162,328	2,028,196	56,977	60,386	44,965	0.02	0.04	0.09	5,240	1,824
1993	14	159,430	2,187,626	55,960	59,308	44,162	0.02	0.04	0.09	5,513	1,920
1994	15	156,285	2,343,911	54,856	58,138	43,291	0.02	0.04	0.09	5,759	2,005
1995	16	159,993	2,503,904	56,158	59,517	44,318	0.02	0.04	0.09	5,977	2,081
1996	17	157,527	2,661,431	55,292	58,600	43,635	0.02	0.04	0.09	6,196	2,157
1997	18	149,430	2,810,861	52,450	55,588	41,392	0.02	0.04	0.09	6,392	2,226
1998	19	138,080	2,948,941	48,466	51,366	38,248	0.02	0.04	0.09	6,545	2,279
1999	20	138,174	3,087,115	48,499	51,401	38,274	0.02	0.04	0.09	6,646	2,314
2000	21	142,239	3,229,354	49,926	52,913	39,400	0.02	0.04	0.09	6,742	2,347
2001	22	138,533	3,367,887	48,625	51,534	38,374	0.02	0.04	0.09	6,849	2,385
2002	23	146,325	3,514,212	51,360	54,433	40,532	0.02	0.04	0.09	6,936	2,415
2003	24	148,225	3,662,437	52,027	55,140	41,058	0.02	0.04	0.09	7,049	2,454
2004	25	154,113	3,816,550	54,094	57,330	42,689	0.02	0.04	0.09	7,163	2,494
2005	26	163,040	3,979,590	57,227	60,651	45,162	0.02	0.04	0.09	7,294	2,540
2006	27	166,820	4,146,410	58,554	62,057	46,209	0.02	0.04	0.09	7,452	2,595
2007	28	174,537	4,320,947	61,262	64,928	48,347	0.02	0.04	0.09	7,616	2,652
2008	29	166,722	4,487,669	58,519	62,021	46,182	0.02	0.04	0.09	7,799	2,716
2009	30	161,194	4,648,863	56,579	59,964	44,651	0.02	0.04	0.09	7,942	2,765
2010	31	152,062	4,800,925	53,374	56,567	42,121	0.02	0.04	0.09	8,054	2,804
2011	32	144,180	4,945,105	50,607	53,635	39,938	0.02	0.04	0.09	8,125	2,829
2012	33	136,763	5,081,868	48,004	50,876	37,883	0.02	0.04	0.09	8,163	2,842
2013	34	131,418	5,213,286	46,128	48,887	36,403	0.02	0.04	0.09	8,170	2,845
2014	35	128,045	5,341,331	45,177	52,311	30,557	0.02	0.04	0.09	8,158	2,841

Appendix A, continued

Year	Year Number	Annual Tonnage (tonnes)	Cumulative Waste-in-place (tonnes)	Waste Tonnage: Relatively Inert (tonnes)	Waste Tonnage: Moderately Decomposable (tonnes)	Waste Tonnage: Decomposable (tonnes)	Methane Generation Rate, k: Relatively Inert ($year^{-1}$)	Methane Generation Rate, k: Moderately Decomposable ($year^{-1}$)	Methane Generation Rate, k: Decomposable ($year^{-1}$)	Annual Methane Production (tonnes/yr)	Annual Landfill Gas Production (m^3/hr)
2015	36	123,381	5,464,712	43,252	50,976	29,153	0.02	0.04	0.09	8,103	2,822
2016	37	146,705	5,611,417	52,809	63,618	30,278	0.02	0.04	0.09	8,038	2,799
2017	38	154,472	5,765,889	55,592	67,007	31,873	0.02	0.04	0.09	8,032	2,797
2018	39	159,942	5,925,831	57,589	69,335	33,018	0.02	0.04	0.09	8,056	2,805
2019	40	163,002	6,088,833	58,544	70,892	33,566	0.02	0.04	0.09	8,101	2,821
2020	41	160,727	6,249,560	56,654	73,371	30,702	0.02	0.04	0.09	8,157	2,840
2021	42	190,209	6,439,769	65,578	89,299	35,332	0.02	0.04	0.09	8,192	2,852
2022	43	192,302	6,632,071	66,348	90,180	35,774	0.02	0.04	0.09	8,325	2,899
2023	44	194,417	6,826,488	67,126	91,071	36,220	0.02	0.04	0.09	8,460	2,946
2024	45	196,555	7,023,043	67,913	91,971	36,671	0.02	0.04	0.09	8,598	2,994
2025	46	198,717	7,221,760	68,709	92,881	37,127	0.02	0.04	0.09	8,737	3,042
2026	47	200,904	7,422,664	69,513	93,802	37,589	0.02	0.04	0.09	8,879	3,092

	Relatively Inert	Moderately Decomposable	Decomposable	
Gas Production potential, Lo =	20	120	160	m^3 CH4/tonne
lag time before start of gas production, lag =	1	years		
Historical Data Used (years)	41			
1st Year of Historical Data Used	1980			
4 Years after Reporting Year	2025			
methane (by volume)	50%			
carbon dioxide (by volume)	50%			
methane (density) - 1atm, 25C	0.6557	kg/m^3	(25C,SP)	
carbon dioxide (density)	1.7988	kg/m^3	(25C,SP)	

Appendix A, continued

Appendix A5 Results of the UBCi Model

Year	Captured LFG, CH_4			Generation Estimate (tonnes/year)		Methane Capture Efficiency	
	SCFM, LFG (at 50% CH_4)	m^3/hr (CH_4)	tonnes/yr (CH_4)	UBCi Model	ENV AR Tool	UBCi Model	ENV AR Tool
2021	1,150	977	5,612	7,167	8,192	78%	69%

Notes:

methane (density) - 1atm, 25C	0.6557	kg/m^3 (ENV AR Tool)

ADVANCED LANDFILL GAS GENERATION ASSESSMENT

FOR

HARTLAND LANDFILL

Prepared For:

CAPITAL REGIONAL DISTRICT

Prepared By:

SPERLING HANSEN ASSOCIATES

June, 2019

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1 INTRODUCTION

1.1 Background

Capital Regional District (CRD) operates Hartland Landfill which is located 14 km northwest of Victoria, British Columbia (BC) in the District of Saanich at 1 Hartland Avenue. The landfill is located on a 293 Ha plot of land of which 33 Ha is occupied by the landfill footprint with an estimated 7,280,000 tonnes of MSW in place as of the end of 2018. Hartland Landfill has been developed in two distinct phases. Phase 1 was landfilled between 1950 and 1996, with final capping completed in 1997. Phase 2 has been operational since 1997, with development planned out in six distinct cells. Cells 1 and 2 have been completed and landfilling is currently occurring in Cell 3.

Hartland Landfill is one of the largest landfills in BC and is required to collect and thermally combust generated methane as per the BC Ministry of Environment (ENV) landfill gas regulation (LFG Regulation). The LFG Regulation stipulates that landfills generating more than 1,000 tonnes of methane per year are to install an active LFG management system with a minimum gas collection efficiency of 75%.

In 2011, the CRD retained Conestoga-Rovers & Associates (CRA) to complete a *Long-Term Landfill Gas Management Plan* for the Landfill. CRA used the ENV's LFG generation assessment tool (ENV Model, a.k.a. MOE Tool) to estimate methane generation and concluded the landfill had a gas capture efficiency of 32% in 2010.

Since 2012, the CRD has significantly improved and expanded the Hartland Landfill's LFG collection system to comply with ENV's LFG regulation requirements. In 2018, CRD retained SCS Engineers (SCS) to prepare a *Renewable Natural Gas Technical Feasibility Design Report* for a potential renewable natural gas (RNG) plant for the Hartland Landfill. If feasible, the CRD will purify the collected LFG to produce and sell biomethane.

In the current assignment, the CRD retained Sperling Hansen Associates (SHA) to conduct an advanced landfill gas (LFG) generation assessment for the Hartland Landfill using UBCiModel© that was developed by SHA's LFG specialist, Dr. Abedini, during his PhD program at UBC.

1.2 Scope of the Current Study

The CRD retained SHA to update Hartland Landfill's LFG generation assessment based on the most recent lifespan analysis for the landfill, to assess the accuracy of the previous LFG generation estimates and to complete an advanced LFG generation assessment for the landfill.

The purpose of the study was to execute the following key tasks:

- Review previous LFG generation assessment completed by CRA and SCS;
- Review the landfill's current LFG collection data;

- Review historical waste tonnages, composition studies and organic waste diversion program;
- Complete an advanced LFG generation assessment using UBCiModel© and based on the recent cell design and volumetric analysis that is being completed by SHA under the *Master Filling Plan* project;
- Compare results of different LFG generation models and assess collection efficiency of the current active gas collection system at the Hartland Landfill based on different models, and;
- Estimate capturable quantity of methane based on the gas generation assessment and historical system performance.

1.3 Waste Tonnage at Hartland Landfill

SHA has completed several projects for the Landfill since 1996, including several environmental monitoring projects, MSW filling plans, leachate management designs, and cell closure designs. SHA is currently completing a master filling plan for the Landfill including completing a comprehensive volumetric analysis, fill plan, and lifespan analysis.

A cell-by-cell volumetric analysis and waste tonnage estimate were prepared using the most recent site survey data (completed in early 2018), the most recent cell development design, and the historic tonnages of waste deposited at the Hartland Landfill. The cell-by-bell volumetric and waste tonnage estimates are presented in Appendix A.

The future waste tonnages were calculated with the following assumptions:

- Population growth rate of 1.1%
- Constant per-capita waste generation and diversion rates
- Waste to cover ratio of 6:1 vol/vol
- Waste settlement rate of 10%
- Waste density of 0.95 tonnes/m^3
- Controlled waste volume of 11,667 m^3/year

Waste tonnages estimates for 2017 to 2053 are presented in Table 1.1.

Table 1.1 - Estimated Cells Volumes and Waste Tonnage at the Hartland Landfill

Year	MSW Disposal Rate*	Cell 3 Tonnage Received (MSW)	Cell 3 Vol. Remaining	Cell 4 Tonnage Received (MSW)	Cell 4 Vol. Remaining	Cell 5 Tonnage Received (MSW)	Cell 5 Vol. Remaining	Cell 6 Tonnage Received (MSW)	Cell 6 Vol. Remaining
NOTES	MSW Only	MSW Only (for LFG Generation)	Available Vol. - Annual Vol.	MSW Only (for LFG Generation)	Available Vol. - Annual Vol.	MSW Only (for LFG Generation)	Available Vol. - Annual Vol.	MSW Only (for LFG Generation)	Available Vol. - Annual Vol.
	(tonnes/year)	(tonnes/year)	(m^3)	(tonnes/year)	(m^3)	(tonnes/year)	(m^3)	(tonnes/year)	(m^3)
2017	144,368	144,368	1,443,834	2018 Survey					
2018	146,431	146,431	1,267,753						
2019	148,042	148,042	1,089,864						
2020	149,670	149,670	910,146						
2021	151,317	151,317	728,580						
2022	152,981	152,981	545,145						
2023	154,664	154,664	359,820						
2024	156,365	156,365	172,585		175,330				
2025	158,085	144,229	0	13,857	158,749		2,859,800		
2026	159,824			132,755	0	27,069	2,827,430		
2027	161,582					161,582	2,634,338		
2028	163,360					163,360	2,439,250		
2029	165,157					165,157	2,242,144		
2030	166,973					166,973	2,042,998		
2031	168,810					168,810	1,841,790		
2032	170,667					170,667	1,638,497		
2033	172,544					172,544	1,433,096		
2034	174,442					174,442	1,225,564		
2035	176,361					176,361	1,015,878		
2036	178,301					178,301	804,013		
2037	180,262					180,262	589,946		
2038	182,245					182,245	373,653		
2039	184,250					184,250	155,109		3,428,016
2040	186,277					130,845	0	55,432	3,362,305
2041	188,326							188,326	3,139,185
2042	190,397							190,397	2,913,738
2043	192,492							192,492	2,685,940
2044	194,609							194,609	2,455,765
2045	196,750							196,750	2,223,186
2046	198,914							198,914	1,988,177
2047	201,102							201,102	1,750,711
2048	203,314							203,314	1,510,762
2049	205,551							205,551	1,268,301
2050	207,812							207,812	1,023,301
2051	210,098							210,098	775,735
2052	212,409							212,409	525,574
2053	214,745							214,745	272,790
2054	217,107							231,857	17,353

* Reported waste tonnages EXCLUDES controlled waste and cover soil.

** Volumes of controlled wastes, soil cover and settlement are taken into account in the Volumetric Analysis.

1.4 Waste Composition at Hartland Landfill

The CRD has historically retained consultants to complete waste composition studies. The two most recent studies were completed in 2010 and 2016 by Tetra Tech.

The CRD successfully implemented a kitchen waste diversion program between 2014 and 2016 which impacted the composition of waste disposed at the Hartland Landfill. Results of this diversion program are clearly reflected in the outcomes of the 2016 waste composition study.

Table 1.2 below shows the 2010 and 2016 waste composition data and the change in each waste category between these two years as reported by Tetra Tech.

Table 1.2 - Waste Composition (Tetra Tech 2016 report)

Primary Category	2009/2010[1]	2016	Change (2016-2010)
	Weighted Average % Composition		
Paper and Paperboard	15.5%	15.4%	-0.1%
Glass	1.9%	1.7%	-0.2%
Ferrous Metals	2.3%	1.8%	-0.5%
Non-ferrous Metals	0.6%	0.7%	+0.1%
Plastics	12.5%	14.3%	+1.8%
Organics	27.7%	21.1%	-6.6%
Wood and Wood Products	12.2%	17.0%	+4.8%
Construction and Demolition (non-wood)	7.4%	6.7%	-0.7%
Textiles	5.3%	5.9%	+0.7%
Tires	0.7%	0.8%	+0.1%
Bulky Objects	0.6%	1.3%	+1.3%
Household Hygiene	8.9%	6.9%	-2.0%
Hazardous Wastes	0.7%	1.8%	+1.0%
Electronics	1.8%	1.8%	0.0%
Other	1.9%	2.7%	+0.8%

SHA believes the 2010 data better reflects the composition of the waste deposited at the landfill historically up until 2013. We assumed a transitioning period between 2013 and 2016, and used the 2016 waste composition data to represent the quality of waste deposited in 2016 and going forward. Therefore, we considered three different waste compositions to more accurately predict the LFG generation from Hartland Landfill. These waste compositions are presented in Section 2 of this report.

1.5 Climate Condition

Hartland Landfill is located in a relatively wet climate. The temperature and precipitation data for 1981 to 2010 were sourced from the Environment Canada website. The nearest weather station to the site is the Saanichton CDA weather station, which is located approximately 8 km north of the Hartland Landfill.

The Saanichton CDA weather station was used to estimate the average climatic conditions for the landfill. As such, the average annual precipitation estimated for the landfill is approximately 908 mm.

Table 1.3 and Figure 1.1 summarize the average monthly precipitation and temperature for the Saanichton CDA weather station.

Table 1.3 - Climate Data for Saanichton CDA Station, 1981 to 2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	Temperature												
Daily Average (°C)	4.8	5.3	7.1	9.3	12.2	14.9	17	17.1	14.6	10.3	6.6	4.5	**10.3**
Extreme Maximum (°C)	16	16.1	20.5	25.5	31.5	33.9	**34.4**	32.8	30.5	27	17.8	15	
Date (yyyy/dd)	2005/ 19	1963/ 08	1994/ 28	1998/ 30	1983/ 28	1925/ 25	**1941/ 16**	1915/ 20	1987/ 01	1987/ 01	1949/ 02	1997/ 28	
Extreme Minimum (°C)	-13.3	-12.2	-8.9	-3.3	-1.1	2.2	3.3	4.4	1.7	-3.9	-12.2	**-13.9**	
Date (yyyy/dd)	1950/ 14	1936/ 07	1955/ 05	1972/ 03	1976/ 30	1933/ 09	1922/ 08	1919/ 27	1972/ 27	1935/ 30	1955/ 15	**1964/ 16**	
	Precipitation												
Rainfall (mm)	136.9	85.4	77.4	51.5	41.5	34.7	20.5	26.5	29.6	92.6	155	134.7	886
Snowfall (cm)	8.1	4.1	1.9	0	0	0	0	0	0	0.4	0.8	6.7	22
Precipitation (mm)	145.1	89.6	79.3	51.5	41.5	34.7	20.5	26.5	29.6	93	155.8	141.3	**908**
Extreme Daily Rainfall (mm)	**73.2**	51.8	44.8	63	45.7	40.6	53	55.6	46.2	120	82.3	68.3	
Date (yyyy/dd)	**1935/ 21**	1995/ 18	1997/ 18	1991/ 03	1948/ 27	1955/ 22	1993/ 19	1975/ 22	1924/ 22	2003/ 16	1955/ 02	1972/ 25	
Extreme Daily Snowfall (cm)	35.1	52.1	20.3	2.5	0	0	0	0	0	6	22.9	**40.6**	
Date (yyyy/dd)	1935/ 20	1923/ 14	1960/ 03	1955/ 13	1914/ 01	1914/ 01	1914/ 01	1914/ 01	1914/ 01	1991/ 28	1937/ 13	**1968/ 30**	

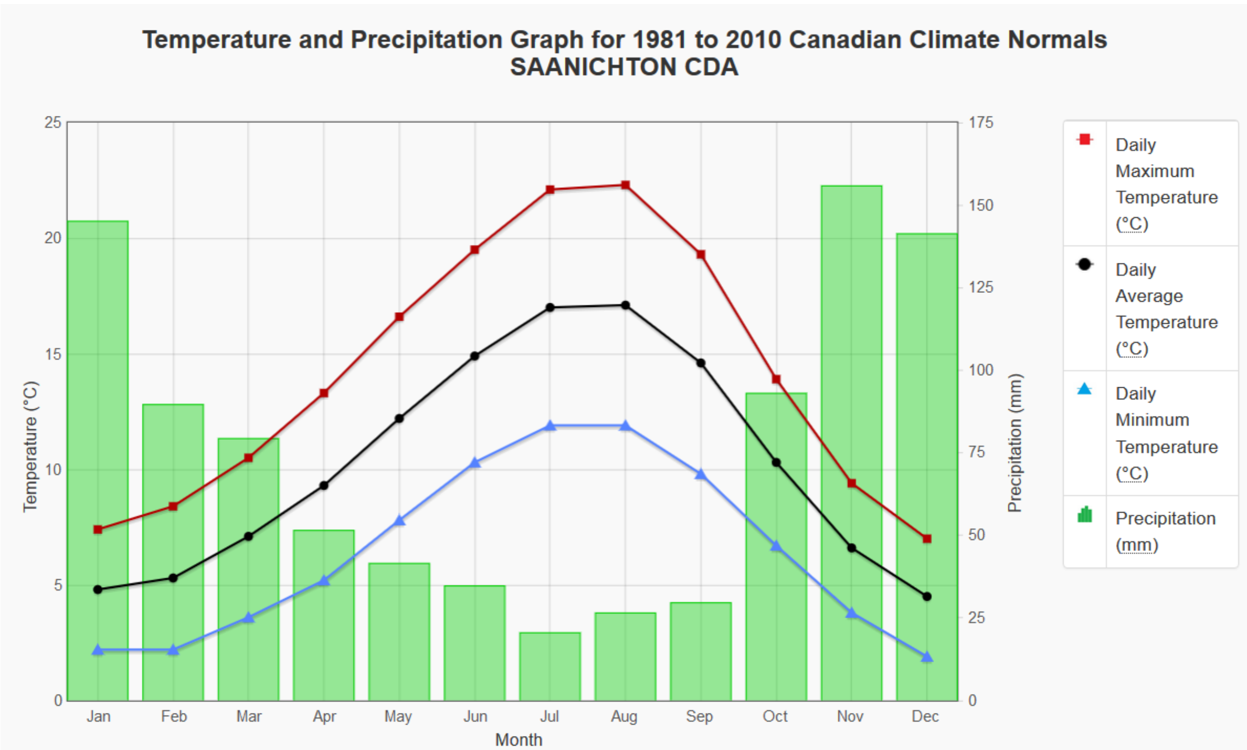

Figure 1.1 - Temperature and Precipitation Graph for 1981 to 2010 Canadian Climate Normals

2 LANDFILL GAS GENERATION ASSESSMENT

There are several LFG generation models which assist landfill designers, operators and regulating authorities to estimate the amount of methane generated in landfills. Among these models, the first order decay reaction model has been the most widely used. The first order decay reaction model assumes that degradable materials in the waste are decomposed at a constant rate over a period of time. First order decay models also assume that the total amount of carbon decreases gradually (consumed by the bacteria) and therefore the rate of gas generation also decreases every year after the deposition of organics in the landfill ceases.

Due to the highly heterogeneous nature of landfills and effects of several dynamic parameters that affect gas generation, these models are not 100% accurate. Normally, the models that are developed and used by regulating authorities, such as the ENV Model, are simpler and easier to use. While these models are known to be great tools for screening the facilities with respect to regulation requirements and compliance reviews, they have limitations that may contribute to uncertainty of the model's predictions. Consulting engineers and qualified professionals, however; tend to use more complicated and advanced models in order to more accurately quantify the methane generation to design LFG management and gas-to-energy (GTE) systems and facilities. These models are normally more complicated and require more site-specific data, however; they are believed to provide more accurate estimation of methane generation form landfills.

In the present study, an advanced LFG generation model (UBCiModel©) was used. This model was developed by SHA's LFG specialist, Dr. Abedini, during his PhD program at the University of British Columbia (UBC) in 2012. This model, which is also based on the first order decay reaction, has proved to provide the most realistic generation estimates based on our experience using this model for multiple sites where active gas collection systems are operational and the actual gas generation rates can be measured (e.g. Vancouver Landfill, Mission Flats Landfill, Creston Landfill, and Delta Shake and Shingle Landfill).

A second round of LFG modeling was completed in this study using the ENV Model (a.k.a. MOE Tool). In order to be able to compare the results of these two models, we used the same assumptions, updated waste quantities and waste composition data as was used in the UBCiModel. Furthermore, we compared results of these gas generation estimates with previous estimates provided by SCS in 2018 (using SCS's inhouse model) and CRA in 2010 (using the MOE Tool).

2.1 University of British Columbia Integrated Model (UBCiModel©)

2.1.1 UBCiModel© Data Input

The UBCiModel© utilizes variable methane generation potential (L_o) developed based on the dry decomposable organic carbon (DOC_{dry}) historically deposited at the landfill. The variable L_o reflects the historical changes in waste consumption, recycling, and disposal strategies. Degradability and moisture content of each waste component and several other factors defining the ultimate bioavailability of the total deposited DOC are also incorporated into development of the historical and future projection of L_o for each year throughout the landfill's lifespan. In UBCiModel©, the decay rate (k) for each organic component of the waste is defined based on the biodegradation half-life of that component.

Table 2.1 shows the values for the DOC_{dry} and Table 2.2 provides the decay rates used by UBCiModel©.

Table 2.1 - DOC_{dry} Ranges and Default Values Used by UBCiModel©

Waste Components		DOC content in % of dry waste	
		Range	Default
A.	Paper and Cardboard	40 – 50	44
B.	Textiles and Nappies	25 – 50	30
C.	Food waste	20 – 50	38
D.	Wood	46 – 54	50
E.	Garden and park waste	45 – 55	49
F.	Rubber and Leather	47	47
G.	Plastics, Metal, Glass and other inert materials	0	0

Table 2.2 - UBCiModel© Default Decay Rates

Waste Components	Decay Rates (k, year $^{-1}$)		
Annual Precipitation (mm)	< 500	500 to 1000	> 1000
Food Waste	0.07	**0.15**	0.35
Yard Waste	0.04	**0.08**	0.14
Paper and Textile	0.02	**0.05**	0.07
Wood Waste	0.02	**0.03**	0.04

Using the waste composition analysis report by Tetra Tech in 2016, we considered three different waste compositions to more accurately predict the LFG generation from the Landfill. Three waste composition scenarios were used to represent the quality of waste deposited at the Landfill and are summarized below for reference:

(i) prior to implementation of the kitchen waste diversion program,

(ii) transitioning period, and

(iii) after completion of the diversion program in 2016.

The three waste composition scenarios are presented in Table 2.3 below as well as Table 2.6 in categories as inputted into UBCiModel and ENV Model, respectively.

Table 2.3 - Waste Composition used in the UBCiModel©

	UBCiModel - Input DOC used for Hartland Advanced LFG Modeling (SHA-PRJ19003)							
	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
Up to 2013	21.7%	6.0%	15.5%	12.5%	5.6%	3.9%	34.9%	100%
2014 & 2015	20.6%	3.8%	15.5%	14.9%	5.9%	3.8%	35.5%	100%
2016 to future	19.5%	1.6%	15.4%	17.4%	6.3%	3.7%	36.1%	100%

2.1.2 UBCiModel© Results

Illustration of the cell-by-cell lifespan LFG generation for the Landfill using the UBCiModel is provided below in Figure 2.1. Full results are also provided in Appendix B.

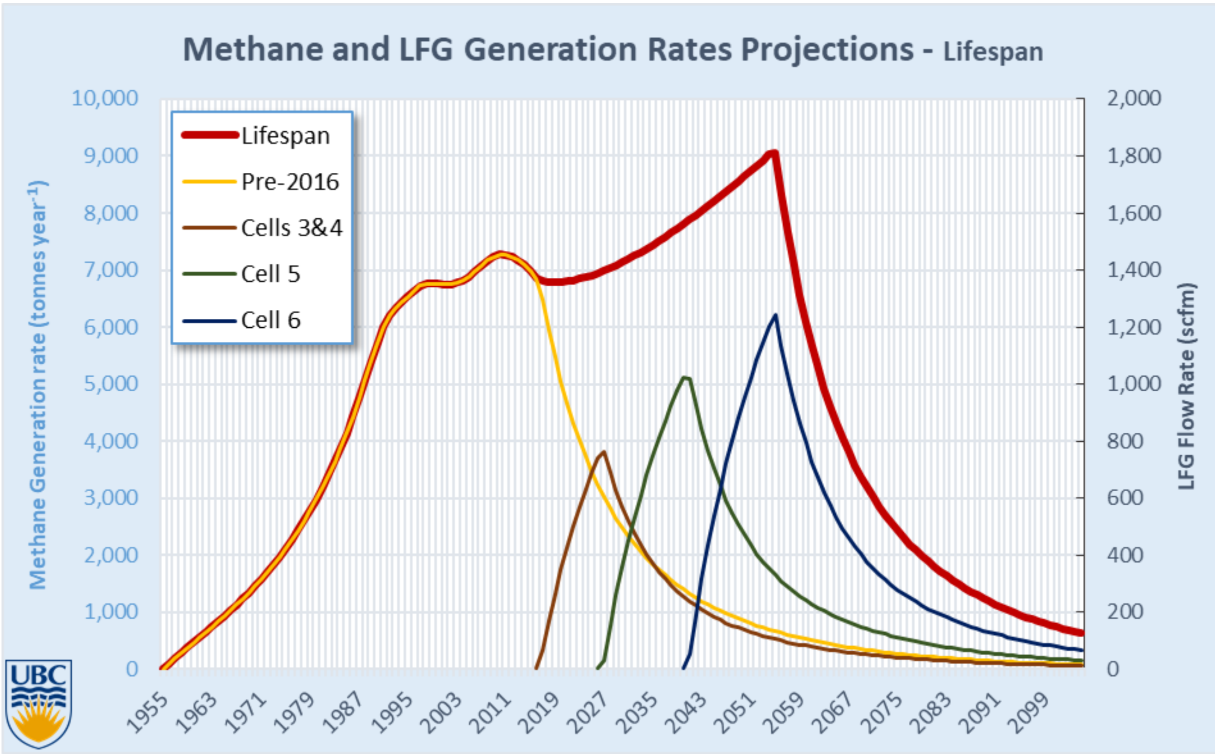

Figure 2.1 - Methane and LFG Generation Estimates, Lifespan and Phase 4 Cells

Based on the results achieved from the UBCiModel©, the current LFG generation at the Landfill is approximately 1,346 standard cubic feet per minute (scfm) (at 50% v/v CH_4), equivalent to 6,787 tonnes of CH_4 per year. The UBCiModel© predicted methane generation at the Landfill in 2018 was approximately 6,790 tonnes/year, equivalent to an average LFG flow rate of 1,347 scfm. Based on the UBCiModel©, the Landfill active LFG management system had a methane capture efficiency of 76% in 2018.

This model shows that LFG generation at the Landfill will peak in 2055 at a maximum LFG generation rate of 1,795 scfm, equivalent to approximately 9,050 tonnes of CH_4 per year.

2.2 ENV Model

The BC LFG Regulation requires that the LFG generation assessment reports be prepared in accordance with the Landfill Gas Generation Assessment Procedure Guidance Report (ENV Guidelines), prepared for ENV by CRA in 2009. The model used for this purpose (ENV Model) relies on the first order decay reaction, where the waste categories are grouped into three major categories of (i) relatively inert, (ii) moderately decomposable, and (iii) decomposable materials.

For the purpose of ENV Guidelines, the historical data on annual waste tonnage should cover the period from the first year of the landfill operations or thirty years before the year in which the gas generation assessment takes place, whichever is more recent, to the year immediately preceding the year in which the assessment is conducted. Therefore, for the case of the Hartland Landfill in the present assessment only wastes deposited after 1989 were taken into account.

The ENV has another LFG generation estimation Tool for Annual Reporting that differs from the above-mentioned LFG Generation Estimation Tool. The ENV Annual Reporting Tool (ENV AR Tool) is also used to assess performance of existing active LFG systems and methane capture efficiency. In the ENV Annual Reporting Tool all waste tonnage data from 1980 to the calendar year prior to the assessment are taken into account, resulting in methane generation estimates higher than the ENV Model estimates.

2.2.1 ENV Model Data Input

Methane Generation Potential, L_o

The methane generation potential (L_o), represents the total potential yield of methane from unit mass of waste. This outcome depends on the waste composition, and more specifically the fraction of organic matter present. The recommended L_o values in the ENV Guidelines for different waste categories were assigned as presented in Table 2.4.

Table 2.4 - ENV Model _ Methane Generation Potential (L_o)

Gas Production potential, L_o		
Relatively Inert	Moderately Decomposable	Decomposable
(m^3 CH_4/tonne)	(m^3 CH_4/tonne)	(m^3 CH_4/tonne)
20	120	160

Methane Generation Rate, k

The methane generation rate (k) is influenced by the moisture content of the waste, the availability of nutrients, pH, and temperature. In determining the value of k from the ENV Guidelines, average annual precipitation of 908 mm, as mentioned in section 1.5, was used. Since the value of average annual precipitation lies within the range >500 mm to <1,000 mm the following value, of k were selected for three different categories of waste:

Table 2.5 - ENV Model _ Methane Generation Rate (k)

Methane Generation Rate, k		
Relatively Inert	Moderately Decomposable	Decomposable
($year^{-1}$)	($year^{-1}$)	($year^{-1}$)
0.02	0.04	0.09

Water Addition Factor

The moisture content within a landfill is influenced primarily by the infiltration of precipitation through the Landfill cover and active area. Other factors that may affect the moisture content in the waste that in turn will affect the rate of LFG generation, include the initial moisture content of the incoming waste, the amount and type of daily cover used at the landfill, the permeability and time of placement of final cover systems, the type of base liner, the leachate collection system and the depth of the waste in the landfill site. SHA collected this information for Hartland Landfill during the preparation of the previous projects. Currently, there is no leachate recirculation or storm water injection system in place. Based on SHA's knowledge, the CRD has no plan for moisture addition in the future either.

The water addition factor was determined from the ENV Guidelines based on the information described above. As the landfill condition is such that partial infiltration is taking place, a factor of 1.0 was selected.

Methane Generation Rate Correction Factor

Part of the Hartland Landfill is capped with a low permeability cover system and the storm water management systems have been implemented across the Landfill. No leachate recirculation and/or storm water injection system neither is in place nor considered to be implemented in the future. Therefore, the methane generation rate correction factor was selected to be 1.0 for the Hartland Landfill.

Waste Characterization Summary

As discussed in Section 2.1.1, using the 2010 and 2016 waste compositions report by Tetra Tech in 2016, three different compositions were developed grouping the waste components in to the categories required by the ENV Model. In calculation of each category's percentages we made the following assumptions based on the details provided in the Tetra Tech report.

- Moderately Decomposable: Including wood waste, paper, textile, 20% of "composite products", and 50% of "other" (to account for diapers),
- Decomposable: Including food waste and yard waste.

These waste compositions are presented in Table 2.6 below in categories required by the ENV Model.

Table 2.6 - ENV Model _ Waste Compositions

	Relatively Inert	Moderately Decomposable	Decomposable
1981 - 2013	35.1%	37.2%	27.7%
2014 - 2015	35.8%	39.8%	24.4%
2016 - end	36.5%	42.4%	21.1%

2.2.2 ENV Model Results

The ENV Model gas generation estimates show that the annual methane generation at the Hartland Landfill in 2018 was approximately 7,016 tonnes/year and is currently about 7,118 tonnes/year.

Based on ENV Model results, Hartland Landfill's active LFG management system had a collection efficiency of 74% in 2018.

The output summary of the results from the ENV Model is presented in Table 3.1. This Table represents the information required in Sections 4(2)d, 4(2)(e) and 4(3)(a) of the LFG Regulation. T2 summary of the ENV Model is presented in Appendix C.

Table 2.7 Output Summary of the ENV Model LFG Generation Assessment Results

Item	Year of Estimate	Mass of Methane (Tonnes/year)
Estimated Quantity of Methane Produced in the Year Preceding the Assessment	2018	7,016
Estimated Quantity of Methane Produced in the Year of Assessment	**2019**	**7,118**
Estimated Quantity of Methane Produced one Year after the Assessment	2020	7,220
Estimated Quantity of Methane Produced two Years after the Assessment	2021	7,323
Estimated Quantity of Methane Produced three Years after the Assessment	2022	7,426
Estimated Quantity of Methane Produced four Years after the Assessment	2023	7,529

The ENV Annual Reporting Tool (ENV AR Tool) estimated slightly higher methane generation rates in comparison to the ENV Model. The ENV AR Tool showed that the annual methane generation at the Hartland Landfill in 2018 was 7,899 tonnes/year and is currently about 7,970 tonnes/year.

Based on the ENV Annual Reporting Tool, Hartland Landfill's active LFG management system had a collection efficiency of 66% in 2018.

These results are illustrated in Figure 2.2 shown as ENV Model 2019 and ENV AR Tool 2019.

2.3 Previous LFG Generation Assessments

2.3.1 CRA LFG Generation Assessment – 2011

In 2011, the CRD retained Conestoga-Rovers & Associates (CRA) to complete a *Long-Term Landfill Gas Management Plan* for the Hartland Landfill. CRA used the ENV Model to estimate methane generation and concluded a 32% LFG capture efficiency at this facility in 2010. CRA also completed a lifespan LFG generation assessment based on a scenario that the CRD would implement an aggressive organic diversion program. Results of the CRA's LFG generation assessment for scenarios of with and without organic diversion are illustrated in Figure 2.2, shown as CRA 2011 Report with Diversion and CRA 2011 Report w/o Diversion, respectively.

2.3.2 SCS LFG Generation Assessment - 2018

In 2018, CRD retained SCS Engineers (SCS) to prepare a *Renewable Natural Gas Technical Feasibility Design Report* for a potential renewable natural gas (RNG) plant for the Hartland Landfill. SCS used its own inhouse model to estimate a lifespan LFG generation for the Hartland Landfill. Based on SCS Model results, methane capture efficiency of the active LFG system at this was about 69% in 2018.

Results of the SCS analyses are illustrated in Figure 2.2 shown as SCS Model 2018.

2.4 Comparison of Different LFG Generation Models

2.4.1 Methane Generation Estimates

Figure 2.2 illustrates the lifespan methane generation results using the UBCiModel©, the ENV Model, the ENV Annual Reporting Tool as well as the results of the previous studies completed by SCS and CRA. Figure 2.3 shows this comparison for years 1995 to 2020.

As shown in these figures, the current methane generation predictions made by the ENV Model in 2019 are very close to the other two models and sitting between predictions made by SCS and UBCiModel. However, the historical and future predictions of the ENV Model greatly differs from the UBCiModel estimates with historical estimations significantly lower that the UBCiModel results and future predictions being higher that the other models. The main reason for this difference is the fact that the ENV Model does not take into account wastes that were deposited prior to 1989 (30 years before the year of assessment). In this particular example, approximately 3 million tonnes of waste that were deposited between 1955 and 1989 at the Hartland Landfill were excluded from the gas generation assessment completed in 2019 using the ENV Model.

The ENV Annual Reporting Tool has a fixed initial year, i.e. 1980. Therefore, unlike the ENV Model, the ENV AR Tool can be used to assess the historical LFG capture efficiency.

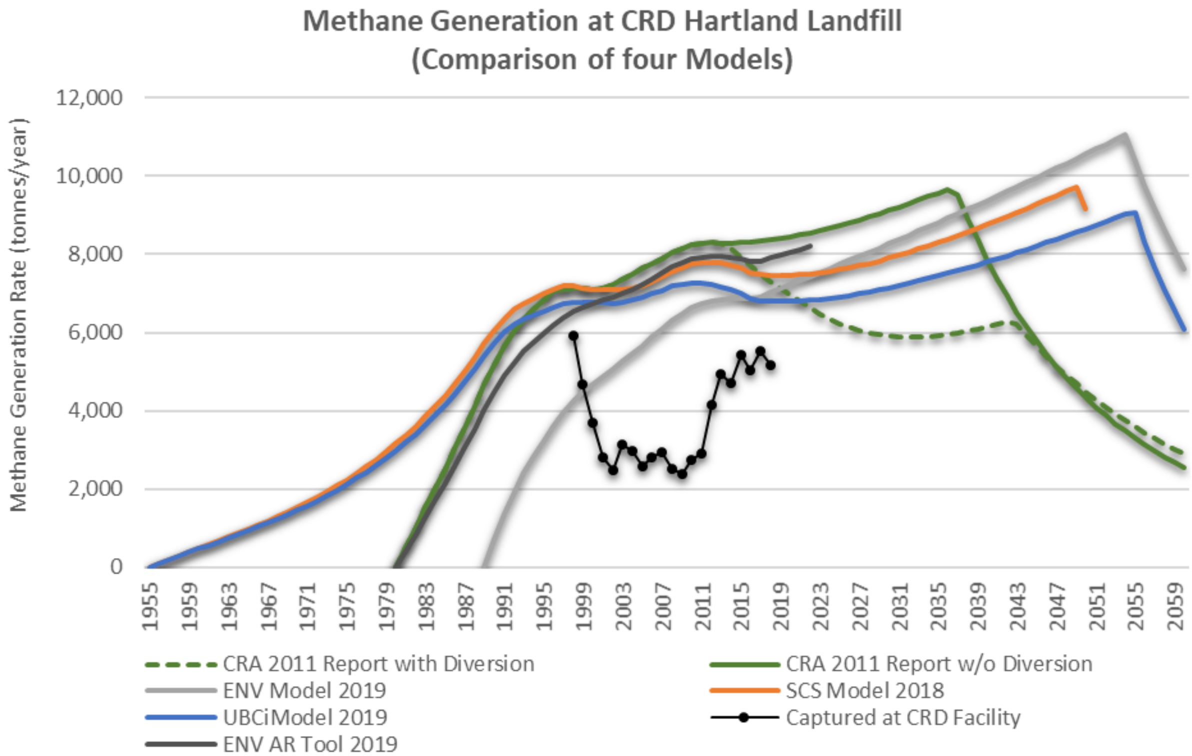

Figure 2.2 - Comparison of Various LFG Modeling Results for the Hartland Landfill

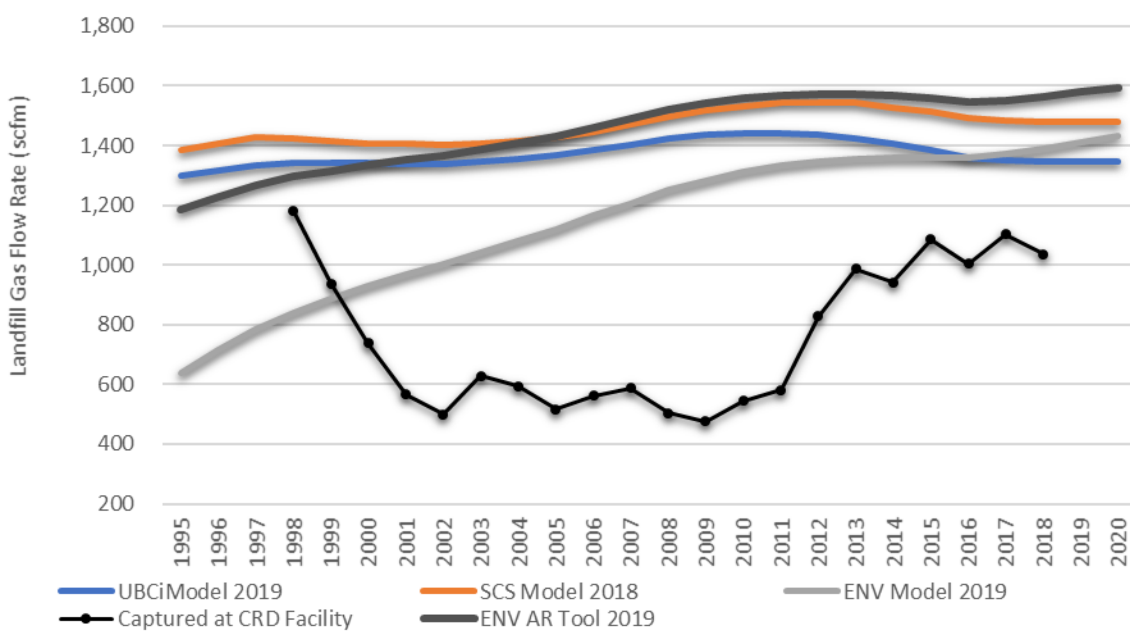

Figure 2.3 - Comparison of Various LFG Modeling Results 1995 - 2020

A summary of the UBCiModel©, ENV Model, and SCS Model results for the years of 1990 to 2020 are presented in Table 2.8 along with the quantity of LFG that was captured at the Hartland Landfill throughout its active LFG system's lifespan. Table 2.8 also includes information regarding total energy content of the generated gas at the landfill. Based on these results, the methane generation rate at the landfill in 2018 was between 6,800 and 7,500 tonnes/year while the total quantity of captured methane in this year was approximately 5,180 tonnes, equivalent to 1,035 scfm LFG at 50% v/v methane content. This quantity of collected methane in 2018 has a total energy content of 259,000 GJ and translates to a gas collection efficiency of 66% to 76% based on different models and methodologies.

Table 2.8 - Hartland Landfill Summary of LFG Generation and Energy Content Projections

Year	UBCiModel 2019			Energy Content	SCS Model 2018			Energy Content	ENV Model 2019			Energy Content	Captured at CRD Facility			Energy Content
	LFG		CH_4		LFG		CH_4		LFG		CH_4		LFG		CH_4	
	scfm	m3/hr	tonnes/yr	GJ/yr	scfm	m3/hr	tonnes/yr	GJ/yr	scfm	m3/hr	tonnes/yr	GJ/yr	scfm	m3/hr	tonnes/yr	GJ/yr
1990	1,136	1,930	5,726	286,287	1,199	2,037	6,049	302,458	140	239	708	35,420				
1991	1,191	2,023	6,004	300,213	1,260	2,141	6,358	317,900	270	459	1,362	68,117				
1992	1,231	2,092	6,207	310,365	1,306	2,220	6,593	329,630	382	649	1,928	96,379				
1993	1,257	2,136	6,339	316,933	1,337	2,272	6,747	337,351	476	809	2,403	120,137				
1994	1,279	2,173	6,448	322,420	1,363	2,317	6,881	344,033	562	955	2,835	141,733				
1995	1,297	2,204	6,540	327,013	1,385	2,353	6,988	349,378	639	1,086	3,226	161,283				
1996	1,317	2,238	6,641	332,041	1,408	2,392	7,103	355,169	714	1,214	3,604	180,224				
1997	1,333	2,265	6,722	336,116	1,427	2,424	7,198	359,920	782	1,330	3,949	197,447				
1998	1,341	2,279	6,763	338,146	1,424	2,420	7,187	359,326	840	1,428	4,240	212,022	1,181	2,008	5,905	295,250
1999	1,340	2,277	6,758	337,913	1,415	2,404	7,139	356,951	886	1,505	4,471	223,530	937	1,593	4,685	234,250
2000	1,340	2,277	6,758	337,883	1,408	2,393	7,106	355,317	928	1,578	4,687	234,336	738	1,255	3,690	184,500
2001	1,340	2,276	6,754	337,706	1,407	2,390	7,097	354,872	967	1,645	4,884	244,187	565	960	2,825	141,250
2002	1,339	2,275	6,752	337,607	1,404	2,385	7,083	354,130	1,003	1,705	5,064	253,207	499	848	2,495	124,750
2003	1,346	2,286	6,784	339,182	1,408	2,393	7,106	355,317	1,042	1,772	5,262	263,096	628	1,068	3,140	157,000
2004	1,353	2,299	6,822	341,075	1,416	2,405	7,142	357,099	1,080	1,836	5,452	272,588	593	1,008	2,965	148,250
2005	1,366	2,321	6,888	344,392	1,428	2,426	7,204	360,217	1,120	1,904	5,655	282,772	517	879	2,585	129,250
2006	1,385	2,353	6,982	349,112	1,447	2,459	7,302	365,117	1,164	1,979	5,877	293,845	562	955	2,810	140,500
2007	1,404	2,385	7,077	353,832	1,469	2,496	7,412	370,611	1,206	2,051	6,090	304,499	587	998	2,935	146,750
2008	1,424	2,420	7,180	358,991	1,497	2,543	7,552	377,590	1,250	2,125	6,309	315,460	504	857	2,520	126,000
2009	1,434	2,437	7,232	361,609	1,517	2,578	7,656	382,787	1,283	2,181	6,476	323,775	476	809	2,380	119,000
2010	1,442	2,450	7,271	363,565	1,533	2,605	7,736	386,796	1,313	2,231	6,626	331,299	546	927	2,728	136,400
2011	1,442	2,449	7,268	363,385	1,542	2,619	7,777	388,874	1,334	2,267	6,732	336,589	581	988	2,907	145,350
2012	1,435	2,438	7,235	361,756	1,544	2,624	7,792	389,617	1,348	2,291	6,805	340,240	829	1,409	4,145	207,250
2013	1,424	2,419	7,177	358,866	1,542	2,620	7,780	389,023	1,357	2,306	6,848	342,388	987	1,678	4,936	246,798
2014	1,408	2,392	7,099	354,949	1,528	2,596	7,709	385,459	1,360	2,312	6,867	343,334	942	1,601	4,710	235,475
2015	1,385	2,353	6,983	349,161	1,514	2,572	7,638	381,896	1,361	2,314	6,871	343,567	1,085	1,845	5,427	271,369
2016	1,361	2,312	6,860	343,015	1,494	2,537	7,534	376,699	1,357	2,307	6,852	342,577	1,004	1,708	5,022	251,123
2017	1,349	2,293	6,803	340,157	1,485	2,523	7,492	374,620	1,370	2,329	6,916	345,810	1,102	1,873	5,510	275,500
2018	1,347	2,288	6,790	339,483	1,481	2,516	7,472	373,581	1,390	2,363	7,016	350,803	1,035	1,760	5,177	258,840
2019	1,346	2,287	6,787	339,333	1,479	2,513	7,463	373,135	1,410	2,397	7,118	355,905				
2020	1,347	2,289	6,791	339,575	1,480	2,514	7,466	373,284	1,430	2,431	7,220	361,021				

Assumptions:

Methane Density: **0.678** kg/m3

Methane Energy Density: **50** GJ/tonne (**50** to 55 MJ/kg)

Lifespan LFG generation assessment results from the UBCiModel (2019), SCS Model (2018), and ENV Model (2019),and ENV Annual Reporting Tool are presented in Appendix D along with the CRA's 2011 estimates for Scenarios with and without organic diversion.

2.4.2 Historical Methane Capture Efficiency

Table 2.9 shows the Hartland Landfill active LFG collection system's efficiency between 2014 and 2019 base on the three models of UBCiModel©, SCS Model, ENV Model, and ENV Annual Reporting Tool. It should be noted that the estimates made by UBCiModel©, SCS Model and ENV AR Tool are based on a 1-time LFG generation assessment completed. However, the estimated efficiencies based on the ENV Model for 2014 through 2018 are based on this model's generation assessments completed with "the year of assessment" assigned as 2015 through 2019, respectively.

Table 2.9 – Hartland Landfill LFG System Capture Efficiency Based on three models

Year	Methane Capture Efficiency			
	UBCiModel	SCS Model	ENV Model*	ENV AR Tool
2014	66%	61%	64%	60%
2015	78%	71%	75%	69%
2016	73%	67%	71%	64%
2017	81%	74%	78%	70%
2018	76%	69%	74%	66%

* Based on generation estimates made in the year following year of assessment

The lifespan collection efficiency of the Landfill's active LFG collection system is presented in Appendix E.

2.4.3 Future Methane Capture Estimates

Since 2012, the CRD has been continuously improving and expanding the Hartland Landfill's LFG collection system. As of 2015, the active LFG system at this facility has maintained an excellent performance with a capture efficiency ranging between 66% to 81% based on our best gas generation estimate. In order to predict future gas quantities available for the CRD's LFG to RNG initiative, we assumed that the LFG wellfield will continue to expand as the landfill progresses, and that this facility will maintain a minimum gas collection efficiency of 73 to 75%.

Figure 2.4 illustrates the lifespan LFG generation, as well as the historical and future gas capture at the Landfill.

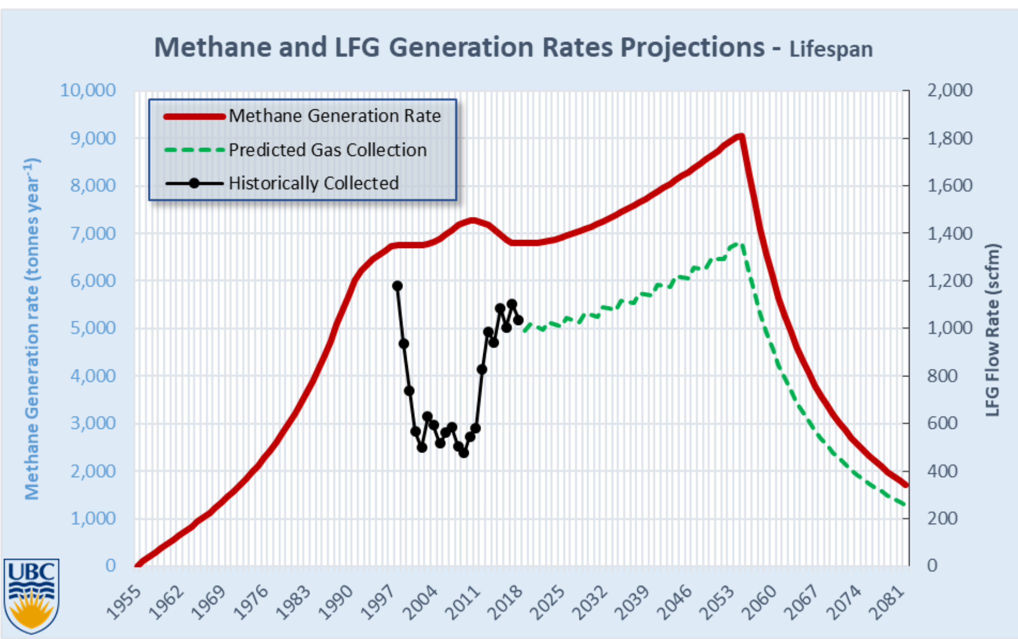

Figure 2.4 - Predicted LFG Collection Rates at the Hartland Landfill

As shown in Figure 2.4, our estimate shows that the LFG flow rate at the Hartland Landfill will peak in 2054 at approximately 1,360 scfm. In SHA's opinion, we believe that this LFG flow rate is a conservative number because when the landfill approaches the full closure status in 2054, the actual gas capture efficiency will approach 85% to 95%. However, to predict the available energy content of the captured gas after purification, we used the conservative lifespan collection efficiency of 75%. Furthermore, we made the following assumptions in calculation of the available energy content of the purified LFG at the Hartland Landfill for the next 20 years.

Assumptions:		
Methane Density:	**0.678**	kg/m3
Methane Energy Density:	**50**	GJ/tonne (**50** to 55 MJ/kg)
Annual GTE Shutdown:	**4%**	(2 weeks Scheduled and Emergency Shutdowns Annually)
Reduction Due to N_2 Control:	**10%**	(reduction of collected gas flow rate due to N_2 limitations in raw gas)
Methane Loss through Purification System:	**8%**	(3 to **8%** methane content in the off gas (half of collected gas))

Table 2.10 - Purified Gas Energy Content Estimates for the Hartland Landfill

Year	Capture Projections			Available Energy Projection
	LFG		CH_4	
	scfm	m^3/hr	tonnes/yr	GJ/yr
2020	1,010	1,716	5,094	202,441
2021	1,012	1,720	5,103	202,795
2022	1,015	1,724	5,116	203,339
2023	1,018	1,730	5,134	204,056
2024	1,023	1,738	5,156	204,930
2025	1,028	1,746	5,182	205,947
2026	1,034	1,756	5,211	207,095
2027	1,040	1,767	5,243	208,363
2028	1,047	1,778	5,277	209,742
2029	1,054	1,791	5,315	211,224
2030	1,062	1,804	5,354	212,801
2031	1,070	1,818	5,396	214,466
2032	1,079	1,833	5,440	216,213
2033	1,088	1,849	5,486	218,038
2034	1,098	1,865	5,534	219,935
2035	1,107	1,881	5,583	221,900
2036	1,118	1,899	5,634	223,930
2037	1,128	1,916	5,687	226,022
2038	1,139	1,935	5,741	228,172
2039	1,150	1,953	5,797	230,378
2040	1,161	1,973	5,853	232,637

The minimum amount of biomethane energy that will be made available through implementation of a potential LFG purification project is estimated to be 202,000 GJ per year. This estimate is based on the methane generation predictions of the UBCiModel©, and a gas capture efficiency of 75% at the Hartland Landfill's LFG facility. Assuming that no significant changes will occur at the CRD's waste generation rate and/or waste composition, this predicted available energy content will continue to increase at an approximate rate of 0.5% to 1% per year.

Please note that the assumptions related to the gas purification efficiency are based on the best management practices in the LFG industry which are greatly dependant on the selected CO_2 and N_2 removal technologies. We recommend these assumptions to be confirmed with the particular gas purification system manufacturers that the CRD will choose to work with.

3 STATEMENT OF LIMITATIONS

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of the Capital Regional District in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by Sperling Hansen Associates to determine its accuracy and completeness. Sperling Hansen Associates has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the Capital Regional District. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Sperling Hansen Associates does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to Sperling Hansen Associates during the course of this project. Should additional new data become available in the future, Sperling Hansen Associates should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

Yours truly,
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Appendix A7 US EPA Oxidation Table Reference for Cover System Capture

Conditions (C1 to C7)	**CH_4 Oxidation Fraction**
I. For all reporting years prior to 2013 reporting year	
C1. For all landfills regardless of cover type or methane flux	0.10
II. For 2013 reporting year and all subsequent years	
C2. For landfills that have a geomembrane (synthetic) cover or other non-soil barrier meeting the definition of final cover with less than 300 mm of cover soil for greater than 50% of the landfill area containing waste	0.0
C3. For landfills that do not meet the conditions in C2 above and for which you elect not to determine CH_4 flux	0.10
C4. For landfills that do not meet the conditions in C2 or C3 above and that do not have final cover, or intermediate or interim cover[a] for greater than 50% of the landfill area containing waste	0.10
C5. For landfills that do not meet the conditions in C2 or C3 above and that have final cover, or intermediate or interim cover[a] for greater than 50% of the landfill area containing waste and for which the CH_4 flux rate[b] is less than 10 grams per square meter per day (g/m^2/d)	0.35
C6. For landfills that do not meet the conditions in C2 or C3 above and that have final cover or intermediate or interim cover[a] for greater than 50% of the landfill area containing waste and for which the CH_4 flux rate[b] is 10 to 70 g/m^2/d	0.25
C7: For landfills that do not meet the conditions in C2 or C3 above and that have final cover or intermediate or interim cover[a] for greater than 50% of the landfill area containing waste and for which the CH_4 flux rate[b] is greater than 70 g/m^2/d	0.1

[a] Where a landfill is located in a state that does not have an intermediate or interim cover requirement, the landfill must have soil cover of 12 inches (300 mm) or greater in order to use an oxidation fraction of 0.25 or 0.35.

[b] Methane flux rate (in grams per square meter per day; g/m^2/d) is the mass flow rate of methane per unit area at the bottom of the surface soil prior to any oxidation and is calculated as follows:

For Equation HH-5 of this subpart, or for Equation TT-6 of subpart TT of this part,

$$\mathrm{MF} = K \times G_{\mathrm{CH}\,4} / \mathrm{SArea}$$

For Equation HH-6 of this subpart,

$$\mathrm{MF} = K \times \left(G_{\mathrm{CH}\,4} - \sum_{n-1}^{N} R_n\right) / \mathrm{SArea}$$

For Equations HH-7 pf this subpart,

$$\mathrm{MF} = K \times \left(\frac{1}{\mathrm{CE}} \sum_{n-1}^{N} \left[\frac{R_n}{f_{\mathrm{Rec},n}}\right]\right) / \mathrm{SArea}$$

For Equation HH-8 of this subpart,

$$\mathrm{MF} = K \times \left(\frac{1}{\mathrm{CE}} \left\{\sum_{n-1}^{N} \left[\frac{R_n}{f_{\mathrm{Rec},n}}\right]\right\} - \sum_{n-1}^{N} R_n\right) / \mathrm{SArea}$$

Where:

MF = Methane flux rate from the landfill in the reporting year (g/m^2/d).

K = unit conversion factor = 10^6/365 (g/metric ton per days/year) or 10^6/366 for a leap year.

SArea = The surface area of the landfill containing waste at the beginning of the reporting year (m^2).

G_{CH4} = Modeled methane generation rate in reporting year from Equation HH-1 of this subpart or Equation TT-1 of subpart TT of this part, as applicable, except for application with Equation HH-6 of this subpart (metric tons CH_4). For application with Equation HH-6 of this subpart, the greater of the modeled methane generation rate in reporting year from Equation HH-1 of this subpart or Equation TT-1 of this part, as applicable, and the quantity of recovered CH_4 from Equation HH-4 of this subpart (metric tons CH4).

CE = Collection efficiency estimated at landfill, taking into account system coverage, operation, and cover system materials from Table HH-3 of this subpart. If area by soil cover type information is not available,

use default value of 0.75 (CE4 in table HH-3 of this subpart) for all areas under active influence of the collection system. N = Number of landfill gas measurement locations (associated with a destruction device or gas sent off-site). If a single monitoring location is used to monitor volumetric flow and CH_4 concentration of the recovered gas sent to one or multiple destruction devices, then N = 1. R^n = Quantity of recovered CH_4 from Equation HH-4 of this subpart for the nth measurement location (metric tons). $f^{Rec,n}$ = Fraction of hours the recovery system associated with the nth measurement location was operating (annual operating hours/8760 hours per year or annual operating hours/8784 hours per year for a leap year).

APPENDIX B

Well Field Data

B1 Gas Well Activation Dates

B2 Hartland Landfill Gas Well Field Data

B3 Hartland Landfill Gas Well Field Data Summary

Appendix B1 Hartland Landfill Gas Well Operation

Operating Year(s) for Gas Wells Hartland Landfill
Capital Regional District

Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
BLGW0001			2002	2003	2005						x	x	x	IA																	*Deactivated 2005*
BLGW0002			2002	2003	2005						x	x	x	IA																	*Deactivated 2005*
BLGW0003			2002	2003	2007						x	x	x	x	x	IA															*Deactivated 2007*
BLGW0004			2002	2003	2007						x	x	x	x	x	IA															*Deactivated 2007*
BLGW0005			2002	2003	2007						x	x	x	x	x	IA															*Deactivated 2007*
BLGW0006			2002	2003	2007						x	x	x	x	x	IA															*Deactivated 2007*
BLGW0007			2002	2003	2007						x	x	x	x	x	IA															*Deactivated 2007*
BLGW0008			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0009			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0010			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0011			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0012			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0013			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0014			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0015			2002	2003	2004						x	x	IA																		*Deactivated 2004*
BLGW0016			2002	2003	2008						x	x	x	x	x	x	IA														*Deactivated 2008*
BLGW0017			2002	2003	2008						x	x	x	x	x	x	IA														*Deactivated 2008*
BLGW0018			2002	2003	2008						x	x	x	x	x	x	IA														*Deactivated 2008*
BLGW0019			2002	2003	2006						x	x	x	x	IA																*Deactivated 2006*
BLGW0020			2002	2003	2006						x	x	x	x	IA																*Deactivated 2006*
BLGW0021			2002	2003	2006						x	x	x	x	IA																*Converted to vertical well OLGW0048s*
LHGW0001	**LHGW0001**		1999	2003	2011						x	x	x	x	x	x	x	x	x	IA											*Abandoned May 2011*
LHGW002A	**LHGW002A**	**147**	1999	2007											x	x	x	x	x	x	x	x	x	x	x	x	x	IA	IA		*Disconnected for Cell 1 closure - reconnected in Dec2012*
LHGW002B	**LHGW002B**		1999	2007	2011								x	x	x	x	x	x	x	IA											*Abandoned in May 2011*
LHGW0003	**LHGW0003**	**147**	1999	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA	IA		*Disconnected for Cell 1 closure reconnected Jan2013*
LHGW0004	**LHGW0004**	**147**	1999	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
LHGW0005																															
LHGW0006	**LHGW0006**	**143**	2008	2009	2014												x	x	x	x	x	x	IA								*Abandoned May 2014*
LHGW0007	**LHGW0007**	**143**	2008	2009													x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*
LHGW0008	**LHGW0008**	**143**	2008	2009													x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*
LHGW0009	**LHGW0009**	**143**	2012	2012	2014															x	x	x	IA								*Start Feb 2012 - abandoned May 2014*

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
LHGW0010	LHGW0010	143	2011	2012	2014															x	x	x	IA								*Start Feb 2012, was 11 - abandoned May 2014*
LHGW0013	LHGW0013	151	2012	2011															x	x	x	x	x	x	x	x	x	x	x		*Start September 2011*
LHGW0017	LHGW0017	163	2014	2012																x	x	x	x	x	x	IA					*Start January 2012 / no readings 2017-2018 - no production*
LHGW0019	LHGW0019	---	2014	2014																		x	x	x	x	x	x	x	x		*Started May 2014*
LHGW0020	LHGW0020	159	2014	2014																		x	x	x	x	x	x	x	x		*Started May 2014*
LHGW0021	LHGW0021	159	2014	2014																		x	x	x	x	x	IA				*Started May 2014*
LHGW0022	LHGW0022	159	2014	2014																		x	x	x	x	x	x	x	x		*Started May 2014*
LHGW0023	LHGW0023	159	2011	2011															x	x	x	x	x	x	x	x	x	x	x		*Start September 2011, was 21*
OHGW0001	HLGW0001	139	1999	2001					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW0002	HLGW0002		1999	2001	2011				x	x	x	x	x	x	x	x	x	x	x	IA											*Abandoned May 2011*
OHGW0003	HLGW0003	139	1999	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW0004	HLGW0004	147	1999	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA					*Disconnected for Cell 1 closure - reconnected Jan2013 / no readings 2017-2018 - no production*
OHGW0005	HLGW0005	147	1999	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW006A	HLGW006A	159	1999	2005									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OHGW006B	HLGW006B	159	1999	2005									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW0007	HLGW0007		1999	2005	2011								x	x	x	x	x	x	x	IA											*Abandoned in May 2011*
OHGW008A	HLGW008A	143	1999	2006										x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW008B	HLGW008B	143	1999	2006										x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		*Disconnected for Cell 1 closure - reconnected Jan2013*
OHGW0009	HLGW0009	139	2007	2008	2014										x	x	x	x	x	x	x	x	IA								*Disconnected for Cell 1 closure - reconnected Jan2013 - abandoned May 2014*
OHGW0010	HLGW0010	139	2007	2008											x	x	x	x	x	x	x	x	x	x	x	IA					*Disconnected for Cell 1 closure - reconnected Jan2013 / no readings 2017-2018 - no production*
OHGW0011	HLGW0011		2007	2008											x	x	x	x	x	x	x	x	x	x	x	IA					*Disconnected for Cell 1 closure - reconnected Jan2013 / no readings 2017-2018 - no production*
OHGW0012	HLGW0012	147		2010														x	x	x	x	x	x	x	x	x	x	x	x		
OHGW0013	HLGW0013	147		2010														x	x	x	x	x	x	x	x	x	x	x	x		
OHGW0014	HLGW0014	155		2011															x	x	x	x	x	x	x	x	x	x	x		
OHGW0015	HLGW0015	155		2011	2014														x	x	x	x	IA								*Abandoned May 2014*

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
	HLGW016A	159	2012	2012																x	x	x	x	x	x	IA					*Started Dec 2012 / no readings 2017-2018 - no production*
OHGW0016 /HLGW0016	HLGW016B	163	2012	2012																x	x	x	x	x	x	x	x	x	x		*Started Jan 2012*
	HLGW017A	163	2012	2013																x	x	x	x	x	x	x	x	IA	IA		*Started Dec 2012*
OHGW0017/HLGW0017	HLGW017B	163	2012	2012																x	x	x	x	x	x	x	x	x	x		*Started Jan 2012*
	HLGW0018	165	2012	2013																	x	x	x	x	x	x	x	x	x		*Started Jan2013*
	HLGW019B	165	2013	2013																	x	x	x	x	x	IA					*Started Jan 2013 / no readings 2017-2018 - no production*
	HLGW019C	165	2012	2012	2020															x	x	x	x	x	x	x	x	IA	IA		*Started Dec 2012 - decommissioned July 2020*
	HLGW020B	165	2013	2013																	x	x	x	x	x	IA					*Started Jan 2013 / no readings 2017-2018 - no production*
	HLGW021B	165	2013	2013																	x	x	x	x	x	x	x	x	x		*Started Jan 2013*
	HLGW022B	165	2013	2013																	x	x	x	x	x	x	x	x	x		*Started Jan 2013*
Previously HLGW0023	HLGW023B	165	2013	2013																	x	x	x	x	x	x	x	x	x		*Started Jan 2013*
	HLGW024B	171	2014	2016																				x	x	x	x	x	x		*Activated 2016*
	HLGW025B	171	2014	2016																				x	x	x	x	x	x		*Activated 2016*
	HLGW026B	171	2014	2015																			x	x	x	x	x	x	x		*Started Jan 2015*
	HLGW027A	171	2014	2017																					x	x	x	x	x		*Activated 2017*
	HLGW027B	171	2014	2015																			x	x	x	x	x	x	x		*Started Jan 2015*
	HLGW028B	171	2014	2015																			x	x	x	x	x	x	x		*Activated Jan 2015*
	HLGW028A	171	2014	2017																					x	x	x	x	x		
	HLGW029B	171	2014	2015																			x	x	x	x	x	x	x		*Activated Jan 2015*
	HLGW029A	171	2014	2017																					x	x	x	x	x		
	HLGW030A	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014 temp disconnected Jun2016 for cell 3/ reactivated Oct2017*
	HLGW030B	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014*
	HLGW031A	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014 temp disconnected Jun2016 for cell 3 / reactivated Oct2017*
	HLGW031B	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014*
	HLGW032A	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014 temp disconnected Jun2016 for cell 3/ reactivated Oct2017*
	HLGW032B	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014*
	HLGW033A	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014 temp disconnected Jun2016 for cell 3 / reactivated Oct2017*
	HLGW033B	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014*

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
	HLGW034A	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014 temp disconnected Jun2016 for cell 3 / reactivated Oct2017*
	HLGW034B	171	2013	2014																		x	x	x	x	x	x	x	x		*Activated Jan 2014*
	HLGW035A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				*Wells not installed*
	HLGW035B	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				*Wells not installed*
	HLGW036B	175	2015	2017																					x	x	x				*Installed 2015 - Temp connection Jan2017*
	HLGW037B	175	2015	2017																					x	x	x	x	x		
	HLGW038B	175	2015	2017																					x	x	x	x	x		*Installed 2015 - Temp connection Jan2017*
	HLGW039A	175	2015	2017																					x	x	x	x	x		
	HLGW039B	175	2015	2017																					x	x	x	x	x		*Installed 2015 - Temp connection Jan2017*
	HLGW040A	175	2015	2017																					x	x	x	x	x		
	HLGW040B	175	2015	2018																						x	x	x	x		*Activated Jan 2018*
	HLGW041A	175	2015	2017																					x	x	x	x	x		
	HLGW041B	175	2015	2017																					x	x	x	x	x		
	HLGW042A	175	2015	2017																					x	x	x	x	x		
	HLGW042B	175	2015	2017																					x	x	x	x	x		*Installed 2015 - Temp Activated Jan2017*
	HLGW043A	175	2015	2017																					x	x	x	x	x		
	HLGW043B	175	2015	2017																					x	x	x	x	x		*Installed 2015 - Temp Activated Jan2017*
	HLGW044A	179	2015	2017																					x	x	x	x	x		
	HLGW044B	179	2015	2017																					x	x	x	x	x		*Installed 2015 - Temp Activated Jan2017*
	HLGW045A	179	2016	2019																				I			x	IA	IA		*Activated April 2019*
	HLGW045B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW046A	179	2016	2019																				I			x	IA	IA		*Activated April 2019*
	HLGW046B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW047A	179	2016	2017																					x	x	x	x	x		
	HLGW047B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW048A	179	2016	2017																					x	x	x	x	x		
	HLGW048B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW049A	179	2016	2017																					x	x	x	IA	IA		
	HLGW049B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW050A	179	2016	2017																					x	x	x	x	x		
	HLGW050B	179	2016	2018																				I		x	x	x	x		*Activated Jan 2018*
	HLGW051A	179	2016	2017																					x	x	x	x	x		
	HLGW051B	179	2016	2017																				I	x	x	x	x	x		

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																														
Well Information						Gas Well Readings																								
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
cell 3	HLGW0052	151(3)	2017	2018																						x	x	x	x		*Activated July 2018*
cell 3	HLGW0053	151(3)	2017	2018																						x	x	x	x		*Activated July 2018*
cell 3	HLGW0054	151(3)	2017	2018																						x	x	x	x		*Activated July 2018*
cell 3	HLGW0055	151(3)	2017	2018																						x	x	x	x		*Activated July 2018*
	HLGW0056	151(3)	2017	2018																						x	x	IA	IA		*Activated August 2018*
cell 3	HLGW0057	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0058	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0059	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0060	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0061	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0062	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0063	155(3)	2018	2019																							x	x	x		*Activated April 2019*
cell 3	HLGW0064	155(3)	2018	2020																							---	---	---		*Active May/June 2020*
cell 3	HLGW0065	159 (3)	2018	2020																								x	x		*Active May/June 2020*
cell 3	HLGW0066	159 (3)	2018	2020																								x	x		*Active May/June 2020*
cell 3	HLGW0067B	159 (3)	2018	2020																								x	x		*Active May/June 2020*
cell 3	HLGW0068B	159 (3)	2018	2020																								x	x		*Active May/June 2020*
cell 3	HLGW0069	159 (3)	2018	2020																								x	x		*Active June 2020*
cell 3	HLGW0070A	163	2019	2021																									x		
cell 3	HLGW0070B	163	2019																												
cell 3	HLGW0071A	163	2019	2021																									x		
cell 3	HLGW0071B	163	2019																												
cell 3	HLGW0072A	163	2019	2021																									x		
cell 3	HLGW0072B	163	2019																												
cell 3	HLGW0073A	163	2019	2021																									x		
cell 3	HLGW0073B	163	2019																												
cell 3	HLGW0074A	163	2019	2021																									x		
cell 3	HLGW0074B	163	2019																												
cell 3	HLGW0075A	163	2019																												
cell 3	HLGW0075B	163	2019	2021																									x		*Activated July 2021*
cell 3	HLGW0076	167	2019																												
cell 3	HLGW0077	167	2019																												
cell 3	HLGW0078	167	2019																												
cell 3	HLGW0079	167	2019	2021																											

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
cell 3	HLGW0080	167	2019	2021																											
cell 3	HLGW0081	167	2019	2021																											
cell 3	HLGW0082	167	2019	2021																											
cell 3	HLGW0083	167	2019	2021																											
cell 3 Should be HLGW 64?	RWHGW01A	3		2020																								x	x		*Rock Wall gas collectors - activated Nov 2020*
cell 3	RWHGW01B	3		2020																								x	x		*Rock Wall gas collectors - activated Nov 2020*
	TOTAL		5	23																											
OLGT001A	TLGW001A		1996			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGT001B	TLGW001B		1996			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGT002A	TLGW002A		1996			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGT002B	TLGW002B		1996			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGT002C	TLGW002C		1996			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGT0003					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0004					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0005					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0006					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0007					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0008					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0009					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0010					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0011					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0012					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0013					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0014					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0015					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0016					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0017					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0018					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGT0019					2002	x	x	x	x	x	IA																				*Deactivated 2002*
OLGW001D	VLGW001D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*
OLGW001S	VLGW001S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*
OLGW002D	VLGW002D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*

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Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
OLGW002S	VLGW002S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA					*No readings 2017-2018 - no production*
OLGW003D	VLGW003D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW003S	VLGW003S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW004D	VLGW004D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW004S	VLGW004S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
OLGW005D	VLGW005D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW005S	VLGW005S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW006D	VLGW006D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW006S	VLGW006S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW007D	VLGW007D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW007S	VLGW007S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW008D	VLGW008D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW008S	VLGW008S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW009D	VLGW009D	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW009S	VLGW009S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW010S	VLGW010S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW011S	VLGW011S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW012S	VLGW012S	---	1996	1996		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW013D	VLGW013D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW013S	VLGW013S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW014D	VLGW014D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW014S	VLGW014S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW015D	VLGW015D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW015S	VLGW015S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW016D	VLGW016D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW016S	VLGW016S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW017D	VLGW017D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW017S	VLGW017S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW018D	VLGW018D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW018S	VLGW018S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW019D	VLGW019D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW019S	VLGW019S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW020D	VLGW020D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW020S	VLGW020S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		

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Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
OLGW021D	VLGW021D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW021S	VLGW021S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW022D	VLGW022D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW022S	VLGW022S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW023D	VLGW023D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW023S	VLGW023S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW024D	VLGW024D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW024S	VLGW024S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW025D	VLGW025D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	IA						
OLGW025S	VLGW025S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		IA	IA		
OLGW026D	VLGW026D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW026S	VLGW026S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW027D	VLGW027D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW027S	VLGW027S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW028S	VLGW028S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW029D	VLGW029D	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW029S	VLGW029S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW030S	VLGW030S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW031S	VLGW031S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW032S	VLGW032S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW033S	VLGW033S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
OLGW034S	VLGW034S	---	1997	1997		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		
OLGW035S		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW035D		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW036S		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW036D		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW037S		---	1997	1998	2005	x	x	x	x	x	x	x	x	IA																	*Deactivated 2005*
OLGW037D		---	1997	1998	2005	x	x	x	x	x	x	x	x	IA																	*Deactivated 2005*
OLGW038S		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW038D		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW039S		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW039D		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW040S		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*
OLGW040D		---	1997	1998	2004	x	x	x	x	x	x	x	IA																		*Deactivated 2004*

Appendix B1, continued

Operating Year(s) for Gas Wells Hartland Landfill Capital Regional District																															
Well Information						Gas Well Readings																									
Old Well Name	New Well Name	Lift (mASL)	Installation Date	Activation Date	Deactivation Date	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Comments
OLGW041D		---	1997	1998	2008	x	x	x	x	x	x	x	x	x	x	x															*Deactivated 2008*
OLGW041S		---	1997	1998	2008	x	x	x	x	x	x	x	x	x	x	x															*Deactivated 2008*
OLGW042S	**VLGW042S**	---	2002	2003	2021						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			*Decommissioned 2021*
OLGW043S	**VLGW043S**	---	2002	2003							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			*Decommissioned 2021*
OLGW044S	**VLGW044S**	---	2002	2003	2011						x	x	x	x	x	x	x	x	x	IA											*Abandoned in May 2011*
OLGW045S	**VLGW045S**	---	2002	2003	2011						x	x	x	x	x	x	x	x	x	IA											*Abandoned in May 2011*
OLGW046S	**VLGW046S**	---	2002	2003	2011						x	x	x	x	x	x	x	x	x	IA											*Abandoned in May 2011*
OLGW047S	**VLGW047S**	---	2002	2003							x	x	x	x	x	x	x	x	x			x	x	x	x	x	IA				*Decommissioned 2021*
OLGW048S	**VLGW048S**	---	2002	2002	2011										x	x	x	x	x	**IA**											*Abandoned in May 2011*
OLGW049	**VLGW0049**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW050	**VLGW0050**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW051	**VLGW0051**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW052	**VLGW0052**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW053	**VLGW0053**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW054	**VLGW0054**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW055	**VLGW0055**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW056	**VLGW0056**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW057	**VLGW0057**	---	2011	2011															x	x	x	x	x	x	IA						*Decommissioned 2021*
OLGW058	**VLGW0058**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW059	**VLGW0059**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		
OLGW060	**VLGW0060**	---	2011	2011															x	x	x	x	x	x	x	x	x	x	x		*73*

Number of wells Active	**95**	**95**	**95**	**97**	**97**	**113**	**113**	**99**	**97**	**99**	**94**	**92**	**92**	**110**	**108**	**115**	**130**	**129**	**131**	**142**	**141**	**146**	**144**	**148**
Number of Inactive Wells	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**18**	**4**	**3**	**5**	**3**	**0**	**0**	**8**	**0**	**0**	**5**	**0**	**12**	**13**	**2**	**9**	**9**

Notes:
New program to identify wells that are no longer read or produce gas. These wells have not been formally decommissioned, but do not contribute to the overall LFG volume either because they are old or inundated with leachate.

Appendix B2 2021 LFG Well Field Data

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0001							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	6/10	42.7	32.3	1.8	23.2	0.6	0.8
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**42.7**	**32.3**	**1.8**	**23.2**	**0.6**	**0.8**
HLGW0003							
January							
February							
March							
April							
May							
June	6/23	44.1	34.3	0.0	21.6	1.4	0.0
July							
August							
September							
October							
November							
December							
Average		**44.1**	**34.3**	**0.0**	**21.6**	**1.4**	**0.0**
HLGW0004							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	6/19	55.4	39.0	0.0	5.6	127.8	134.2
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**55.4**	**39.0**	**0.0**	**5.6**	**127.8**	**134.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0005							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
HLGW006A							
January	1/22	35.6	31.3	0.1	33.0	1.0	2.0
February	2/26	34.1	30.7	0.0	35.2	2.0	0.0
March	3/26	31.6	30.0	0.0	38.4	0.0	0.0
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**33.8**	**30.7**	**0.0**	**35.5**	**1.0**	**0.7**
HLGW006B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW008A							
January	1/19	40.8	32.2	0.3	26.7	20.0	22.0
February	2/18	39.4	32.2	0.1	28.3	19.0	21.0
March	3/25	39.7	31.1	1.2	28.0	19.0	6.0
April	4/14	40.3	32.2	2.0	25.5	11.0	6.0
May	5/27	43.9	33.6	0.6	21.9	2.4	0.0
June	6/10	42.7	32.3	1.8	23.2	0.6	0.8
July	7/16	40.8	30.7	2.8	25.7	1.3	0.0
August	8/20	48.3	35.4	0.1	16.2	0.7	0.5
September	9/15	44.7	34.5	0.1	20.7	0.0	0.0
October	---	---	---	---	---	---	---
November	11/23	44.4	33.5	0.0	22.1	0.8	1.3
December	---	---	---	---	---	---	---
Average		**42.5**	**32.8**	**0.9**	**23.8**	**7.5**	**5.8**
HLGW008B							
January	1/22	38.2	32.3	0.0	29.5	8.0	7.0
February	2/26	37.6	31.9	0.0	30.5	8.0	5.0
March	3/26	37.1	30.9	0.7	31.3	5.0	2.0
April	4/14	38.9	32.0	0.0	29.1	2.0	0.0
May	5/28	41.7	33.2	0.0	25.1	1.2	0.0
June	6/23	44.1	34.3	0.0	21.6	1.4	0.0
July	7/17	44.5	34.9	0.1	20.5	0.0	0.0
August	8/31	44.7	35.1	0.0	20.2	0.0	0.0
September	---	---	---	---	---	---	---
October	10/27	44.7	34.8	0.2	20.3	0.0	0.0
November	11/24	42.8	32.6	0.3	24.3	0.0	0.0
December	---	---	---	---	---	---	---
Average		**41.4**	**33.2**	**0.1**	**25.2**	**2.6**	**1.4**
HLGW0009							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	Decommissioned May 2014						
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average	**---**	**---**	**---**	**---**	**---**	**---**	**---**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0010							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average	---	---	---	---	---	---	---
HLGW0011							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average	---	---	---	---	---	---	---
HLGW0012							
January	1/22	5.9	6.7	19.2	68.2	3.0	3.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**5.9**	**6.7**	**19.2**	**68.2**	**3.0**	**3.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0013							
January	1/22	50.3	37.1	0.6	12.0	1.0	2.0
February	2/26	47.3	36.8	0.0	15.9	2.0	2.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**48.8**	**37.0**	**0.3**	**14.0**	**1.5**	**2.0**
HLGW0014							
January	1/22	26.2	17.3	10.6	45.9	1.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**26.2**	**17.3**	**10.6**	**45.9**	**1.0**	**1.0**
HLGW0015							---
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	Decommissioned May 2014						
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW016A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
HLGW016B							
January	1/21	59.7	40.2	0.0	0.1	190.0	185.0
February	2/24	53.7	38.5	0.0	7.8	257.0	261.0
March	3/27	51.2	37.2	0.3	11.3	256.0	263.0
April	4/15	50.3	37.1	0.0	12.6	260.0	259.0
May	5/28	47.8	35.8	0.3	16.1	208.3	122.4
June	6/19	55.4	39.0	0.0	5.6	127.8	134.2
July	7/20	51.3	37.5	0.1	11.1	138.6	138.5
August	8/21	53.8	38.5	0.1	7.6	136.9	137.8
September	9/16	56.4	39.1	0.0	4.5	138.4	153.3
October	10/30	55.9	39.4	0.0	4.7	150.0	149.9
November	11/26	60.6	39.3	0.1	0.0	151.5	153.4
December	12/18	59.8	40.2	0.0	0.0	174.3	177.9
Average		**54.7**	**38.5**	**0.1**	**6.8**	**182.4**	**178.0**
HLGW017A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW017B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	8/21	24.9	26.7	0.1	48.3	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**24.9**	**26.7**	**0.1**	**48.3**	**0.0**	**0.0**
HLGW0018							
January	1/21	58.0	41.7	0.1	0.2	30.0	26.0
February	2/24	55.4	40.0	0.0	4.6	27.0	28.0
March	3/27	53.7	39.4	0.1	6.8	23.0	32.0
April	4/15	50.8	38.7	0.0	10.5	33.0	35.0
May	5/28	47.8	37.3	0.0	14.9	35.4	12.5
June	6/19	58.2	40.3	0.0	1.5	11.7	16.8
July	7/20	53.7	38.6	0.1	7.6	16.2	16.3
August	8/21	55.0	38.7	0.0	6.3	17.0	16.9
September	9/16	55.0	38.8	0.1	6.1	16.2	16.3
October	10/30	56.3	39.5	0.0	4.2	15.7	20.3
November	11/26	59.9	39.9	0.1	0.1	0.0	25.5
December	12/18	59.2	40.8	0.0	0.0	25.9	26.1
Average		**55.3**	**39.5**	**0.0**	**5.2**	**20.9**	**22.6**
HLGW019B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW019C							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
HLGW020B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
HLGW021B							
January	1/20	52.4	36.8	2.2	8.6	188.0	198.0
February	2/20	50.1	37.4	1.3	11.2	93.0	92.0
March	3/27	58.5	40.7	0.6	0.2	1.0	27.0
April	4/15	58.6	41.3	0.0	0.1	42.0	42.0
May	5/28	57.8	40.6	0.0	1.6	9.0	8.9
June	6/19	57.8	40.7	0.0	1.5	11.6	12.4
July	7/20	58.1	40.5	0.4	1.0	12.3	13.0
August	8/21	56.6	40.4	0.1	2.9	12.8	12.8
September	---	---	---	---	---	---	---
October	10/30	52.8	38.5	0.9	7.8	13.7	13.2
November	11/26	57.5	39.3	1.0	2.2	8.1	9.0
December	12/17	58.0	42.0	0.0	0.0	4.8	4.6
Average		**56.2**	**39.8**	**0.6**	**3.4**	**36.0**	**39.4**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW022B							
January	1/20	50.8	37.8	0.2	11.2	12.0	17.0
February	2/25	56.9	39.3	1.1	2.7	8.0	14.0
March	3/27	44.7	35.7	0.7	18.9	19.0	17.0
April	4/15	33.9	30.0	2.4	33.7	16.0	3.0
May	5/28	58.6	41.1	0.0	0.3	9.4	8.6
June	6/19	22.5	23.5	4.5	49.5	7.3	1.0
July	7/20	18.7	31.2	5.2	44.9	0.0	0.0
August	8/21	19.5	34.9	3.0	42.6	0.0	0.0
September	---	---	---	---	---	---	---
October	10/30	16.5	26.6	8.2	48.7	1.5	1.0
November	11/26	2.1	3.3	19.4	75.2	0.0	0.0
December	12/17	11.9	17.4	12.6	58.1	3.8	1.9
Average		**30.6**	**29.2**	**5.2**	**35.1**	**7.0**	**5.8**
HLGW023B							
January	1/20	0.7	1.0	20.8	77.5	3.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/26	31.2	23.3	0.4	45.1	17.7	0.0
December	---	---	---	---	---	---	---
Average		**16.0**	**12.2**	**10.6**	**61.3**	**10.4**	**0.5**
HLGW024B							
January	1/21	52.0	37.1	0.4	10.5	15.0	11.0
February	2/25	54.4	37.4	1.0	7.2	19.0	23.0
March	3/27	31.1	24.2	4.3	40.4	8.0	1.0
April	4/15	44.1	36.2	0.4	19.3	17.0	12.0
May	5/28	24.2	36.4	0.0	23.2	8.0	4.4
June	6/19	19.6	16.0	9.7	54.7	1.5	0.0
July	7/20	26.2	25.6	3.2	45.0	0.0	0.0
August	8/21	17.5	17.1	8.6	56.8	0.0	0.0
September	9/16	42.7	34.8	0.0	22.5	0.0	1.0
October	10/30	22.7	26.7	1.2	49.4	0.0	0.0
November	11/26	50.2	35.5	0.4	13.9	12.5	12.9
December	12/18	60.7	39.3	0.0	0.0	11.0	31.0
Average		**37.1**	**30.5**	**2.4**	**28.6**	**7.7**	**8.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW025B							
January	1/21	59.4	40.3	0.1	0.2	5.0	6.0
February	2/25	57.9	39.2	0.6	2.3	7.0	13.0
March	---	---	---	---	---	---	---
April	4/15	50.0	37.7	0.3	12.0	30.0	23.0
May	5/28	56.5	39.1	0.1	4.3	21.3	22.5
June	6/19	51.2	43.6	0.0	5.2	23.5	23.5
July	7/20	53.7	44.2	0.1	2.0	24.4	24.2
August	8/21	56.6	43.4	0.1	-0.1	24.1	25.0
September	9/16	58.6	41.2	0.1	0.1	25.4	29.4
October	10/30	57.8	42.0	0.2	0.0	28.2	28.1
November	11/26	59.4	40.4	0.2	0.0	17.0	36.4
December	12/18	59.2	40.8	0.0	0.0	36.8	34.1
Average		**56.4**	**41.1**	**0.2**	**2.4**	**22.1**	**24.1**
HLGW026B							
January	1/20	50.3	36.0	1.0	12.7	25.0	49.0
February	2/20	49.4	36.4	1.0	13.2	19.0	15.0
March	3/27	40.6	32.5	1.8	25.1	7.0	3.0
April	4/15	53.8	37.3	0.2	8.7	14.0	15.0
May	5/28	53.5	36.9	0.5	9.1	4.6	7.8
June	5/28	53.2	38.0	0.1	8.7	8.5	7.5
July	7/20	54.8	38.3	0.3	6.6	4.8	4.5
August	8/21	57.4	39.1	0.4	3.1	7.3	10.6
September	5/28	50.2	36.6	0.5	12.7	5.3	2.4
October	10/30	60.2	39.4	0.4	0.0	15.1	7.9
November	11/26	33.1	19.6	9.8	37.5	4.5	4.3
December	12/17	30.0	22.1	11.4	36.5	0.0	0.0
Average		**48.9**	**34.4**	**2.3**	**14.5**	**9.6**	**10.6**
HLGW027A							
January	1/19	46.0	36.7	0.0	17.3	22.0	23.0
February	2/18	52.8	39.4	0.4	7.4	6.0	15.0
March	3/25	47.6	36.9	1.2	14.3	14.0	12.0
April	4/14	49.2	37.7	0.4	12.7	12.0	29.0
May	5/27	52.6	40.0	0.0	7.4	5.5	6.0
June	6/10	50.7	38.3	0.1	10.9	8.8	8.3
July	7/16	55.4	39.6	0.0	5.0	8.4	9.3
August	8/20	52.7	38.6	0.1	8.6	14.6	15.6
September	9/15	49.4	37.9	0.0	12.7	13.4	12.0
October	10/23	53.6	39.1	0.3	7.0	11.7	8.5
November	11/23	53.1	38.1	0.5	8.3	8.8	8.3
December	12/16	57.1	40.3	0.0	2.6	13.2	8.5
Average		**51.7**	**38.6**	**0.3**	**9.5**	**11.5**	**13.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW027B							
January	1/20	28.4	28.5	0.7	42.4	7.0	11.0
February	2/25	37.5	30.9	1.6	30.0	7.0	0.0
March	3/27	31.1	24.2	4.3	40.4	8.0	1.0
April	4/15	27.9	20.2	6.7	45.2	1.0	1.0
May	5/28	24.2	18.6	7.7	49.5	3.8	1.0
June	6/19	19.6	16.0	9.7	54.7	1.5	0.0
July	7/20	26.2	25.6	3.2	45.0	0.0	0.0
August	8/21	17.5	17.1	8.6	56.8	0.0	0.0
September	9/16	42.7	34.8	0.0	22.5	0.0	1.0
October	10/30	22.7	26.7	1.2	49.4	0.0	0.0
November	11/26	50.2	35.5	0.4	13.9	12.5	12.9
December	12/17	52.4	35.6	0.0	12.0	0.0	0.0
Average		**31.7**	**26.1**	**3.7**	**38.5**	**3.4**	**2.3**
HLGW028A							
January	1/19	50.5	37.8	0.0	11.7	76.0	73.0
February	2/18	56.6	39.7	0.0	3.7	56.0	56.0
March	3/25	55.3	39.2	0.2	5.3	47.0	58.0
April	4/14	53.3	38.5	0.0	8.2	66.0	81.0
May	5/27	53.4	39.0	0.0	7.6	51.6	53.1
June	6/10	53.6	38.4	0.0	8.0	83.8	96.6
July	7/16	53.5	38.3	0.1	8.1	54.3	54.1
August	8/20	53.4	38.6	0.1	7.9	60.7	60.6
September	9/15	51.3	38.1	0.1	10.5	58.8	54.2
October	10/23	54.2	38.6	0.0	7.2	55.6	55.3
November	11/23	51.3	37.5	0.0	11.2	58.2	48.7
December	12/16	54.2	38.6	0.0	7.2	48.4	48.3
Average		**53.4**	**38.5**	**0.0**	**8.1**	**59.7**	**61.6**
HLGW028B							
January	1/20	58.5	41.4	0.0	0.1	35.0	16.0
February	3/27	58.5	41.4	0.0	0.1	4.0	27.0
March	2/20	59.3	40.5	0.0	0.2	4.0	10.0
April	4/15	53.4	38.8	0.0	7.8	8.0	12.0
May	5/28	55.1	39.2	0.0	5.7	9.5	10.5
June	6/19	49.7	37.6	0.0	12.7	8.3	6.3
July	7/20	59.4	40.6	0.0	0.0	6.1	7.4
August	8/21	59.0	41.0	0.0	0.0	3.8	4.5
September	9/16	59.0	40.9	0.1	0.0	24.7	25.3
October	10/30	59.2	40.8	0.1	N/A	39.5	39.5
November	11/26	>>>>	39.7	0.0	N/A	39.0	36.2
December	12/17	61.2	38.8	0.0	0.0	2.6	0.0
Average		**57.5**	**40.1**	**0.0**	**2.7**	**15.4**	**16.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW029A							
January	1/19	55.4	39.5	0.0	5.1	16.0	39.0
February	2/18	58.9	40.5	0.3	0.3	5.0	9.0
March	3/25	55.4	38.7	1.0	4.9	26.0	37.0
April	4/14	55.0	39.1	0.0	5.9	20.0	24.0
May	5/27	55.4	40.2	0.0	4.4	10.7	14.9
June	6/10	51.0	38.2	0.0	10.8	19.5	14.8
July	7/16	48.5	37.3	0.1	14.1	16.0	14.0
August	8/20	52.8	38.9	0.2	8.1	18.1	19.5
September	9/15	47.9	37.5	0.1	14.5	20.0	5.6
October	10/23	54.3	39.6	0.0	6.1	16.1	15.4
November	11/23	50.3	37.2	0.4	12.1	8.3	18.5
December	12/16	59.4	40.6	0.0	0.0	6.8	6.8
Average		**53.7**	**38.9**	**0.2**	**7.2**	**15.2**	**18.2**
HLGW029B							
January	1/20	57.7	39.4	0.0	2.9	5.0	6.0
February	2/25	59.3	40.2	0.3	0.2	2.0	7.0
March	3/27	54.3	37.8	1.0	6.9	11.0	15.0
April	4/15	40.4	32.2	2.2	25.2	8.0	4.0
May	5/28	51.5	38.1	0.0	10.4	7.6	7.3
June	6/19	43.6	34.5	0.4	21.5	3.1	1.5
July	7/20	59.6	39.1	0.0	1.3	3.1	4.0
August	8/21	58.5	39.7	0.0	1.8	0.0	1.0
September	9/16	59.3	40.6	0.1	0.0	3.4	2.2
October	10/30	57.2	38.7	0.3	3.8	6.9	6.7
November	11/26	56.4	38.0	0.4	5.2	14.7	10.3
December	12/17	59.6	40.4	0.0	0.0	2.6	5.0
Average		**54.8**	**38.2**	**0.4**	**6.6**	**5.6**	**5.8**
HLGW030A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	50.8	37.8	0.5	10.9	1.0	1.0
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/23	30.6	26.3	2.2	40.9	0.8	1.1
December	---	---	---	---	---	---	---
Average		**40.7**	**32.1**	**1.4**	**25.9**	**0.9**	**1.1**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW030B							
January	1/20	57.3	39.1	0.0	3.6	5.0	54.0
February	2/20	60.1	39.8	0.0	0.1	27.0	31.0
March	3/26	38.2	28.3	6.3	27.2	18.0	9.0
April	4/15	53.8	37.8	0.3	8.1	11.0	15.0
May	5/28	53.8	38.5	0.0	7.7	2.7	2.9
June	6/19	55.3	38.6	0.1	6.0	6.6	19.6
July	7/17	55.7	39.4	0.1	4.8	19.9	22.8
August	8/21	57.5	39.6	0.1	2.8	10.8	12.5
September	9/16	56.8	39.6	0.1	3.5	10.6	11.6
October	10/27	52.9	38.8	0.1	8.2	33.3	33.3
November	11/25	59.0	39.3	0.1	1.6	10.6	27.3
December	12/17	60.2	39.0	0.0	0.8	12.2	10.7
Average		**55.1**	**38.2**	**0.6**	**6.2**	**14.0**	**20.8**
HLGW031A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	27.8	28.3	2.2	41.7	0.0	1.0
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	7/16	11.3	19.8	2.9	66.0	4.5	0.0
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/23	29.7	27.5	1.5	41.3	0.0	0.0
December	---	---	---	---	---	---	---
Average		**22.9**	**25.2**	**2.2**	**49.7**	**1.5**	**0.3**
HLGW031B							
January	1/20	44.7	34.7	0.9	19.7	31.0	25.0
February	2/26	52.1	37.4	0.3	10.2	15.0	15.0
March	3/26	44.7	34.1	1.6	19.6	14.0	5.0
April	4/15	58.7	41.2	0.0	0.1	12.0	16.0
May	5/28	50.8	36.9	0.6	11.7	16.5	15.5
June	6/19	59.6	40.3	0.1	0.0	14.4	24.9
July	7/17	51.8	37.7	0.2	10.3	21.3	21.6
August	8/21	59.5	40.5	0.1	-0.1	30.2	30.4
September	9/16	47.4	36.2	0.2	16.2	28.3	18.7
October	10/27	59.6	40.1	0.2	0.1	10.3	9.0
November	11/25	56.2	38.2	0.5	5.1	10.3	10.5
December	12/17	60.4	39.3	0.3	0.0	0.0	2.5
Average		**53.8**	**38.1**	**0.4**	**7.7**	**16.9**	**16.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW032A							
January	1/19	26.7	27.1	2.0	44.2	10.0	4.0
February	2/18	34.8	32.2	0.2	32.8	7.0	6.0
March	3/25	46.0	35.8	0.1	18.1	2.0	3.0
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	7/16	31.8	30.5	0.0	37.7	0.0	0.0
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/23	50.4	36.2	0.0	13.4	2.5	4.6
December	---	---	---	---	---	---	---
Average		**37.9**	**32.4**	**0.5**	**29.2**	**4.3**	**3.5**
HLGW032B							
January	1/20	55.9	38.1	0.4	5.6	23.0	50.0
February	2/26	55.3	37.4	0.4	6.9	25.0	27.0
March	3/26	48.6	35.2	1.4	14.8	40.0	23.0
April	4/15	59.3	40.4	0.1	0.2	32.0	33.0
May	5/28	56.1	38.8	0.0	5.1	18.6	28.8
June	6/19	54.0	38.2	0.0	7.8	17.2	40.0
July	7/17	49.7	37.0	0.1	13.2	30.8	20.6
August	8/21	60.0	39.6	0.4	0.0	14.5	33.2
September	9/16	52.0	37.3	0.5	10.2	29.5	25.4
October	10/27	58.6	39.3	0.6	1.5	13.9	29.1
November	11/25	58.4	38.9	0.4	2.3	13.3	29.9
December	12/17	58.8	41.2	0.0	0.0	2.9	15.2
Average		**55.6**	**38.5**	**0.4**	**5.6**	**21.7**	**29.6**
HLGW033A							
January	1/19	47.5	33.9	2.4	16.2	17.0	17.0
February	2/18	46.9	33.8	2.5	16.8	20.0	15.0
March	3/25	52.1	36.5	1.6	9.8	11.0	13.0
April	4/14	54.4	37.4	0.7	7.5	15.0	16.0
May	5/27	48.7	35.5	1.6	14.2	14.4	11.1
June	6/10	55.3	38.3	0.4	6.0	10.5	13.0
July	7/16	51.5	36.5	0.7	11.3	12.5	10.1
August	8/20	58.1	39.4	0.0	2.5	10.5	12.8
September	9/15	51.5	36.8	0.7	11.0	13.0	11.2
October	10/23	58.4	39.5	0.0	2.1	10.7	15.4
November	11/23	46.7	33.9	2.0	17.4	15.6	8.4
December	12/16	58.0	42.0	0.0	0.0	10.2	10.5
Average		**52.4**	**37.0**	**1.1**	**9.6**	**13.4**	**12.8**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW033B							
January	1/20	8.5	9.2	4.8	77.5	2.0	3.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	6/19	53.9	37.1	0.2	8.8	9.8	12.3
July	7/17	7.3	18.8	3.2	70.7	0.0	0.0
August	8/21	26.2	26.2	2.1	45.5	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/25	59.7	39.8	0.5	0.0	16.8	17.0
December	---	---	---	---	---	---	---
Average		**31.1**	**26.2**	**2.2**	**40.5**	**5.7**	**6.5**
HLGW034A							
January	1/19	31.6	29.6	0.0	38.8	0.0	<<>>
February	2/18	35.1	31.0	0.0	33.9	1.0	1.0
March	3/25	43.3	33.4	0.4	22.9	2.0	0.0
April	---	---	---	---	---	---	---
May	5/27	34.0	29.2	0.9	35.9	0.0	0.0
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/23	57.2	36.5	0.0	6.3	0.5	1.4
December	---	---	---	---	---	---	---
Average		**40.2**	**31.9**	**0.3**	**27.6**	**0.7**	**0.6**
HLGW034B							
January	1/20	47.3	34.7	0.8	17.2	15.0	22.0
February	2/26	49.0	35.3	0.7	15.0	11.0	7.0
March	3/26	50.8	35.3	1.2	12.7	15.0	14.0
April	4/15	55.0	37.7	0.0	7.3	24.0	25.0
May	5/28	43.6	32.9	1.0	22.5	18.7	18.1
June	---	---	---	---	---	---	---
July	7/17	54.8	37.7	0.2	7.3	15.6	15.6
August	8/21	56.5	38.1	0.1	5.3	9.7	13.3
September	9/16	56.9	37.9	0.2	5.0	45.1	52.8
October	10/27	48.4	36.2	0.3	15.1	46.8	31.1
November	11/25	60.2	39.8	0.0	0.0	10.6	26.9
December	12/17	59.8	40.2	0.0	0.0	26.8	28.9
Average		**52.9**	**36.9**	**0.4**	**9.8**	**21.7**	**23.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW036B							
January	1/20	60.2	39.7	0.0	0.1	2.0	3.0
February	---	---	---	---	---	---	---
March	3/27	40.4	33.5	0.4	25.7	5.0	1.0
April	4/15	62.3	37.5	0.0	0.2	2.0	6.0
May	5/28	23.0	27.3	0.0	49.7	4.0	0.0
June	---	---	---	---	---	---	---
July	7/20	57.8	42.2	0.0	0.0	4.2	5.0
August	8/21	57.6	42.4	0.0	0.0	7.1	6.7
September	9/16	57.6	42.4	0.0	0.0	9.9	8.3
October	10/30	56.4	43.6	0.1	N/A	31.0	31.0
November	9/16	57.6	42.4	0.0	0.0	9.9	8.3
December	9/16	57.6	42.4	0.0	0.0	9.9	8.3
Average		**53.1**	**39.3**	**0.1**	**8.4**	**8.5**	**7.8**
HLGW037B							
January	1/20	60.0	39.0	0.9	0.1	12.0	31.0
February	2/20	59.0	38.9	0.5	1.6	9.0	15.0
March	3/27	40.5	31.6	3.1	24.8	18.0	5.0
April	4/15	60.2	39.4	0.2	0.2	16.0	24.0
May	5/28	60.0	40.0	0.0	0.0	8.1	8.1
June	---	---	---	---	---	---	---
July	7/20	59.8	39.9	0.0	0.3	19.7	23.2
August	8/21	58.2	39.2	0.6	2.0	24.7	33.1
September	9/16	59.6	39.4	0.7	0.3	22.8	34.6
October	10/30	55.4	36.9	2.1	5.6	32.6	48.6
November	11/26	60.5	39.1	0.4	0.0	30.4	40.6
December	9/16	59.6	39.4	0.7	0.3	22.8	34.6
Average		**57.5**	**38.4**	**0.8**	**3.2**	**19.6**	**27.1**
HLGW038B							
January	1/20	53.0	37.0	0.3	9.7	1.0	7.0
February	2/20	59.5	40.2	0.1	0.2	11.0	9.0
March	3/27	48.0	35.5	0.9	15.6	2.0	4.0
April	4/15	56.2	38.4	0.1	5.3	7.0	8.0
May	5/28	48.0	36.4	0.0	15.6	30.0	27.6
June	---	---	---	---	---	---	---
July	7/20	54.8	38.9	0.0	6.3	7.2	7.2
August	8/21	57.2	39.9	0.0	2.9	1.8	5.0
September	9/16	59.6	40.4	0.0	0.0	2.4	2.7
October	10/30	58.3	39.1	0.5	2.1	8.6	8.3
November	11/26	50.4	35.2	0.2	14.2	30.4	8.2
December	12/17	59.0	41.0	0.0	0.0	0.0	1.6
Average		**54.9**	**38.4**	**0.2**	**6.5**	**9.2**	**8.1**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW039A							
January	1/19	50.5	36.5	0.9	12.1	34.0	6.0
February	2/18	40.4	31.8	0.0	27.8	2.0	2.0
March	3/25	48.6	34.4	0.3	16.7	0.0	6.0
April	4/14	50.3	36.1	1.2	12.4	8.0	8.0
May	5/27	58.9	41.1	0.0	0.0	5.5	5.9
June	---	---	---	---	---	---	---
July	7/16	37.6	31.4	0.2	30.8	32.5	0.0
August	8/20	52.4	36.6	0.0	11.0	0.0	0.0
September	9/15	55.3	38.9	0.0	5.8	11.2	11.2
October	10/23	47.2	35.9	0.2	16.7	35.0	3.3
November	11/23	43.5	33.5	0.0	23.0	0.0	0.0
December	12/16	58.8	41.2	0.0	0.0	3.9	4.1
Average		49.4	36.1	0.3	14.2	12.0	4.2
HLGW039B							
January	1/20	48.1	34.4	1.0	16.5	7.0	13.0
February	2/25	59.8	39.3	0.8	0.1	0.0	16.0
March	3/27	30.1	28.6	0.2	41.1	19.0	7.0
April	4/15	49.9	32.6	3.6	13.9	2.0	2.0
May	5/28	61.3	38.4	0.3	0.0	7.4	7.3
June	---	---	---	---	---	---	---
July	7/20	32.1	30.3	0.6	37.0	5.1	0.0
August	8/21	37.6	30.1	0.1	32.2	0.0	0.0
September	9/16	39.4	30.0	0.2	30.4	0.0	0.0
October	10/30	39.2	31.0	0.0	29.8	2.9	1.1
November	11/26	62.8	37.1	0.1	0.0	1.6	1.6
December	12/17	67.3	32.7	0.0	0.0	42.3	42.7
Average		**48.0**	**33.1**	**0.6**	**18.3**	**7.9**	**8.2**
HLGW040A							
January	1/19	58.5	41.4	0.0	0.1	5.0	5.0
February	2/18	57.6	42.3	0.0	0.1	4.0	5.0
March	3/25	49.8	37.8	0.2	12.2	7.0	6.0
April	4/14	58.3	41.6	0.0	0.1	4.0	7.0
May	5/27	58.4	41.6	0.1	N/A	5.9	5.9
June	---	---	---	---	---	---	---
July	7/16	59.0	41.0	0.0	0.0	3.3	3.3
August	8/20	58.4	41.6	0.0	0.0	3.7	5.1
September	9/15	54.7	39.6	0.0	5.7	6.0	5.8
October	10/23	58.7	41.3	0.0	0.0	1.1	4.9
November	11/23	45.3	35.3	0.5	18.9	4.9	4.1
December	12/16	57.8	42.2	0.0	0.0	4.6	4.1
Average		56.0	40.5	0.1	3.7	4.5	5.1

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW040B							
January	1/20	47.8	35.2	0.4	16.6	4.0	14.0
February	2/20	50.1	36.2	0.4	13.3	5.0	9.0
March	3/27	45.6	35.0	0.0	19.4	19.0	16.0
April	4/15	46.8	35.1	0.2	17.9	12.0	8.0
May	5/28	56.3	38.8	0.0	4.9	8.6	10.3
June	---	---	---	---	---	---	---
July	7/20	59.8	40.0	0.0	0.2	4.9	6.1
August	8/21	59.8	40.1	0.1	0.0	6.0	6.6
September	9/16	60.2	39.7	0.1	0.0	2.9	5.2
October	10/30	56.3	37.2	0.9	5.6	3.9	20.5
November	11/26	57.5	37.1	0.3	5.1	11.8	19.9
December	12/17	64.1	35.7	0.2	0.0	15.7	0.0
Average		54.9	37.3	0.2	7.5	8.5	10.5
HLGW041A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	56.2	39.0	0.2	4.6	2.0	6.0
April	4/14	37.5	30.5	0.3	31.7	1.0	1.0
May	5/27	56.7	40.2	0.0	3.1	1.1	2.7
June	---	---	---	---	---	---	---
July	7/16	31.5	30.2	0.4	37.9	1.4	0.0
August	8/20	48.5	35.6	0.0	15.9	0.0	0.0
September	---	---	---	---	---	---	---
October	10/23	55.0	38.9	0.0	6.1	3.4	3.6
November	11/23	21.0	26.7	1.3	51.0	1.5	0.0
December	---	---	---	---	---	---	---
Average		**43.8**	**34.4**	**0.3**	**21.5**	**1.5**	**1.9**
HLGW041B							
January	1/20	58.7	39.4	1.8	0.1	1.0	7.0
February	2/25	42.2	31.2	1.9	24.7	19.0	3.0
March	3/27	57.5	39.8	0.0	2.7	3.0	17.0
April	4/15	57.3	39.8	0.0	2.9	9.0	11.0
May	5/28	59.3	40.7	0.0	0.0	7.5	9.7
June	---	---	---	---	---	---	---
July	7/20	58.8	40.1	0.0	1.1	4.5	6.2
August	8/21	58.2	40.5	0.0	1.3	9.8	9.0
September	9/16	59.1	40.8	0.0	0.1	5.9	7.4
October	10/30	59.4	40.5	0.2	N/A	34.2	35.0
November	11/26	42.6	34.3	1.0	22.1	12.3	12.6
December	12/17	55.9	33.8	3.3	7.0	15.5	14.1
Average		**55.4**	**38.3**	**0.7**	**6.2**	**11.1**	**12.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW042A							
January	1/19	53.0	37.8	0.1	9.1	10.0	4.0
February	2/18	57.2	39.0	0.2	3.6	8.0	8.0
March	3/25	55.1	37.8	0.8	6.3	8.0	3.0
April	4/14	53.7	37.3	0.0	9.0	16.0	15.0
May	5/27	51.8	38.1	0.2	9.9	4.2	4.2
June	---	---	---	---	---	---	---
July	7/16	53.9	38.1	0.0	8.0	3.5	3.2
August	8/20	57.6	38.6	0.0	3.8	4.7	4.9
September	9/15	54.6	38.2	0.0	7.2	2.8	3.2
October	10/23	57.2	38.9	0.4	3.5	4.4	4.4
November	11/23	53.2	37.0	0.2	9.6	4.5	4.5
December	12/16	58.9	41.1	0.0	0.0	4.5	4.5
Average		**55.1**	**38.4**	**0.2**	**6.4**	**6.4**	**5.4**
HLGW042B							
January	1/20	55.3	38.0	0.2	6.5	26.0	33.0
February	2/20	54.8	38.7	0.4	6.1	20.0	30.0
March	3/26	50.9	36.7	0.7	11.7	44.0	43.0
April	4/15	54.0	38.0	0.4	7.6	32.0	38.0
May	5/28	50.1	36.4	0.7	12.8	34.4	38.4
June	---	---	---	---	---	---	---
July	7/17	53.5	38.2	0.1	8.2	14.8	15.8
August	8/21	56.1	39.2	0.0	4.7	16.1	16.5
September	9/16	57.2	39.2	0.0	3.6	14.0	25.9
October	10/27	51.7	38.3	0.2	9.8	18.5	18.6
November	11/25	60.1	39.6	0.1	0.2	17.2	23.4
December	12/17	59.1	40.9	0.0	0.0	31.7	32.1
Average		**54.8**	**38.5**	**0.3**	**6.5**	**24.4**	**28.6**
HLGW043A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	59.4	38.0	0.0	2.6	0.0	3.0
April	4/14	38.1	33.4	0.0	28.5	1.0	1.0
May	5/27	34.2	30.7	0.3	34.8	0.0	0.0
June	---	---	---	---	---	---	---
July	7/16	40.6	33.8	0.0	25.6	1.5	1.0
August	8/20	47.9	33.5	0.0	18.6	1.1	0.0
September	---	---	---	---	---	---	---
October	10/23	55.6	37.2	0.1	7.1	4.6	3.9
November	11/23	61.5	38.5	0.0	0.0	6.0	5.6
December	---	---	---	---	---	---	---
Average		**48.2**	**35.0**	**0.1**	**16.7**	**2.0**	**2.1**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW043B							
January	1/20	57.1	37.3	0.3	5.3	10.0	22.0
February	2/26	52.7	35.4	1.3	10.6	21.0	22.0
March	3/26	55.3	36.9	0.1	7.7	17.0	17.0
April	4/15	47.9	35.1	0.4	16.6	14.0	22.0
May	5/28	52.7	36.3	0.0	11.0	10.4	7.7
June	---	---	---	---	---	---	---
July	7/17	48.7	36.1	0.1	15.1	6.6	5.4
August	8/21	55.9	38.1	0.0	6.0	6.4	7.7
September	9/16	60.7	38.3	0.5	0.5	1.9	5.4
October	10/27	35.6	28.2	1.5	34.7	31.8	0.0
November	11/25	61.3	38.1	0.0	0.6	90.6	6.3
December	12/17	61.2	38.6	0.2	0.0	13.6	0.0
Average		**53.6**	**36.2**	**0.4**	**9.8**	**20.3**	**10.5**
HLGW044A							
January	1/19	60.4	39.5	0.0	0.1	20.0	16.0
February	2/18	47.8	35.1	0.2	16.9	10.0	14.0
March	3/25	54.3	37.5	0.2	8.0	8.0	11.0
April	4/14	46.1	34.4	0.0	19.5	8.0	4.0
May	5/27	50.2	36.4	0.0	13.4	6.5	6.1
June	---	---	---	---	---	---	---
July	7/16	50.2	35.9	0.0	13.9	5.9	6.0
August	8/20	54.8	37.3	0.0	7.9	7.4	7.0
September	9/15	44.8	34.3	0.0	20.9	2.4	0.0
October	10/23	60.4	39.6	0.1	N/A	35.7	35.6
November	11/23	61.2	38.8	0.0	0.0	34.6	39.2
December	12/16	59.9	40.1	0.0	0.0	30.9	30.7
Average		**53.6**	**37.2**	**0.0**	**10.1**	**15.4**	**15.4**
HLGW044B							
January	1/20	22.8	22.7	6.0	48.5	7.0	6.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**22.8**	**22.7**	**6.0**	**48.5**	**7.0**	**6.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW047A							
January	1/19	54.2	38.6	0.0	7.2	35.0	36.0
February	2/18	55.4	39.2	0.0	5.4	13.0	15.0
March	3/25	49.3	37.3	0.2	13.2	11.0	14.0
April	4/14	51.6	38.2	0.0	10.2	12.0	12.0
May	5/27	48.2	36.3	4.3	11.2	15.6	12.9
June	---	---	---	---	---	---	---
July	7/16	59.4	40.6	0.0	0.0	9.4	12.4
August	8/20	59.2	40.8	0.0	0.0	7.0	7.9
September	9/15	54.2	39.2	0.0	6.6	8.3	8.3
October	10/23	58.2	40.7	0.0	1.1	40.2	40.0
November	11/23	50.7	37.1	0.0	12.2	35.3	35.2
December	12/16	60.5	39.5	0.0	0.0	3.8	4.2
Average		**54.6**	**38.9**	**0.4**	**6.1**	**17.3**	**18.0**
HLGW048A							
January	1/19	59.5	40.4	0.0	0.1	4.0	5.0
February	2/18	51.8	37.8	0.0	10.4	4.0	4.0
March	3/25	47.6	36.3	0.6	15.5	7.0	7.0
April	4/14	49.8	37.4	0.0	12.8	5.0	5.0
May	5/27	58.8	40.8	0.0	0.4	2.4	2.7
June	---	---	---	---	---	---	---
July	7/16	59.5	40.5	0.0	0.0	8.8	11.1
August	8/20	58.4	40.1	0.0	1.5	4.7	5.3
September	9/15	51.2	38.5	0.0	10.3	6.8	6.8
October	10/23	53.2	38.0	0.0	8.8	6.7	6.3
November	11/23	56.7	38.8	0.0	4.5	4.0	4.8
December	---	---	---	---	---	---	---
Average		**54.7**	**38.9**	**0.1**	**6.4**	**5.3**	**5.8**
HLGW049A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	26.8	27.2	1.5	44.5	2.0	0.0
April	4/14	58.8	41.1	0.0	0.1	5.0	6.0
May	5/27	53.3	38.9	0.0	7.8	2.2	2.2
June	---	---	---	---	---	---	---
July	7/16	24.1	27.4	0.7	47.8	0.0	0.0
August	8/20	29.3	29.5	0.1	41.1	1.5	0.0
September	---	---	---	---	---	---	---
October	10/23	35.3	31.3	0.3	33.1	0.0	0.0
November	11/23	23.2	24.6	1.3	50.9	0.0	0.0
December	---	---	---	---	---	---	---
Average		**35.8**	**31.4**	**0.6**	**32.2**	**1.5**	**1.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW050A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	34.6	32.4	0.0	33.0	2.0	0.0
April	4/14	38.3	33.0	0.0	28.7	0.0	0.0
May	5/27	33.8	31.1	0.8	34.3	0.0	0.0
June	---	---	---	---	---	---	---
July	7/16	34.8	31.6	0.6	33.0	0.0	0.0
August	8/20	40.2	33.8	0.1	25.9	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/23	59.4	38.4	0.0	2.2	0.0	1.5
December	---	---	---	---	---	---	---
Average		**40.2**	**33.4**	**0.3**	**26.2**	**0.3**	**0.3**
HLGW051A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	3/25	34.1	28.1	0.9	36.9	2.0	0.0
April	4/14	34.4	29.7	0.0	35.9	0.0	0.0
May	5/27	30.6	28.2	0.0	41.2	0.0	0.0
June	---	---	---	---	---	---	---
July	7/16	35.7	30.7	0.1	33.5	0.0	0.0
August	8/20	42.8	31.4	0.0	25.8	0.0	1.0
September	---	---	---	---	---	---	---
October	10/23	45.1	25.8	0.2	28.9	1.1	1.1
November	11/23	62.7	37.3	0.0	0.0	2.5	3.4
December	---	---	---	---	---	---	---
Average		**40.8**	**30.2**	**0.2**	**28.9**	**0.8**	**0.8**
LHGW002A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
LHGW0003							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0004							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0006							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	Decommissioned May 2014						
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
LHGW0007							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0008							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0009							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	Decommissioned May 2014						
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
LHGW0010							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	Decommissioned May 2014						
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0013							
January	1/22	54.9	37.4	1.2	6.5	8.0	8.0
February	2/24	51.4	37.0	1.0	10.6	8.0	8.0
March	3/27	49.5	35.4	1.9	13.2	8.0	6.0
April	---	---	---	---	---	---	---
May	5/29	52.9	36.5	1.5	9.1	5.7	10.9
June	---	---	---	---	---	---	---
July	7/20	57.9	39.5	0.2	2.4	0.0	0.0
August	8/31	59.7	40.2	0.0	0.1	0.0	0.9
September	---	---	---	---	---	---	---
October	10/30	59.4	40.5	0.1	0.0	0.0	3.6
November	11/30	60.4	39.5	0.1	0.0	3.8	8.7
December	12/18	54.4	38.6	0.0	7.0	11.1	11.1
Average		**55.6**	**38.3**	**0.7**	**5.4**	**5.0**	**6.4**
LHGW0017							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
LHGW0019							
January	---	---	---	---	---	---	---
February	2/26	16.9	20.7	6.2	56.2	3.0	0.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	8/21	59.2	40.8	0.0	0.0	0.8	1.1
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**38.1**	**30.8**	**3.1**	**28.1**	**1.9**	**0.6**
LHGW0020							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
LHGW0021							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
LHGW0022							
January	1/22	60.1	39.8	0.0	0.1	1.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**60.1**	**39.8**	**0.0**	**0.1**	**1.0**	**1.0**
LHGW0023							
January	1/22	47.6	33.0	0.0	19.4	1.0	1.0
February	2/26	47.6	31.0	0.0	21.4	1.0	1.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	8/21	23.8	32.8	0.1	43.3	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**39.7**	**32.3**	**0.0**	**28.0**	**0.7**	**0.7**
TLGW001A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
TLGW001B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
TLGW002A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
TLGW002B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
TLGW002C							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
VLGW001D							
January	1/21	71.8	13.2	0.0	15.0	6.0	5.0
February	2/18	72.5	13.0	0.0	14.5	4.0	4.0
March	3/25	67.9	13.0	0.0	19.1	10.0	11.0
April	4/14	45.7	13.8	0.6	39.9	3.0	2.0
May	5/27	64.3	12.1	0.3	23.3	6.3	6.2
June	---	---	---	---	---	---	---
July	7/15	55.4	12.4	0.4	31.8	4.0	2.3
August	8/24	61.4	12.2	0.2	26.2	0.0	0.0
September	---	---	---	---	---	---	---
October	10/26	80.6	11.0	0.0	8.4	3.2	2.2
November	11/23	63.3	12.4	0.8	23.5	2.7	3.5
December	12/16	87.2	9.0	0.5	3.3	4.1	3.6
Average		**67.0**	**12.2**	**0.3**	**20.5**	**4.3**	**4.0**
VLGW001S							
January	1/21	26.7	25.6	0.0	47.7	2.0	4.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW002D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
VLGW002S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
VLGW003D							
January	1/21	44.0	21.2	0.1	34.7	8.0	4.0
February	2/26	37.8	20.2	0.7	41.3	14.0	14.0
March	3/25	39.1	20.2	0.7	40.0	32.0	2.0
April	4/14	56.1	22.8	0.0	21.1	2.0	5.0
May	5/27	67.0	21.5	0.0	11.5	3.4	3.8
June	---	---	---	---	---	---	---
July	7/16	49.6	18.1	0.1	32.2	6.7	4.8
August	8/20	67.5	19.0	0.4	13.1	8.0	7.1
September	9/15	64.6	19.0	0.4	16.0	1.1	2.6
October	10/26	58.2	19.7	0.3	21.8	6.3	6.3
November	11/23	60.2	19.9	0.2	19.7	7.5	7.4
December	12/16	75.6	24.4	0.0	0.0	0.0	0.0
Average		**56.3**	**20.5**	**0.3**	**22.9**	**8.1**	**5.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW003S							
January	1/21	40.3	25.2	0.0	34.5	2.0	3.0
February	2/26	35.2	24.1	1.4	39.3	3.0	2.0
March	3/25	37.9	24.2	3.3	34.6	3.0	0.0
April	4/14	73.7	22.9	0.0	3.4	3.0	6.0
May	5/27	59.2	23.0	0.0	17.8	3.1	2.9
June	---	---	---	---	---	---	---
July	7/16	52.7	23.0	0.2	24.1	5.3	2.2
August	8/20	61.0	23.2	0.2	15.6	4.9	4.9
September	9/15	54.2	23.0	0.3	22.5	4.5	4.0
October	10/26	55.5	23.9	0.6	20.0	2.0	4.9
November	11/23	52.2	25.3	0.0	22.5	6.1	4.8
December	12/16	71.4	17.7	2.3	8.6	2.8	2.2
Average		**53.9**	**23.2**	**0.8**	**22.1**	**3.6**	**3.4**
VLGW004D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**
VLGW004S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**---**	**---**	**---**	**---**	**---**	**---**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW005D							
January	1/21	89.4	10.5	0.0	0.1	3.0	3.0
February							
March	3/25	90.1	9.8	0.0	0.1	4.0	12.0
April	4/14	10.6	1.3	18.4	69.7	2.0	0.0
May	5/27	90.1	9.9	0.0	0.0	0.0	2.6
June							
July	7/15	90.7	9.2	0.1	0.0	0.0	1.2
August	8/24	17.1	2.2	16.1	64.6	0.0	0.0
September							
October	10/26	89.8	10.2	0.0	0.0	9.0	9.2
November	11/23	89.4	9.7	0.8	0.1	8.9	12.9
December	12/16	89.5	10.5	0.0	0.0	3.9	3.6
Average		**73.0**	**8.1**	**3.9**	**15.0**	**0.0**	**0.0**
VLGW005S							
January	1/21	82.1	17.8	0.0	0.1	2.0	4.0
February	---	---	---	---	---	---	---
March	3/25	31.6	20.6	0.0	47.8	3.0	1.0
April	4/14	76.5	16.3	0.0	7.2	2.0	5.0
May	5/27	44.5	19.7	0.7	35.1	3.2	0.0
June	---	---	---	---	---	---	---
July	7/15	50.1	19.9	0.7	29.3	2.2	0.0
August	8/24	83.5	15.0	0.2	1.3	6.2	0.0
September	---	---	---	---	---	---	---
October	10/26	63.1	20.5	1.8	14.6	0.0	0.0
November	11/23	40.9	9.9	9.8	39.4	5.5	5.0
December	12/16	79.2	15.2	1.8	3.8	6.6	6.3
Average		**61.3**	**17.2**	**1.7**	**19.8**	**3.4**	**2.4**
VLGW006D							
January	1/21	53.3	19.1	0.2	27.4	5.0	1.0
February	2/26	38.4	17.9	1.5	42.2	7.0	2.0
March	3/26	40.1	17.5	1.9	40.5	17.0	2.0
April	4/14	79.4	20.5	0.0	0.1	5.0	10.0
May	5/27	77.1	18.9	0.0	4.0	1.2	6.0
June	---	---	---	---	---	---	---
July	7/16	81.8	18.0	0.1	0.1	0.0	0.0
August	8/31	81.7	18.2	0.1	0.0	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**64.5**	**18.6**	**0.5**	**16.3**	**5.0**	**3.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW006S							
January	1/21	68.1	13.6	1.5	16.8	1.0	2.0
February	2/26	33.3	17.3	0.7	48.7	6.0	4.0
March	3/26	43.4	12.7	4.9	39.0	2.0	0.0
April	4/14	81.3	18.5	0.0	0.2	0.0	4.0
May	5/27	50.5	16.8	0.4	32.3	0.0	0.0
June	---	---	---	---	---	---	---
July	7/16	77.3	17.8	0.4	4.5	0.0	3.9
August	8/31	61.3	17.7	0.3	20.7	4.3	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**59.3**	**16.3**	**1.2**	**23.2**	**1.9**	**2.0**
VLGW007D							
January	1/20	39.0	16.1	1.5	43.4	5.0	16.0
February	2/19	52.3	18.8	0.8	28.1	19.0	6.0
March	3/26	21.2	7.2	13.1	58.5	21.0	1.0
April	4/14	77.0	22.9	0.0	0.1	0.0	4.0
May	5/27	76.5	22.1	0.0	1.4	6.8	6.7
June	---	---	---	---	---	---	---
July	7/16	38.7	11.6	9.2	40.5	6.0	0.0
August	8/31	75.0	25.0	0.0	0.0	0.0	4.9
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**54.2**	**17.7**	**3.5**	**24.6**	**8.3**	**5.5**
VLGW007S							
January	1/20	45.9	19.9	0.0	34.2	2.0	4.0
February	2/19	47.3	18.6	0.0	34.1	3.0	4.0
March	3/26	36.8	16.6	1.8	44.8	5.0	0.0
April	4/14	75.7	18.0	0.0	6.3	1.0	4.0
May	5/27	65.2	18.2	0.1	16.5	5.3	4.8
June	---	---	---	---	---	---	---
July	7/16	78.1	15.0	0.2	6.7	1.7	2.8
August	8/31	68.3	18.2	0.4	13.1	3.9	1.7
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**59.6**	**17.8**	**0.4**	**22.2**	**3.1**	**3.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW008D							
January	1/21	2.5	5.7	15.7	76.1	4.0	2.0
February	---	---	---	---	---	---	---
March	3/26	26.0	19.4	0.8	53.8	0.0	0.0
April	4/14	79.9	20.0	0.0	0.1	0.0	2.0
May	5/27	66.6	16.4	0.0	17.0	7.1	7.0
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**43.8**	**15.4**	**4.1**	**36.8**	**2.8**	**2.8**
VLGW008S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	57.7	20.7	0.1	21.5	6.0	8.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**57.7**	**20.7**	**0.1**	**21.5**	**6.0**	**8.0**
VLGW009D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	90.5	9.3	0.0	0.2	1.0	6.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**90.5**	**9.3**	**0.0**	**0.2**	**1.0**	**6.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW009S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	10.9	3.0	17.0	69.1	1.0	0.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**10.9**	**3.0**	**17.0**	**69.1**	**1.0**	**0.0**
VLGW010S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW011S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	36.7	19.1	0.0	44.2	1.0	2.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**36.7**	**19.1**	**0.0**	**44.2**	**1.0**	**2.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW012S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	70.0	22.7	0.0	7.3	1.0	7.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**70.0**	**22.7**	**0.0**	**7.3**	**1.0**	**7.0**
VLGW013D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW013S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW014D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW014S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW015D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	46.8	16.1	0.0	37.1	33.0	2.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**46.8**	**16.1**	**0.0**	**37.1**	**33.0**	**2.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW015S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	47.4	22.8	0.0	29.8	2.0	1.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**47.4**	**22.8**	**0.0**	**29.8**	**2.0**	**1.0**
VLGW016D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	61.8	21.7	0.0	16.5	5.0	10.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**61.8**	**21.7**	**0.0**	**16.5**	**5.0**	**10.0**
VLGW016S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	75.6	24.3	0.0	0.1	2.0	6.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**75.6**	**24.3**	**0.0**	**0.1**	**2.0**	**6.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW017D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	71.5	28.4	0.0	0.1	1.0	11.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**71.5**	**28.4**	**0.0**	**0.1**	**1.0**	**11.0**
VLGW017S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	71.2	28.7	0.0	0.1	2.0	7.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**71.2**	**28.7**	**0.0**	**0.1**	**2.0**	**7.0**
VLGW018D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	66.0	33.9	0.0	0.1	2.0	5.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**66.0**	**33.9**	**0.0**	**0.1**	**2.0**	**5.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW018S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	67.9	30.2	0.0	1.9	1.0	4.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**67.9**	**30.2**	**0.0**	**1.9**	**1.0**	**4.0**
VLGW019D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	62.5	33.9	0.0	3.6	10.0	10.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**62.5**	**33.9**	**0.0**	**3.6**	**10.0**	**10.0**
VLGW019S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	58.3	32.9	0.0	8.8	3.0	6.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**58.3**	**32.9**	**0.0**	**8.8**	**3.0**	**6.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW020D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW020S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW021D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	74.3	25.6	0.0	0.1	2.0	7.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**74.3**	**25.6**	**0.0**	**0.1**	**2.0**	**7.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW021S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	61.9	18.7	0.0	19.4	4.0	5.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**61.9**	**18.7**	**0.0**	**19.4**	**4.0**	**5.0**
VLGW022D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW022S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW023D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	89.5	10.4	0.0	0.1	1.0	5.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**89.5**	**10.4**	**0.0**	**0.1**	**1.0**	**5.0**
VLGW023S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	64.1	26.7	2.6	6.6	2.0	4.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**64.1**	**26.7**	**2.6**	**6.6**	**2.0**	**4.0**
VLGW024D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	56.0	24.3	0.0	19.7	2.0	3.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**56.0**	**24.3**	**0.0**	**19.7**	**2.0**	**3.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW024S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW025D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW025S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW026D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	38.6	27.3	0.0	34.1	3.0	0.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**38.6**	**27.3**	**0.0**	**34.1**	**3.0**	**0.0**
VLGW026S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	36.1	25.9	0.2	37.8	6.0	0.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**36.1**	**25.9**	**0.2**	**37.8**	**6.0**	**0.0**
VLGW027D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	67.4	22.3	0.0	10.3	4.0	5.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**67.4**	**22.3**	**0.0**	**10.3**	**4.0**	**5.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW027S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW028S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	60.8	25.8	0.0	13.4	0.0	2.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**60.8**	**25.8**	**0.0**	**13.4**	**0.0**	**2.0**
VLGW029D							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	73.1	26.3	0.0	0.6	0.0	4.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**73.1**	**26.3**	**0.0**	**0.6**	**0.0**	**4.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW029S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	45.4	23.6	0.0	31.0	2.0	1.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**45.4**	**23.6**	**0.0**	**31.0**	**2.0**	**1.0**
VLGW030S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW031S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW032S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	64.7	31.2	0.0	4.1	2.0	4.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**64.7**	**31.2**	**0.0**	**4.1**	**2.0**	**4.0**
VLGW033S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW034S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW042S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	4/14	68.1	20.2	0.0	11.7	0.0	5.0
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**68.1**	**20.2**	**0.0**	**11.7**	**0.0**	**5.0**
VLGW043S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
VLGW047S							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW0049							
January	1/20	44.0	21.9	6.9	27.2	7.0	8.0
February	2/26	16.2	8.3	16.3	59.2	18.0	0.0
March	3/26	67.9	32.0	0.0	0.1	35.0	28.0
April	4/14	6.8	3.5	19.1	70.6	1.0	1.0
May	5/28	67.9	32.0	0.2	N/A	0.0	8.7
June	---	---	---	---	---	---	---
July	7/17	58.3	31.9	0.4	9.4	4.6	5.2
August	8/31	52.9	30.3	0.5	16.3	6.6	3.7
September	---	---	---	---	---	---	---
October	10/27	61.1	30.8	0.5	7.6	4.7	4.7
November	11/24	43.4	19.7	7.9	29.0	8.2	4.9
December	---	---	---	---	---	---	---
Average		**46.5**	**23.4**	**5.8**	**27.4**	**9.5**	**7.1**
VLGW0050							
January	1/21	72.3	27.6	0.0	0.1	4.0	5.0
February	---	---	---	---	---	---	---
March	3/26	72.2	25.0	1.2	1.6	1.0	4.0
April	4/14	42.9	27.9	0.1	29.1	2.0	1.0
May	5/28	45.4	28.8	0.0	25.8	3.4	1.9
June	---	---	---	---	---	---	---
July	7/15	66.8	27.0	0.1	6.1	4.4	6.7
August	8/31	38.5	28.8	0.3	32.4	3.1	0.0
September	---	---	---	---	---	---	---
October	10/27	74.6	25.3	0.1	0.0	0.0	4.1
November	11/24	43.5	26.9	0.0	29.6	4.4	4.4
December	---	---	---	---	---	---	---
Average		**57.0**	**27.2**	**0.2**	**15.6**	**2.8**	**3.4**
VLGW0051							
January	1/21	43.9	31.5	0.0	24.6	13.0	16.0
February	2/26	43.8	30.2	0.0	26.0	12.0	8.0
March	3/26	45.7	30.2	0.2	23.9	10.0	1.0
April	4/14	60.5	30.7	0.0	8.8	7.0	10.0
May	5/28	62.8	31.1	0.0	6.1	8.8	9.7
June	---	---	---	---	---	---	---
July	7/17	58.7	32.2	0.1	9.0	11.2	11.3
August	8/31	55.6	32.5	0.0	11.9	9.1	8.2
September	---	---	---	---	---	---	---
October	10/27	59.5	32.9	0.1	7.5	35.8	36.4
November	11/25	58.7	32.9	0.0	8.4	6.7	31.4
December	---	---	---	---	---	---	---
Average		**54.4**	**31.6**	**0.0**	**14.0**	**12.6**	**14.7**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW0052							
January	1/20	44.0	33.0	0.0	23.0	9.0	8.0
February	2/26	43.5	32.3	0.0	24.2	10.0	3.0
March	3/26	41.6	30.0	1.8	26.6	4.0	1.0
April	4/14	42.0	31.6	0.0	26.4	1.0	1.0
May	5/28	45.1	32.3	0.0	22.6	1.1	0.0
June	---	---	---	---	---	---	---
July	7/17	61.5	36.4	0.1	2.0	1.9	3.4
August	8/31	55.9	36.5	0.0	7.6	4.1	3.7
September	---	---	---	---	---	---	---
October	10/27	57.3	36.3	0.0	6.4	4.3	3.6
November	11/24	43.3	32.4	0.1	24.2	1.5	1.5
December	---	---	---	---	---	---	---
Average		**48.2**	**33.4**	**0.2**	**18.1**	**4.1**	**2.8**
VLGW0053							
January	1/20	46.4	33.4	0.0	20.2	3.0	3.0
February	2/26	43.6	32.1	0.0	24.3	5.0	3.0
March	3/26	40.1	30.3	0.7	28.9	8.0	0.0
April	4/14	46.9	32.6	0.0	20.5	2.0	3.0
May	5/28	43.7	31.2	0.6	24.5	2.5	0.0
June	---	---	---	---	---	---	---
July	7/17	49.0	33.0	0.6	17.4	0.0	1.1
August	8/31	50.4	33.6	0.0	16.0	0.0	0.0
September	---	---	---	---	---	---	---
October	10/27	44.7	32.6	0.0	22.7	0.0	0.0
November	11/24	50.1	33.0	0.1	16.8	0.0	0.0
December	---	---	---	---	---	---	---
Average		**46.1**	**32.4**	**0.2**	**21.3**	**2.3**	**1.1**
VLGW0054							
January	1/21	43.2	31.8	0.0	25.0	2.0	4.0
February	26/02/21 1:09:PM	41.8	30.9	0.0	27.3	5.0	2.0
March	3/26	39.0	29.5	0.4	31.1	4.0	1.0
April	4/14	67.1	32.8	0.0	0.1	1.0	3.0
May	5/28	47.4	30.1	0.0	22.5	5.0	1.5
June	---	---	---	---	---	---	---
July	7/17	53.6	31.0	0.1	15.3	3.6	3.6
August	8/31	54.1	31.2	0.0	14.7	2.5	0.0
September	---	---	---	---	---	---	---
October	10/27	68.2	31.8	0.0	0.0	5.2	5.1
November	11/25	53.1	31.0	0.1	15.8	4.9	4.9
December	---	---	---	---	---	---	---
Average		**51.9**	**31.1**	**0.1**	**16.9**	**3.7**	**2.8**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW0055							
January	1/21	43.5	32.5	0.0	24.0	6.0	6.0
February	2/26	39.1	30.8	0.0	30.1	5.0	3.0
March	3/26	38.1	30.1	0.1	31.7	4.0	0.0
April	---	---	---	---	---	---	---
May	5/28	46.1	30.7	0.0	23.2	0.0	0.0
June	---	---	---	---	---	---	---
July	7/17	62.4	35.3	0.9	1.4	3.6	3.2
August	8/31	64.4	35.2	0.4	0.0	1.6	3.2
September	---	---	---	---	---	---	---
October	10/27	65.5	34.5	0.0	0.0	4.9	4.4
November	11/25	63.0	37.0	0.0	0.0	3.6	3.6
December	---	---	---	---	---	---	---
Average		**52.8**	**33.3**	**0.2**	**13.8**	**3.6**	**2.9**
VLGW0056							
January	1/21	34.5	28.8	0.0	36.7	3.0	3.0
February	2/26	30.8	27.1	0.0	42.1	5.0	2.0
March	3/26	30.7	26.3	0.3	42.7	2.0	1.0
April	4/14	55.2	32.3	0.0	12.5	2.0	3.0
May	5/28	40.7	26.9	0.0	32.4	2.9	1.1
June	---	---	---	---	---	---	---
July	7/17	58.3	30.6	0.4	10.7	0.0	2.2
August	8/31	64.9	32.6	0.1	2.4	0.0	1.1
September	---	---	---	---	---	---	---
October	10/27	46.2	31.2	0.1	22.5	0.0	1.5
November	11/25	64.4	33.4	0.0	2.2	2.6	2.6
December	---	---	---	---	---	---	---
Average		**47.3**	**29.9**	**0.1**	**22.7**	**1.9**	**1.9**
VLGW0057							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
VLGW0058							
January	1/21	57.8	42.1	0.0	0.1	2.0	3.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**57.8**	**42.1**	**0.0**	**0.1**	**2.0**	**3.0**
VLGW0059							
January	1/22	46.9	35.5	0.0	17.6	3.0	5.0
February	2/26	47.7	36.1	0.0	16.2	6.0	6.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**47.3**	**35.8**	**0.0**	**16.9**	**4.5**	**5.5**
VLGW0060							
January	1/22	19.3	24.2	0.2	56.3	5.0	6.0
February	2/26	18.2	23.1	0.2	58.5	7.0	1.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**18.8**	**23.7**	**0.2**	**57.4**	**6.0**	**3.5**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW049B							
January	1/20	45.5	34.7	2.1	17.7	11.0	13.0
February	2/20	52.9	38.1	0.5	8.5	5.0	16.0
March	3/27	44.1	33.1	3.0	19.8	35.0	7.0
April	4/15	58.9	41.0	0.0	0.1	5.0	14.0
May	5/28	59.3	40.7	0.0	0.0	7.4	9.4
June	---	---	---	---	---	---	---
July	7/20	50.4	37.7	0.2	11.7	9.0	9.5
August	8/21	52.4	38.8	0.2	8.6	11.2	11.4
September	9/16	53.5	38.7	0.2	7.6	5.5	8.7
October	10/30	52.4	37.8	0.7	9.1	9.3	6.8
November	11/25	59.7	38.0	0.2	2.1	14.3	11.9
December	12/17	59.8	39.7	0.5	0.0	15.2	17.2
Average		**53.5**	**38.0**	**0.7**	**7.7**	**11.6**	**11.4**
HLGW040B							
January	1/20	47.8	35.2	0.4	16.6	4.0	14.0
February	2/20	50.1	36.2	0.4	13.3	5.0	9.0
March	3/27	45.6	35.0	0.0	19.4	19.0	16.0
April	4/15	46.8	35.1	0.2	17.9	12.0	8.0
May	5/28	56.3	38.8	0.0	4.9	8.6	10.3
June	---	---	---	---	---	---	---
July	7/20	59.8	40.0	0.0	0.2	4.9	6.1
August	8/21	59.8	40.1	0.1	0.0	6.0	6.6
September	9/16	60.2	39.7	0.1	0.0	2.9	5.2
October	10/30	56.3	37.2	0.9	5.6	3.9	20.5
November	11/26	57.5	37.1	0.3	5.1	11.8	19.9
December	12/17	64.1	35.7	0.2	0.0	15.7	0.0
Average		**54.9**	**37.3**	**0.2**	**7.5**	**8.5**	**10.5**
HLGW045B							
January	1/20	5.4	4.3	19.1	71.2	2.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/30	24.5	26.2	0.4	48.9	0.0	0.0
December	---	---	---	---	---	---	---
Average		**15.0**	**15.3**	**9.8**	**60.1**	**1.0**	**0.5**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW046B							
January	1/20	0.0	0.1	21.3	78.6	2.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**0.0**	**0.1**	**21.3**	**78.6**	**2.0**	**1.0**
HLGW047B							
January	1/20	32.6	26.8	4.8	35.8	1.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/30	11.3	10.1	14.6	64.0	0.0	0.0
December	---	---	---	---	---	---	---
Average		**22.0**	**18.5**	**9.7**	**49.9**	**0.5**	**0.5**
HLGW048B							
January	1/20	29.0	27.9	0.2	42.9	1.0	1.0
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	11/30	14.4	22.8	0.1	62.7	0.0	1.0
December	---	---	---	---	---	---	---
Average		**21.7**	**25.4**	**0.2**	**52.8**	**0.5**	**1.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW050B							
January	1/20	53.0	37.5	0.0	9.5	12.0	11.0
February	2/20	49.7	37.2	0.0	13.1	34.0	34.0
March	3/26	45.8	35.5	0.2	18.5	13.0	12.0
April	4/15	54.5	38.5	0.0	7.0	6.0	8.0
May	5/28	48.3	36.8	0.0	14.9	8.2	8.2
June	---	---	---	---	---	---	---
July	7/17	50.0	38.0	0.0	12.0	7.0	5.9
August	8/21	56.3	39.6	0.0	4.1	33.5	33.4
September	9/16	53.3	38.3	0.1	8.3	12.2	31.6
October	10/27	45.5	36.2	0.1	18.2	2.2	0.0
November	11/25	59.3	40.7	0.0	0.0	31.9	8.3
December	12/17	58.9	41.1	0.0	0.0	5.1	5.2
Average		**52.2**	**38.1**	**0.0**	**9.6**	**15.0**	**14.3**
HLGW051B							
January	1/20	56.1	38.0	0.0	17.7	11.0	13.0
February	2/20	53.6	37.9	0.0	8.5	5.0	16.0
March	3/27	45.6	35.3	0.2	19.8	35.0	7.0
April	4/15	52.2	37.7	0.0	0.1	5.0	14.0
May	5/28	46.3	35.6	0.0	0.0	7.4	9.4
June	---	---	---	---	---	---	---
July	7/17	50.5	37.7	0.1	11.7	9.0	9.5
August	8/21	57.2	41.6	0.0	8.6	11.2	11.4
September	9/16	52.1	37.3	0.0	7.6	5.5	8.7
October	10/30	41.5	35.4	0.3	9.1	9.3	6.8
November	11/25	59.5	40.4	0.1	2.1	14.3	11.9
December	12/17	59.8	39.0	0.0	0.0	15.2	17.2
Average		**52.2**	**37.8**	**0.1**	**7.7**	**11.6**	**11.4**
HLGW0052							
January	1/19	46.8	35.8	0.9	16.5	14.0	26.0
February	2/25	57.6	41.5	0.8	0.1	7.0	10.0
March	3/27	47.9	37.7	0.3	14.1	14.0	14.0
April	4/15	51.8	39.4	0.0	8.8	6.0	13.0
May	5/29	45.6	37.1	0.1	17.2	16.4	5.3
June	---	---	---	---	---	---	---
July	7/20	55.4	41.1	0.0	3.5	5.7	5.7
August	8/20	58.8	41.1	0.1	0.0	3.8	7.3
September	9/16	54.6	39.1	1.1	5.2	7.8	7.4
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**52.3**	**39.1**	**0.4**	**8.2**	**9.3**	**11.1**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0053							
January	1/19	50.8	39.4	0.0	9.8	11.0	14.0
February	2/25	56.6	43.2	0.1	0.1	3.0	9.0
March	3/27	57.5	42.1	0.3	0.1	6.0	12.0
April	4/15	57.5	42.4	0.0	0.1	10.0	16.0
May	5/29	57.2	42.8	0.0	0.0	9.0	15.9
June	---	---	---	---	---	---	---
July	7/20	44.3	37.0	0.9	17.8	20.4	19.0
August	8/20	51.4	40.4	0.4	7.8	17.3	17.3
September	9/16	57.3	42.7	0.0	0.0	10.7	14.2
October	10/30	56.9	42.6	0.0	0.5	10.7	13.2
November	11/30	57.8	42.2	0.0	0.0	17.0	17.2
December	12/18	49.2	39.5	0.0	11.3	20.7	6.0
Average		**54.2**	**41.3**	**0.2**	**4.3**	**12.3**	**14.0**
HLGW0054							
January	1/19	21.9	19.9	8.4	49.8	9.0	4.0
February	2/25	55.6	41.7	2.5	0.2	5.0	22.0
March	3/27	34.3	33.1	0.5	32.1	1.0	1.0
April	4/15	57.2	42.7	0.0	0.1	1.0	5.0
May	5/29	57.1	42.9	0.0	0.0	3.2	8.2
June	---	---	---	---	---	---	---
July	7/20	48.7	39.9	0.0	11.4	3.2	3.2
August	8/20	56.8	42.7	0.0	0.5	2.7	4.3
September	9/16	55.3	41.6	0.1	3.0	4.4	4.2
October	10/30	56.9	43.0	0.0	0.1	3.2	4.4
November	11/30	57.7	42.3	0.0	0.0	4.4	6.7
December	12/18	52.7	39.6	0.0	7.7	7.4	8.2
Average		**50.4**	**39.0**	**1.0**	**9.5**	**4.0**	**6.5**
HLGW0055							
January	1/19	49.7	37.5	0.7	12.1	14.0	17.0
February	2/26	44.3	36.2	1.9	17.6	16.0	9.0
March	3/27	43.9	35.3	1.4	19.4	16.0	4.0
April	4/15	58.4	41.5	0.0	0.1	6.0	10.0
May	5/29	58.0	41.4	0.0	0.6	5.0	8.3
June	---	---	---	---	---	---	---
July	7/20	50.8	39.5	0.0	9.7	5.7	5.6
August	8/20	53.2	40.5	0.0	6.3	5.7	5.6
September	9/16	55.2	40.7	0.1	4.0	4.5	5.2
October	10/30	57.5	40.3	0.1	2.1	8.1	8.2
November	11/30	52.2	35.1	0.8	11.9	5.5	5.5
December	12/18	59.2	40.8	0.0	0.0	5.7	6.7
Average		**52.9**	**39.0**	**0.5**	**7.6**	**8.4**	**7.7**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0056							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		---	---	---	---	---	---
HLGW0057							
January	1/19	58.3	40.9	0.1	0.7	56.0	62.0
February	2/24	53.5	39.2	0.6	6.7	50.0	59.0
March	3/27	50.8	38.2	0.8	10.2	70.0	69.0
April	4/15	51.5	38.6	0.3	9.6	60.0	70.0
May	5/29	51.5	38.5	0.7	9.3	77.4	76.9
June	---	---	---	---	---	---	---
July	7/20	50.2	38.8	0.2	10.8	76.3	76.2
August	8/20	52.7	39.2	0.3	7.8	75.6	75.7
September	9/16	49.8	38.0	0.8	11.4	69.8	59.2
October	10/30	48.6	37.2	1.2	13.0	60.4	45.6
November	11/30	59.8	40.1	0.1	0.0	48.0	40.2
December	12/18	57.5	39.7	0.4	2.4	40.6	42.5
Average		**53.1**	**38.9**	**0.5**	**7.4**	**62.2**	**61.5**
HLGW0058							
January	---	---	---	---	---	---	---
February	2/24	58.6	40.7	0.5	0.2	37.0	42.0
March	3/27	37.7	28.0	6.6	27.7	39.0	3.0
April	4/15	57.7	42.2	0.0	0.1	1.0	5.0
May	5/29	58.7	41.0	0.3	0.0	3.4	8.9
June	---	---	---	---	---	---	---
July	7/20	46.6	37.9	0.0	15.5	4.3	3.3
August	8/20	49.4	38.4	0.0	12.2	2.5	2.2
September	9/16	58.8	41.0	0.2	0.0	3.1	4.2
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**52.5**	**38.5**	**1.1**	**8.0**	**12.9**	**9.8**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0059							
January	1/19	54.0	40.0	0.1	5.9	77.0	76.0
February	2/24	58.3	41.2	0.4	0.1	9.0	17.0
March	3/27	50.6	38.4	0.7	10.3	21.0	21.0
April	4/15	58.3	41.6	0.0	0.1	7.0	23.0
May	5/29	54.8	40.2	0.0	5.0	21.8	21.7
June	---	---	---	---	---	---	---
July	7/20	48.7	39.1	0.0	12.2	27.5	26.1
August	8/20	51.2	39.6	0.0	9.2	24.9	24.9
September	9/16	51.5	39.4	0.1	9.0	27.5	26.8
October	10/30	55.5	40.6	0.1	3.8	22.3	22.3
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**53.7**	**40.0**	**0.2**	**6.2**	**26.4**	**28.8**
HLGW0060							
January	1/19	22.4	24.4	3.5	49.7	24.0	23.0
February	2/25	17.4	11.3	14.5	56.8	10.0	1.0
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**19.9**	**17.9**	**9.0**	**53.3**	**17.0**	**12.0**
HLGW0061							
January	1/19	48.3	37.9	0.2	13.6	30.0	35.0
February	2/26	49.1	39.5	0.1	11.3	4.0	6.0
March	3/27	43.2	36.4	0.6	19.8	21.0	3.0
April	4/15	56.2	41.0	0.0	2.8	1.0	3.0
May	5/29	54.1	40.5	0.0	5.4	2.0	1.9
June	---	---	---	---	---	---	---
July	7/20	47.8	39.6	0.0	12.6	0.0	0.0
August	8/20	51.3	39.9	0.1	8.7	0.0	1.3
September	9/16	51.9	40.1	0.2	7.8	19.5	20.9
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	12/18	57.2	42.8	0.0	0.0	4.1	3.7
Average		**51.0**	**39.7**	**0.1**	**9.1**	**9.1**	**8.3**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW0062							
January	1/19	47.5	38.6	0.1	13.8	30.0	33.0
February	2/24	53.5	40.7	0.0	5.8	28.0	29.0
March	3/27	41.4	34.8	1.5	22.3	29.0	8.0
April	4/15	57.4	42.5	0.0	0.1	9.0	12.0
May	5/29	53.8	41.4	0.1	4.7	13.7	14.1
June	---	---	---	---	---	---	---
July	7/20	49.5	40.2	0.0	10.3	14.2	14.3
August	8/20	52.3	41.1	0.0	6.6	14.7	16.0
September	9/16	50.9	40.3	0.0	8.8	17.3	17.1
October	10/30	51.8	40.4	0.1	7.7	17.7	17.6
November	11/30	56.8	43.1	0.1	0.0	11.4	17.1
December	12/18	57.4	42.6	0.0	0.0	0.0	0.0
Average		**52.0**	**40.5**	**0.2**	**7.3**	**16.8**	**16.2**
HLGW0063							
January	1/19	58.5	40.6	0.0	0.9	6.0	13.0
February	2/25	58.3	41.4	0.1	0.2	2.0	13.0
March	3/27	32.5	27.9	4.5	35.1	14.0	3.0
April	4/15	58.1	41.8	0.0	0.1	2.0	7.0
May	5/29	57.4	41.5	0.1	1.0	5.8	6.3
June	---	---	---	---	---	---	---
July	7/20	48.4	38.8	0.0	12.8	5.8	5.9
August	8/20	52.0	40.2	0.0	7.8	6.9	6.9
September	9/16	57.9	41.5	0.3	0.3	6.0	7.0
October	10/30	53.4	39.7	0.1	6.8	6.0	6.1
November	11/30	57.6	42.3	0.0	0.1	5.1	9.4
December	---	---	---	---	---	---	---
Average		**53.4**	**39.6**	**0.5**	**6.5**	**6.0**	**7.8**
HLGW064B							
January	1/19	57.3	40.8	0.0	1.9	17.0	23.0
February	2/24	55.0	39.6	0.8	4.6	11.0	11.0
March	3/27	53.6	39.0	0.6	6.8	10.0	20.0
April	4/15	55.7	40.8	0.0	3.5	22.0	26.0
May	5/28	55.2	40.8	0.0	4.0	20.0	22.9
June	---	---	---	---	---	---	---
July	7/20	52.6	40.2	0.0	7.2	28.6	28.6
August	8/20	55.8	40.9	0.0	3.3	30.1	33.3
September	9/16	54.1	40.4	0.0	5.5	34.1	35.2
October	10/30	54.4	40.1	0.0	5.5	36.4	36.5
November	11/26	47.9	36.3	0.5	15.3	18.7	18.6
December	12/18	56.8	40.1	0.0	3.1	18.8	15.4
Average		**54.4**	**39.9**	**0.2**	**5.5**	**22.4**	**24.6**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW065A							
January	1/19	58.0	41.9	0.0	0.1	57.0	58.0
February	2/23	58.2	41.6	0.0	0.2	16.0	22.0
March	3/25	57.2	41.4	0.1	1.3	19.0	22.0
April	4/14	56.8	41.6	0.0	1.6	25.0	28.0
May	5/22	54.9	42.5	0.0	2.6	40.1	45.8
June	--	--	--	--	--	--	--
July	7/21	54.3	40.8	0.0	4.9	57.3	57.9
August	8/20	55.3	41.1	0.0	3.6	58.3	63.2
September	9/15	54.7	40.8	0.0	4.5	60.4	65.7
October	10/22	55.2	40.7	0.0	4.1	62.2	66.3
November	11/23	57.6	41.2	0.0	1.2	63.9	65.9
December	12/16	58.0	42.0	0.0	0.0	63.8	66.7
Average		**56.4**	**41.4**	**0.0**	**2.2**	**47.5**	**51.0**
HLGW065B							
January	1/19	54.9	40.1	0.0	5.0	17.0	35.0
February	2/24	54.9	40.1	0.4	4.6	36.0	44.0
March	3/27	52.7	38.8	1.0	7.5	41.0	45.0
April	4/15	52.1	39.3	0.4	8.2	47.0	51.0
May	5/28	50.9	38.7	0.6	9.8	54.5	54.5
June	---	---	---	---	---	---	---
July	7/20	50.2	38.7	0.6	10.5	55.9	54.7
August	8/20	52.8	39.2	0.6	7.4	56.6	57.8
September	9/16	51.2	38.6	1.0	9.2	59.3	49.6
October	10/30	51.5	38.3	1.1	9.1	53.1	47.8
November	11/26	53.5	37.8	1.7	7.0	7.1	7.2
December	12/18	51.1	37.1	1.4	10.4	20.4	4.5
Average		**52.3**	**38.8**	**0.8**	**8.1**	**40.7**	**41.0**
HLGW066A							
January	1/19	48.7	39.2	0.0	12.1	21.0	18.0
February	2/27	40.7	35.5	0.2	23.6	12.0	9.0
March	3/25	48.7	39.2	0.0	12.1	21.0	18.0
April	---	---	---	---	---	---	---
May	5/22	29.5	31.7	0.1	38.7	0.0	0.0
June	---	---	---	---	---	---	---
July	7/21	42.7	36.7	0.1	20.5	0.0	0.0
August	8/20	36.8	33.9	0.2	29.1	0.0	0.0
September	9/15	36.8	33.7	0.1	29.4	0.0	0.0
October	10/22	23.8	21.2	7.8	47.2	0.0	0.0
November	11/23	44.3	35.8	0.0	19.9	0.0	0.0
December	12/16	42.9	35.4	0.0	21.7	0.5	0.5
Average		**39.5**	**34.2**	**0.9**	**25.4**	**5.5**	**4.6**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW066B							
January	1/19	57.4	42.0	0.2	0.4	95.0	96.0
February	2/25	55.2	41.2	3.5	0.1	107.0	110.0
March	3/27	50.0	37.0	2.3	10.7	111.0	112.0
April	4/15	55.1	40.6	0.2	4.1	104.0	117.0
May	5/28	50.1	39.1	0.6	10.2	77.6	77.7
June	---	---	---	---	---	---	---
July	7/20	47.6	37.5	1.0	13.9	58.2	55.0
August	8/20	50.4	38.1	0.9	10.6	55.0	55.0
September	9/16	51.6	39.2	0.5	8.7	53.3	49.9
October	10/30	54.8	40.1	0.1	5.0	50.5	56.0
November	11/26	59.1	40.7	0.2	0.0	42.0	57.8
December	12/18	59.1	40.9	0.0	0.0	77.1	73.4
Average		**53.7**	**39.7**	**0.9**	**5.8**	**75.5**	**78.2**
HLGW067A							
January	1/19	49.4	38.3	0.4	11.9	27.0	24.0
February	2/23	58.0	41.9	0.0	0.1	10.0	16.0
March	3/25	54.5	39.7	0.6	5.2	16.0	21.0
April	4/14	55.0	39.6	1.4	4.0	19.0	21.0
May	5/22	57.8	41.3	0.0	0.9	3.1	11.2
June	---	---	---	---	---	---	---
July	7/21	51.8	39.1	0.2	8.9	13.9	13.8
August	8/20	54.2	40.1	0.2	5.5	15.9	18.9
September	9/15	48.5	37.9	0.6	13.0	17.8	13.7
October	10/22	56.2	40.6	0.0	3.2	19.7	21.3
November	11/23	57.7	42.3	0.0	0.0	5.6	7.5
December	12/16	57.0	43.0	0.0	0.0	7.6	9.9
Average	**7/7**	**54.6**	**40.3**	**0.3**	**4.8**	**14.1**	**16.2**
HLGW067B							
January	---	---	---	---	---	---	---
February	2/25	41.8	32.3	5.8	20.1	8.0	4.0
March	3/27	0.6	0.9	19.4	79.1	0.0	0.0
April	---	---	---	---	---	---	---
May	5/28	33.2	29.7	2.6	34.5	2.0	0.5
June	---	---	---	---	---	---	---
July	7/20	23.2	25.9	0.9	50.0	0.0	0.0
August	8/20	24.8	25.5	1.4	48.3	0.6	0.0
September	9/16	30.5	29.2	3.3	37.0	3.2	2.8
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**25.7**	**23.9**	**5.6**	**44.8**	**2.3**	**1.2**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW068B							
January	1/19	56.7	41.0	0.2	2.1	2.0	13.0
February	2/25	57.6	41.6	0.3	0.5	24.0	33.0
March	3/27	53.3	39.2	0.7	6.8	38.0	36.0
April	4/15	52.7	39.7	0.2	7.4	39.0	46.0
May	5/28	48.4	37.7	0.6	13.3	40.9	26.4
June	---	---	---	---	---	---	---
July	7/20	50.1	38.7	0.4	10.8	30.6	30.6
August	8/20	52.8	39.2	0.4	7.6	27.5	30.0
September	9/16	51.1	39.1	0.6	9.2	29.0	20.4
October	10/30	55.6	40.1	0.5	3.8	16.9	19.3
November	11/26	58.4	40.5	0.4	0.7	17.2	21.3
December	12/18	57.2	41.0	0.2	1.6	24.8	25.5
Average		**54.0**	**39.8**	**0.4**	**5.8**	**26.4**	**27.4**
RWHGW01A							
January	1/19	29.2	29.0	2.1	39.7	4.0	4.0
February	2/23	39.6	35.1	0.4	24.9	3.0	2.0
March	3/25	32.2	30.6	1.9	35.3	3.0	2.0
April	4/14	36.2	33.5	0.4	29.9	1.0	1.0
May	5/22	58.1	41.8	0.1	0.0	0.0	7.0
June	---	---	---	---	---	---	---
July	7/21	43.3	36.8	0.2	19.7	3.1	0.9
August	8/20	55.0	40.6	0.0	4.4	2.3	3.1
September	9/15	42.9	37.0	0.2	19.9	3.0	2.8
October	10/22	52.6	40.4	0.2	6.8	16.7	16.7
November	11/23	29.3	26.8	5.0	38.9	17.4	5.7
December	12/16	46.8	37.7	0.6	14.9	4.4	5.8
Average		**42.3**	**35.4**	**1.0**	**21.3**	**5.3**	**4.6**
RWHGW01B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	8/20	43.2	34.9	1.6	20.3	0.0	0.0
September	---	---	---	---	---	---	---
October	---	---	---	---	---	---	---
November	---	---	---	---	---	---	---
December	---	---	---	---	---	---	---
Average		**43.2**	**34.9**	**1.6**	**20.3**	**0.0**	**0.0**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW070A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	5/22	55.7	43.8	0.0	0.5	20.0	25.6
June	---	---	---	---	---	---	---
July	7/21	52.3	40.7	0.1	6.9	30.2	30.2
August	8/20	51.9	40.8	0.1	7.2	29.5	27.5
September	9/15	50.9	40.3	0.1	8.7	28.0	27.9
October	10/22	51.0	40.1	0.1	8.8	32.6	27.0
November	11/23	54.7	40.4	0.0	4.9	29.2	29.8
December	12/16	52.1	39.6	0.0	8.3	32.3	32.6
Average		**52.7**	**40.8**	**0.1**	**6.5**	**28.8**	28.7
HLGW071A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	5/22	50.8	49.2	0.0	0.0	8.9	8.8
June	---	---	---	---	---	---	---
July	7/21	57.1	42.8	0.1	0.0	10.4	12.2
August	8/20	50.3	39.8	0.5	9.4	11.9	9.3
September	9/15	57.4	42.5	0.1	0.0	9.1	11.5
October	10/22	48.5	38.4	1.2	11.9	19.7	18.3
November	11/23	58.5	41.5	0.0	0.0	9.8	12.4
December	12/16	49.8	37.3	1.2	11.7	22.6	17.9
Average		53.2	41.6	0.4	4.7	13.2	12.9
HLGW072A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	5/22	53.3	46.7	0.0	0.0	17.1	19.5
June	---	---	---	---	---	---	---
July	7/21	48.2	40.8	0.0	11.0	22.2	22.2
August	8/20	49.4	40.8	0.0	9.8	22.7	16.5
September	9/15	48.4	40.0	0.0	11.6	16.7	13.5
October	10/22	50.4	39.8	0.0	9.8	21.3	21.3
November	11/23	58.0	42.0	0.0	0.0	18.7	18.8
December	12/16	58.4	41.6	0.0	0.0	29.2	30.1
Average		52.3	41.7	0.0	6.0	21.1	20.3

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW073A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	5/22	50.3	41.0	0.0	8.7	29.6	29.7
June	---	---	---	---	---	---	---
July	7/21	50.7	40.0	0.0	9.3	23.1	23.0
August	8/20	52.5	40.6	0.0	6.9	22.8	22.8
September	8/20	52.5	40.6	0.0	6.9	22.8	22.8
October	9/15	51.5	40.0	0.0	8.5	22.1	22.1
November	10/22	55.2	40.8	0.0	4.0	31.2	30.3
December	11/23	58.4	41.6	0.0	0.0	23.4	26.2
Average		**53.0**	**40.7**	**0.0**	**6.3**	**25.0**	**25.3**
HLGW074A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	5/22	48.5	39.7	0.0	11.8	34.4	35.8
June	---	---	---	---	---	---	---
July	7/21	48.6	39.3	0.0	12.1	47.6	45.2
August	8/20	49.7	39.7	0.0	10.6	47.4	32.9
September	9/15	54.3	41.0	0.0	4.7	32.0	35.8
October	10/22	52.3	39.6	0.2	7.9	41.4	44.1
November	11/23	57.5	40.6	0.0	1.9	35.2	27.9
December	12/16	54.0	40.0	0.0	6.0	49.3	33.0
Average		**52.1**	**40.0**	**0.0**	**7.9**	**41.0**	**36.4**
HLGW075B							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	7/29	57.9	42.0	0.1	0.0	35.6	35.6
August	8/20	57.0	40.5	0.1	2.4	6.0	7.2
September	9/16	57.3	41.1	0.1	1.5	10.3	11.5
October	10/30	56.0	39.6	0.1	4.3	12.5	12.7
November	11/26	58.0	39.8	0.1	2.1	13.9	17.4
December	12/18	58.3	41.6	0.0	0.1	16.9	17.1
Average		**57.4**	**40.8**	**0.1**	**1.7**	**15.9**	**16.9**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW079A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	10/22	25.3	21.4	10.0	43.3	19.1	16.5
November	11/23	59.8	40.2	0.0	0.0	17.6	26.3
December	12/16	54.8	39.8	0.0	5.4	13.6	13.6
Average		**46.6**	**33.8**	**3.3**	**16.2**	**16.8**	**18.8**
HLGW080A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	10/22	54.3	45.5	0.1	0.1	16.7	17.2
November	11/23	58.3	41.7	0.0	0.0	10.0	12.1
December	12/16	57.5	42.5	0.0	0.0	7.0	12.5
Average		**56.7**	**43.2**	**0.0**	**0.0**	**11.2**	**13.9**
HLGW081A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	10/22	54.7	43.8	0.0	1.5	28.1	24.3
November	11/23	57.7	42.3	0.0	0.0	18.9	19.0
December	12/16	58.0	42.0	0.0	0.0	21.0	30.2
Average		**56.8**	**42.7**	**0.0**	**0.5**	**22.7**	**24.5**

Appendix B2, continued

Month	Date	CH4 %	CO2 %	O2 %	Balance %	Init. Flow SCFM	Adj. Flow SCFM
HLGW082A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	10/22	36.3	29.5	5.9	28.3	54.4	11.2
November	11/23	57.1	42.9	0.1	N/A	1.7	2.1
December	12/16	59.1	40.9	0.0	0.0	13.3	23.6
Average		**50.8**	**37.8**	**2.0**	**14.2**	**23.1**	**12.3**
HLGW083A							
January	---	---	---	---	---	---	---
February	---	---	---	---	---	---	---
March	---	---	---	---	---	---	---
April	---	---	---	---	---	---	---
May	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---
July	---	---	---	---	---	---	---
August	---	---	---	---	---	---	---
September	---	---	---	---	---	---	---
October	10/22	57.8	39.9	0.1	2.2	16.6	18.5
November	11/23	55.4	40.3	0.1	4.2	5.9	6.3
December	12/16	59.7	40.3	0.0	0.0	31.0	34.1
Average		**57.6**	**40.2**	**0.1**	**2.1**	**17.8**	**19.6**

Note: <<>> = under or over range of instrument

Appendix B3 2021 Hartland Landfill Gas Well Field Data Summary

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW016B	163	2012	54.7	182.4	12	52,371,925	1,483,016	53,240	16%	19%
HLGW066B	159 (3)	2018	53.7	75.5	11	19,517,939	552,689	19,842	6%	83%
HLGW028A	171	2017	53.4	59.7	12	16,741,615	474,072	17,019	5%	54%
HLGW0057	155(3)	2019	53.1	62.2	11	15,904,665	450,372	16,168	5%	68%
HLGW065B	159 (3)	2018	52.3	40.7	11	10,263,515	290,632	10,434	3%	77%
HLGW021B	165	2013	56.2	36.0	11	9,749,817	276,086	9,911	3%	22%
HLGW067A	159 (3)	2018	48.8	26.9	12	6,895,752	195,267	7,010	2%	85%
HLGW074A	163	2019	52.1	41.0	7	6,556,130	185,650	6,665	2%	91%
HLGW042B	175	2017	54.8	24.4	11	6,445,911	182,529	6,553	2%	41%
HLGW032B	171	2014	55.6	21.7	12	6,340,541	179,545	6,446	2%	32%
HLGW0018	165	2013	55.3	20.9	12	6,073,165	171,974	6,174	2%	3%
HLGW0025	171	2016	56.4	22.1	11	5,991,216	169,653	6,091	2%	24%
HLGW0064	155(3)	2018	54.4	22.4	11	5,874,949	102,982	3,697	2%	74%
HLGW0068	160 (3)	2018	46.2	23.1	12	5,600,828	158,599	5,694	2%	87%
HLGW0059	155(3)	2019	53.7	26.4	9	5,590,205	158,298	5,683	2%	71%
HLGW034B	171	2014	52.9	21.7	11	5,522,227	156,373	5,614	2%	34%
HLGW0037	175	2017	57.5	19.6	11	5,442,076	154,103	5,532	2%	37%
HLGW043B	175	2017	53.6	20.3	11	5,235,054	148,241	5,322	2%	42%
HLGW031B	171	2014	53.8	16.9	12	4,787,276	135,561	4,867	1%	30%
HLGW070A	163	2019	52.7	28.8	7	4,651,730	131,723	4,729	1%	89%
HLGW047A	179	2017	54.6	17.3	11	4,557,939	129,067	4,634	1%	60%
HLGW029A	171	2017	53.7	15.2	12	4,289,492	121,466	4,361	1%	55%
HLGW028B	171	2015	57.5	15.4	11	4,255,733	120,510	4,326	1%	26%
HLGW0062	155(3)	2019	52.0	16.8	11	4,213,460	119,313	4,283	1%	72%
HLGW073A	163	2019	53.0	25.0	7	4,061,318	115,004	4,129	1%	89%
HLGW030B	171	2014	55.1	14.0	12	4,041,350	114,439	4,108	1%	28%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW044A	179	2017	53.6	15.4	11	3,978,162	112,650	4,044	1%	59%
HLGW050B	179	2018	52.2	15.0	11	3,775,340	106,906	3,838	1%	62%
HLGW033A	171	2014	52.4	13.4	12	3,681,111	104,238	3,742	1%	33%
HLGW065A	159 (3)	2018	44.8	16.8	11	3,636,742	102,982	2,916	1%	75%
HLGW072A	163	2019	52.3	21.1	7	3,386,148	95,886	3,442	1%	90%
HLGW0053	151(3)	2018	54.2	12.3	11	3,223,692	91,285	3,277	1%	63%
HLGW027A	171	2017	51.7	11.5	12	3,131,286	88,669	3,183	1%	49%
HLGW0004	147	2003	55.4	127.8	1	3,099,393	87,766	3,151	1%	1%
HLGW049B	179	2018	53.5	11.6	11	2,997,474	84,879	3,047	1%	60%
HLGW041B	175	2017	55.4	11.1	11	2,949,519	83,522	2,998	1%	39%
HLGW051B	179	2017	52.2	11.6	11	2,923,670	82,790	2,972	1%	61%
HLGW039A	175	2017	49.4	12.0	11	2,857,234	80,908	2,905	1%	56%
VLGW0051	---	2011	54.4	12.6	9	2,703,077	76,543	2,748	1%	45%
HLGW0026	171	2015	48.9	9.6	12	2,462,624	69,734	2,503	1%	25%
HLGW038B	175	2017	54.9	9.2	11	2,437,352	69,019	2,478	1%	37%
HLGW0075	163	2019	57.4	15.9	6	2,392,825	67,758	2,432	1%	89%
HLGW040B	175	2018	54.9	8.5	11	2,255,791	63,877	2,293	1%	61%
VLGW003D	---	1996	56.3	8.1	11	2,194,901	62,153	2,231	1%	44%
HLGW071A	163	2019	53.2	13.2	7	2,151,888	60,935	2,188	1%	87%
HLGW0055	151(3)	2018	52.9	8.4	11	2,136,956	60,512	2,172	1%	64%
HLGW0058	155(3)	2019	52.5	12.9	7	2,075,311	58,767	2,110	1%	69%
HLGW0036	175	2017	53.1	8.5	10	1,973,969	55,897	2,007	1%	35%
HLGW039B	175	2017	48.0	7.9	11	1,833,000	51,905	1,863	1%	38%
HLGW0061	155(3)	2019	51.0	9.1	9	1,822,179	51,599	1,852	1%	71%
VLGW0049	---	2011	46.5	9.5	9	1,732,282	49,053	1,761	1%	44%
HLGW0052	151(3)	2018	52.3	9.3	8	1,710,654	48,441	1,739	1%	62%
HLGW042A	175	2017	55.1	6.4	11	1,703,194	48,229	1,731	1%	57%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW081A	167	2019	56.8	22.7	3	1,690,804	47,879	1,719	1%	92%
HLGW029B	171	2015	54.8	5.6	12	1,616,384	45,771	1,643	0%	27%
HLGW082A	167	2019	50.8	23.1	3	1,544,344	43,731	1,570	0%	90%
HLGW0024	171	2016	37.1	7.7	12	1,494,834	42,329	1,520	0%	22%
HLGW0063	155(3)	2019	53.4	6.0	10	1,393,493	39,460	1,417	0%	73%
HLGW008A	143	2006	42.5	7.5	10	1,391,639	39,407	1,415	0%	3%
VLGW007D	---	1996	54.2	8.3	7	1,372,481	38,865	1,395	0%	47%
HLGW083A	167	2019	57.6	17.8	3	1,349,782	38,222	1,372	0%	93%
HLGW048A	179	2017	54.7	5.3	10	1,277,519	36,176	1,299	0%	59%
VLGW001D	---	1996	67.0	4.3	10	1,270,175	35,968	1,291	0%	43%
HLGW040A	175	2017	56.0	4.5	11	1,214,456	34,390	1,235	0%	57%
LHGW0013	151	2011	55.6	5.0	9	1,085,757	30,745	1,104	0%	43%
RWHGW01A	3	2020	42.3	5.3	11	1,071,918	30,354	1,090	0%	87%
HLGW0024	165	2013	30.6	7.0	11	1,029,918	29,164	1,047	0%	22%
HLGW079A	167	2019	46.6	16.8	3	1,026,835	29,077	1,044	0%	92%
VLGW006D	---	1996	64.5	5.0	7	994,551	28,163	1,011	0%	47%
HLGW0054	151(3)	2018	50.4	4.0	11	981,454	27,792	998	0%	63%
VLGW003S	---	1996	53.9	3.6	11	937,364	26,543	953	0%	44%
HLGW080A	167	2019	56.7	11.2	3	836,467	23,686	850	0%	90%
VLGW005S	---	1996	61.3	3.4	9	823,526	23,320	837	0%	47%
VLGW0052	---	2011	48.2	4.1	9	779,309	22,068	792	0%	46%
VLGW0054	---	2011	51.9	3.7	9	754,941	21,378	767	0%	46%
VLGW015D	---	1997	46.8	33.0	1	676,077	19,144	687	0%	48%
VLGW0055	---	2011	52.8	3.6	8	662,893	18,771	674	0%	46%
VLGW007S	---	1996	59.6	3.1	7	571,519	16,184	581	0%	48%
HLGW027B	171	2015	31.7	3.4	12	566,181	16,033	576	0%	25%
VLGW0050	---	2011	57.0	2.8	8	556,681	15,764	566	0%	45%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW008B	143	2006	41.4	2.6	10	464,292	13,147	472	0%	3%
VLGW0053	---	2011	46.1	2.3	9	413,705	11,715	421	0%	46%
HLGW033B	171	2014	31.1	5.7	5	389,620	11,033	396	0%	33%
VLGW0056	---	2011	47.3	1.9	9	362,356	10,261	368	0%	46%
HLGW032A	171	2014	37.9	4.3	5	357,085	10,112	363	0%	30%
VLGW006S	---	1996	59.3	1.9	7	345,340	9,779	351	0%	47%
HLGW043A	175	2017	48.2	2.0	7	299,532	8,482	304	0%	57%
HLGW0060	155(3)	2019	19.9	17.0	2	296,188	8,387	301	0%	71%
VLGW019D	---	1997	62.5	10.0	1	273,600	7,748	278	0%	48%
VLGW008D	---	1996	43.8	2.8	4	212,587	6,020	216	0%	48%
HLGW041A	175	2017	43.8	1.5	7	199,278	5,643	203	0%	57%
VLGW0059	---	2011	47.3	4.5	2	186,354	5,277	189	0%	46%
HLGW049A	179	2017	35.8	1.5	7	167,822	4,752	171	0%	59%
VLGW008S	---	1996	57.7	6.0	1	151,553	4,292	154	0%	48%
VLGW016D	---	1997	61.8	5.0	1	135,268	3,830	138	0%	48%
HLGW067B	159 (3)	2018	25.7	2.3	5	129,296	3,661	131	0%	85%
VLGW027D	---	1997	67.4	4.0	1	118,020	3,342	120	0%	48%
VLGW021S	---	1997	61.9	4.0	1	108,389	3,069	110	0%	48%
HLGW051A	179	2017	40.8	0.8	7	99,949	2,830	102	0%	59%
VLGW0060	---	2011	18.8	6.0	2	98,496	2,789	100	0%	47%
VLGW026S	---	1997	36.1	6.0	1	94,819	2,685	96	0%	48%
VLGW019S	---	1997	58.3	3.0	1	76,564	2,168	78	0%	48%
HLGW0023	165	2013	16.0	10.4	1	72,267	2,046	73	0%	3%
HLGW0023	165	2013	16.0	10.4	1	72,267	2,046	73	0%	55%
HLGW044B	179	2017	22.8	7.0	1	69,866	1,978	71	0%	42%
VLGW016S	---	1997	75.6	2.0	1	66,189	1,874	67	0%	48%
VLGW021D	---	1997	74.3	2.0	1	65,051	1,842	66	0%	48%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW0013	147	2010	48.8	1.5	2	64,088	1,815	65	0%	1%
LHGW0019	---	2014	38.1	1.9	2	63,296	1,792	64	0%	43%
VLGW017S	---	1997	71.2	2.0	1	62,337	1,765	63	0%	48%
HLGW034A	171	2014	40.2	0.7	5	61,654	1,746	63	0%	33%
VLGW018D	---	1997	66.0	2.0	1	57,784	1,636	59	0%	48%
VLGW032S	---	1997	64.7	2.0	1	56,646	1,604	58	0%	48%
VLGW023S	---	1997	64.1	2.0	1	56,121	1,589	57	0%	48%
VLGW026D	---	1997	38.6	3.0	1	50,693	1,435	52	0%	48%
VLGW0058	---	2011	57.8	2.0	1	50,605	1,433	51	0%	46%
VLGW024D	---	1997	56.0	2.0	1	49,029	1,388	50	0%	48%
HLGW031A	171	2014	22.9	1.5	3	45,177	1,279	46	0%	28%
HLGW006A	159	2005	33.8	1.0	3	44,345	1,256	45	0%	3%
VLGW015S	---	1997	47.4	2.0	1	41,500	1,175	42	0%	48%
VLGW029S	---	1997	45.4	2.0	1	39,749	1,126	40	0%	48%
VLGW009D	---	1996	90.5	1.0	1	39,617	1,122	40	0%	48%
VLGW023D	---	1997	89.5	1.0	1	39,180	1,109	40	0%	48%
HLGW050A	179	2017	40.2	0.3	6	35,181	996	36	0%	59%
LHGW0023	159	2011	39.7	0.7	3	34,729	983	35	0%	43%
HLGW030A	171	2014	40.7	0.9	2	32,070	908	33	0%	27%
VLGW017D	---	1997	71.5	1.0	1	31,300	886	32	0%	48%
VLGW012S	---	1996	70.0	1.0	1	30,643	868	31	0%	48%
VLGW018S	---	1997	67.9	1.0	1	29,724	842	30	0%	48%
HLGW0003	139	2003	44.1	1.4	1	27,027	765	27	0%	0%
LHGW0022	159	2014	60.1	1.0	1	26,309	745	27	0%	43%
VLGW011S	---	1996	36.7	1.0	1	16,066	455	16	0%	48%
HLGW0045	179	2018	15.0	1.0	2	13,089	371	13	0%	61%
HLGW0014	155	2011	26.2	1.0	1	11,469	325	12	0%	1%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
HLGW0001	139	2001	42.7	0.6	1	11,215	318	11	0%	0%
HLGW047B	179	2018	22.0	0.5	2	9,609	272	10	0%	61%
HLGW048B	179	2018	21.7	0.5	2	9,499	269	10	0%	61%
HLGW0012	147	2010	5.9	3.0	1	7,748	219	8	0%	1%
VLGW009S	---	1996	10.9	1.0	1	4,772	135	5	0%	48%
HLGW0005	147	2003	0.0	0.0	0	0	0	0	0%	1%
HLGW0009	139	2008	0.0	0.0	0	0	0	0	0%	1%
HLGW0010	139	2008	0.0	0.0	0	0	0	0	0%	1%
HLGW0011	0	2008	0.0	0.0	0	0	0	0	0%	1%
HLGW0015	155	2011	0.0	0.0	0	0	0	0	0%	1%
HLGW006B	159	2005	0.0	0.0	0	0	0	0	0%	3%
HLGW016A	159	2012	0.0	0.0	0	0	0	0	0%	3%
HLGW017A	163	2013	0.0	0.0	0	0	0	0	0%	19%
HLGW017B	163	2012	24.9	0.0	1	0	0	0	0%	19%
HLGW019B	165	2013	0.0	0.0	0	0	0	0	0%	19%
HLGW019C	165	2012	0.0	0.0	0	0	0	0	0%	19%
HLGW020B	165	2013	0.0	0.0	0	0	0	0	0%	19%
LHGW0003	147	2003	0.0	0.0	0	0	0	0	0%	42%
LHGW0004	147	2003	0.0	0.0	0	0	0	0	0%	42%
LHGW0006	143	2009	0.0	0.0	0	0	0	0	0%	42%
LHGW0007	143	2009	0.0	0.0	0	0	0	0	0%	42%
LHGW0008	143	2009	0.0	0.0	0	0	0	0	0%	42%
LHGW0009	143	2012	0.0	0.0	0	0	0	0	0%	42%
LHGW0010	143	2012	0.0	0.0	0	0	0	0	0%	42%
LHGW0017	163	2012	0.0	0.0	0	0	0	0	0%	43%
LHGW0020	159	2014	0.0	0.0	0	0	0	0	0%	43%
LHGW0021	159	2014	0.0	0.0	0	0	0	0	0%	43%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
LHGW002A	147	2007	0.0	0.0	0	0	0	0	0%	43%
VLGW001S	---	1996	0.0	0.0	1	0	0	0	0%	43%
VLGW002D	---	1996	0.0	0.0	0	0	0	0	0%	43%
VLGW002S	---	1996	0.0	0.0	0	0	0	0	0%	43%
VLGW004D	---	1996	0.0	0.0	0	0	0	0	0%	44%
VLGW004S	---	1996	0.0	0.0	0	0	0	0	0%	44%
VLGW0057	---	2011	0.0	0.0	0	0	0	0	0%	46%
VLGW005D	---	1996	73.0	0.0	9	0	0	0	0%	46%
VLGW010S	---	1996	0.0	0.0	0	0	0	0	0%	48%
VLGW013D	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW013S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW014D	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW014S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW020D	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW020S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW022D	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW022S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW024S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW025D	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW025S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW027S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW028S	---	1997	60.8	0.0	1	0	0	0	0%	48%
VLGW029D	---	1997	73.1	0.0	1	0	0	0	0%	48%
VLGW030S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW031S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW033S	---	1997	0.0	0.0	0	0	0	0	0%	48%
VLGW034S	---	1997	0.0	0.0	0	0	0	0	0%	48%

Appendix B3, continued

Name	Refuse Lift (mASL)	Year Activated	Average Methane (% by vol)	Average Flow (scfm)	Months in Operation	Methane Annual Flow (scfm)	Methane Flow (m3)	Energy (GJ)	Well Production (% of Total)	Cumulative Total (%)
VLGW042S	---	2003	68.1	0.0	1	0	0	0	0%	48%
VLGW043S	---	2003	0.0	0.0	0	0	0	0	0%	48%
VLGW047S	---	2003	0.0	0.0	0	0	0	0	0%	48%
HLGW0046	179	2018	0.0	2.0	0	0	0	0	0%	61%
HLGW0056	151(3)	2018	0.0	0.0	0	0	0	0	0%	64%
HLGW066A	159 (3)	2018	44.8	16.8	11	0	0	0	0%	77%
RWHGW01B	3	2020	43.2	0.0	1	0	0	0	0%	87%

APPENDIX C

Hartland Landfill Gas Collection Data

Appendix C1 **Hartland Landfill Gas Collection Data**

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Jan-21	53.94	0.71	-32.49	84.81	321.51	0	883,633	780247	1,663,880	
2-Jan-21	---	0.30	-29.73	322.75	296.70	239,852	687,789	532059	1,459,700	
3-Jan-21	55.70	0.30	-31.94	654.54	219.19	566,903	483,980	410316	1,461,199	
4-Jan-21	53.80	0.30	-30.02	536.50	248.35	443,299	552,888	424414	1,420,601	
5-Jan-21	53.30	0.80	-32.04	82.30	316.54	0	881,363	720247	1,601,610	
6-Jan-21	54.60	0.60	-30.29	98.24	288.68	13,198	815,593	690898	1,519,689	
7-Jan-21	54.60	0.00	-26.19	213.03	214.18	134,804	712,750	525390	1,372,944	
8-Jan-21	51.84	0.85	-33.50	80.60	262.40	0	953,643	829668	1,783,311	
9-Jan-21	51.61	0.87	-33.30	82.75	278.01	0	1,042,051	905075	1,947,126	
10-Jan-21	51.42	0.97	-32.73	84.83	272.74	0	1,079,198	943681	2,022,879	
11-Jan-21	52.58	0.86	-32.23	85.94	303.40	0	1,080,404	925907	2,006,311	
12-Jan-21	54.30	0.30	-31.32	112.89	311.30	30,391	993,112	827802	1,851,305	
13-Jan-21	52.10	0.50	-216.43	832.33	2,036.16	218,126	637,012	527332	1,382,470	
14-Jan-21	53.30	0.40	-32.23	793.81	161.51	751,789	558,752	308512	1,619,053	
15-Jan-21	51.10	0.50	-33.65	81.79	284.65	0	1,108,989	737635	1,846,624	
16-Jan-21	51.00	0.94	-31.87	86.33	254.05	0	1,027,079	899522	1,926,601	
17-Jan-21	---	0.10	-32.22	1,446.55	48.71	1,565,252	70,153	59527	1,694,932	
18-Jan-21	50.70	0.60	-32.28	547.45	212.05	524,691	745,909	632944	1,903,544	
19-Jan-21	50.87	0.94	-32.26	82.13	296.30	0	1,099,453	938714	2,038,167	
20-Jan-21	50.65	1.01	-31.73	85.90	280.80	0	1,151,822	932237	2,084,059	
21-Jan-21	49.08	1.30	-32.34	83.56	296.73	0	1,193,608	882063	2,075,671	
22-Jan-21	49.13	1.39	-31.96	76.37	290.54	0	1,049,713	776885	1,826,598	
23-Jan-21	50.35	1.13	-32.51	78.63	297.43	0	975,040	718994	1,694,034	
24-Jan-21	53.03	0.84	-32.51	82.00	295.11	0	979,130	692336	1,671,466	
25-Jan-21	52.19	0.93	-32.51	79.42	304.26	0	1,028,386	617984	1,646,370	
26-Jan-21	53.35	0.99	-32.51	81.25	324.06	0	1,007,877	642386	1,650,263	
27-Jan-21	52.31	1.34	-32.50	80.19	316.23	0	975,069	667720	1,642,789	
28-Jan-21	51.33	1.41	-32.50	80.06	309.70	0	968,948	674315	1,643,263	
29-Jan-21	51.39	1.33	-32.51	82.08	260.88	0	976,454	685789	1,662,243	
30-Jan-21	49.80	0.90	-32.13	108.10	287.45	22,175	978,044	683540	1,683,759	
31-Jan-21	51.89	---	0.00	0.00	0.00	0	1,003,148	702422	1,705,570	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Feb-21	52.68	1.17	-32.50	83.50	301.96	0	1,009,200	641307	1,650,507	
2-Feb-21	51.30	0.70	-32.38	1,108.80	140.07	1,121,333	297,534	219727	1,638,594	
3-Feb-21	49.80	0.80	-32.31	797.05	200.21	770,672	532,809	320977	1,624,458	
4-Feb-21	50.69	0.70	-32.52	84.49	383.51	0	855,150	793857	1,649,007	
5-Feb-21	51.24	0.80	-32.52	82.90	387.37	0	808,188	834102	1,642,290	
6-Feb-21	52.30	0.70	-32.27	80.74	427.84	0	809,219	817974	1,627,193	
7-Feb-21	51.90	---	-32.18	76.12	378.95	0	818,563	804100	1,622,663	
8-Feb-21	51.23	0.90	-32.44	79.80	338.43	0	931,661	695814	1,627,475	
9-Feb-21	50.53	0.80	-32.51	72.22	383.05	0	853,568	786457	1,640,025	
10-Feb-21	50.40	0.80	-32.51	75.87	367.49	0	814,102	829078	1,643,180	
11-Feb-21	49.41	0.70	-31.35	72.44	521.99	0	801,212	776548	1,577,760	
12-Feb-21	49.24	0.70	-32.51	75.54	521.25	0	796,074	820598	1,616,672	
13-Feb-21	51.42	0.80	-26.46	78.99	420.30	0	813,566	832389	1,645,955	
14-Feb-21	50.70	---	-12.07	79.14	314.02	0	899,519	851040	1,750,559	
15-Feb-21	---	---	-20.23	674.32	207.41	642,459	534,224	851040	2,027,723	
16-Feb-21	---	---	-31.96	634.20	243.40	586,844	576,885	735198	1,898,927	
17-Feb-21	49.64	0.70	-32.50	88.69	331.53	0	836,274	824686	1,660,960	---
18-Feb-21	51.23	0.60	-32.52	95.16	305.17	0	832,697	826699	1,659,396	---
19-Feb-21	51.25	0.70	-32.51	93.21	410.85	0	830,160	816279	1,646,439	---
20-Feb-21	50.59	0.60	-32.53	94.59	376.72	0	800,210	832890	1,633,100	---
21-Feb-21	51.30	---	-32.53	97.71	448.51	0	781,298	825239	1,606,537	---
22-Feb-21	51.93	0.80	-32.53	93.94	443.43	0	728,335	811181	1,539,516	---
23-Feb-21	51.20	0.80	-32.52	85.86	392.87	0	760,835	800490	1,561,325	---
24-Feb-21	50.16	0.60	-32.52	84.93	329.00	0	899,186	711474	1,610,660	---
25-Feb-21	50.29	0.70	-32.33	502.74	238.87	452,205	869,724	264204	1,586,133	---
26-Feb-21	51.80	0.90	-32.07	1,222.78	97.13	1,215,613	224,633	134172	1,574,418	---
27-Feb-21	50.30	0.90	-32.50	1,552.28	30.44	1,568,962	-	17241	1,586,203	---
28-Feb-21	---	---	---	---	---	1,576,082	-	0	1,576,082	---
29-Feb-20										

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Mar-21	52.50	0.60	-31.46	732.38	186.08	684,666	685,281	181013	1,550,960	#N/A
2-Mar-21	52.60	0.70	-31.55	768.29	163.04	729,750	703,284	108462	1,541,496	Manual reading
3-Mar-21	52.80	0.60	-30.06	444.37	195.19	385,055	1,085,294	81035	1,551,384	Manual reading
4-Mar-21	51.50	0.70	-31.73	500.90	230.81	473,859	692,245	487413	1,653,517	Manual reading
5-Mar-21	51.90	0.90	-32.47	82.81	349.09	0	952,047	690968	1,643,015	---
6-Mar-21	51.50	0.90	-32.52	80.35	309.33	0	943,615	704644	1,648,259	---
7-Mar-21	---	---	-32.52	77.76	337.10	0	939,645	711109	1,650,754	---
8-Mar-21	49.50	1 .2	-32.38	991.12	120.05	1,006,573	372,573	267762	1,646,908	Manual reading
9-Mar-21	50.90	1.00	-32.49	1,560.33	32.10	1,623,872	-	8554	1,632,426	Manual reading
10-Mar-21	50.70	1.00	-32.50	1,622.82	29.65	1,624,441	-	14882	1,639,323	Manual reading
11-Mar-21	---	1.10	-32.49	1,602.47	27.96	1,629,813	-	11217	1,641,030	---
12-Mar-21	48.00	1.20	-32.49	1,573.70	29.51	1,638,492	-	9402	1,647,894	---
13-Mar-21	---	---	-32.48	1,592.43	30.74	1,642,248	-	6652	1,648,900	Manual reading
14-Mar-21	---	---	-33.77	1,634.70	34.87	1,561,036	-	22224	1,583,260	---
15-Mar-21	49.20	1.40	-32.48	1,475.98	24.97	1,627,305	-	25828	1,653,133	---
16-Mar-21	50.50	0.70	-31.81	2,188.45	256.21	458,125	651,960	518044	1,628,129	---
17-Mar-21	51.70	0.70	-31.44	1,322.93	235.73	6,634	1,170,507	416138	1,593,279	---
18-Mar-21	52.17	0.80	-31.83	114.88	271.62	0	1,353,054	259698	1,612,752	---
19-Mar-21	51.57	0.70	-32.48	105.05	346.93	0	838,306	835324	1,673,630	---
20-Mar-21	50.28	0.80	-32.46	101.51	382.89	0	823,960	852761	1,676,721	---
21-Mar-21	50.30	---	-32.50	98.42	333.34	0	1,067,773	600468	1,668,241	---
22-Mar-21	50.46	---	-32.46	97.38	361.25	0	835,531	847184	1,682,715	---
23-Mar-21	48.94	0.80	-32.51	100.96	314.71	0	879,542	814725	1,694,267	---
24-Mar-21	51.81	0.80	-31.76	110.21	259.67	0	1,582,964	44496	1,627,460	---
25-Mar-21	51.08	0.70	-30.98	112.59	245.93	0	1,567,925	29296	1,597,221	---
26-Mar-21	49.43	0.90	-32.03	113.55	246.98	0	1,559,644	35249	1,594,893	---
27-Mar-21	49.95	9.00	-32.49	105.70	346.20	0	1,062,379	532902	1,595,281	---
28-Mar-21	44.47	1.22	-27.06	90.58	366.22	0	641,251	668021	1,309,272	---
29-Mar-21	48.57	1.15	-30.50	90.98	355.37	0	740,898	756314	1,497,212	---
30-Mar-21	50.18	1.38	-31.50	131.77	353.76	8,422	746,118	789959	1,544,499	---
31-Mar-21	50.78	1.23	-32.35	197.51	337.27	131,423	704,935	737499	1,573,857	---

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Apr-21	52.80	0.90	-32.30	437.35	300.04	361,083.00	631,428	563356	1,555,867	#N/A
2-Apr-21	52.62	1.27	-32.49	81.67	392.15	0.00	739,882	822891	1,562,773	---
3-Apr-21	52.39	1.24	-32.47	83.54	389.41	0.00	739,288	826020	1,565,308	---
4-Apr-21	51.92	1.29	-32.49	80.37	334.39	0.00	879,857	680972	1,560,829	---
5-Apr-21	52.18	1.27	-32.49	77.77	345.50	0.00	797,511	764720	1,562,231	---
6-Apr-21	52.69	1.23	-32.48	81.04	374.35	0.00	965,568	575684	1,541,252	---
7-Apr-21	53.06	1.28	-32.47	83.32	377.08	0.00	932,790	612624	1,545,414	---
8-Apr-21	51.93	1.33	-32.50	78.39	433.35	0.00	771,648	778123	1,549,771	---
9-Apr-21	52.60	0.70	-32.20	415.97	288.49	340,995.00	685,672	508901	1,535,568	---
10-Apr-21	52.22	1.36	-32.50	74.36	391.56	0.00	835,169	706119	1,541,288	---
11-Apr-21	51.50	1.32	-32.50	76.54	411.21	0.00	716,998	832469	1,549,467	---
12-Apr-21	51.85	1.19	-32.49	79.28	458.11	0.00	719,380	825972	1,545,352	---
13-Apr-21	51.80	1.12	-32.49	81.09	458.64	0.00	716,599	823729	1,540,328	---
14-Apr-21	52.68	1.03	-32.49	81.39	406.80	0.00	742,470	811274	1,553,744	---
15-Apr-21	52.74	0.99	-32.19	83.19	359.74	0.00	787,789	811927	1,599,716	---
16-Apr-21	51.73	0.99	-32.36	85.55	343.72	0.00	798,752	827825	1,626,577	---
17-Apr-21	51.70	0.95	-32.30	86.61	371.78	0.00	801,872	827757	1,629,629	---
18-Apr-21	52.14	0.98	-32.09	86.66	358.12	0.00	799,033	823475	1,622,508	---
19-Apr-21	51.59	1.05	-32.42	85.74	382.25	0.00	797,191	832272	1,629,463	---
20-Apr-21	51.90	1.06	-32.31	85.95	373.41	0.00	796,778	828432	1,625,210	---
21-Apr-21	52.77	1.09	-32.00	86.65	340.08	0.00	794,957	819344	1,614,301	---
22-Apr-21	53.16	1.14	-31.82	87.74	382.00	0.00	784,968	819709	1,604,677	
23-Apr-21	53.20	1.20	-32.05	85.47	383.70	0.00	825,074	776918	1,601,992	
24-Apr-21	53.83	1.26	-32.38	85.62	356.76	0.00	784,066	821527	1,605,593	
25-Apr-21	53.79	1.24	-32.12	85.26	364.75	0.00	773,259	824221	1,597,480	
26-Apr-21	52.73	1.21	-32.37	83.94	379.74	0.00	768,305	832441	1,600,746	
27-Apr-21	51.71	1.27	-32.50	84.01	363.41	0.00	766,691	841321	1,608,012	
28-Apr-21	51.39	1.25	-32.50	88.04	360.83	0.00	769,200	841150	1,610,350	
29-Apr-21	52.22	1.10	-32.07	86.47	390.39	0.00	782,683	825469	1,608,152	
30-Apr-21	52.69	1.08	-31.80	88.53	331.82	0.00	904,904	752671	1,657,575	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-May-21	52.23	1.08	-32.48	86.07	358.14	0.00	905,090	820,791	1,725,881	
2-May-21	51.62	1.10	-32.49	85.92	353.77	0.00	895,731	827,543	1,723,274	
3-May-21	51.37	1.10	-32.48	86.96	342.02	0.00	893,662	821,055	1,714,717	
4-May-21	51.54	0.82	-32.49	88.04	337.52	0.00	867,694	818,667	1,686,361	
5-May-21	52.68	0.89	-32.34	86.64	318.02	0.00	891,667	782,290	1,673,957	
6-May-21	53.88	0.49	-32.11	89.88	339.17	0.00	911,122	799,263	1,710,385	
7-May-21	51.64	0.52	-32.48	84.91	364.67	0.00	943,722	826,943	1,770,665	
8-May-21	51.44	0.48	-32.49	84.80	369.88	0.00	924,250	826,152	1,750,402	
9-May-21	52.19	0.47	-32.47	88.31	302.80	0.00	929,099	816,213	1,745,312	
10-May-21	52.45	0.49	-32.48	88.68	283.75	0.00	930,296	814,068	1,744,364	
11-May-21	52.85	0.47	-32.48	88.28	305.08	0.00	930,844	810,086	1,740,930	
12-May-21	52.00	0.30	-32.29	265.89	260.65	209,480.00	927,007	579,399	1,715,886	
13-May-21	51.30	0.50	-32.32	1,552.76	31.26	1,722,402.00	-	12,192	1,734,594	
14-May-21	53.10	0.20	-31.96	729.84	193.71	746,206.00	581,311	376,046	1,703,563	
15-May-21	53.47	0.50	-32.49	90.38	313.01	0.00	934,475	806,931	1,741,406	
16-May-21	53.07	0.60	-30.07	135.79	268.83	45,786.00	891,949	677,678	1,615,413	
17-May-21	54.06	0.53	-32.47	88.91	348.42	0.00	939,112	800,557	1,739,669	
18-May-21	52.17	0.59	-32.47	84.30	384.31	0.00	914,380	822,439	1,736,819	
19-May-21	51.70	0.30	-32.13	451.84	206.54	367,700.00	769,577	589,373	1,726,650	
20-May-21	52.50	0.30	-31.96	197.62	262.05	120,637.00	1,036,557	533,459	1,690,653	
21-May-21	52.45	0.59	-32.49	89.24	299.11	0.00	918,910	822,104	1,741,014	
22-May-21	52.49	0.56	-32.44	93.04	314.22	0.00	942,301	813,556	1,755,857	
23-May-21	52.53	0.60	-32.49	91.09	319.22	0.00	1,007,243	792,242	1,799,485	
24-May-21	51.19	0.62	-32.48	88.53	327.44	0.00	986,126	817,274	1,803,400	
25-May-21	51.26	0.63	-32.47	90.06	322.98	0.00	983,634	819,690	1,803,324	
26-May-21	50.78	0.55	-31.92	90.38	324.26	0.00	995,171	790,887	1,786,058	
27-May-21	51.87	0.48	-31.51	86.60	346.09	0.00	958,706	817,393	1,776,099	
28-May-21	50.66	0.50	-32.45	88.22	345.22	0.00	881,915	840,778	1,722,693	
29-May-21	52.36	0.44	-32.49	88.30	376.69	0.00	789,881	812,092	1,601,973	
30-May-21	51.65	0.46	-32.51	90.73	320.32	0.00	800,704	809,190	1,609,894	
31-May-21	51.79	0.44	-32.52	---	442.09	0.00	810,112	797,438	1,607,550	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Jun-21	52.94	0.38	-32.08	89.76	318.04	0.00	821,100	769,375	1,590,475	
2-Jun-21	41.65	0.09	-29.47	321.74	246.10	249,336.00	664,844	562,366	1,476,546	
3-Jun-21	53.38	0.42	-32.52	91.02	359.05	0.00	866,162	743,467	1,609,629	
4-Jun-21	52.48	0.47	-32.22	86.69	366.51	0.00	884,099	724,372	1,608,471	
5-Jun-21	52.72	0.48	-32.48	85.23	400.10	0.00	813,550	802,526	1,616,076	
6-Jun-21	53.11	0.43	-32.50	87.36	373.40	0.00	817,326	800,134	1,617,460	
7-Jun-21	52.47	0.48	-32.49	85.78	339.74	0.00	805,193	808,106	1,613,299	
8-Jun-21	52.23	0.49	-32.49	87.01	375.61	0.00	803,620	808,640	1,612,260	
9-Jun-21	51.74	0.51	-32.49	87.72	394.45	0.00	802,249	809,166	1,611,415	
10-Jun-21	51.80	0.49	-32.48	86.66	375.33	0.00	820,197	768,223	1,588,420	
11-Jun-21	50.69	0.46	-32.16	415.45	279.76	341,607.00	635,519	585,850	1,562,976	
12-Jun-21	52.67	0.47	-32.28	89.03	366.47	0.00	782,477	790,100	1,572,577	
13-Jun-21	51.16	0.88	-29.89	87.42	334.91	0.00	747,308	712,829	1,460,137	
14-Jun-21	52.52	0.50	-32.46	89.51	372.29	0.00	788,054	789,501	1,577,555	
15-Jun-21	51.51	0.51	-32.50	87.02	369.32	0.00	779,062	797,684	1,576,746	
16-Jun-21	51.25	0.48	-32.50	89.85	348.33	0.00	834,256	742,251	1,576,507	
17-Jun-21	52.27	0.44	-32.43	90.12	367.53	0.00	795,958	780,043	1,576,001	
18-Jun-21	52.51	0.46	-32.40	89.91	382.89	0.00	790,310	780,092	1,570,402	
19-Jun-21	52.73	0.42	-32.48	91.96	361.09	0.00	843,179	732,614	1,575,793	
20-Jun-21	52.84	0.37	-32.47	90.00	326.62	0.00	908,508	661,757	1,570,265	
21-Jun-21	53.31	0.35	-32.16	90.83	324.81	0.00	865,802	696,534	1,562,336	
22-Jun-21	53.46	0.40	-32.15	91.56	306.46	0.00	917,824	637,966	1,555,790	
23-Jun-21	52.76	0.43	-32.49	90.99	346.58	0.00	817,725	755,630	1,573,355	
24-Jun-21	52.14	0.41	-32.49	90.84	343.43	0.00	839,231	725,692	1,564,923	
25-Jun-21	52.03	0.40	-32.28	90.72	341.07	0.00	834,458	719,043	1,553,501	
26-Jun-21	49.05	0.41	-32.38	458.84	251.52	405,124.00	663,592	484,860	1,553,576	
27-Jun-21	42.31	0.49	-32.29	1,356.93	54.49	1,366,977.00	133,500	70,972	1,571,449	
28-Jun-21	51.76	0.41	-32.10	92.02	308.09	0.00	969,958	563,970	1,533,928	
29-Jun-21	49.37	0.49	-31.16	515.44	237.50	454,998.00	668,954	385,365	1,509,317	
30-Jun-21	52.15	0.57	-32.51	90.19	331.95	0.00	958,886	592,761	1,551,647	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Jul-21	51.72	0.61	-32.49	93.52	330.77	0.00	903,129	660,015	1,563,144	
2-Jul-21	52.09	0.45	-32.50	93.87	339.11	0.00	826,231	724,675	1,550,906	
3-Jul-21	52.60	0.37	-32.50	91.85	374.26	0.00	771,613	774,504	1,546,117	
4-Jul-21	52.77	0.38	-32.53	91.12	373.12	0.00	774,677	770,752	1,545,429	
5-Jul-21	52.51	0.38	-32.52	91.39	383.17	0.00	764,519	779,069	1,543,588	
6-Jul-21	52.69	0.35	-32.11	90.62	386.03	0.00	766,497	767,589	1,534,086	
7-Jul-21	52.80	0.34	-31.85	541.97	244.89	469,091.00	571,990	483,081	1,524,162	
8-Jul-21	52.52	0.37	-32.26	90.57	382.95	0.00	753,717	783,538	1,537,255	
9-Jul-21	52.23	0.36	-32.11	90.76	398.35	0.00	750,324	784,482	1,534,806	
10-Jul-21	51.99	0.36	-32.13	91.19	355.19	0.00	767,866	767,039	1,534,905	
11-Jul-21	51.30	0.35	-32.18	90.49	363.31	0.00	733,683	803,562	1,537,245	
12-Jul-21	52.82	0.34	-31.86	90.75	364.54	0.00	810,193	714,521	1,524,714	
13-Jul-21	52.97	0.35	-31.73	91.16	351.72	0.00	763,412	759,933	1,523,345	
14-Jul-21	53.01	0.35	-31.73	90.65	369.70	0.00	756,914	764,920	1,521,834	
15-Jul-21	52.98	0.36	-31.66	90.99	415.82	0.00	756,074	766,779	1,522,853	
16-Jul-21	52.77	0.38	-32.22	90.02	378.93	0.00	763,918	769,828	1,533,746	
17-Jul-21	52.74	0.37	-32.44	92.29	382.36	0.00	760,696	768,111	1,528,807	
18-Jul-21	52.73	0.35	-32.48	90.95	386.22	0.00	762,166	767,007	1,529,173	
19-Jul-21	53.10	0.35	-32.39	90.17	385.21	0.00	773,464	749,662	1,523,126	
20-Jul-21	53.11	0.36	-32.50	88.93	401.61	0.00	752,119	771,322	1,523,441	
21-Jul-21	53.04	0.37	-32.51	87.88	401.19	0.00	751,515	765,433	1,516,948	
22-Jul-21	52.79	0.36	-32.50	89.81	387.68	0.00	768,573	746,888	1,515,461	
23-Jul-21	52.61	0.36	-32.50	90.86	392.75	0.00	772,161	742,149	1,514,310	
24-Jul-21	54.50	0.30	-29.37	284.22	274.80	199,522.00	624,759	561,260	1,385,541	
25-Jul-21	54.19	0.33	-31.97	91.02	384.56	0.00	767,887	735,910	1,503,797	
26-Jul-21	53.50	0.31	-32.27	1,117.16	109.23	1,081,071.00	227,849	218,631	1,527,551	
27-Jul-21	53.30	0.29	-32.45	1,550.49	30.66	1,532,233.00	-	-	1,532,233	
28-Jul-21	53.00	0.26	-32.30	1,547.23	30.74	1,528,971.00	-	1,415	1,530,386	
29-Jul-21	54.00	0.20	-29.49	1,422.74	30.58	1,425,977.00	-	-	1,425,977	
30-Jul-21	54.20	0.30	-32.45	1,553.66	30.74	1,557,328.00	-	1,078	1,558,406	
31-Jul-21	53.80	0.20	-32.45	1,551.01	33.12	1,536,315.00	-	-	1,536,315	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Aug-21	---	0.23	-32.45	1,552.05	30.06	1,531,678.00	-	-	1,531,678	
2-Aug-21	---	0.23	-32.46	1,552.76	30.03	1,532,262.00	-	-	1,532,262	
3-Aug-21	---	0.27	-32.17	872.91	163.35	808,239.00	434,837	260,780	1,503,856	
4-Aug-21	54.16	0.31	-31.97	91.40	292.32	0.00	880,898	609,210	1,490,108	
5-Aug-21	54.60	0.32	-30.70	89.74	333.83	0.00	827,430	631,101	1,458,531	
6-Aug-21	54.40	0.36	-31.00	87.55	360.85	0.00	845,805	622,759	1,468,564	
7-Aug-21	54.82	0.35	-31.46	90.27	367.00	0.00	832,538	649,850	1,482,388	
8-Aug-21	53.77	0.37	-31.62	91.11	368.77	0.00	824,916	658,952	1,483,868	
9-Aug-21	53.41	0.36	-31.82	90.73	304.52	0.00	831,564	662,992	1,494,556	
10-Aug-21	53.67	0.33	-31.36	91.06	313.99	0.00	824,325	656,756	1,481,081	
11-Aug-21	54.20	0.31	-30.80	90.70	341.86	0.00	811,388	654,474	1,465,862	
12-Aug-21	54.21	0.30	-30.45	92.03	359.94	0.00	812,731	635,927	1,448,658	
13-Aug-21	53.60	0.30	-30.62	92.19	301.18	0.00	859,953	584,692	1,444,645	
14-Aug-21	53.98	0.32	-32.39	91.59	284.79	0.00	881,547	621,574	1,503,121	
15-Aug-21	54.25	0.32	-32.20	90.34	332.56	0.00	875,808	623,209	1,499,017	
16-Aug-21	55.12	0.36	-32.14	92.82	359.31	0.00	876,005	620,797	1,496,802	
17-Aug-21	53.99	0.36	-30.93	91.98	346.73	0.00	788,945	677,060	1,466,005	
18-Aug-21	53.57	0.35	-31.35	90.39	393.05	0.00	750,850	728,803	1,479,653	
19-Aug-21	53.66	0.35	-32.50	91.90	348.38	0.00	791,653	717,999	1,509,652	
20-Aug-21	54.14	0.37	-32.43	93.02	374.61	0.00	800,162	716,415	1,516,577	
21-Aug-21	54.46	0.37	-31.78	92.70	384.08	0.00	818,637	708,059	1,526,696	
22-Aug-21	53.71	0.39	-32.15	89.45	397.23	0.00	826,182	718,985	1,545,167	
23-Aug-21	52.64	0.38	-32.31	91.51	322.60	0.00	812,312	740,249	1,552,561	
24-Aug-21	52.89	0.36	-32.03	89.24	315.32	0.00	850,844	689,935	1,540,779	
25-Aug-21	52.50	0.20	-31.27	909.72	102.17	874,033.00	412,355	223,625	1,510,013	
26-Aug-21	52.70	0.34	-32.28	981.06	162.73	933,093.00	387,641	218,662	1,539,396	
27-Aug-21	53.10	0.39	-32.34	111.99	283.14	23,551.00	1,045,550	455,445	1,524,546	
28-Aug-21	53.60	0.36	-31.16	515.37	261.76	446,112.00	586,270	483,634	1,516,016	
29-Aug-21	54.02	0.35	-29.92	89.27	360.15	0.00	757,319	730,632	1,487,951	
30-Aug-21	54.06	0.37	-30.23	87.80	412.34	0.00	757,113	732,819	1,489,932	
31-Aug-21	53.23	0.38	-31.14	88.96	381.59	0.00	761,441	746,347	1,507,788	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Sep-21	52.62	0.36	-31.94	86.92	353.58	0.00	814,077	702,809	1,516,886	
2-Sep-21	52.63	0.36	-31.76	87.20	353.52	0.00	786,141	728,844	1,514,985	
3-Sep-21	53.05	0.38	-31.77	91.00	352.83	0.00	803,778	710,579	1,514,357	
4-Sep-21	53.30	0.38	-30.18	90.89	345.36	0.00	742,531	731,050	1,473,581	
5-Sep-21	52.99	0.37	-29.83	90.53	362.58	0.00	725,872	736,862	1,462,734	
6-Sep-21	52.69	0.37	-29.82	87.55	363.90	0.00	723,180	736,585	1,459,765	
7-Sep-21	53.40	0.34	-29.40	86.33	374.97	0.00	733,922	713,689	1,447,611	
8-Sep-21	53.66	0.37	-29.88	88.62	352.95	0.00	807,501	648,859	1,456,360	
9-Sep-21	54.13	0.36	-29.85	89.45	346.91	0.00	749,970	707,834	1,457,804	
10-Sep-21	52.34	0.38	-31.99	88.57	374.46	0.00	774,609	733,612	1,508,221	
11-Sep-21	50.28	0.39	-32.48	91.55	361.96	0.00	763,728	758,501	1,522,229	
12-Sep-21	51.30	0.39	-32.49	89.16	368.60	0.00	771,477	749,739	1,521,216	
13-Sep-21	50.58	0.38	-32.49	86.31	344.04	0.00	773,119	747,882	1,521,001	
14-Sep-21	52.16	0.37	-31.97	90.69	374.58	0.00	758,695	750,929	1,509,624	
15-Sep-21	52.82	0.38	-30.66	86.07	373.61	0.00	724,381	752,297	1,476,678	
16-Sep-21	53.14	0.37	-29.72	84.00	389.91	0.00	721,584	735,252	1,456,836	
17-Sep-21	55.03	0.35	-29.69	87.76	355.71	0.00	722,769	726,013	1,448,782	
18-Sep-21	54.53	0.39	-30.34	85.51	376.92	0.00	721,197	737,781	1,458,978	
19-Sep-21	52.66	0.40	-31.62	86.94	398.29	0.00	730,364	758,197	1,488,561	
20-Sep-21	51.17	0.40	-32.46	88.09	347.12	0.00	757,704	759,076	1,516,780	
21-Sep-21	53.23	0.35	-31.57	83.42	334.41	0.00	768,771	726,965	1,495,736	
22-Sep-21	52.87	0.40	-31.57	88.54	343.97	0.00	754,618	734,570	1,489,188	
23-Sep-21	52.27	0.38	-31.58	87.06	352.43	0.00	731,624	761,095	1,492,719	
24-Sep-21	54.21	0.35	-29.68	84.42	370.67	0.00	731,557	705,937	1,437,494	
25-Sep-21	54.91	0.36	-30.43	85.75	338.26	0.00	761,501	687,172	1,448,673	
26-Sep-21	54.17	0.36	-32.49	89.78	328.21	0.00	792,869	704,169	1,497,038	
27-Sep-21	53.21	0.36	-32.48	86.87	361.22	0.00	777,607	704,800	1,482,407	
28-Sep-21	51.63	0.37	-32.48	83.36	370.06	0.00	753,643	724,208	1,477,851	
29-Sep-21	52.53	0.34	-32.48	87.93	340.90	0.00	768,143	714,369	1,482,512	
30-Sep-21	51.46	0.37	-32.48	---	---	0.00	767,785	702,071	1,469,856	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Oct-21	52.13	0.36	-32.49	83.01	342.76	0.00	783,323	698,822	1,482,145	
2-Oct-21	52.89	0.38	-32.32	88.29	355.76	0.00	775,351	698,978	1,474,329	
3-Oct-21	53.94	0.39	-30.69	85.54	381.33	0.00	713,925	718,827	1,432,752	
4-Oct-21	55.28	0.38	-29.72	81.92	335.25	0.00	735,199	668,070	1,403,269	
5-Oct-21	54.53	0.38	-31.29	86.06	374.15	0.00	792,063	637,129	1,429,192	
6-Oct-21	53.18	0.38	-32.26	85.97	324.13	0.00	813,912	653,425	1,467,337	
7-Oct-21	53.25	0.38	-32.48	83.96	315.82	0.00	814,313	663,820	1,478,133	
8-Oct-21	53.56	0.39	-32.48	82.61	340.52	0.00	818,579	655,651	1,474,230	
9-Oct-21	53.23	0.39	-32.31	88.15	313.70	0.00	845,729	625,005	1,470,734	
10-Oct-21	52.58	0.44	-32.30	83.08	311.38	0.00	987,129	472,171	1,459,300	
11-Oct-21	51.77	0.44	-32.42	81.26	233.04	0.00	1,380,465	55,492	1,435,957	
12-Oct-21	53.26	0.43	-32.26	86.56	270.73	0.00	1,141,972	313,800	1,455,772	
13-Oct-21	53.10	0.30	-31.86	957.25	146.01	860,065.00	328,782	261,907	1,450,754	
14-Oct-21	53.30	0.40	-32.46	1,551.09	33.33	1,450,146.00	-	42,765	1,492,911	
15-Oct-21	53.80	0.30	-32.47	1,549.97	32.88	1,455,651.00	-	30,034	1,485,685	
16-Oct-21	54.10	0.30	-32.46	1,552.84	33.20	1,457,459.00	-	16,499	1,473,958	
17-Oct-21	---	---	-32.46	1,550.55	32.89	1,445,562.00	-	8,799	1,454,361	
18-Oct-21	53.60	0.30	-30.84	739.32	183.78	632,011.00	507,925	264,353	1,404,289	
19-Oct-21	54.78	0.39	-31.62	85.84	370.86	0.00	665,965	770,114	1,436,079	
20-Oct-21	54.00	0.41	-32.44	86.52	341.17	0.00	667,569	781,060	1,448,629	
21-Oct-21	53.93	0.50	-32.02	89.19	338.40	0.00	791,687	711,593	1,503,280	
22-Oct-21	53.46	0.54	-32.44	88.55	354.73	0.00	767,721	789,149	1,556,870	
23-Oct-21	54.69	0.43	-32.41	88.41	347.47	0.00	765,483	773,243	1,538,726	
24-Oct-21	---	---	-30.97	119.07	350.93	34,671.00	741,034	704,278	1,479,983	
25-Oct-21	55.30	0.20	-31.98	566.51	262.25	479,702.00	553,204	462,963	1,495,869	
26-Oct-21	53.57	0.45	-31.88	85.57	395.37	0.00	784,146	739,616	1,523,762	
27-Oct-21	51.51	0.45	-32.39	86.31	355.23	0.00	864,934	660,248	1,525,182	
28-Oct-21	55.20	0.30	-32.31	634.58	173.92	557,151.00	740,028	189,498	1,486,677	
29-Oct-21	54.00	0.40	-32.24	614.56	217.82	523,928.00	546,974	409,823	1,480,725	
30-Oct-21	53.15	0.45	-32.48	78.00	399.26	0.00	782,984	725,974	1,508,958	
31-Oct-21	53.65	0.45	-32.45	--	--	0.00	790,824	765,161	1,555,985	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Nov-21	54.90	0.50	-32.35	1,078.53	138.59	1,017,846.00	254,133	233,079	1,505,058	
2-Nov-21	53.60	0.50	-32.46	1,549.21	34.05	1,506,230.00	-	21,539	1,527,769	
3-Nov-21	55.20	0.50	-32.29	974.75	140.62	903,617.00	377,911	223,662	1,505,190	
4-Nov-21	55.10	0.30	-32.37	232.36	329.09	149,220.00	721,878	607,649	1,478,747	
5-Nov-21	55.40	0.30	-31.94	1,105.16	117.02	1,019,495.00	392,971	34,227	1,446,693	
6-Nov-21	---	---	-32.26	935.63	172.84	846,531.00	331,079	294,702	1,472,312	
7-Nov-21	54.19	0.46	-32.47	79.78	364.12	0.00	744,210	809,526	1,553,736	
8-Nov-21	55.40	0.43	-32.40	83.63	345.33	0.00	749,435	740,778	1,490,213	
9-Nov-21	53.72	0.51	-32.69	81.49	432.91	0.00	705,847	776,362	1,482,209	
10-Nov-21	52.47	0.48	-33.47	82.31	350.63	0.00	736,680	793,502	1,530,182	
11-Nov-21	54.25	0.44	-33.47	83.30	361.14	0.00	747,686	771,529	1,519,215	
12-Nov-21	53.99	0.45	-33.47	87.04	394.00	0.00	735,115	769,883	1,504,998	
13-Nov-21	54.49	0.42	-33.47	83.89	342.45	0.00	743,523	759,572	1,503,095	
14-Nov-21	56.53	0.41	-33.77	86.58	411.53	0.00	717,289	739,229	1,456,518	
15-Nov-21	59.00	0.10	-33.25	551.23	270.72	376,137.00	425,325	392,522	1,193,984	
16-Nov-21	59.30	0.40	-33.81	1,476.31	42.88	1,195,447.00	34,986	1,004	1,231,437	
17-Nov-21	58.60	0.43	-33.29	328.74	420.12	229,332.00	590,786	512,384	1,332,502	
18-Nov-21	56.62	0.43	-33.94	76.92	478.08	0.00	633,825	736,486	1,370,311	
19-Nov-21	54.61	0.45	-34.02	75.47	404.11	0.00	671,728	755,646	1,427,374	
20-Nov-21	53.45	0.45	-34.03	79.19	330.74	0.00	706,470	757,921	1,464,391	
21-Nov-21	54.66	0.41	-34.34	79.95	323.28	0.00	742,996	744,479	1,487,475	
22-Nov-21	56.11	0.42	-34.12	81.82	344.84	0.00	738,932	736,965	1,475,897	
23-Nov-21	55.14	0.42	-34.08	77.60	372.05	0.00	744,596	746,590	1,491,186	
24-Nov-21	54.12	0.43	-34.08	82.59	319.31	0.00	822,602	750,206	1,572,808	
25-Nov-21	55.53	0.41	-33.27	84.31	299.08	0.00	931,264	738,572	1,669,836	
26-Nov-21	53.49	0.45	-33.09	84.11	303.77	0.00	987,640	763,694	1,751,334	
27-Nov-21	53.65	0.44	-31.74	87.82	285.00	0.00	1,004,379	769,510	1,773,889	
28-Nov-21	51.97	0.49	-34.66	89.33	362.71	0.00	1,008,124	794,158	1,802,282	
29-Nov-21	51.47	0.49	-31.53	88.86	340.54	0.00	910,213	799,063	1,709,276	
30-Nov-21	52.52	0.47	---	---	344.09	0.00	884,785	838,128	1,722,913	

Appendix C1, continued

Date	Methane Daily Avg	Oxygen Daily Avg	Field Pressure ("H20)	Flare 1 Temp Avg	Flare 2 Temp Avg	Groundflare Daily Flow	Candlestick Flare 2 Daily Flow	Gen Flow	TotalFlow	Comments
1-Dec-21	54.35	0.43	-33.08	89.19	398.59	0.00	784,136	758,656	1,542,792	
2-Dec-21	54.18	0.46	-33.52	82.28	342.87	0.00	753,637	754,083	1,507,720	
3-Dec-21	54.69	0.45	-33.45	75.52	379.63	0.00	755,122	745,847	1,500,969	
4-Dec-21	54.55	0.49	-33.34	76.34	345.60	0.00	768,310	717,356	1,485,666	
5-Dec-21	52.73	0.54	-33.52	74.53	307.24	0.00	832,325	678,683	1,511,008	
6-Dec-21	55.19	0.47	-33.44	75.56	331.83	0.00	808,793	694,453	1,503,246	
7-Dec-21	55.65	0.43	-32.39	81.74	345.76	0.00	834,472	633,392	1,467,864	
8-Dec-21	55.50	0.46	-32.95	75.51	443.09	0.00	739,069	735,596	1,474,665	
9-Dec-21	55.26	0.47	-33.39	74.91	413.72	0.00	735,438	752,418	1,487,856	
10-Dec-21	55.42	0.46	-33.37	78.67	347.53	0.00	748,296	745,667	1,493,963	
11-Dec-21	57.37	0.39	-32.36	78.31	440.56	0.00	703,098	696,421	1,399,519	
12-Dec-21	57.88	0.42	-33.03	74.01	434.59	0.00	654,428	734,309	1,388,737	
13-Dec-21	58.50	0.40	-32.40	79.03	347.86	0.00	852,516	502,722	1,355,238	
14-Dec-21	59.50	0.00	-32.93	495.13	208.20	409,401.00	725,788	259,598	1,394,787	
15-Dec-21	59.70	0.00	-33.02	545.09	285.33	440,346.00	546,673	435,722	1,422,741	
16-Dec-21	54.94	0.48	-33.27	79.97	355.76	0.00	741,228	758,926	1,500,154	
17-Dec-21	54.09	0.47	-33.50	78.42	344.42	0.00	813,606	761,265	1,574,871	
18-Dec-21	56.79	0.40	-33.44	79.45	368.64	0.00	799,423	722,955	1,522,378	
19-Dec-21	55.79	0.40	-33.90	74.82	379.53	0.00	735,376	711,685	1,447,061	
20-Dec-21	55.90	0.43	-34.51	69.53	394.94	0.00	770,776	716,247	1,487,023	
21-Dec-21	56.21	0.43	-34.51	74.49	360.51	0.00	795,460	738,724	1,534,184	
22-Dec-21	58.17	0.40	-34.24	80.95	341.31	0.00	806,341	727,916	1,534,257	
23-Dec-21	58.09	0.42	-34.16	77.32	356.15	0.00	790,479	735,939	1,526,418	
24-Dec-21	57.77	0.45	-34.02	77.61	368.62	0.00	786,965	738,477	1,525,442	
25-Dec-21	57.13	0.47	-34.14	71.87	380.14	0.00	799,511	746,987	1,546,498	
26-Dec-21	51.02	0.55	-34.50	63.79	495.12	0.00	806,104	760,702	1,566,806	
27-Dec-21	51.54	0.43	-34.13	63.64	386.21	0.00	854,093	720,881	1,574,974	
28-Dec-21	50.26	0.55	-33.49	67.50	366.73	0.00	810,600	763,815	1,574,415	
29-Dec-21	52.55	0.57	-33.50	71.64	374.78	0.00	808,966	779,759	1,588,725	
30-Dec-21	53.79	0.54	-33.08	78.82	362.24	0.00	799,748	769,391	1,569,139	
31-Dec-21	50.30	---	---	73.99	436.00	0.00	819,868	760,038	1,579,906	
Total	**52.77**					**66,878,119**	**272,663,800**	**233,191,661.00**	**571,953,333**	
Daily Average	**52.8**	**0.6**	**-32.5**			**183,731**	**749,076**	**638,493**	**1,571,300**	
scfm						**127.59**	**520.19**	**443.40**	**1,091**	
normalize to 50% methane						**134.7**	**548.99**	**467.9**	**1152**	

APPENDIX D

Subsurface Perimeter and Foundation Probe Monitoring

Appendix D1 Subsurface Perimeter and Foundation Probe Monitoring Methodology

The following is the subsurface probe and foundation monitoring field methodology, as outlined in *Hartland Landfill Standard Operating Procedures* (2019). All monitoring is completed with a LANDTEC Gas Analyzer and Extraction Monitor (GEM) 2000+.

CALIBRATION

Prior to each monitoring event, the gas analyzer is calibrated using the calibration gases at Hartland. Prior to calibration, the gas monitor is set to Gas Analyzer (GA) mode for ambient measurements.

Methane and carbon dioxide gases are used to calibrate the methane and carbon dioxide sensors, and zero the oxygen sensor. Oxygen gas is used to calibrate the oxygen sensor and zero the methane sensor. All calibration values should be recorded on the field sheet.

MONITORING

Weather conditions, including barometric pressure, precipitation and temperature are recorded prior to commencing work.

The following monitoring procedure is followed for each gas probe:

1. Zero pressure.
2. Connect tubing to the gas sample port (ensure pump is off), open valve, wait until pressure reading stabilizes and record value.
3. Turn on pump and wait at least 200 seconds.
4. Watch for any methane or carbon dioxide spikes.
5. At the end of 200 seconds, record the gas concentrations and any spikes on the field sheet.
6. Quickly navigate to the pressure screen and record the static pressure reading (this helps determine whether the screen is plugged/open, or water is covering the screen).
7. Disconnect the tubing from the sampling port and close the gas monitoring valve.
8. Open the water level monitoring port (not all wells will have a water level monitoring port).
9. Follow the same procedure (steps 1-8) for gas probe B.
10. Once monitoring for probe B is completed measure the water level for probe A, followed by probe B.
11. Before moving to the next station, ensure that all valves are closed.

At the end of the day, check gas levels using the calibration gas and record on the field sheet.

Appendix D2 Probe Location and Completion Information

Probe	Probe Location	Well Information
East Property Boundary Perimeter Probes		
GP-1A	90 m north of main gate	Depth: 10.37 m, Screen height: 2.91 m
GP-1B	90 m north of main gate	Depth: 5.82 m, Screen height: 2.91 m
GP-2A	70 m north of GP-1	Depth: 10.61 m, Screen height: 2.91 m
GP-2B	70 m north of GP-1	Depth: 6.36 m, Screen height: 2.91 m
GP-3A	120 m north of GP-1	Depth: 10.63 m, Screen height: 2.91 m
GP-3B	120 m north of GP-1	Depth: 4.83 m, Screen height: unknown
GP-11A	20 m north of main gate in mountain biking parking lot	Depth: 10.72 m, Screen height: unknown
GP-11B	20 m north of main gate in mountain biking parking lot	Depth: 5.23 m, Screen height: unknown
GP-12A	50 m north of GP-3 along perimeter road	Depth: 9.00 m, Screen height: unknown
GP-12B	50 m north of GP-3 along perimeter road	Depth: 5.72 m, Screen height: unknown
Horizontal Subsurface Building Gas Probes		
GP-4A	South east corner of workshop	2.4 m from southeast corner of building in gravel road
GP-5A	Admin building parking lot, behind mountain bike washrooms	3 m along west side of mountain bike washroom building
GP-6A	Northeast corner of admin building	15 m west along north side of building
GP-6B	Northeast corner of admin building	15 m west along north side of building
GP-7A	Against north wall of Hartland admin office	10 m south toward southeast corner of building
GP-7B	Against wall in southwest corner of Hartland admin building	Follows 'H' pattern under building extension
GP-8A	East side of auto-scale building	Unknown
GP-9A	West side of auto-scale building	Unknown
GP-13A	2 m south of Hartland workshop entrance	Unknown
GP-14A	West side of Hartland workshop	12 m along east side of workshop
GP-17A	North corner of Hartland Interpretive Centre (monitoring initiated January 2011)	Follows building perimeter
GP-18A	Northwest corner of the contractor’s workshop	Follows building perimeter

Appendix D3 Hartland Landfill Gas Monitoring Program 2021 Gas Probe Data

GAS PROBE 01A

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	12:17	-24	4.26	1.35	0.0	0.0	21.6	
2021	07/06/2021	13:37	-22	4.98	2.07	0.0	0.0	22	
2021	01/11/2021	12:02	---	---	---	0.0	0.1	20.9	
2021	14/12/2021	12:29	---	3.77	0.86	0.0	0.1	21.5	

GAS PROBE 01B

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	13:37	-18	4.31	1.4	0.0	1	19.3	
2021	07/06/2021	13:41	-20	4.61	1.7	0.0	3.1	18.1	
2021	01/11/2021		---	---	---	0.0	4.9	13.5	
2021	14/12/2021	12:32	---	5.4	2.49	0.0	2.9	13.3	

GAS PROBE 02A

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	13:18	-20	5.93	3.02	0.0	0.0	21.6	
2021	07/06/2021	13:18	-21	6.64	3.73	0.0	0.0	21.8	
2021	01/11/2021		---	7.83	4.92	0.0	0.1	21.8	
2021	14/12/2021	12:12	---	2.46	-0.45	0.0	0.1	21.3	

Appendix D3, continued

GAS PROBE 02B

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	13:23	-11	5.46	2.55	0.0	1.4	17.5	
2021	07/06/2021	13:22	-13	5.81	2.9	0.0	2.3	15.2	
2021	01/11/2021		---	4.71	1.8	0.0	5.0	13.7	
2021	14/12/2021	12:13	---	3.55	0.64	0.0	0.2	20.9	

GAS PROBE 03A

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	13:05	-20	10.6	7.69	0.0	1	17.2	
2021	07/06/2021	12:47	-14	10.63	7.72	0.0	1.3	16.2	
2021	01/11/2021		---	8.52	5.61	0.0	5.0	19.7	
2021	14/12/2021	12:01	---	7.1	4.19	0.0	0.2	20.8	

GAS PROBE 03B

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	13:09	-16	4.76	1.85	0.0	2.2	19.4	
2021	07/06/2021	12:51	-10	4.73	1.82	0.0	4.7	17.9	
2021	01/11/2021		---	4.75	1.84	0.0	7.9	9.5	
2021	14/12/2021	12:04	---	3.81	0.9	0.0	5.1	12.7	

GAS PROBE 04A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	12:06	-14	0.0	0.14	22	
2021	07/06/2021	14:10	-4	0.0	1.8	20	
2021	01/11/2021		---	---	---	---	
2021	14/12/2021	13:09	---	0.0	1.3	20.4	

Appendix D3, continued

GAS PROBE 05A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	10:04	-14.0	0.0	0.8	20.6	
2021	07/06/2021	14:32	-15.0	0.0	0.6	21.3	
2021	01/11/2021		---	0.0	0.9	21.1	
2021	14/12/2021	13:45	---	0.0	0.9	20.8	

GAS PROBE 06A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	10:09	-19.0	0.0	1.4	19.8	
2021	07/06/2021	14:36	-16.0	0.0	2.1	19.5	
2021	01/11/2021		---	0.0	0.2	21.7	
2021	14/12/2021	13:49	---	0.0	1.6	20.3	

GAS PROBE 06B

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	10:14	-18	0.0	1.9	19.5	
2021	07/06/2021	14:39	-14	0.0	1.7	19.8	
2021	01/11/2021		---	0.0	0.2	21.7	
2021	14/12/2021	13:53	---	0.0	2.2	19.8	

GAS PROBE 07A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	10:20	-12	0.0	0.5	2.8	
2021	07/06/2021	14:45	-15	0.0	0.4	21.8	
2021	01/11/2021		---	0.0	0.4	21.5	
2021	14/12/2021	14:00	---	0.0	0.8	21	

GAS PROBE 7B

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	10:25	-19	0.0	0.3	21.4	
2021	07/06/2021	14:48	-16	0.0	0.4	22	
2021	01/11/2021		---	0.0	0.3	21.4	
2021	14/12/2021	14:09	---	0.0	0.3	21.5	

Appendix D3, continued

GAS PROBE 08A

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	10:31	-18	0.0	0.2	21.4	
2021	07/06/2021	14:52	-21	0.0	0.4	21.9	
2021	01/11/2021		---	0.0	0.2	21.7	
2021	14/12/2021	14:15	---	0.0	0.2	21.6	

GAS PROBE 09A

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	10:37	-20	0.0	0.1	21.6	
2021	07/06/2021	14:56	-16	0.0	0.3	21.8	
2021	01/11/2021		---	0.0	0.2	21.7	
2021	14/12/2021	14:20	---	0.0	0.2	21.6	

GAS PROBE 11A

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Static water level metres	Exposed screen above water metres	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	11:09	-29	4.73	1.82	0.0	0.0	21.3	
2021	07/06/2021	14:24	-18	6.06	3.15	0.0	0.2	22.1	
2021	01/11/2021		---	7.99	5.08	0.0	0.2	21.2	
2021	14/12/2021	13:33	---	3.14	0.23	0.0	0.1	21.5	

GAS PROBE 11B

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Static water level metres	Exposed screen above water metres	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	11:13	-19	4.82	1.91	0.0	2.1	19.4	
2021	07/06/2021	14:28	-13	5.66	2.75	0.0	2.5	19.7	
2021	01/11/2021		---	4.14	1.23	0.0	2.6	18.3	
2021	14/12/2021	13:37	---	2.77	-0.14	0.0	0.7	20.7	

Appendix D3, continued

GAS PROBE 12A

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	12:50	-17	6.98	4.07	0.0	0.0	21.5	
2021	07/06/2021	12:03	-17	10.19	7.28	0.0	4.0	5	
2021	01/11/2021		---	8.13	5.22	0.0	2.8	14.4	
2021	14/12/2021	11:46	---	4.61	1.7	0.0	0.4	20.1	

GAS PROBE 12B

Reporting Year	Date	Time	Pressure/Vacuum	Static water level	Exposed screen above water	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	metres	metres	percent in air	percent in air	percent in air	
2021	22/03/2021	12:54	-14	6.26	3.35	0.0	3.4	13	
2021	07/06/2021	12:07	-15	5.72	2.81	0.0	8.0	8.1	
2021	01/11/2021		---	6.52	3.61	0.0	9.3	9.6	
2021	14/12/2021	11:50	---	3.8	0.89	0.0	0.2	21	

GAS PROBE 13A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	11:54	-15	0.0	2.8	18	
2021	07/06/2021	14:03	-17	0.0	3.9	18.2	
2021	01/11/2021		---	0.0	2.4	18.4	
2021	14/12/2021	12:50	---	0.0	0.3	21.5	

GAS PROBE 14A

Reporting Year	Date	Time	Pressure/Vacuum	Methane (CH_4)	Carbon Dioxide (Co_2)	Oxygen (O_2)	Comment
			inches of water	percent in air	percent in air	percent in air	
2021	22/03/2021	0.500694	-20.0	0.0	0.3	21.0	
2021	07/06/2021	0.582639	-17.0	0.0	1.1	19.5	
2021	01/11/2021		---	---	---	---	
2021	14/12/2021	---	---	---	---	---	

Appendix D3, continued

GAS PROBE 17A HLC

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	11:48	-15	0.0	0.1	21.1	
2021	07/06/2021	13:54	-16	0.0	0.1	22.0	
2021	01/11/2021		---	0.0	0.1	22.0	
2021	14/12/2021	12:45	---	0.0	0.3	21.5	

GAS PROBE 18A

Reporting Year	Date	Time	Pressure/Vacuum inches of water	Methane (CH_4) percent in air	Carbon Dioxide (Co_2) percent in air	Oxygen (O_2) percent in air	Comment
2021	22/03/2021	12:40	-15	0.0	0.1	21.3	
2021	07/06/2021	11:52	-15	0.0	0.2	21.4	
2021	01/11/2021		---	0.0	0.3	20.6	
2021	14/12/2021	11:47	---	0.0	0.1	20.8	

APPENDIX E

Grid and Hot Spot Monitoring

Appendix E1 Grid and Hot Spot Monitoring Methodology

The following is the grid sampling field methodology, as outlined in *Hartland Landfill Standard Operating Procedures* (2012).

Monitoring usually takes two full days, beginning at 0730 hours and ending between 1600 and 1630. Prior to each monitoring day, the gas analyzer must be calibrated using the calibration gases at Hartland. At the beginning of each field day, the fuel cell for the Flame Ionization Detector (FID) is filled with hydrogen gas and the unit is warmed up for at least 30 minutes before calibration. Calibration is conducted with two methane span gases (currently 500 ppm and 14,990 ppm methane), and a zero gas to generate a proper calibration slope. After successful calibration, as span check is completed and recorded on the calibration sheet. In addition, the Jerome sensor is regenerated at the beginning and end of each day to remove any residual hydrogen sulphide on the gold sensor.

The Jerome analyzer is factory calibrated and, therefore, does not require field calibration. After regeneration, the instrument is turned on for 30 minutes before zeroing. Once it is zeroed, the zero filter is attached to the unit and a sample is taken.

MONITORING

There is an established walking pattern over the grid points, and it denotes two distinct monitoring areas (Phase 1 and Phase 2/Active Face). These areas are monitored separately, due to the distinct differences in gas concentrations, level of landfilling activity, and placement of litter fences. This results in acquisition of data from a similar area under similar environmental conditions, as monitoring typically takes two days. In each area, the grid points are traversed alphabetically (e.g., B1, B2, B3, B4, etc.) where physically possible. In some cases, litter fences, controlled waste trenches or active filling areas limit or restrict access resulting in deviation from the standard protocol. These deviations should be recorded on the field sheet.

Weather conditions dictate when this monitoring can be completed. The FID cannot operate in rainy conditions and monitoring should be delayed until two consecutive days of dry weather are predicted. In addition, high to moderate winds blow gases away from their origin and dilute gas concentrations. These conditions are not representative of typical landfill conditions and monitoring does not take place on these days.

The following procedure is used to collect methane and H_2S readings at each grid point:

1. Place the hydrogen sulphide (H_2S) analyzer on the ground then press the “Sample” button.
2. The second staff person should place the FID intake controller 4 inches from the ground surface for 30 seconds.
3. Once the H_2S analyzer has reported a value (approximately 30 seconds), the methane value should be read from the FID and both values recorded on the field sheet.
4. The FID is programmed to alarm if methane levels exceed 100 ppm. If the alarm sounds while walking a traverse, staff must investigate the area for the source of elevated methane by means of a detailed 10-by-10 metre (m) grid. The 10-by-10 m grid should be traversed between all adjacent grid points. Obvious sources of methane include bird poles or a seam/edge of a temporary closure lining.
5. Once the source has been identified, record the source description, methane and H_2S values, as well as the location coordinates. This data represents a “hot spot” (>1,000 ppm of methane) or “Z-spot” (>12,500 ppm of methane), identified on figures 5 and 6 as a red, or purple, ‘X’, respectively.
6. If an obvious source cannot be identified, the location and data/observations from the highest localized reading should be recorded.
7. Continue with this method until all grid points, background stations, and pre-existing Z-spots have been monitored. Pre-existing Z-spots can be removed from the monitoring list if methane levels are below 1,000 ppm for three consecutive monitoring events.
8. At the end of each field day, a span check is completed on the FID and recorded on the field sheet.

Appendix E2 2021 Grid and Z Point Monitoring Data

Table 1. Hartland Landfill VOC & TRS Grid Data

July 2021		
WAYPOINT	Methane (ppm)	H_2S
B1	0	0.001
B2	0	0.000
B3	0	0.001
B4	0	0.001
B5	0	0.002
B6	0	0.000
B7	0	0.001
B8	0	0.001
B9	0	0.002
B10	0	0.006
BACK-1	0	0.000
BACK-6	0	0.000
BACK-7	0	0.000
BACK-10	0	0.000
BACK-11	0	0.000
BACK-12	0	0.000
BACK-13	0	0.000
BACK-20	0	0.000
BACK-21	0	0.000
C1	0	0.002
C2	0	0.002
C3	0	0.002
C4	0	0.002
C5	0	0.002
C6	0	0.002
C7	0	0.000
C8	0	0.002
C9	0	0.002
C10	0	0.002
C11	0	0.002
D1	0	0.002
D2	0	0.001
D3	0	0.001
D4	0	0.002
D5	0	0.002
D6	0	0.002
D7	0	0.002
D8	0	0.002
D9	1	0.002
D10	0	0.002
D11	0	0.002
E1	0	0.002
E2	0	0.002
E3	0	0.001
E4	0	0.002
E5	0	0.002
E6	0	0.002
E7	0	0.002

Appendix E2
Table 1, continued

July 2021		
WAYPOINT	Methane (ppm)	H_2S
E8	46	0.003
E9	0	0.002
E10	14	0.002
E11	95	0.002
F1	0	0.000
F2	0	0.000
F3	0	0.001
F4	0	0.001
F5	0	0.002
F6	0	0.002
F7	0	0.002
F10	4	0.000
F11	17	0.000
F12	18	0.001
G1	0	0.000
G2	0	0.001
G3	0	0.002
G4	0	0.002
G5	0	0.002
G6	3	0.002
G7	1	0.003
G8	4	0.003
G9	0	0.004
G10	1	0.000
G12	1	0.001
G13	3	0.000
G14	1	0.001
G15	4	0.002
H1	0	0.000
H2	0	0.001
H3	0	0.002
H4	0	0.000
H5	0	0.003
H6	1	0.003
H7	0	0.003
H8	0	0.003
H9	0	0.003
H11	0	0.000
H12	2	0.002
H13	51	0.002
I1	0	0.001
I2	0	0.002
I3	0	0.002
I4	0	0.001
I5	0	0.002
I6	0	0.002
I7	2	0.000
I11	24	0.002
I12	10	0.001
I13	4	0.002
I14	18	0.000

Appendix E2
Table 1, continued

July 2021		
WAYPOINT	Methane (ppm)	H_2S
I15	3	0.001
J1	0	0.000
J2	0	0.001
J3	0	0.002
J4	0	0.002
J5	0	0.002
J6	8	0.002
J7	2	0.001
J8	22	0.002
K1	0	0.000
K2	0	0.000
K3	0	0.001
K4	0	0.000
K5	1	0.000
K6	15	0.000
K7	1	0.000
K8	1	0.002
K9	2	0.002
K10	5	0.002
K11	78	0.001
K12	150	0.003
K13	10	0.001
K14	8	0.001
L1	1	0.002
L2	0	0.002
L3	1	0.002
L4	1	0.001
L5	1	0.002
L6	0	0.002
L7	0	0.001
L8	0	0.000
L9	0	0.001
L10	1	0.002
L11	1	0.002
L12	4	0.002
L13	2	0.001
L14	6	0.001
M1	0	0.002
M2	0	0.003
M3	1	0.002
M4	1	0.001
M5	1	0.002
M6	0	0.002
M7	0	0.002
M8	0	0.002
M9	0	0.001
M10	0	0.002
M11	1	0.002
M12	4	0.006
M13	1	0.003
M14	2	0.004

Appendix E2
Table 1, continued

July 2021		
WAYPOINT	Methane (ppm)	H_2S
N1	0	0.000
N2	0	0.000
N3	0	0.003
N4	0	0.003
N5	0	0.003
N6	0	0.002
N7	0	0.002
N8	0	0.003
N9	0	0.002
N10	0	0.002
N11	0	0.003
N12	2	0.002
N13	2	0.002
P1	1	0.002
P2	1	0.002
P3	1	0.002
P4	4	0.002
Z88	311	0.007
Z94	2	0.002
Z106	5007	0.006
Z119	2400	0.004
Z122	1077	0.004
Z123	0	0.002
Z124	693	0.001
Z125	700	0.006
Z126	456	0.004
Z127	75,000	0.016
Z128	2120	0.077
Z129	2670	0.002
Z130	1111	0.002
Z131	1905	0.002
Z132	391	0.002
Z133	3000	3.2
Z134	14000	0.15
Z135	2200	0.004

Appendix E2, continued

Table 2. Hartland Landfill VOC from Walkabout

WAYPOINT	Methane ppm	Comments
Z94	2	Buried
Z106	5007	LFG infrastructure on North Face interim closure
Z119	2400	4 holes along LFG pipe
Z122	1077	Concrete box infrastructure with black lid, across and up the road from wheel wash
Z123	0	Buried
Z124	693	Concrete box with metal hatch by road
Z125	700	Concrete box with metal hatch by road, adjacent to Z124, slightly south
Z126	456	Concrete box with metal hatch by road, uphill of Z125
Z127	75000	Metal culvert parallel to road, flowing downhill into Toutle Valley
Z128	2120	Inside casing of wells 90-1-1 and 90-2-1
Z129	2670	Large hole in black tarp with metal poking out, 50ft south of well #90
Z130	1111	Hole in tarp
Z131	1905	Hole in tarp between bench roads, downhill of Z130
Z132	391	Hole in tarp (large rock poking through), near bench road and black pipe
Z133	3000	Flange on black pipe wrapped in blue plastic at top of slope
Z134	14000	Flange on black pipe at top of slope
Z135	2200	Hole in tarp with metal rebar

Appendix E3 Hartland Landfill Historical Z-Point Data

Northing	Easting	Point	Sort Order	Created	Active?	Oct-2009	Jan-2010	Jun-2010	Jan-2011	Dec-2011	Mar-2012	May-2012	Jul-2012	Dec-2012	Mar-2013	Oct-2013	Mar-2014	Jul-2014	Mar-2015	Sep-2015	Sep-2016	Mar-2017	Aug-2017	Mar-2018	Mar-2019	Jul-2020	Jul-2021	Description
5376376.24	465770.27	Z1	1	Apr-2001	N																							
5376382.91	465752.09	Z2	2	Apr-2001	N																							
5376390.19	465731.55	Z3	3	Apr-2001	N																							
5376404.12	465695.20	Z4	4	Apr-2001	N																							
5376409.56	465682.96	Z5	5	Apr-2001	N																							
5376307.82	465646.30	Z6	6	Apr-2001	N																							
5376379.40	465641.99	Z7	7	Apr-2001	N																							
5376358.61	465629.59	Z8	8	Apr-2001	N																							
5376294.56	465571.38	Z9	9	Apr-2001	N																							
5376288.59	465571.74	Z10	10	Apr-2001	N																							
5376301.61	465588.85	Z11	11	Apr-2001	N																							
5376153.49	465921.77	Z12	12	Apr-2001	N																							
5376069.56	465700.69	Z13	13	Jun-2003	N																							
---	---	Z14	14	n/a	N																							
---	---	Z15	15	n/a	N																							
---	---	Z16	16	n/a	N																							
---	---	Z17	17	n/a	N																							
---	---	Z18	18	n/a	N																							
---	---	Z19	19	n/a	N																							
5376240.81	465682.72	Z20	20	Dec-2001	N																							
5376249.22	465672.08	Z21	21	Nov-2002	N																							
5376140.63	465682.91	Z22	22	Dec-2001	N																							
5376199.46	465617.53	Z23	23	Dec-2001	N																							
5376344.34	465719.78	Z24	24	Dec-2001	N																							
5376341.83	465741.15	Z25	25	Dec-2001	N																							
5376332.13	465767.23	Z26	26	Dec-2001	N																							
5376157.75	465907.15	Z27	27	Jun-2003	N																							
5376127.51	465683.22	Z28	28	Jun-2003	N																							
5376305.09	465604.31	Z29	29	Nov-2003	N																							
5376154.49	465756.65	Z30	30	Nov-2003	N																							
5375849.50	465901.32	Z31	31	Dec-2004	N																							
5376179.56	465851.44	Z32	32	Dec-2004	N																							
5376200.63	465818.31	Z33	33	Dec-2004	N																							
5376157.59	465835.86	Z34	34	Dec-2004	N																							
5376147.38	465848.08	Z35	35	Dec-2004	N																							
5376099.41	465792.74	Z36	36	Dec-2004	N																							
5376298.24	465750.39	Z37	37	Dec-2004	N					15																		
5376283.62	465801.38	Z38	38	Dec-2004	N																							
5376322.83	465824.59	Z39	39	Dec-2004	N																							
5375817.05	465744.70	Z40	40	Mar-2005	N																							
5376147.36	465850.85	Z41	41	Sep-2005	N																							
5376155.19	465838.23	Z42	42	Sep-2005	N					14,400		---	1,285	1,116	1,442	667	---	565	---	4.27	10.56	DISCON TINUED						
5376256.03	465630.94	Z43	43	Mar-2005	N																							
5376364.18	465792.37	Z44	44	Mar-2005	N																							

Appendix E3, continued

Northing	Easting	Point	Sort Order	Created	Active?	Oct-2009	Jan-2010	Jun-2010	Jan-2011	Dec-2011	Mar-2012	May-2012	Jul-2012	Dec-2012	Mar-2013	Oct-2013	Mar-2014	Jul-2014	Mar-2015	Sep-2015	Sep-2016	Mar-2017	Aug-2017	Mar-2018	Mar-2019	Jul-2020	Jul-2021	Description
5376338.64	465774.39	Z45	45	Feb-2006	N																							
5376322.08	465752.91	Z46	46	Feb-2006	N																							
5376175.39	465850.23	Z47	47	Feb-2006	N					16,700																		
5376101.47	465847.01	Z48	48	Feb-2006	N					121																		
5375901.10	465848.17	Z49	49	Feb-2006	N					13																		
5375953.93	465888.09	Z50	50	Feb-2006	N					43																		
5376100.18	465962.24	Z51	51	Feb-2006	N					3																		
5375975.37	465696.95	Z52	52	Feb-2006	N					18																		
5376194.67	465817.08	Z53	53	Feb-2006	N																							
5376112.28	465834.80	Z54	54	Feb-2007	N					56																		
5376360.04	465590.39	Z55	55	Feb-2007	N																							
5376230.52	465707.61	Z56	56	Feb-2007	N																							
5376146.42	465711.45	Z57	57	Feb-2007	N					13,500																		
5376156.98	465740.43	Z58	58	Feb-2007	N					14																		
5376179.09	465731.85	Z59	59	Feb-2007	N																							
		Z60	60	n/a	N																							
5375826.01	465743.17	Z61	61	Mar-2007	N																							
		Z62	62	n/a	N																							
5376202.48	465808.02	Z63	63	Mar-2007	N					432																		
5376222.89	465785.18	Z64	64	Mar-2007	N					61,300	1,020	23,500		467		52	53				34.34	DISCONTINUED						
5376022.24	465735.25	Z65	65	Mar-2007	N																							
5376254.13	465648.75	Z66	66	Mar-2007	N																							
5376200.88	465678.92	Z67	67	Mar-2007	N					10,100																		
5376231.00	465640.00	Z68	68	Nov-2007	N					17																		
5376259.00	465772.00	Z69	69	Mar-2008	N					2																		
5376112.00	465801.00	Z70	70	Nov-2007	N																							
5376097.00	465704.00	Z71	71	Sep-2008	N					573																		
5376153.49	465921.77	Z72	72	Sep-2008	N																							
5376307.59	465739.45	Z73	73	Sep-2008	N					3																		
5376230.77	465743.00	Z74	74	Sep-2008	N																							
5375953.74	465849.99	Z75	75	Sep-2008	N					26																		
5376050.48	465710.00	Z76	76	Feb-2009	N					33																		
5376051.20	465820.81	Z77	77	Feb-2009	N					13																		
5376222.29	465772.39	Z78	78	Feb-2009	N					97																		
5376120.72	465805.84	Z79	79	Feb-2009	N					88																		
5376199.66	465562.00	Z80	80	Oct-2009	N					26,800	13,100	48,600	21,100	15,000	12,500	14	66.1	5,048	326	5032	MISSED	MISSED	0	79	72	DISCONTINUED		DISCONTINUED
5376249.92	465708.55	Z81	81	Oct-2009	N					106																		
5376240.56	465727.11	Z82	82	Oct-2009	N																							
5376354.32	465720.64	Z83	83	Oct-2009	N					5																		
5375847.24	465856.80	Z84	84	Jan-2010	N					56		9,890	3,706	12,000	886	12	174	DISCONTINUED										
5375908.06	465797.51	Z85	85	Jan-2010	N					24																		
5376299.34	465738.10	Z86	86	Jan-2010	N					21,000	11,700	32,200	28,800	2,798	4	38	18,600	3,076	8	35	4.01	DISCONTINUED						
5376293.64	465535.40	Z87	87	Jan-2010	N					60,000	51,700	38,000	11,700	15,000	7,200	29	10,800	20,800	1,326	13	0.7	MISSED	10.27	MISSED	DISCONTINUED			
5376317.71	465627.16	Z88	88	Jan-2010	ACTIVE		50,000	0	2,395	15,000	22,000	15,000	10,300	15,000	8,720	3,600	41,700	8,919	10,500	15,400	15700	4,700	10,300	6,370	874	6,816	311	Infrastructure hatch, north face closure at Toutle Valley

Appendix E3, continued

Northing	Easting	Point	Sort Order	Created	Active?	Oct-2009	Jan-2010	Jun-2010	Jan-2011	Dec-2011	Mar-2012	May-2012	Jul-2012	Dec-2012	Mar-2013	Oct-2013	Mar-2014	Jul-2014	Mar-2015	Sep-2015	Sep-2016	Mar-2017	Aug-2017	Mar-2018	Mar-2019	Jul-2020	Jul-2021	Description
		Z89	89		N					170																		
		Z90	90		N					3,028																		
		Z91	91		N					364																		
		Z92	92		N					1,049		15,000	19,200	52	463	DISCONTINUED												
		Z93	93		N					23		3,791				56	70.9											
5376339.03	465598.07	Z94	94	Jan-2011	ACTIVE				12,500	20,000	15,000	15,000	79,700	15,000	12,500	MISSED	23,800	73,200	42,100	41,400	134	14,000	11,300	16,700	2,859	8,600	2	Buried
		Z95	95		N					1,490	34,400	34,400		3	29	12	DISCONTINUED											
		Z96	96		N					927			3,668	423	261	28	DISCONTINUED											
		Z97	97		N					1,750			2,280	2	5	37	DISCONTINUED											
		Z98	98		N					5,364			1,032	7	1	1	DISCONTINUED											
		Z99	99		N					3,800					---													
5376298.15	465682.45	Z100	100	Dec-2011	ACTIVE					2,300	15,000	15,000	10,800	15,000	12,500	1,088	18,900	314	5,685	11,200	3.21	MISSED	MISSED	MISSED	7	1511	MISSED	Hole in tarp beside black pipe, approximately 20 ft downhill of gas well
5376283.35	465708.83	Z101	101	Dec-2011	N					11,700	23	17,800	30,900	15,000	12,500	127	14,500	17,600	2,803	28,200	52	8,500	85.81	1,400	39	2	22	DISCONTINUED
		Z102	102		N						9,657	14,700		352	360	13	3	DISCONTINUED										
		Z103	103		N						13,700	15,000	6,400	2,531	12,500	27	5.4	DISCONTINUED										
5376171.21	465831.76	Z104	104	Mar-2012	N						32,500	18,000	19,400	5,325	12,500	2,510	36,500	12,300	19,700	1,168	84	6,600	172	4	4	DISCONTINUED		DISCONTINUED
		Z105	105		N							6,766	3,865	1,531	360	88	36	DISCONTINUED										
5376327.32	465654.99	Z106	106	May-2012	ACTIVE							61,300	35,700	42,000	12,500	6,566	2,693	9,300	2,072	8,086	50,300	11,000	1989	0	3950	3800	5007	LFG infrastructure on North Face interim closure
5376291.17	465680.05	Z107	107		N							1,600	3,376		25	113	25,000	12,200	83	23,500	8		0	MISSED	9	1	DISCONTINUED	DISCONTINUED
		Z108	108		ACTIVE										12,500	7	0.31	15,500	3							Missed	DISCONTINUED	DISCONTINUED
5376181.69	465671.86	Z109	109	Dec-2012	N									1,800	88	52	7,559	13	30,100	3	7,924	13,000	1,199	1	0	33	DISCONTINUED	DISCONTINUED
		Z110	110		N																						DISCONTINUED	DISCONTINUED
5376292.76	465689.88	Z111	111	Dec-2012	N									138,900	10,900	4,200	53.2	26,900	385	5,270	84	1,200	1,127	2	0	2	DISCONTINUED	DISCONTINUED
		Z112	112		N										12,500	12	76,800	32	48,400	7,000	105		MISSED	1	0	1	DISCONTINUED	DISCONTINUED
5376254.68	465641.39	Z113	113	Oct-2013	N											9,466	5,900	30,000	31,600	MISSED	26,700	25,000	17,300	9	38	65	DISCONTINUED	DISCONTINUED
5376257.42	465644.69	Z114	114	Oct-2013	N											48,400	---	34,400	11,400	MISSED	185	25,000	13,100	12	0	4	DISCONTINUED	DISCONTINUED
5376257.97	465597.96	Z115	115		Y											61,800	---	6,560	12,900	MISSED	1	MISSED	MISSED	MISSED	MISSED	MISSED	MISSED	?
5376251.73	465651.90	Z116	116	Mar-2013	N												---	MISSED	MISSED	MISSED	MISSED	25,000	23,500	21	48	24	DISCONTINUED	DISCONTINUED
		Z117	117		N												26,500	MISSED	30,700	MISSED	6	MISSED	MISSED	9	0	MISSED	DISCONTINUED	DISCONTINUED
5376314.21	465611.88	Z118	118	Jul-2014	N												12,600	3600	MISSED	9,639	10	25	1,032	1,407	2,487	369	2	DISCONTINUED
5376296.43	465718.43	Z119	119	Jul-2014	ACTIVE												15,900	15,900	16,200	7,000	4,773	6,966	8,890	3,100	9,632	700	2,400	4 holes along LFG pipe
5376250.71	465549.48	Z120	120	Mar-2015	N														16,900	MISSED	2	17,000	-0.66	4	0	DISCONTINUED		DISCONTINUED
5376150.60	465840.36	Z121	121	?	N															1,000	MISSED	MISSED	MISSED	MISSED	MISSED	MISSED	MISSED	DISCONTINUED
5375891.79	465602.61	Z122	122	Mar-2017	ACTIVE																MISSED	8,500	7,224	MISSED	65	2,444	1,077	Concrete box infrastructure with black lid, across and up the road from wheel wash
5375891.79	465602.61	Z123	123	Mar-2017	ACTIVE																MISSED	8,400	365	MISSED	28747	25,600	0	Buried

Appendix E3, continued

Northing	Easting	Point	Sort Order	Created	Active?	Oct-2009	Jan-2010	Jun-2010	Jan-2011	Dec-2011	Mar-2012	May-2012	Jul-2012	Dec-2012	Mar-2013	Oct-2013	Mar-2014	Jul-2014	Mar-2015	Sep-2015	Sep-2016	Mar-2017	Aug-2017	Mar-2018	Mar-2019	Jul-2020	Jul-2021	Description
5376156.54	465848.29	Z124	124	Mar-2017	ACTIVE																MISSED	6,300	6,645	3,288	MISSED	2,043	693	Concrete box with metal hatch by road
5376155.12	465848.01	Z125	125	Mar-2017	ACTIVE																MISSED	14,000	3,002	5,028	MISSED	10,100	700	Concrete box with metal hatch by road, adjacent to Z124, slightly south
5376147.43	465854.57	Z126	126	Jul-2020	ACTIVE																					9,400	456	Concrete box with metal hatch by road, uphill of Z125
5376276.39	465621.81	Z127	127	Aug-2020	ACTIVE																					21,400	75,000	Metal culvert parallel to road, flowing downhill into Toutle Valley
5376286.65	465651.33	Z128	128	Sep-2020	ACTIVE																					3,400	2,120	Inside casing of wells 90-1-1 and 90-2-1
5376281.02	465652.79	Z129	129	Oct-2020	ACTIVE																					8,900	2,670	Large hole in black tarp with metal poking out, 50ft south of well #90
5376282.15	465729.97	Z130	130	Nov-2020	ACTIVE																					1,686	1,111	Hole in tarp
5376286.60	465730.09	Z131	131	Dec-2020	ACTIVE																					1,430	1,905	Hole in tarp between bench roads, downhill of Z130
5376359.74	465654.26	Z132	132	Jan-2021	ACTIVE																					2,302	391	Hole in tarp (large rock poking through), near bench road and black pipe
5376209.99	465672.68	Z133	133	Jul-2021	ACTIVE																						3,000	Flange on black pipe wrapped in blue plastic at top of slope
5376197.89	465653.66	Z134	134	Jul-2021	ACTIVE																						14,000	Flange on black pipe at top of slope
5376280.91	465730.54	Z135	135	Jul-2021	ACTIVE																						2,200	Hole in tarp with metal rebar
Existing hot spots surveyed						0	1	1	2	44	12	19	18	22	25	29	32	26	23	23	28	23	25	25	24	29	23	
Missed (m)						0	0	0	0	0	0	0	0	0	0	1	0	2	2	6	7	6	5	7	4	4	3	
Active z pts at start						0	1	1	2	44	12	19	18	22	25	29	32	26	23	23	28	26	25	25	25	32	33	
Added - new (n)						4	5	0	1	2	1	1	0	2	1	2	0	2	0	0	0	4	0	0	0	1	3	
Discontinued at end of survey						0	0	0	0	0	0	0	0	0	0	1	4	4	0	0	0	3	0	0	1	3	10	
Max Methane Concentration						0	50,000	0	12,500	61,300	51,700	61,300	79,700	138,900	12,500	61,800	76,800	73,200	48,400	41,400	50,300	25,000	23,500	16,700	28,747	25,600	75,000	

Notes:

(red)	Methane over 1,000 ppm
(green)	Methane under 1,000 ppm