the Energy to Lead

TASK 2 FINAL REPORT
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Laboratory Testing and Analysis

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Executive Summary

One of the most efficient ways to use biomass resources is through the production and distribution of the resulting biomethane through existing natural gas systems. Dairy waste, for example, can be used to produce biogas of varying quality through anaerobic digestion. This biogas has been traditionally used to produce electricity. However, there is a growing trend to upgrade the biogas to biomethane and use it directly as a renewable natural gas (RNG). With the introduction of this new alternative energy source, specific issues related to gas quality, health and safety must be addressed. Therefore, GTI has conducted an extensive Biogas Testing Program to address these issues.

GTI's Laboratory Testing and Analysis Program (Task 2) focused on the investigation of raw and cleaned biogas samples, where constituents typically monitored in natural gas supplies and additional trace constituents were analyzed. The results from the testing program were compared to existing analytical parameters outlined in the American Gas Association's (AGA) *Report No. 4A - Natural Gas Contract Measurement and Quality Clauses* which compiles and references pipeline tariffs from various natural gas transmission and distribution companies in North America. The objective of Task 2 was two-fold: 1) to verify that discreet biomethane samples supplied to the study could meet overall quality natural gas parameters, and, 2) to verify that the supplied biomethane samples could meet the specific requirements of their contract to the specific pipeline company. As such, required gas quality between the two biomethane suppliers was different. This study also provides supportive information regarding constituents outside of the set of gas quality parameters covered in AGA Report 4A. These data provide input to recommendations included in the Guidance Document (Task 3) as part of this project: *Pipeline Quality Biomethane: North American Guidance Document for Introduction of Dairy Waste Derived Biomethane Into Existing Natural Gas Networks.*

A total of 40 raw biogas, partially cleaned biogas and cleaned biogas (termed biomethane) samples were collected from 14 farms in the northeast, mid-west and west coast from a variety of dairy farm operations. Farms included flush manure and scrape manure management systems; some were organic. An attempt was made to sample a wide variety of farm manure management systems across the US. All farms were processing manure and farm effluent through anaerobic digester systems to produce biogas. Some biogas was partially cleaned. *Pertaining to sampling of biomethane, only two biomethane producers and the associated farms volunteered samples for this project*. Biomethane from these plants was destined for injection into existing gas pipeline networks. Samples of natural gas and ambient air from a farm were also collected as part of the study. Samples were retrieved by a designated sampling team; the same team retrieved all samples using the same sampling equipment and protocols, for all sampling efforts. All samples were sent overnight to the GTI Gas Quality Laboratory; some samples were also sent to an outside laboratory for specific analysis. Tier I testing and Tier II testing was performed on the samples to determine chemical profiles. Biological testing was performed by GTI. Data was collected and was compared against each other, typical natural gas profiles and contract requirements specific to the biomethane suppliers.

The results from the testing program show that raw biogas, as well as biogas that has been subjected to partial cleanup, does not analytically fall within constituent ranges consistent

with natural gas tariffs for natural gas (AGA report 4A, 2001). For example, the concentrations for major components such as carbon dioxide, nitrogen, oxygen and hydrogen sulfide are significantly higher than what is specified in typical pipeline tariffs and natural gas contracts. In addition, the biogas samples were found to contain other hydrocarbons, volatile/semi-volatile organic compounds, metals and pesticides.

In contrast, the average gas quality of the biomethane (cleaned biogas) samples tested in this project were within the range of typical tariff values for natural gas *and* met the contract requirements specific to the receiving natural gas company. Biomethane contained much lower concentrations (up to four times lower) of the semi-volatile and volatile organic compounds as compared with raw and partially cleaned biogas. All concentrations of semi- volatile and volatile compounds were well below a GTI selected metric for evaluation, that is, the recommended exposure limits as defined by NIOSH and OSHA. Of note, NIOSH and OSHA exposure limit criteria is specific to hazard assessments and use assessing personal exposure of constituents over a specified period of time. These reference limits are not intended to be used as surrogate gas quality constituent limits for contracts or tariffs and may not be transferable to this context. However, they serve as reference numbers to which constituent levels may be assessed in biomethane.

No samples were found to possess concentrations of pharmaceuticals. Only one pesticide was present in one sample of biomethane, but it was present at levels four times lower than OSHA exposure limits; other pesticides were found at low levels in raw and partially cleaned biogas samples.

The results also indicated that most raw biogas samples had an average of 2.72E+06 live and dead heterogeneous bacteria per 100 scf of gas, most likely the result of microbial carry over from the anaerobic digestion process. In addition, acid-producing bacteria and iron oxidizing bacteria were found (the two main types of corrosion-causing bacteria). Due to the small physical size of microorganisms, the partial cleanup of biogas does not seem to be effective in reducing the bacteria number in the raw biogas stream. However, the partial cleanup process, which is typically designed for sulfur removal, can effectively kill some live bacteria in raw biogas and consequently decrease the number of live bacteria present within the resulting product biogas. Furthermore, the cleanup technology used for biomethane production seems to be more effective in reducing the number of bacteria carried over from raw biogas; however, the incidence of live bacteria, while still lower than that in raw biogas, was higher in biomethane than in partially clean biogas. However, these results may be related to the cleanup systems employed or other factors. The incidence of total live and dead bacteria were similar to those in natural gas and ambient air samples. However, live bacteria in biomethane is higher (orders of magnitude) than both of the representative natural gas samples analyzed (no live bacteria present in one and negligible in the second) and the ambient air sample (negligible). Spore count was much higher in biomethane than natural gas and ambient air samples (not detected in one natural gas sample and the ambient air sample).

Analysis of two natural gas samples was not conclusive. One natural gas sample, derived from a GTI laboratory, showed no live bacteria or spores; dead bacteria were present and some of the dead bacteria are identified as corrosion-causing. Another natural gas sample indicated

the presence of both very low levels of live bacteria as well as bacteria, corrosion-causing bacteria and spores. Ambient air samples showed negligible live anaerobic bacteria, although total live and dead bacteria were similar to natural gas samples. No spores were detected in the ambient air sample.

Spores were detected in both the biogas and biomethane samples. It is indicated that partial cleanup processes or cleanup technologies used in biomethane production may have little impact on the reduction of spores in the resulting gas.

Importantly, a limited (previously executed) study conducted at one biomethane production facility examined the use of filters for microbe reduction in the biomethane. Preliminary results indicated that using filters of various pore sizes, in parallel, as a final cleanup step appears to reduce live microbe levels to below detection. However, these data are preliminary and the study was not exhaustive.

In summary, Task 2 results conclude and demonstrate that dairy waste derived biomethane of high quality may be produced within typical tariff and contract constituent and property considerations for natural gas supplies as compiled in AGA Report 4A (2001). The tested biomethane samples also met the specific contract requirements for acceptance into the specific pipeline network. Biogas needs to be conditioned, cleaned and/or filtered in order to produce high quality biomethane. More research should be performed to create a robust database for comparison between biomethane products and processes, in order to better understand biomethane interchangeability with natural gas supplies and effects on pipeline integrity and human health and safety.

Introduction

Background

The market for energy from renewable sources is growing rapidly, stimulated by dramatic increases in the costs of crude petroleum and natural gas as well as concerns regarding global climate change. Converting or capturing combustible gases from biomass is one of the most rapidly developing areas of energy production. This type of gas is typically referred to as "biogas." To date in the United States, the main use of energy production from biogas is electricity generation which is either used on-site or sold to the local electric utility. However, there is a growing trend to sell a cleaned biogas product (biomethane or renewable natural gas, RNG) to gas transmission and distribution companies. This increasing trend has resulted in a need by producers of biomethane and gas utilities for guidance on integrating the biomethane into current natural gas systems. Quality control measures for the quality of the biomethane, for appropriate conditioning of the biomethane, and methods for measuring the composition of the gas are needed to ensure safe delivery into pipelines.

Project Objective

The objective of this project is to develop a Guidance Document (Task 3) bounding the analytical parameters for consideration in introducing a biomethane product into the natural gas network. The Guidance Document is not prescriptive; it is intended to provide framework for productive discussions regarding biomethane quality. It provides reference and recommendations for the introduction of biomethane, a renewable natural gas (RNG), from dairy waste digestion with natural gas in existing gas pipeline networks in North America.

Task 2 Objective

The objective of Task 2 was to conduct the supportive sample collection and laboratory testing and analysis of raw biogas, partially cleaned biogas and cleaned biogas (biomethane) samples to determine the gas quality associated with these biogas products. To this end, samples were retrieved from farms across the United States (from the northeast, mid-west, and west coast); these farms were actively engaged in biogas production. Some of these farms also cleaned the biogas to varying degrees. The objective of Task 2 was to analyze for constituents in the raw biogas and compare concentrations with the associated cleaned gas product; a further comparison was then made to typical natural gas tariff values outlined in AGA Report 4A, 2001. The AGA Report 4A serves as an industry-wide reference tool pertaining to natural gas quality and measurement provisions in contracts or tariffs (see www.ferc.gov). It also describes factors to consider when determining appropriate limits for gas quality specifications. Other parameters not included in the Report 4A document were also analyzed. The goal was to verify that biomethane would meet typical tariff and contract considerations compiled in Report 4A and provide supportive information regarding constituents outside of the set covered in Report 4A. Importantly, the biomethane samples retrieved for this study were compared with the specific applicable tariff requirements for the natural gas particular to the point of interchange. These data served as the reference for information in Task 3: Guidance Document.

Task 2 Report Objective

The objective of this Task 2 Report is to present the results of GTI's biogas testing program. Comparisons will be drawn on the quality of the three types of biogas tested: raw, partially clean and biomethane. As outlined in the project proposal, the Task 2 Report has the following objectives:

- Determine the chemical and biological constituents found in raw biogas, partially cleaned biogas and biomethane, and the levels of constituents contained in raw biogas, partially cleaned biogas and biomethane.
- Assess the presence and concentrations of constituents outside of those listed in Report 4A, to minimize (or eliminate) their impact on: 1) public safety and health, 2) pipeline delivery infrastructure, 3) end use equipment.
- Identify any major areas of concern that may require further investigation (beyond the scope of this project).
- Validate the ability of gas treatment technologies, methods, and processes to effectively treat biodigestion outputs to remove undesirable components to within acceptable limits.
- Investigate the ability of two representative gas treatment systems to meet acceptable biomethane quality limits (tariff) required by the contracting gas company.

Constituents Found in Natural Gas

Natural gas is typically composed of methane but can also include other light hydrocarbons such as ethane, propane, butane and pentane. It also contains other components such as diluents gases, which include carbon dioxide, nitrogen, oxygen and helium. Natural gas can contain other contaminants such as hydrogen sulfide, mercaptans, and various toxic and corrosive chemical compounds that are composed of combinations of sulfur, carbon, hydrogen and oxygen. The quality of natural gas is typically addressed by the Federal Energy Regulatory Commission (FERC). FERC regulates the interstate transmission of electricity, natural gas, and oil and requires natural gas transmission companies to file tariffs. Although FERC has no generic quality policy[1] it has the authority under section 5 of the Natural Gas Act to require a pipeline company to include "just and reasonable gas quality and interchangeability standards" in their tariffs[2]. In Report No. 4A, the American Gas Association's Transmission Measurement Committee reported on variations in natural gas pipeline tariffs. Table 1 presents their findings of the threshold and typical values of gas properties specified in tariffs. ***However, AGA Report 4A is currently being updated and a 2009 version is expected to be released, therefore the values and parameters reported in Table 1 are subject to change.*** The components typically addressed in pipeline tariffs were included in GTI's biogas testing program, as well as other potential compounds of concern (discussed in the following section) that may be present in biogas. It should be noted that caution needs to be exercised when using tariff value ranges suggested within AGA Report 4A, as local requirements may vary. Specific tariff requirements for individual natural gas companies should be consulted for the purpose of constructing a suitable contract for biomethane delivery.

[1] United States. Federal Energy Regulatory Commission.Natural Gas Interchangeability Docket No. PL04-3-000. INGAA, 2006.
[2] United States. Federal Energy Regulatory Commission.Opinion No. 495. FERC, 2007.

Table 1. Constituents and Properties of Natural Gas as Reported in AGA Report 4A (2001)[3]

Gas Property	Contract Limits	Typical Values
Water Content	7lb./MMscf, Maximum	2 – 7 lb./MMscf
Heat Content (dry)	967 – 1120 Btu/scf	1010 – 1060 Btu/scf
Temperature	32 – 120 °F	40 - 60°F
Hydrocarbon Dew Point - °F	15°F Maximum at Pipeline Pressures	0 - 15°F at 550 psig
Sulfur Compounds – Hydrogen Sulfide (H_2S)	¼ - 0.3 grains per 100 scf, Maximum [4]	0 – 2 grains per 100 scf
Mercaptans (RSH)	No Specification	Highly Variable 0 – 40ppm[5]
Total Sulfur Compounds, as sulfur	5 – 20 grains per 100 scf – Maximum	0 – 1 grains per 100 scf
Diluent Gases Total	4 – 5% Maximum	0.5 – 3%
Oxygen (O_2)	0.2% Maximum[6] 0.001% Desirable	0 – 0.001%
Helium (He)	0.2% Maximum	0 – 0.1%
Nitrogen (N_2)[7]	3% Maximum [8]	0 – 2%
Carbon Dioxide (CO_2)	2 – 3% Maximum[9]	0 – 2%
Mercury (Hg)	No Specification	0 – 1ppb[10]
Solid Particles	3 – 15 microns, Maximum	3 – 15 microns

[3] American Gas Association. Transmission Measurement Committee. AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses. Washington, DC: American Gas Association, 2001
[4]NFPA 54-1999, ANSI Z223.1, Natural Fuel Gas Code, section 2.6 lists pipe material restrictions if more than 0.3 gr. H_2S/100 scf. Where H_2S cannot be limited to 0.3 gr. /100 scf or less, notify end-users, LDCs, and/or state agencies, which can affect the use of appropriate pipe materials for high H_2S gas.
[5] Parts per million (10^{-6}), molar basis
[6]To limit pipeline corrosion effects, the desirable O_2 contract limit is 0.001% but the maximum contract limit may be specified up to 0.2% in dry or processed gas with no H_2O present in liquid form.
[7]This is free, gaseous nitrogen, nitrogen compounds are not known to occur in most gas.
[8]The carbon dioxide and nitrogen are sometimes limited to combined maximum content of 3%.
[9]The carbon dioxide and nitrogen are sometimes limited to combined maximum content of 3%.
[10]Parts per billion (10^{-9}), molar basis

Potential Compounds of Concern in Biogas

The quality of the biomass introduced to the anaerobic digester directly influences the quality of the resulting product biogas. Depending upon the organic and inorganic compounds contained in the biomass fed to the anaerobic digester and the operating conditions of the digester, resulting biogas may or may not contain compounds of concern to the natural gas industry. Biogas samples retrieved for this study were subjected to testing for selected compounds outside of the set listed in AGA Report 4A. This is because typical dairy operations use chemicals, pharmaceuticals and pesticides which may be contained in the manure or manure slurry that is used in the anaerobic digestion process. As such, there exists a possibility that these compounds would be present in the product biogas. The cleaning process to produce a quality biomethane product may remove these constituents. Testing as part of this study focused on these constituents and the potential for removal, if present.

GTI conducted an extensive search for potential compounds of concern that may be present in biogas. Information was gathered from various interviews with Dairy Farmers, Veterinarians, Academic Professors and Biogas Producers (of both raw biogas and biomethane). In addition GTI created a survey that was sent to the candidate dairy farm sampling sites. Although only a few of the dairy farms participated in the survey, information such as the types of digesters used, animal care practices, pesticides used, and other relevant information that would help identify the potential compounds of concern in biogas were collected through these surveys.

Furthermore, GTI conducted a literature search for potential pesticides and animal care products used in the dairy industry. The National Pesticide Impact Assessment Program (NAPIAP) conducted a survey in 2003 with major farms in the northeast region of the United States. The survey included information regarding different supplements that are given to the cows such as antibiotics, hormones/diuretics, anti-inflammatory, and antiparasitic drugs.

Figure 1 shows many different supplements that are used in dairy farms.

Another group of potential contaminants present in the manure and the digester, depending on half-life and vapor pressure, are pesticides. The NAPIAP study included how dairy farms apply their pesticides, and what insecticides they use for various needs. Table 2 lists the application equipment, and Tables 3-5 list the insecticides used for fly control in the barn, fly control on cattle in pasture, and lice/mite control.

In addition to the information presented above, other sources of literature were used to determine a list of candidate target compounds for analytical testing. These include the following chemical groups: semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), pharmaceuticals, hormones and pesticides. A list of these candidate compounds is presented in Table 6.

Based on the list of candidate compounds presented in Table 6, GTI selected a suite of standard referenced analytical methods (such as NIOSH and EPA analytical methods) to use for this testing program. The standard common target analytes specific for each of the chosen analytical methods encompassed many of the chemical compounds that have been previously

reported as being present in the air around dairy farms and in digesters. GTI recognized that other classes of chemicals may be present in the biogas therefore GTI included an exploratory analysis in the testing program. This exploratory analysis was to be used as a screening method to tentatively identify (but not quantify) additional chemical compounds (that were outside of the selected target analytes for each analytical method) present in the biogas samples.

GTI carefully evaluated all of the information collected on the compounds potentially present in biogas and based on this information designed a chemical testing program for this project. The chemical tests were grouped into two Tiers. The First Tier chemical tests included the analysis of compounds typically defined in pipeline tariffs for natural gas, in addition to compounds that were previously tested for in a separate Biomethane Testing and Verification Program that GTI conducted for Intermountain Gas Company. The biomethane (produced also from dairy waste conversion) tested in that program was to be injected into an existing natural gas pipeline. The target compounds for the First Tier chemical tests are presented in Table 7. The target compounds are grouped based on the analytical methods used for detection and quantification. Seven different analytical methods were used in the First Tier chemical tests: major components analysis, sulfur analysis, extended hydrocarbon analysis, halocarbon analysis, siloxanes analysis, metals analysis and mercury analysis (mercury was analyzed separately from the other target metals because the detection and quantification requires a different analytical instrument).

The Second Tier chemical tests (presented in Table 8) include target compounds, such as pesticides and pharmaceuticals that were found to be additional compounds of concern which may also be present in biogas but is not routinely tested for in natural gas. Similar to the First Tier chemical tests, the target compounds in the Second Tier chemical tests were grouped based on the analytical methods used for detection and quantification. Four different types of analytical methods were used: volatile/semivolatile organic compounds analysis, pesticides analysis, polychlorinated biphenyls analysis and pharmaceuticals analysis.

Figure 1. Drugs Used to Treat Dairy Cattle

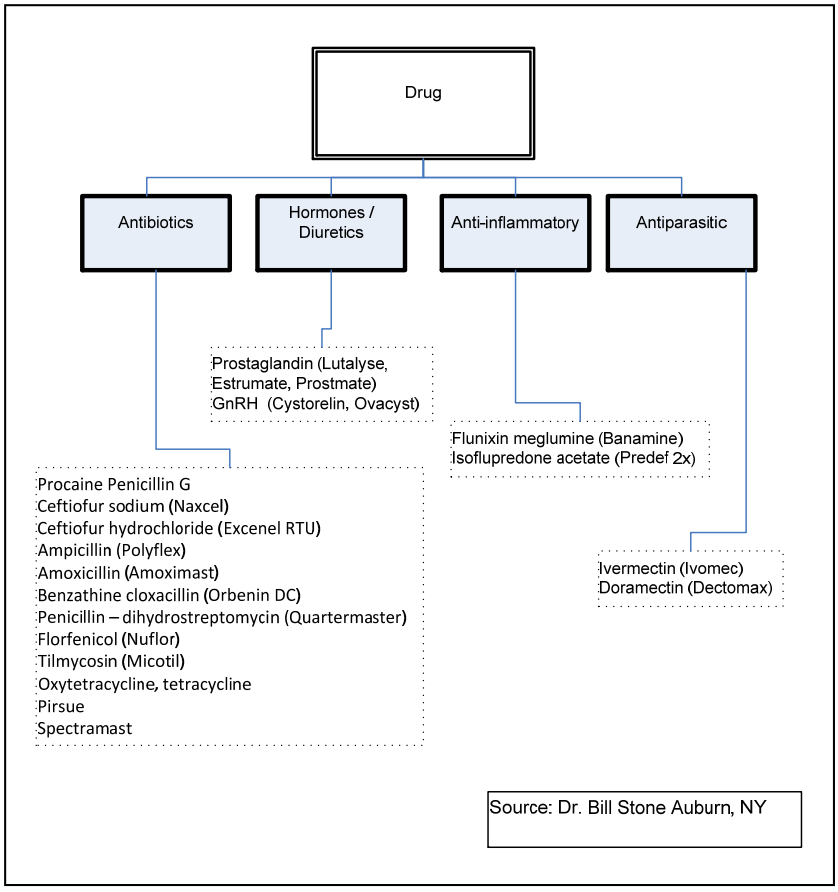

Table 2. Application Equipment used by Dairy Producers[11]

Equipment	Number of Responses	Percent of Records (167)
Aerosol can	7	4.2%
Backpack or hand-pump sprayer	66	39.5%
Backrubbers	13	7.8%
Dish-soap bottle	1	0.6%
Dust bags	47	28.1%
Fogger	44	26.3%
Hand duster	4	2.4%
High-pressure sprayer	9	5.4%
Jar	1	0.6%
Liquid duster	1	0.6%
Mist blower	7	4.2%
NA	4	2.4%
Pour-on	15	9.0%
Pour-on applicator	1	0.6%
Spray bottle	1	0.6%
Total:	**221**	

[11] National Pesticide Impact Assessment Program (NAPIAP) Survey, 2003

Table 3. Insecticides Used for Fly Control in the Barn[12]

Method of Application	Insecticide	Number of Responses	Percent of Records (167)
Baits	Apache, Golden Malrin (or other methomyl bait)	75	44.9%
Manure treating	Cygon (or other dimethoate formulations)	1	0.6%
	Rabon (or other tetrachlorvinphos formulations)	5	3.0%
	Orkin Pest Control	1	0.6%
Milk room	Pyrethrins plus synergist	43	25.7%
	IND Food Handling Spray	1	0.6%
	Orkin Pest Control	1	0.6%
Oral formulations	Rabon Oral Larvicide (or other tetrachlorvinphos)	6	3.6%
	Orkin Pest Control	1	0.6%
Residual sprays	Atroban, Ectiban, Permectrin (or other permethrin)	14	8.4%
	Cygon (or other dimethoate formulations)	6	3.6%
	Rabon (or other tetrachlorvinphos formulations)	6	3.6%
	Tempo (or other cyfluthrin formulations)	7	4.2%
	3-M Spray	1	0.6%
	Orkin Pest Control	6	3.6%
	Sodium hypochlorite	1	0.6%
Space sprays	Atroban, Ectiban, Permectrin (or other permethrin)	25	15.0%
	Pyrethrins plus synergist	22	13.2%
	Vapona, Cionap (or other dichlorvos formulations)	2	1.2%
	C-EM-DIE	1	0.6%
	Orkin Pest Control	4	2.4%
	Sodium hypochlorite	1	0.6%
	Sure Kill	1	0.6%

[12] National Pesticide Impact Assessment Program (NAPIAP) Survey, 2003

Table 4. Insecticide Used for Fly Control on Cattle in Pasture[13]

Method of Application	Insecticide	Number of Responses	Percent of Records (167)
Animal sprays	Atroban, Ectiban, Permectrin (or other permethrin)	45	26.9%
	Ciodrin (or other crotoxphos formulations)	2	1.2%
	Malathion	6	3.6%
	Pyrethrins plus synergist	7	4.2%
	Vapona, Ciovap (or other dichlorvos formulations)	6	3.6%
	C-EM-DIE	1	0.6%
	Eprinomectin	1	0.6%
	Orkin Pest Control	3	1.8%
	pyrenone	1	0.6%
	Sure Kill	1	0.6%
Backrubbers	Ciodrin (or other crotoxphos formulations)	2	1.2%
	Co-Ral (or other coumaphos formulations)	8	4.8%
	Ectiban, Permectrin (or other permethrin formulations)	13	7.8%
	Malathion	2	1.2%
	Methoxychlor	1	0.6%
	Vapona, Ciovap (or other dichlorvos formulations)	2	1.2%
	D furl Ten Count Back Rub	1	0.6%
	Eprinomectin	1	0.6%
	Orkin Pest Control	1	0.6%
Dust Bags	Ciodrin (or other crotoxphos formulations)	1	0.6%
	Permectrin (or other permethrin formulations)	18	10.8%
	Rabon (or other tetrachlorvinphos formuations)	7	4.2%
	Coumaphos	3	1.8%
	IBA	1	0.6%
Ear tags	Atroban, Ectiban, Permectrin (or other permethrin)	2	1.2%
	Ectrin (fenvalerate)	5	3.0%
Hand dusting	Ciodrin (or other crotoxphos formulations)	1	0.6%
	Permectrin (or other permethrin formulations)	7	4.2%
	Rabon (or other tetrachlorvinphos formulations)	10	6.0%
	Coumaphos	3	1.8%
	Eprinomectin	1	0.6%
Oral formulations	Rabon Oral Larvicide (or other tetrachlorvinphos)	6	3.6%
	Vigilante (diflubenzuron)	1	0.6%
	Orkin Pest Control	1	0.6%

[13] National Pesticide Impact Assessment Program (NAPIAP) Survey, 2003

Table 5. Insecticide Used for Lice or Mite Control[14]

Method of Application	Insecticide	Number of Responses	Percent of Records (167)
Animal sprays	Atroban, Ectiban, Permectrin (or other permethrin)	41	24.6%
	Ciodrin (or other crotoxphos formulations)	1	0.6%
	Co-Ral (or other coumaphos formulations)	10	6.0%
	Pyrethrins plus synergist	1	0.6%
	Taktic (amitraz)	13	7.8%
	Vapona, Ciovap (or other dichlorvos formulations)	1	0.6%
	Boss	3	1.8%
	Dectomax	1	0.6%
	DeLice Pour-on	2	1.2%
	Difuel Injectable	1	0.6%
	Durasect	1	0.6%
	Eprinomectin	9	5.4%
	Ivermectin	4	2.4%
	Lysoff	2	1.2%
	Pyrenone (or other pyrethrin plus synergist)	1	0.6%
	Used oil	1	0.6%
Dusts	Ciodrin (or other crotoxphos formulations)	4	2.4%
	Co-Ral (or other coumaphos formulations)	25	15.0%
	Permectrin (or other permethrin formulations)	11	6.6%
	Rabon (or other tetrachlorvinphos formulations)	5	3.0%
	DeLice Pour-on	1	0.6%
	IBA	1	0.6%

[14] National Pesticide Impact Assessment Program (NAPIAP) Survey, 2003

Table 6. List of compounds from literature search[15,16,17,18,19]

Alcohols	**Aldehydes**	i-propylamine	**Halogenated Hydrocarbons**	2-Heptanone, 6-methyl-	propylporop-1-enyl disulfide
Methanol	formaldehyde	pentylamine	Carbon tetrachloride	5-Hepten-2-one, 6-methyl-	diphenylsulfide
Ethanol	Propanal	Trimethylamine	Chloromethane	3-Octanone	3,5-dimethyl-1,2,4-trithiolane
Propanol	2-Propenal	triethylamine	Methylene Chloride	3-hydroxy-2-butanone	3-methyl-5-propyl-1,2,4-trithiolane
2-Butanol	butanal	Tributylamine	Chloroform	2-heptanone	3,6-dimethyltetra-thiane
Butanol, 2-methyl	2-butenal	Ethanamine, 2-chloro-N, N-diethyl	Iodomethane	2-nonanone	2,6-dimethylthi-3-inc-crabonaldehyde
1-Pentanol	2-pentenal	1,4-butanediamine	Iodoethane	1-oxiranylethanone	methyl mercaptan
3-hexanol	Propanal, 2-methyl	butylamine	Trichloroethane	acetophenone	ethyl mercaptan
1-heptanol	Butanal, 2-methyl	2-methyl-1-propanonamine	Trichloroethylene	**Other nitrogen compounds**	n-propyl mercaptan
1-octanol	Butanal, 3-methyl	diethylamine	Tetrachloroethylene	1H-Pyrrole, 1-methyl	isopropyl mercaptan
1-butanol	Pentanal	**Aromatic Hydrocarbons**	Trichloromonofluoromethane	1H-Pyrrole, 1-ethyl	allyl mercaptan
2-butanol	Hexanal	Benzene	Dichlorodifluoromethane	indole	n-butyl mercaptan
3-methyl-1-butanol	2-hexenal	Toluene	Dichlorotetrafluoroethane	3-methylindole	2-butene-1-thiol
Cyclopentanol	Heptanal	Ethyl benzene	Ethane, 1,1,2-trichloro-1,2,2-trifluoro-	2-Propenenitrile	benzenethiol
1-penten-3-ol	2-heptenal	m, p-Xylene	Butane, 2-chloro-2-methyl-	Methyl nitrate	benzyl mercaptan
1-hexanol	2,3-heptadienal	Benzene, trimethyl	Bornyl chloride	Nitromethane	Thiophene
3-Hexen-1-ol	Octanal	Benzene, 1-methyl-3-(1-methylethyl)	1-chloro-3-methylbutane	Acetonitrile, dichloro	Thiophene, 3-methyl-
2-ethyl-1-hexanol	Nonanal	Benzene, 1-methyl-4-(1-methylethyl)	Tetrachloroethane	pyridine	Thiophene, 2-methyl-
benzyl alcohol	2-nonanal	Cyclopropane, 1,1-dimethyl-	**Ketones**	3-aminopyridine	Thiophene, 2,3-dimethyl-
phenylethyl alcohol	2,4-nonenal	Cyclohexene	Acetone	2-methylpyrazine	Thiophene, 2,4-dimethyl-
Terpinen-4-ol	Decanal	Cyclohexene, 3,3,5-trimethyl-	2-Butanone	methylpyrazine	Thiophene, 3 or 2-ethyl-
2-methyl-2-pentanol	2,4-decadienal	2H-Pyran, 3,4-dihydro	3-hydroxy-2-butanone	trimethylpyrazine	Dimethyl disulfide
iso-heptanol	tetradecane	Naphthalene	2-Pentanone	tetramethylpyrazine	Dimethyl trisulfide
3-octanol	Benzaldehyde	Naphthalene, 2-methyl	3-Pentanone	**Sulfides**	Ethylenethiourea
2-methoxyethanol	Benzaldehyde, 4-methyl-	**Ethers**	cyclopentanone	Carbonyl sulfide	**Terpenes**
2-ethoxy-1-propanol	2-methyl-propnanal	Furan, 2-methyl-	Cyclohexanone	Dimethyl sulfide	beta-myrcene
2,3-butanediol	2-Octenal	2-pentylfuran	Cyclopentanone, 2-methyl-	Carbon disulfide	campher

[15] Emissions from Animal Feeding Operations Draft. 2001, U.S. Environmental Protection Agency, Emissions Standards Division, Office of Air Quality Planning and Standards: Research Triangle Park, NC 27711.
[16]Filipy, J., Rumburg, B., Mount, G., Westberg, H., and Lamb, B., Identification and quantification of volatile organic compounds from a dairy. Atmospheric Environment, 2006. 40: p. 1480-1494.
[17]Rabaud, N.E., Ebeler, S.E., Ashbaugh, L.L., and Flocchini, R.G., Characterization and quantification of odorous and non-odorous volatile organic compounds near a commercial dairy in California. Atmospheric Environment, 2003. 37: p. 933-940.
[18]Stone, D.B., Drugs used on dairy farms: Auburn, NY.
[19]Sunesson, A., Gullberg, J., and Blomquist, G., Airborne chemical compounds on dairy farms. Journal of Environmental Monitoring, 2001. 3: p. 210-216.

benzy alcohol
methylbenzyl alcohol
4-methylcyclohexanol
2-pentylethannol
isobutyl alcohol

diacetyl

Amines

methylamine
ethylamine
n-propylamine

Furan, 2,4-dimethyl-
2, 3-Dihyrofuran
Furan, tetrahydro

Fixed Gases

Carbon dioxide

2-octanone
amylvinylketone
Methyl isobutal ketone
3-Penten-2-one, 4-methyl-, or 3-Hexen-2-one
3-Pentanone, 2-methyl-

Carbon disulphinde
diethyl sulfide
diethyldisulfide
dipropyldisulfide
methylpropyldisulfide

alpha-pinene
Camphene
beta-pinene
3-Carene
D-limonene

copaene
Alpha-phellandrene
Tricyclene

Phenols

phenol
p-cresol
m-cresol
o-cresol
p-ethylphenol
p-methoxyphenol
o-methoxyphenol
m-ethylphenol
o-methylphenol
2,6-dimethyl phenol
3,4-dimethylphenol
3-hyroxy-2-methyl-4-pyrone

Acetates and Esters

methylformate
ethylformate
methyl isobutyrate
methyl heptanoate
ethyl valerate
ethyl hexanoate
ethyl heptanoate
ethyl nonanoate
ethyl undecanoate
Acetic Acid, methyl ester
ethyl acetate
Acetic Acid, propyl ester
isopropylacetate
butyl acetate
isobutylacetate

hexyl acetate
ethyl propionate
2-methylbutyrate
2-methyl-1-butanol acetate
ethyl butyrate
butyl butyrate
ethyl butylacetate
ethyl benzoate
Cyanic Acid, ethyl ester
Nitric Acid, ethyl ester
Benzoic Acid, methyl ester

Organic Acids

acetic acid
valeric acid
2-methylbutanoic acid
hexanoic acid
nonanoic acid
dodecanoic acid
cyclohexane carboxylic acid
formic acid
propionic acid
n-butyric acid
2-methylpropanoic acid
pentanoic acid
3-methylbutanoic acid
2-methyl-2-butanoic acid
4-methylpentanoic acid
2-methylpentanoic acid
heptanoic acid
octanoic acid
decanoic acid
undecanoic acid

tredecanoic acid
tetradecanoic acid
benzoic acid
phenylacetic acid
3-phenylpropionic acid

Other hydrocarbons

1-Propene, 2-methyl-
Butane
Butane, 2-methyl
2-Butene
1,3-Butadiene
Pentane
1-Pentene
Pentane, 2-methyl
2-Pentene, 4-methyl
Hexane
Hexane, 3-methyl
1-Hexene
Heptane
1-Heptene
Octane
1-Octene
Nonane
Decane
propylcyclopropane
2-methyldecane
3-methyldecane
5-methyldecane
undecane
dodecane
tridecane

Other Compounds

DMSO
undecene
ethyl ether
diethyl ether
propylene glycol
sulfur dioxide
methane
indane
hydrazine
ocimene

Table 7. Target Compounds for First Tier Chemical Testing

Major Components	Cycloalkanes	Sulfur	Halocarbons	Siloxanes	Metals	Calculated Real Gas Properties
Helium	Cyclopentane	Hydrogen Sulfide	Dichlorodifluoromethane (CFC-12)	1,1,3,3-Tetramethyldisiloxane	Mercury	Compressibility Factor [z] (Dry)
Hydrogen	Methylcyclopentane	Sulfur Dioxide	1,2-Dichlorotetrafluoroethane (CFC-114)	Pentamethyldisiloxane	Arsenic	Compressibility Factor [z] (Sat.)
Carbon Dioxide	Cyclohexane	Carbonyl Sulfide	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)	Hexamethyldisilane	Cadmium	Specific Gravity
Oxygen/Argon	Methylcyclohexane	Carbon Disulfide	Trichlorofluoromethane (CFC-11)	Hexamethyldisiloxane	Copper	Gross HV (Dry) (Btu/ft^3)
Nitrogen	Benzene	Methyl Mercaptan	Chloromethane	Octamethyltrisiloxane	Lead	Gross HV (Sat.) (Btu/ft^3)
Carbon Monoxide	Toluene	Ethyl Mercaptan	Dichloromethane (Methylene Chloride)	Octamethylcyclotetrasiloxane	Molybdenum	Wobbe Index
Methane	Ethylbenzene	i-Propyl Mercaptan	Chloroform	Decamethyltetrasiloxane	Selenium	Net HV (Dry) (Btu/ft^3)
Ethane	m,p-Xylene	n-Propyl Mercaptan	Carbon Tetrachloride	Decamethylcyclopentasiloxane		Net HV (Sat.) (Btu/ft^3)
Ethene	Styrene	t-Butyl Mercaptan	Chloroethane	Dodecamethylpentasiloxane		Real Gas Density (lbs/ft^3)
Ethyne	o-Xylene	Dimethyl Sulfide	1,1-Dichloroethane			
Propane	C3 Benzenes	Methyl Ethyl Sulfide	1,2-Dichloroethane			
Propene	Naphthalene	Diethyl Sulfide	1,1,1-Trichloroethane			
Propadiene	C1 Naphthalenes	Di-t-Butyl Sulfide	1,1,2-Trichloroethane			
Propyne	C2 Naphthalenes	Dimethyl Disulfide	1,1,2,2-Tetrachloroethane			
i-Butane		Methyl Ethyl Disulfide	Chloroethene (Vinyl Chloride)			
n-Butane		Methyl i-Propyl Disulfide	1,1-Dichloroethene			
1-Butene	Hexanes	Diethyl Disulfide	cis-1,2-Dichloroethene			
i-Butene	Heptanes	Methyl n-Propyl Disulfide	Trichloroethene			
trans-2-Butene	2,2,4-Trimethylpentane	Methyl t-Butyl Disulfide	Tetrachloroethene			
cis-2-Butene	Octanes	Ethyl i-Propyl Disulfide	1,2-Dichloropropane			
1,3-Butadiene	Nonanes	Ethyl n-Propyl Disulfide	3-Chloropropene			
i-Pentane	Decanes	Ethyl t-Butyl Disulfide	cis-1,3-Dichloropropene			
n-Pentane	Undecanes	Di-i-Propyl Disulfide	trans-1,3-Dichloropropene			
neo-Pentane	Dodecanes	i-Propyl n-Propyl Disulfide	Bromomethane			
Pentenes	Tridecanes	Di-n-Propyl Disulfide	1,2-Dibromoethane			
Hexane Plus	Tetradecanes	i-Propyl t-Butyl Disulfide	Chlorobenzene			

Ammonia Hydrogen Sulfide Carbonyl Sulfide	Pentadecanes Hexadecanes Heptadecanes Octadecanes Nonadecanes Eicosanes + Total from Cyclopentane and Eicosanes+ (Mol%)	n-Propyl t-Butyl Disulfide Di-t-Butyl Disulfide Dimethyl Trisulfide Diethyl Trisulfide Di-t-Butyl Trisulfide Thiophene C1-Thiophenes C2-Thiophenes C3-Thiophenes Benzothiophene C1-Benzothiophenes C2-Benzothiophenes Thiophane Thiophenol Individual Unidentified Sulfur Compounds (all as monosulfides) Total Sulfur (ppm) Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachloro-1,3-butadiene Total TO-14 Halocarbon Components			

Table 8. Target Compounds for Second Tier Chemical Testing

Semi-volatile/Volatile Organic Compounds				Pesticides	Polychlorinated Biphenyls				Pharmaceuticals
1,1,1-Trichloroethane	sec-Butylbenzene	2-Chloronaphthalene	Di-n-octylphthalate	a-BHC	PCB 2	PCB 73	PCB 81	PCB 158	Ampicillin Trihydrate
1,2-Dichloroethane	Phenol	2-Nitroaniline	Benzo[b]fluoranthene	b-BHC	PCB 3	PCB 49	PCB 87	PCB 129	Amoxicillin Trihydrate
1,1-Dichloropropene	bis(2-Chloroethyl)ether	1,4-Dinitrobenzene	Benzo[k]fluoranthene	g-BHC	PCB 4	PCB 47	PCB 115	PCB 178	Oxytocin
Benzene	Aniline	Dimethylphthalate	Benzo[a]pyrene	d-BHC	PCB 10	PCB 48	PCB 85	PCB 175	Florfenicol
Carbon Tetrachloride	2-Chlorophenol	1,3-Dinitrobenzene	Indeno[1,2,3-cd]pyrene	Heptachlor	PCB 7	PCB 75	PCB 136	PCB 187	Tripelennamine hydrochloride
1,2-Dichloropropane	1,3-Dichlorobenzene	Acenaphthylene	Dibenz[a,h]anthracene	Aldrin	PCB 9	PCB 104	PCB 77	PCB 183	Ceftiofur
Trichloroethene	1,4-Dichlorobenzene	2,6-dinitrotoluene	Benzo[g,h,i]perylene	Heptachlor epoxide	PCB 6	PCB 35	PCB 110	PCB 128	Tilmicosin
Dibromomethane	p-Isopropyltoluene	1,2-Dinitrobenzene		g-Chlordane	PCB 8	PCB 44	PCB 154	PCB 167	Furosemide
Bromodichloromethane	Benzyl Alcohol	3-Nitroaniline		Endosulfan I	PCB 5	PCB 59	PCB 82	PCB 185	Flunixin meglumine
Pyridine	2-Methylphenol (m-cresol)	Acenaphthene		a-Chlordane	PCB 19	PCB 37	PCB 151	PCB 174	Fenbendazol
cis-1,3-Dichloropropene	1,2-Dichlorobenzene	2,4-Dinitrophenol		Dieldrin	PCB 12	PCB 42	PCB 135	PCB 177	Doramectin
N-nitrosodimethylamine	3,4-Methylphenol (o,p-cresol)	4-Nitrophenol		4,4'-DDE	PCB 13	PCB 71	PCB 144	PCB 202	
Toluene	bis(2-chloroisopropyl)ether	Dibenzofuran		Endrin	PCB 18	PCB 41	PCB 124	PCB 171	
trans-1,3-Dichloropropene	n-Butylbenzene	2,4-dinitrotoluene		Endosulfan II	PCB 17	PCB 64	PCB 147	PCB 156	
1,1,2-Trichloroethane	N-nitroso-di-n-propylamine	2,3,4,6-Tetrachlorophenol		4,4'-DDD	PCB 15	PCB 40	PCB 107	PCB 173	
1,3-Dichloropropane	Hexachloroethane	2,3,5,6-Tetrachlorophenol		Endrin aldehyde	PCB 24	PCB 103	PCB 123	PCB 157	
Dibromochloromethane	1,2-Dibromo-3-Chloropropane	Diethylphthalate		Endosulfan sulfate	PCB 27	PCB 67	PCB 149	PCB 201	
1,2-Dibromoethane	Nitrobenzene	4-Chlorophenyl-phenylether		4,4'-DDT	PCB 16	PCB 100	PCB 118	PCB 172	
Tetrachloroethene	Isophorone	Fluorene		Endrin ketone	PCB 32	PCB 63	PCB 134	PCB 197	
Chlorobenzene	2-Nitrophenol	4-Nitroaniline		Methoxychlor	PCB 34	PCB 74	PCB 114	PCB 180	
1,1,1,2-Tetrachloroethane	2,4-Dimethylphenol	4,6-Dinitro-2-methylphenol			PCB 29	PCB 70	PCB 131	PCB 193	
Ethylbenzene	bis(2-	n-Nitrosodiphenylamine			PCB	PCB 66	PCB	PCB	

	Chloroethoxy)methane			54		122	191	
m/p-Xylenes	1,2,4-Trichlorobenzene	4-Bromophenyl phenyl ether		PCB 26	PCB 93	PCB 165	PCB 200	
Bromoform	Naphthalene	Hexachlorobenzene		PCB 25	PCB 95	PCB 146	PCB 170	
Styrene	2,4-Dichlorophenol	Pentachlorophenol		PCB 31	PCB 91	PCB 188	PCB 190	
o-Xylene	4-Chloroaniline	Phenanthrene		PCB 50	PCB 56	PCB 153	PCB 199	
1,1,2,2-Tetrachloroethane	Hexachlorobutadiene	Anthracene		PCB 28	PCB 60	PCB 132	PCB 196	
1,2,3-Trichloropropane	1,2,3-Trichlorobenzene	Carbazole		PCB 20	PCB 92	PCB 105	PCB 203	
Isopropylbenzene	4-Chloro-3-methylphenol	Di-n-butylphthalate		PCB 33	PCB 84	PCB 141	PCB 189	
Bromobenzene	2-Methylnaphthalene	Bis(2-ethylhexyl) adipate		PCB 53	PCB 90	PCB 179	PCB 208	
2-Chlorotoluene	1-Methylnaphthalene	Fluoranthene		PCB 51	PCB 101	PCB 137	PCB 195	
n-Propylbenzene	Hexachlorocyclopentadiene	Pyrene		PCB 22	PCB 99	PCB 176	PCB 207	
4-Chlorotoluene	2,4,6-Trichlorophenol	Butylbenzylphthalate		PCB 45	PCB 119	PCB 130	PCB 194	
1,3,5-Trimethylbenzene	2,4,5-Trichlorophenol	Benz[a]anthracene		PCB 46	PCB 83	PCB 138	PCB 205	
tert-Butylbenzene	Diphenylamine	Chrysene		PCB 69	PCB 97	PCB 163	PCB 206	
1,2,4-Trimethylbenzene	Azobenzene	bis(2-Ethylhexyl)phthalate		PCB 52	PCB 117	PCB 164		

Sample Test Design

In efforts to execute a comprehensive evaluation of the chemical and biological composition of biogas, the sample set for the testing program should be representative of the various types of dairy farm operations and biogas production and cleanup technologies that are currently being used in North America. Consequently, several parameters were taken into account during the identification of candidate dairy farm sampling sites. The parameters included but were not limited to the types of manure collection systems used, beddings used for cows, location of the dairy farms, type of biogas production technology (e.g., digester, lagoon), type of biogas cleanup technology (if applicable), and other parameters that ensured the samples collected were representative of the various conditions for biogas production. GTI with support from Curt Gooch (an expert in the dairy farm industry and consultant to the project) identified over 20 candidate dairy farms that represented a broad range of the parameters discussed above. However quite a few of the dairy farms elected to not participate in the testing program. It should also be noted that it was difficult to identify sites that were producing biomethane of pipeline quality. Only five sites were identified (at time of projection of this report) in the U.S. that were currently producing or possessed the capability to produce biomethane of pipeline quality. GTI made numerous efforts to work with these dairy Farms and biogas companies, however although all parties supported the use of biogas as a renewable source of energy, most had reservations about participating in this GTI's Testing Program. As a result, only two sites were secured for the collection of pipeline quality biomethane samples.

As mentioned in the previous section, a survey was sent to the selected dairy farm sampling sites to collect additional information about each farm and their practices. However, only a limited number of farms returned the survey, therefore the results are not presented in this report because it would not give a complete and accurate depiction of the various dairy farm operations that were represented in this testing program. Nonetheless, GTI was able to secure dairy farm sampling sites that were located in the western, midwestern, and eastern regions of the U.S. In addition these dairy farms include the following types of operations and practices: various biogas production technologies (e.g., plug and flow digester, complete mix digester, covered lagoon), flush and scrape manure collection systems, farms that used different types of bedding ranging from hay to post-digested manure solids, and farms that used antibiotic/hormone free and organic farming practices. Several types of biogas clean-up technologies, ranging from iron impregnated wood chips for sulfur removal to systems specifically designed for producing pipeline quality biomethane, were also represented in the final set of sampling sites. Specific digester and cleanup technology information will not be disclosed in this report at the request of the host biogas producers and dairy farms. In total, the selected sampling sites included 14 different dairy farms across the U.S. Table 9 presents a summary of the dairy farms that participated in the testing program.

Several types of biogas samples were included in the sample design for this project: raw biogas, partially clean biogas and biomethane. Raw biogas is gas that has not been subjected to any type of treatment for removal of unwanted components; partially clean biogas is gas that has been subjected to limited treatment, typically for sulfur removal, and is commonly used for electricity generation; and biomethane is gas that has been subjected to an extensive upgrading process to produce pipeline quality biomethane. Additional sample types were included in the

design, such as natural gas and background ambient air from a dairy farm. These samples were included because of the limited data available on the biological materials that may be present within these types of samples or environments. Table 10 presents a summary of the samples collected. A more detailed description of the samples that were collected for the testing program is provided in the "Results" Section of this report.

Table 9. Summary of Dairy Farm Sampling Sites

Dairy Farm	Region	Biogas Production Technology	Samples Collected
Dairy Farm 1	Midwestern	plug and flow digester	raw biogas and biomethane
Dairy Farm 2	Western	complete mix digester	raw biogas and biomethane
Dairy Farm 3	Eastern	plug and flow digester	raw and partially clean biogas
Dairy Farm 4	Eastern	plug and flow digester	raw and partially clean biogas
Dairy Farm 5	Midwestern	plug and flow digester	raw and partially clean biogas
Dairy Farm 6	Western	covered lagoon	raw and partially clean biogas
Dairy Farm 7	Western	covered lagoon	raw and partially clean biogas
Dairy Farm 8	Midwestern	plug and flow digester	raw biogas
Dairy Farm 9	Eastern	plug and flow digester	raw biogas
Dairy Farm 10	Eastern	plug and flow digester	raw biogas
Dairy Farm 11	Eastern	plug and flow digester	raw biogas
Dairy Farm 12	Midwestern	plug and flow digester	raw biogas
Dairy Farm 13	Western	covered lagoon	raw biogas
Dairy Farm 14	Eastern	complete mix digester	raw biogas

Table 10. Summary of Samples Collected

Sample Type	Region Samples were Collected From	Samples Collected for Chemical Testing	Samples Collected for Biological Testing
Raw	Western, Eastern, and Midwestern	12 *(from 12 dairy farms)*	11 *(from 10 dairy farms)*
Partially Clean	Western, Eastern, and Midwestern	7 *(from 5 dairy farms)*	7 *(from 5 dairy farms)*
Biomethane	Western and Midwestern	23 *(from 2 dairy farms)*	22 *(from 2 dairy farms)*
Natural Gas	Midwestern	0	2 *(from one dairy farm and GTI Bio Lab)*
Air	Midwestern	0	1 *(from one dairy farm)*
Total	3 different U.S. regions	42	43

Materials and Methods

Field Sampling Overview

Sampling Team

The sampling team consisted of two primary field sampling technicians and four alternate field sampling technicians. At least two technicians were present for each sampling event and with the exception of a few sampling events one of the primary field sampling technicians was always present. The primary technicians consisted of a Chemist with 18 years of field sampling experience for the natural gas industry and an Environmental Scientist with 2 years of field sampling experience. In addition to the GTI sampling team, a consultant from META Environmental, with over ten years of environmental field sampling experience, also participated in the field sampling events.

Sampling Event Preparation

Prior to each sampling event, a survey was sent out to each farm to determine necessary equipment and tools that were needed for sampling. Each site required ample space for all necessary equipment, and access to a power outlet for pumps and a heated gas regulator, if necessary. Determining the size of the sampling port in advance was imperative to bringing the necessary attachments for sample collection.

A sampling date was scheduled and confirmed at least 3 days in advance for local farms and at least a week in advance for farms on the western and eastern regions of the U.S. to ensure sufficient access to the dairy farm and/or biomethane plant. However, discussions with the dairy farmers and biogas companies of the host sampling sites were held months in advance to appropriately plan for the sampling events. When sampling for only one type of gas, such as raw biogas or biomethane, GTI requested access to the site for at least eight hours per day to ensure that sampling for each type of analysis would be completed. When collecting a pair of samples such as a raw biogas sample and a biomethane sample from the same site, 1.5 days was needed to complete the sampling event. Each biogas digester and cleanup system if applicable was in full operation prior to sampling. For non-local farms (dairy farms located in the eastern or western regions of the U.S.), the sample trip was designed to include sampling from 2-4 different farms within the same region to maximize time and resources.

Due to the rapid degradation of sulfur, the samples collected specifically for sulfur analysis were sent to GTI overnight. Arrangements were made with the Federal Express facility nearest to the sampling site to either pick up the samples or have the package dropped off at a facility that accepted hazardous good packages. The biogas samples are considered hazardous materials therefore special packaging was required. Prior to the sampling event, the proper shipping materials were prepared, such as the hazardous goods declaration form, shipping labels, required labels and codes indicating the declared hazards, and 5-gallon cinched pail that was used to ship the Tedlar bag samples. The remaining samples were either shipped ground, or directly taken to GTI by the sampling team.

Setup

GTI constructed a sampling device to connect to the biogas or biomethane sampling port so that up to three samples could be taken simultaneously. Depending on the pressure of the line, all three ports were used to increase sampling efficiency. Typically the sampling line for the raw biogas had low pressure; therefore only one or two samples could be collected simultaneously. Therefore, when necessary, vacuum pumps were located downstream from the samples to draw biogas from the sampling line. The sampling line for the biomethane was typically at a high pressure (700 psi or greater) therefore a heated regulator was used to decrease the pressure to a level that was suitable for sampling. All connections utilized stainless steel, silicone, or Teflon tubing and all sampling ports were purged prior to sample collection. In addition, the following personal protection equipment was used by the sampling team during the sampling events; earplugs, gloves, and proper work boots.

Sampling Methods

The sampling methods are presented according to the design of the testing program. As described in the "
Potential Compounds of Concern in Biogas" section of this report, the chemical tests performed were grouped into two tiers: First Tier Chemical Testing and Second Tier Chemical Testing. The First Tier chemical testing sampling methods include collecting gas samples using Tedlar bags or stainless steel gas canisters as well as sorbent trap methods. Samples subjected to the Second Tier chemical testing were collected using only sorbent trap methods. Table 7 and Table 8 (presented previously in this report) contains a complete list of the various types of analyses performed (as well as the target compounds of concern) in the first and Second Tier chemical tests. The third set of analytical tests performed was biological testing which used a filtration sampling method. All of the sampling methods used for this project are presented in Appendix A.

Sampling Methods for First Tier Chemicals

Tedlar Bags and Stainless Steel Gas Canisters for Major Components, Extended Hydrocarbons, Sulfur, Halocarbons, and Siloxanes Sampling

Clean Tedlar bags or stainless steel gas canisters were used to collect samples for major components analysis, extended hydrocarbons, siloxanes, halocarbons and sulfur analysis. In the event that the line pressure was too low, a SKC Vac-U-Chamber™ connected to a sampling pump downstream was used to create a negative pressure to collect the sample. The line was purged and a piece of silicon tubing connected the line directly to the Tedlar bag (Figure 2) or to the SKC Vac-U-Chamber™ as shown in Figure 3. (The vacuum chamber is closed for actual sample collection.) An alternative technique to use for collecting biomethane samples from a high pressure line is to use inerted stainless steel cylinders that are rated to 1800 psia. The preferred technique for raw biogas samples or partially cleaned biogas samples is the Tedlar bag due to the high concentration of hydrogen sulfide present in raw biogas.

Figure 2. Tedlar Bag Sample Collection

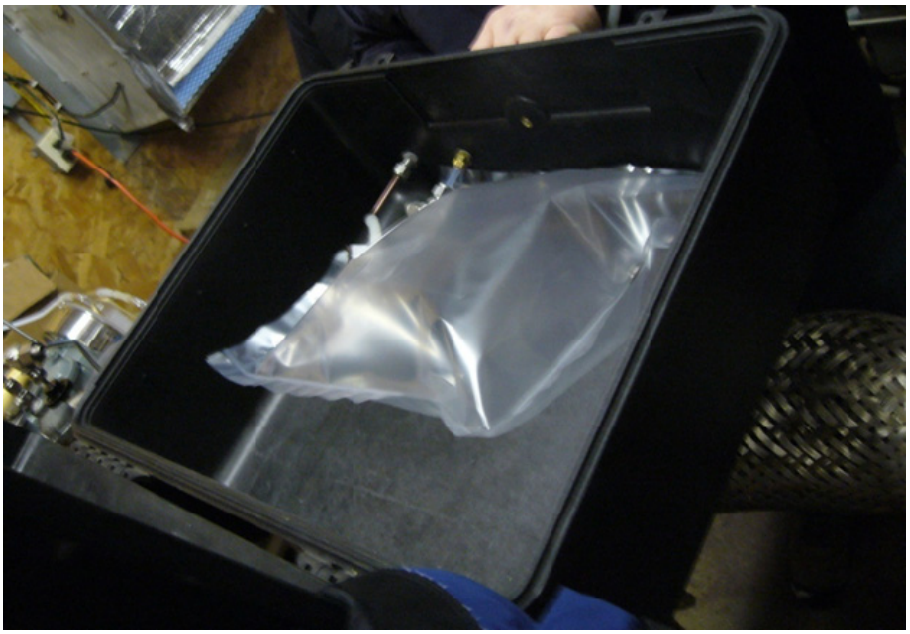

Figure 3. Tedlar Bag Sample Collection with Opened SKC Vac-U-Chamber™

Liquid Sorbent Method for Metals Sampling

Samples for volatile metals analysis were collected using a modified version of EPA Method 29 which uses a sampling train that consists of three glass impingers connected in series. The first two impingers each contained 100ml of a 5% HNO_3 (nitric acid)/10% H_2O_2 (hydrogen peroxide) liquid sorbent solution in deionized water. An empty third impinger was attached to the second impinger to prevent any accidental solution leakage. Sample biogas flowed thru the impingers and the metals sorbed into the solution. Downstream from the impingers was a dry test meter, followed by a pump if necessary, depending on the pressure from the sample line (Figure 4). After completion of sampling, the solution was transferred to separate bottles and rinsed using deionized water. A separate bottle contained 100ml of unused solution to use as a blank. The bottles were labeled and securely packed for transport to the laboratory.

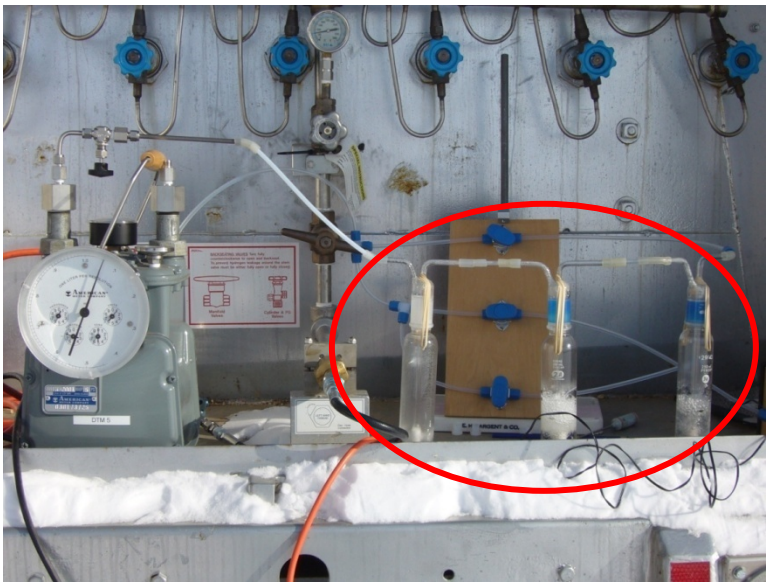

Figure 4. Volatile Metals (Impingers) Sample Collection

Sorbent Tubes for Mercury Sampling

Mercury samples were collected using gold plated beads packed in a glass tube and connected to a dry test meter which was used to determine the total sample volume. The dry test meter was connected to a sampling pump if necessary, depending on the pressure from the sample line (see Figure 5). After sampling the tubes were capped and protected from breakage. The flow rate on the dry test meter is determined by the number of rotations the meter completes in one minute (i.e. one rotation corresponds to 1L collected). A reading was taken before and after sample collection. The total volume was calculated by subtracting the final volume reading from the initial volume reading. For mercury and volatile metals, the flow rate was set to 1.0 – 2.0 L/min for 30 minutes to an hour.

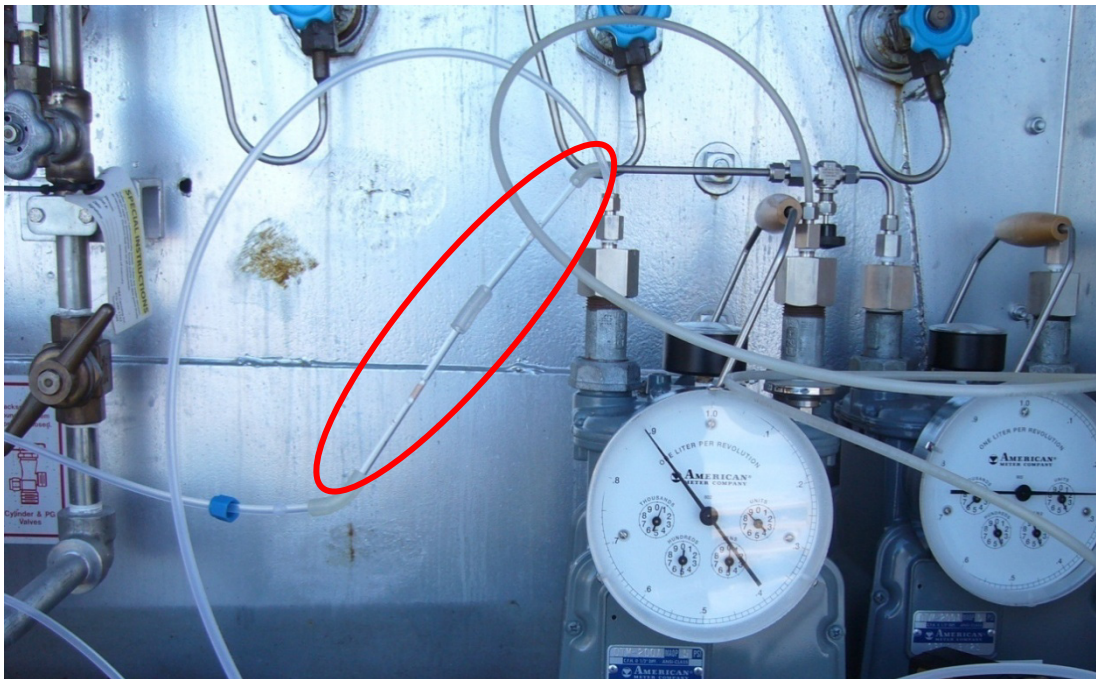

Figure 5. Mercury Sample Collection

Sampling Methods for Second Tier Chemicals

The Second Tier chemicals sampling methods used solid adsorbent traps coupled with sampling pumps to collect samples for the following types of analyses: semi-volatile/volatile organic compounds (SVOCs and VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and pharmaceuticals. Because of the wide range of target chemicals and expected concentrations in the biogas, several different trap/pump arrangements were developed to ensure that a sufficient amount of sample was collected for each type of analysis.

Sorbent Tubes for VOC/SVOCs, PAHs, PCBs, Pesticides, and Pharmaceuticals Sampling

XAD-2 resin packed in glass sample tubes was used to collect samples subjected to VOC/SVOCs, PAHs, PCBs, and pesticides analysis. These samples were collected using two XAD-2 sorbent tubes attached in series connected to a personal air pump capable of sampling up to 5 L/min and was set to flow at 2.0L/min for 4 hours to collect a total volume of approximately 480L (see Figure 6). Porapak-R sorbent packed in glass sample tubes were used to collect samples subjected to pharmaceutical analysis. These samples were collected using two Porapak-R sorbent tubes attached in series connected to a personal air pump capable of sampling up to 5 L/min and was set to flow at 1.0L/min for 4 hours to collect a total volume of approximately 240L (see Figure 6).

The sampling pumps used for the Second Tier chemical testing were calibrated prior to each use. The pumps were calibrated by using two representative sorbent tubes attached in series and connected to the pump. The pump was calibrated to provide the required flow based on the parameters to be sampled. The calibrated flow for the pump and start time was noted. At the end of the sampling event the pump flow was checked and recorded in the same manner in which the pump was calibrated. The total volume of the samples was calculated by determining the average flow of the pump used to collect the sample and the sampling duration. During sampling the sorbent tubes were covered with aluminum foil to prevent photodegradation. At the completion of the sampling event, the sorbent tubes were capped to prevent any sorption of contaminants from ambient air during transportation and storage.

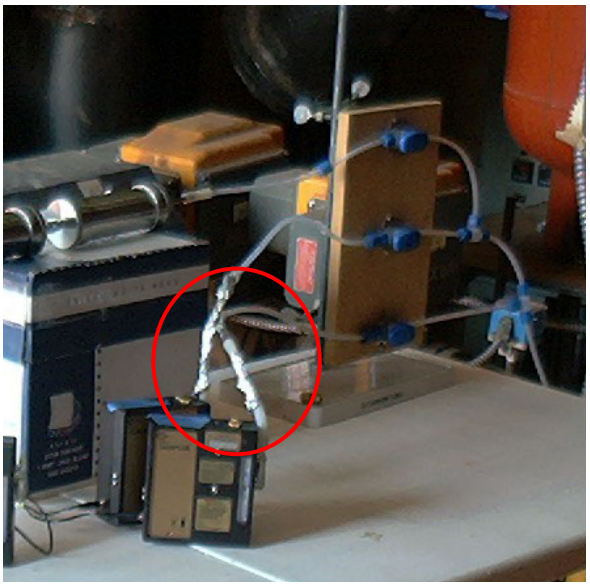

Figure 6. Porapak & XAD-2 Sorbent Tubes Sample Collection

Sampling Method for Biological Testing

The biological samples were collected using two connected stainless steel pressure filtration funnels. A PTFE gas filter was placed inside of each funnel. Approximately 400 L of gas sample was allowed to pass through the first funnel with 2.0 µm pore size filter followed by the second funnel which contained a 0.2 µm pore size filter (see Figure 6). After sampling, using tweezers, sterilized with ethanol, the filters were folded in half with the sample side inward and placed in clean and separate plastic zip-lock bag. Between sampling, the filtration funnel was rinsed with ethanol and air dried on a clean surface. This filter combination was used on all farms with the exception of samples that were collected at Dairy Farm 2. A 1 µm and a 0.2 µm filter combination was used to collect samples for biological testing at Dairy Farm 2; however, these filters were placed directly on-line in a biomethane production system. A slip stream of biomethane was allowed to flow through these filters for 1 week sampling time which resulted in approximately 240L – 330L biomethane passing through the filters.

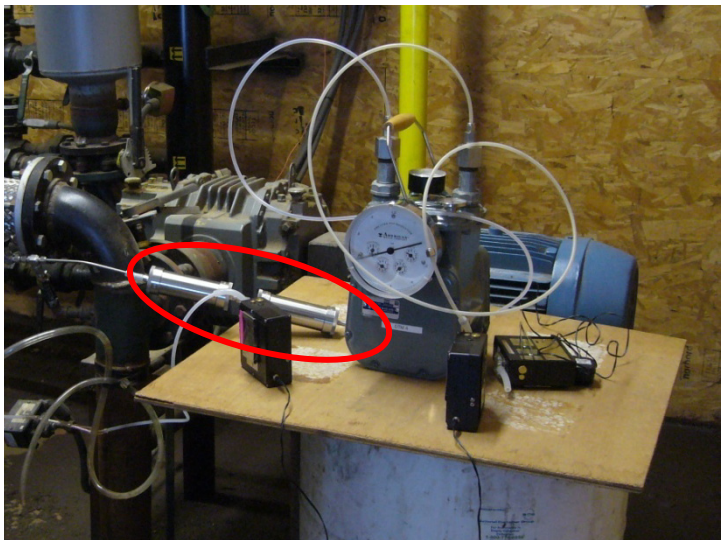

Figure 7. Biological Sample Collection

Shipping

The First Tier chemical samples that were sampled in Tedlar bags or stainless steel cylinders were shipped overnight to GTI using proper hazardous materials packaging. The remaining First Tier chemical samples were shipped to GTI or hand carried to the laboratory. The Second Tier chemical samples and the biological samples were packed on ice and shipped to GTI or hand carried to the laboratory.

QA/QC

All dairy biogas samples were shipped under proper chain of custody (COC) documentation. For the semi-volatile and non-volatile organic compounds collected using XAD-2 sorbent tubes, an unopened sorbent tube were submitted to the laboratory for analysis as a resin media blank sample with each batch. Duplicate samples were collected at a rate of 1 per 5 field samples. If not able to be collected at the same time duplicate samples will be collected sequentially.

When multiple samples were collected simultaneously, the sampling equipment was setup such that the flow at each location was unaffected by the sample collection at each sample port in the multi-sampling device GTI designed for this project. Field notes were also recorded in a field notebook specific for this project. Site-specific information including, but not limited to, the type of dairy farm, digester, gas conditioning equipment, process flows and pressures, ambient temperature, digester internal temperature, relative humidity, time, interruptions and difficulties encountered, were recorded by the field technician.

Analytical Methods

Two types of analyses were performed on the samples, chemical and biological. The chemical tests were grouped into two tiers. The ***First Tier chemical tests*** included the following types of analyses:

- Major Components via ASTM D1945/1946 Standard Test Method for Analysis of Natural Gas by Gas Chromatography / Standard Practice for Analysis of Reformed Gas by Gas Chromatography
- Expanded Hydrocarbons via Gas Chromatography/Flame Ionization Detection
- Sulfur via ASTM D6228 Standard Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Flame Photometric Detection
- Halocarbons via Gas Chromatography/Electrolytic Conductivity Detection
- Siloxanes via Gas Chromatography/Atomic Emission Detection
- Mercury via ASTM D5954 Standard Test Method for Mercury Sampling and Measurement in Natural Gas by Atomic Absorption Spectroscopy
- Metals via EPA Method 29 (modified) Determination of Metals Emissions from Stationary Sources

The ***Second Tier chemical tests*** consisted of the following types of analyses:

- Volatile Organic Compounds (VOCs), Semi-volatile organic compounds (SVOCs) and Polycyclic Aromatic Hydrocarbons (PAHs) via EPA Method 8270C Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry
- Polychlorinated Biphenyls (PCBs) via EPA Method 8082 Polychlorinated Biphenyls by Gas Chromatography
- Pesticides via EPA Method 8081 Organochlorine Pesticides by Gas Chromatography
- Pharmaceuticals via Liquid Chromatography Mass Spectrometry

The ***biological testing*** included the following types of analyses:

- Quantitative Polymerase Chain Reaction (qPCR), a genetic technique that allows for the direct detection and quantification of total (live and dead) heterogenous bacteria and various corrosion causing bacteria[20]
- Most Probable Number (MPN) determination of total live bacteria (this traditional microbiological method does not account for the presence of dead bacteria)
- Spores enumeration via modified National Aeronautics and Space Administration (NASA) Protocol for Spore Testing NHB 5340.1D [21,22]

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[20] Zhu, X.Y., et al., *Rapid detection and quantification of microbes related to microbiologically influenced corrosion using quantitative polymerase chain reaction.* Corrosion, 2006. **62**: p. 950-955.
[21] NASA, *Procedures and Guidelines NPG: 5340.1D NASA standard procedures for the microbial examination of space hardware*.

- Spore identity determination via published genetic methods[23]

Table 11 presents a summary of all the sampling and analytical methods used for this project. Most of the methods used are based on existing American Society for Testing and Materials (ASTM), National Institute for Occupational Safety and Health (NIOSH), or Environmental Protect Agency (EPA) methods. GTI developed and patented biological testing methods, which were based on a common and referenced molecular biological technique, specifically for the quantification of total heterogenous bacteria and various corrosion causing bacteria.

[22] Yung, P.T., M.J. Kempf, and A. Ponce. *A Rapid Single Spore Enumeration Assay*. in *IEEE Aerospace Conference 2006, IEEEAC paper #1029*. 2006.
[23] Zhu, X.Y., J. Lubeck, and J.J. Kilbane, II, *Characterization of microbial communities in gas industry pipelines.* Appl Environ Microbiol, 2003. **69**(9): p. 5354-5363.

Analysis	Sampling Method Reference(s)	Sampling Material	Instrument/ Analytical Method	Analytical Lab
Major Components	GTI SOP for Tedlar Bag or Inerted Cylinder Sampling	5 L Tedlar bag or Inerted Stainless Steel Cylinder	ASTM D1945/D1946	GTI
Extended Hydrocarbons			GC/FID	
Sulfur			ASTM D6228	
Halocarbons			EPA TO-14 GC/ELCD	
Siloxanes			GC/AED	
VOCs/SVOCs/PAHs	Mod NIOSH 5515	XAD-2 resin	GC/MS/ EPA Method 8270C	META Environmental
PCBs	Mod NIOSH 5503		GC/ECD or GC/MS EPA Method 8082	
Pesticides	Mod NIOSH 5600/5601		GC/ECD or GC/MS EPA Method 8081	
Exploratory analyses	Mod NIOSH 5515, 5503,5600/5601		GC/MS	
Pharmaceuticals/ Animal care products	META analytical method	Porapak-R	LC/MS	
Mercury	ASTM D5954	Gold plated silica beads	AAS ASTM D5954	GTI
Metals	EPA Method 29 modified	Nitric acid and Peroxide aqueous solutions	ICP	
Biologicals	GTI SOP	2 µm and 0.2 µm filters	MPN, qPCR, spore enumeration (NHB 5340.1D) and identification	GTI

Table 11. Summary of Sampling and Analytical Methods Used By GTI for Task 2 Testing

Results and Discussion

Samples Collected

Several types of biogas were sampled for this project, raw biogas, partially clean biogas and biomethane. Raw biogas is gas that has not been subjected to any type of treatment for removal of unwanted components; partially clean biogas is gas that has been subjected to limited treatment, typically for sulfur removal, and is commonly used for electricity generation; and biomethane is gas that has been subjected to an extensive upgrading process to produce pipeline quality biogas. *In addition, one ambient air sample was collected from a building that houses a biogas clean-up system at Dairy Farm 1 and two natural gas samples were collected, one from Dairy Farm 5 and one from the GTI Biology Lab. The air and natural gas samples were only subjected to biological testing.*

The number of samples between the chemical and biological tests slightly varied due to external factors, such as weather conditions, during the sampling events. In some cases, samples were not able to be collected for both types of tests. In total, 42 samples were collected for chemical testing and 43 samples were collected for biological testing from 14 different dairy farms across the U.S. A summary of the type of samples collected and the corresponding sampling location is presented in Table 12.

Out of 14 dairy farms, five farms were located in the Midwestern region, five farms were located in the Eastern region, and four farms were located in the Western region of the U.S. Most farms provided one raw biogas sample for chemical and biological testing; however, only five farms provided 1-2 partially clean biogas samples for testing. All the biomethane samples for the testing program were collected from two farms, one in the Midwest and another in the West.

Table 12. Description of Samples Collected at each Dairy Farm

Dairy Farm	Region	Manure Collection System	Biogas Production Technology	Raw Biogas Samples Collected		Partially Clean Biogas Samples Collected		Biomethane Samples Collected	
				Chemical Testing	Biological Testing	Chemical Testing	Biological Testing	Chemical Testing	Biological Testing
Dairy Farm 1	Midwestern	scrape	plug and flow digester	1	1	0	0	10	9
Dairy Farm 2	Western	scrape	complete mix digester	1	0	0	0	13	13
Dairy Farm 3	Eastern	scrape	plug and flow digester	1	1	2	2	0	0
Dairy Farm 4	Eastern	scrape	plug and flow digester	0	0	1	1	0	0
Dairy Farm 5	Midwestern	scrape	plug and flow digester	0	0	2	2	0	0
Dairy Farm 6	Western	flush	covered lagoon	1	1	1	1	0	0
Dairy Farm 7	Western	flush	covered lagoon	1	1	1	1	0	0
Dairy Farm 8	Midwestern	scrape	plug and flow digester	1	2	0	0	0	0
Dairy Farm 9	Eastern	scrape	plug and flow digester	1	1	0	0	0	0
Dairy Farm 10	Eastern	scrape	plug and flow digester	1	1	0	0	0	0
Dairy Farm 11	Eastern	scrape	plug and flow digester	1	1	0	0	0	0
Dairy Farm 12	Midwestern	scrape	plug and flow digester	1	1	0	0	0	0
Dairy Farm 13	Western	flush	covered lagoon	1	1	0	0	0	0
Dairy Farm 14	Eastern	scrape	complete mix digester	1	0	0	0	0	0
Total				12	11	7	7	23	22

Results for Raw Biogas Samples

First Tier Chemical Testing

Raw Natural Gas vs. Raw Biogas

Raw natural gas can be classified into three categories: 1) Raw natural gas that is extracted from oil wells is called "associated" or casing head gas, 2) Gas well gas is gas removed from natural gas wells, 3) Natural gas mixed with liquid hydrocarbons, found in condensate wells, is known as condensate well gas.[24] In this project, we compared the content of the most common compounds in raw natural gas with that found in 12 raw biogas samples collected from 12 different dairy farms throughout the U.S. (see Table 12). Table 13 shows that the light hydrocarbons such as ethane and propane are typically present in raw natural gas and contribute to the burning characteristic of natural gas which is typically indicated by its Wobbe index. In contrast, the major components in raw biogas aside from methane, are CO_2 and N_2 gas, two major metabolic byproducts of anaerobic digestion, though the variation from sample to sample was found to be significant. Hydrogen sulfide is also a significant component in raw biogas compared to raw natural gas.

Table 13. Raw Natural Gas[25] vs. Raw Biogas[26]

Compound	Casing head (Wet) Gas Mol%	Gas Well (Dry) Gas Mol%	Condensate Well Gas Mol%	Average Mol%	Min Mol %	Max Mol%
	Raw Natural Gas			Raw Biogas Samples		
Carbon Dioxide	0.63	-	-	35.48	28.57	40.4
Nitrogen	3.73	1.25	0.53	3.08	0.64	12.67
Hydrogen Sulfide	0.57	-	-	0.31	0.148	0.66
Methane	64.48	91.01	94.87	60.4	49.03	68.6
Ethane	11.98	4.88	2.89	< 0.002	< 0.002	< 0.002
Propane	8.75	1.69	0.92	< 0.002	< 0.002	< 0.002
Iso-Butane	0.93	0.14	0.31	< 0.002	< 0.002	< 0.002
n-Butane	2.91	0.52	0.22	< 0.002	< 0.002	< 0.002
Iso-Pentane	0.54	0.09	0.09	< 0.002	< 0.002	< 0.002
n-Pentane	0.8	0.18	0.06	< 0.002	< 0.002	< 0.002
Hexanes	0.37	0.13	0.05	< 0.0001	0.0001	0.0002
Heptanes plus	0.31	0.11	0.06	0.0003	0.0001	0.0004

[24] Gas Distribution Self-Study Course. CD-ROM, Gas Technology Institute: Des Plaines, IL, 2005.
[25] Foss, Michelle Michot. Interstate Natural Gas - Quality Specifications & Interchangeability. Sugarland, TX: Center for Energy Economics, 2004.
[26] Data presented in Table 13 is reported in mole percent which is equivalent to 100 times the mole fraction of the compound

Gas Properties

As discussed in the "Analytical Methods" Section of this report, the First Tier chemical tests include seven types of analyses. In addition to these analyses, several major gas property values were calculated for each biogas sample and are summarized in Table 14. The gross heating value of raw biogas varied from 497 Btu/scf to 697 Btu/scf, with an average value of 615 ± 55 Btu/scf , which is much lower than the typical tariff heating values of natural gas (minimum values range from 900 – 1000 Btu/scf and maximum values range from 1075 – 1200 Btu/scf) [27].

Table 14. Average Gas Properties from 12 Raw Biogas Samples

Sample Type	Average Value	Standard Deviation	Min Value	Max Value
Compressibility Factor [z] (Dry)	0.9970	0.000207	0.99675	0.9973
Compressibility Factor [z] (Sat.)	0.9966	0.000216	0.9964	0.9970
Specific Gravity	0.9176	0.042027	0.8	0.9665
Gross HV (Dry) (Btu/ft^3)	615.3	54.9	497.7	697.1
Gross HV (Sat.) (Btu/ft^3)	604.8	53.9	489.2	685.2
Wobbe Index	643.9	71.75	506.3	758.6
Net HV (Dry) (Btu/ft^3)	554.0	49.4	448.1	627.7
Net HV (Sat.) (Btu/ft^3)	544.6	48.6	440.482	617.0
Real Gas Density (lbs/ft^3)	0.070	0.0032	0.06462	0.074

[27] American Gas Association. Transmission Measurement Committee. AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008

Major Components

Natural gas samples are typically analyzed for methane, carbon dioxide, oxygen, and a handful of other compounds that are included in the major components analysis that GTI routinely performs on natural gas samples. This analysis is performed using method ASTM D1956/1946 and includes 29 target compounds. The results from the Major Component Analysis are presented in mole percent. Table 15 includes only the compounds that had observed concentrations above the method detection limit. For example, of the 12 raw biogas samples tested, only 11 raw biogas samples contained hydrogen sulfide above the method detection limit with an average concentration of 0.3085% ± 0.1473%. The compounds analyzed but not presented in Table 15 had concentrations below the detection limit for all 12 raw biogas samples. A full profile of the analytical results for this analysis is presented in Appendix B.

Table 15. Results from Major Components Analysis for 12 Raw Biogas Samples

Compound	Detection Limit (Mol%)	Samples Above Detection Limit	Average (Mol%)	Standard Deviation	Min (Mol%)	Max (Mol%)
Carbon Dioxide	0.03	12	35.5	4.17	28.57	40.39
Oxygen/Argon	0.03	12	0.74	0.82	0.22	2.94
Nitrogen	0.03	12	3.08	3.46	0.64	12.67
Methane	0.002	12	60.42	5.40	49.03	68.58
Hexane Plus	0.0001	7	0.0002	0.0001	0.0001	0.0004
Ammonia	0.001	1	0.004	NA	0.004	0.004
Hydrogen Sulfide	0.000005	11	0.3085	0.1473	0.148	0.6570
Carbonyl Sulfide	0.000005	12	0.000154	0.0001	0.000034	0.000409

Sulfur Compounds

As indicated in Table 15 hydrogen sulfide is a significant component in raw biogas and a thorough speciation analysis was performed on 12 raw biogas samples to identify the species of sulfur compounds as shown in Table 16. The raw biogas samples tested had an average total sulfur concentration of 2832 ppmv (168 grains/100 scf) with a range from 0.34 ppmv (0.02 grains/100scf) to 6580 ppmv (390 grains/100 scf). While the major sulfur species is hydrogen sulfide for almost all of samples analyzed, most of the samples also contain other sulfur compounds in various quantities such as sulfur dioxide, carbonyl sulfide, mercaptan, etc. It should be noted that one raw biogas sample collected from Dairy Farm 1 contained an unusually low amount of total sulfur, 0.02015 grains/100scf. No explanation for this low concentration has been confirmed but the weather conditions on that day were very unfavorable for sample collection. The recorded ambient temperature during this specific sampling event was -8°C therefore it is possible that the integrity of the sample was compromised. ***If this sample is removed from the raw biogas data set, then the new calculated average for total sulfur concentration would be 182 grains/100 scf.*** Unlike the average total sulfur concentration

observed from the raw biogas samples, the total sulfur concentrations typically found in pipeline tariffs are much lower and range form 0.5 - 20 grains/100 scf [28].

Table 16. Results from Sulfur Analysis for 12 Raw Biogas Samples

Compound	Detection Limit (ppmv)	Samples Above the Detection Limit	Average (ppmv)	Standard Deviation	Min (ppmv)	Max (ppmv)
Hydrogen Sulfide	0.05	11	3085	1473	1480.00	6570
Sulfur Dioxide	0.05	10	1.31	2.36	0.07	7.73
Carbonyl Sulfide	0.05	12	1.54	1.05	0.34	4.09
Carbon Disulfide	0.05	3	0.09	0.072	0.03	0.17
Methyl Mercaptan	0.05	11	2.00	2.01	0.25	6.12
Ethyl Mercaptan	0.05	11	0.20	0.072	0.07	0.30
i-Propyl Mercaptan	0.05	11	0.55	0.39	0.09	1.35
n-Propyl Mercaptan	0.05	4	0.08	0.012	0.06	0.09
t-Butyl Mercaptan	0.05	4	0.27	0.242	0.05	0.60
Dimethyl Sulfide	0.05	9	0.30	0.321	0.09	0.32
Dimethyl Disulfide	0.05	1	0.32	NA	0.32	0.32
Diethyl Disulfide	0.05	1	0.15	NA	0.15	0.15
Thiophene	0.05	7	0.15	0.068	0.25	0.26
Total Sulfur (ppm)	NA	12	2832	1665	0.34	6580
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	NA	12	168	98	0.02	390

[28] American Gas Association. Transmission Measurement Committee. AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008

Metals

Only nine samples were collected for volatile metals analysis which included the detection of six different metals - arsenic, cadmium, copper, lead, molybdenum and selenium. Of those nine samples, only two samples had one metal each with concentrations above the detection limit. One sample was collected from Dairy Farm 13 located on the west coast. It had a copper concentration of 60 $\mu g/m^3$. The other sample was collected from Dairy Farm 9 on the east coast had a molybdenum concentration of 2 $\mu g/m^3$ and a mercury concentration of 0.02 $\mu g/m^3$. The remaining 10 raw biogas samples had reported mercury concentrations below the detection limit. The results from the metals and mercury testing are presented in Appendix B.

Halocarbons, Extended Hydrocarbons and Siloxanes

The raw biogas samples were also subjected to testing for halocarbons (31 target compounds), extended hydrocarbons (30 target compounds) and siloxanes (nine target compounds). The results from the halocarbon and siloxane testing were all below the detection limit. Trace amount of various compounds were found in seven of the raw biogas samples during the extended hydrocarbon testing, all in the single digit ppmv range. All of the data for the raw biogas samples is presented in Appendix B.

Second Tier Chemical Testing

The Second Tier chemical tests include analysis of the following four groups of compounds:

1. Volatile/semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (115 target compounds)
2. Pesticides (20 target compounds)
3. Polychlorinated biphenyls (144 target compounds)
4. Pharmaceuticals (11 target compounds)

Ten raw biogas samples were collected for the Second Tier chemical testing and each sample was subjected to the four groups of analysis. The estimated detection limits for the Second Tier chemical testing is calculated specifically for each target compound and varies for each individual sample. The detection limits for the Second Tier chemical tests are presented in Appendix F.

Volatile and Semi-Volatile Organic Compounds

Volatile organic compounds and SVOCs were tested using EPA Method 8270C. Results indicated that all ten raw biogas samples possessed low concentrations of VOCs/SVOCs. Of all 115 target compounds tested, 34 compounds were present in concentrations above the minimum detection limit as shown in Table 17. The concentrations of each compound varied significantly among different raw biogas samples, indicated by the high standard deviation values. Of interest, the maximum concentration of any one compound observed from the total 115 target compounds tested for the entire set of raw biogas samples was 147.26 ppbv or 0.147 ppmv of toluene (Dairy Farm 13). The OSHA REL (Occupational Safety & Health Administration Recommended Exposure Limit) for toluene is 200 ppm and the National Institute for Occupational Safety and Health (NIOSH) REL is 100 ppm. Therefore, the observed concentration for toluene in the raw biogas sample is 3 orders of magnitude lower than both NIOSH and OSHA recommended exposure limits. The compounds that were detected in every raw biogas sample were benzene, toluene, and bis(2-Ethylhexyl)phthalate. Benzene, toluene, xylene and ethylbenzene (BTEX) are compounds typically associated with petroleum products which may be used in farming operations. Phthalates are man-made plasticizer compounds ubiquitously used in many common consumer products. Other VOCs/SVOCs frequently detected in raw biogas are ethylbenzene, p-Isopropyltoluene, m/p-xylenes, carbon tetrachloride, o-xylene, 1,2,4-trimethylbenzene, 3,4-methylphenol (o,p-cresol), di-n-butylphthalate, 1,3,5-trimethylbenzene, phenol, sec-butylbenzene, and naphthalene. The complete set of analytical data for the VOCs/SVOCs analysis is presented in Appendix C.

Table 17. Results from VOCs/SVOCs Analysis for 10 Raw Biogas Samples

Compound	Samples Above Detection Limit	Average (ppbv)	Standard Deviation	Min (ppbv)	Max (ppbv)
Benzene	10	4.20	4.17	1.07	13.65
Carbon Tetrachloride	8	1.30	0.36	0.87	1.93
Pyridine	1	1.49	NA	1.49	1.49
Toluene	10	43.27	44.64	11.63	147.26
1,1,2-Trichloroethane	4	31.62	14.74	20.20	52.82
Tetrachloroethene	2	1.26	0.25	1.09	1.44
Ethylbenzene	9	10.94	10.53	2.12	33.81
m/p-Xylenes	8	9.80	15.12	1.01	44.67
Styrene	1	0.45	NA	0.45	0.45
o-Xylene	8	7.86	11.75	0.65	34.22
Isopropylbenzene	3	3.56	3.42	0.68	7.35
n-Propylbenzene	4	5.74	5.28	0.99	11.03
1,3,5-Trimethylbenzene	7	4.72	5.27	1.15	13.58
tert-Butylbenzene	3	3.26	2.03	0.93	4.65
1,2,4-Trimethylbenzene	8	12.02	17.51	0.67	41.53
sec-Butylbenzene	6	3.83	4.79	0.37	13.36
Phenol	6	9.68	9.97	2.00	28.14
Aniline	2	21.34	6.85	16.50	26.18
2-Chlorophenol	2	0.85	0.45	0.53	1.17
p-Isopropyltoluene	9	3.26	2.53	0.54	8.17
Benzyl Alcohol	3	5.08	7.52	0.46	13.76
3,4-Methylphenol (o,p-cresol)	7	17.97	31.48	0.54	82.07
bis(2-chloroisopropyl)ether	1	3.35	NA	3.35	3.35
n-Butylbenzene	5	3.55	4.27	0.63	10.99
N-nitroso-di-n-propylamine	1	0.68	NA	0.68	0.68
Nitrobenzene	2	0.55	0.03	0.53	0.57
Naphthalene	6	1.62	0.92	1.02	3.47
2-Methylnaphthalene	3	2.20	2.68	0.43	5.28
1-Methylnaphthalene	1	3.08	NA	3.08	3.08
Diethylphthalate	1	0.21	NA	0.21	0.21
Phenanthrene	1	1.09	NA	1.09	1.09
Di-n-butylphthalate	8	0.75	0.25	0.42	1.06
Fluoranthene	1	0.43	NA	0.43	0.43
bis(2-Ethylhexyl)phthalate	10	0.39	0.14	0.21	0.65

Pesticides

Pesticides were analyzed using EPA Method 8081. Twenty different pesticides were included in GTI's testing program, based on dairy farm surveys and information gathered from literature and dairy farm professionals (Table 8). Testing of the raw biogas samples for pesticides indicated that most of samples did not contain pesticides with concentrations above the detection limit (Table 18). The maximum observed concentration of any one pesticide from the entire pesticides analysis for the raw biogas samples was 0.047 ppbv of methoxyclor which was from a sample collected at Dairy Farm 3. The OSHA REL for methoxychlor is 1062 ppb, which is 4 orders of magnitude higher than the maximum observed concentration in the raw biogas samples. The complete set of analytical data for the pesticides is presented in Appendix C.

Table 18. Results from Pesticides Analysis for 10 Raw Biogas Samples

Compound	Samples Above Detection Limit	Average (ppbv)	Standard Deviation	Min (ppbv)	Max (ppbv)
Heptachlor	1	0.0133	NA	0.0133	0.0133
Heptachlor epoxide	1	0.0133	NA	0.0133	0.0133
Endosulfan I	1	0.0015	NA	0.0015	0.0015
Endrin	1	0.0012	NA	0.0012	0.0012
4,4'-DDD	1	0.0014	NA	0.0014	0.0014
Endrin aldehyde	2	0.0041	0.0025	0.0013	0.0059
4,4'-DDT	2	0.0129	0.0041	0.0077	0.0158
Methoxychlor	3	0.0198	0.0237	0.00381	0.0471

Polychlorinated Biphenyls (PCBs) and Pharmaceuticals

The raw biogas samples were also subjected to testing for PCBs and pharmaceuticals. The results from these tests were all below the detection limit for each raw biogas sample. The analytical data for these tests is presented in Appendix C.

Biological Testing

Eleven raw biogas samples from 10 dairy farms in the midwestern, eastern and western regions of the U.S. were collected for biological testing. However, one raw biogas sample was compromised during sample preparation therefore only ten raw biogas samples were subjected to biological testing. In addition two natural gas samples and one indoor air sample was collected. One natural gas sample was collected from Dairy Farm 5 from a pipeline that delivers natural gas to an electric generator, however it is unclear as to the history of the pipeline usage, and specifically it is not known whether this pipeline had been previously used for delivering biogas to the generator as well. The other natural gas sample was collected from a natural gas line within GTI's environmental laboratory. The indoor air sample was collected from a building that housed the biogas clean up unit at Dairy Farm 1. Several tests were performed to determine the following characteristics for each sample:

- The number of total (live and dead) microbes, including heterogenous bacteria, various corrosion causing bacteria (acid-producing bacteria, iron oxidizing bacteria, and sulfate-reducing bacteria) and methanogens
- The number of live bacteria
- The number of spores
- The identity of spores

Table 19 summarizes the results from the biological analyses on 10 raw biogas samples. The live bacteria and spores were determined by inoculating samples (phosphate buffer saline suspension of filter) to the appropriate bacteria medium and then incubating the cultures at 37 ºC for a pre-determined time period. The data from this test is reported as colony-forming unit (CFU) per 100 scf of gas. For the purposes of simplification of results, methanogens (Archaea domain) will be reported with total bacterial counts. Total bacteria and total corrosion-causing bacteria, which include both dead and live bacteria on the original filter sample, were determined using a referenced and widely used genetic method, quantitative polymerase chain reaction (qPCR) by targeting specific genes present in the target microorganisms. This resulting data is reported as number per 100 scf of gas. Similar reporting of results from analysis of the natural gas samples and the ambient air sample are also included in the Table.

The results from the genetic quantification of the filter samples indicate how many heterogeneous bacteria are generated by anaerobic digestion and have remained in the raw biogas stream, alive or dead. Acid-producing bacteria (APB), iron oxidizing bacteria (IOB), and sulfate-reducing bacteria (SRB) are major corrosion-causing bacteria, and the genetic tests that target this group of bacteria indicate that microbes originating from the anaerobic digestion process may pose a pipeline corrosion risk if the raw biogas is not sufficiently treated for microbe removal. The results in Table 19 indicate that raw biogas samples had an average of 2.72E+06 heterogeneous bacteria per 100 scf with a range of 5.81E+05 to 3.8E+07 per 100 scf which was carried over from the anaerobic digestion process. In terms of more specific groups of bacteria, most raw biogas samples also contained two major types of corrosion-causing bacteria - APB and IOB, with an average of 1.82E+04 and 2.52E+03, respectively. SRB was detected only in one raw biogas sample, indicating that SRB generally cannot survive in the anaerobic digestion environment during biogas production.

Anaerobic digestion is a process of harnessing the ability of microbes to degrade carbon sources for the purposes of producing methane; bacteria and microbes are foundational to the process of methane production. Four possibilities may account for the presence of dead microbes in the raw biogas; 1) Dead microbial bodies are passed from the original biomass material (manure, etc.) through digester and into the resulting biogas, 2) Live microbes entering the digester were killed through the digester process and were carried into the resulting biogas, 3) Live microbes present in the digester (liquid phase) are carried to the resulting biogas, but do not survive, and, 4) Live microbes originating from the digester and entrained in the raw biogas, are killed as they are trapped on the sample filter (succumb to desiccation). Of these possibilities, drying of microbes (Number 4) is most likely. Therefore, the live bacteria or spores in raw biogas Table 19 only represent a small portion of microorganisms which had originally survived the entire process from biogas production to sampling. Live bacteria, both aerobes or anaerobes, were detected in all ten raw biogas samples.

Table 19. Results from Biological Testing for 10 Raw Biogas Samples

	Live Aerobic Bacteria	Live Anaerobic Bacteria	Viable Spores	Total Bacteria	Total Acid-producing Bacteria	Total Iron-oxidizing Bacteria	Total Sulfate-reducing Bacteria
	CFU/100 scf or #/100 scf						
Mean	404.09	145.45	536.89	2.72E+06	1.82E+04	2.52E+03	1.10E+02
Standard Deviation	2.75	1.86	1.74	3.14	3.30	1.66	NA
Minimum	98.20	87.50	248.20	5.81E+05	1.23E+03	1.02E+03	1.10E+02
Maximum	2106.90	595.20	851.06	3.80E+07	6.03E+04	5.09E+03	1.10E+02
Samples above Detection Limit	10	8	4	10	9	8	1
Natural Gas from Dairy Farm 5	924.7	82.2	616.4	3.5E+06	BDL	4.3E+03	BDL
Natural Gas from GTI Lab	negative	negative	not detected	6.5E+05	1.4E+04	BDL	BDL
Air from Dairy Farm 1	Negative	41.3	not detected	7.9E+05	2.3E+03	BDL	BDL

Spore testing was also performed on the raw biogas samples. Only four of the ten raw biogas samples tested positive for the presence of spores. These samples were collected from 2 dairies (Dairy Farms 1 and 8) in the Midwest and 2 dairies (Dairy Farms 9 and 10) in the East. Four samples contained an average spore number of 537 spores /100 scf. A preliminary screening was performed on the spores to determine the identity of the spores, for the purposes of identifying potential spore-forming pathogens. The majority of spores were identified as *Bacillus licheniformis*, and other *Bacillus* species through Genbank testing. Specific pathogenic species were not queried. Bacillus is a rod-shaped gram-positive usually aerobic bacteria producing endospores and including many saprophytes and some parasites[29]. There are many strains and species of *Bacillus* and they are ubiquitous in the environment. Some strains of *Bacillus*, as well as many other strains of bacteria, can be potentially pathogenic, producing enterotoxins[30].

[29] http://www.merriam-webster.com/dictionary/bacillus

[30] Vinnerås, B., C. Schönning, and A. Nordin, *Identification of the microbiological community in biogas systems and evaluation of microbial risks from gas usage.* Science of the Total Environment, 2006. **367**: p. 606-615.

Results for Partially Clean Biogas Samples

A total of seven partially clean biogas samples were collected from five dairy farms in the western, midwestern, and eastern regions of the U.S. The biogas upgrading systems at these farms vary from water scrubbers to sulfur removal systems such as iron impregnated wood chips. The biogas at these farms is typically used for onsite electricity generation.

First Tier Chemical Testing

Gas Properties

The average gas property values for the partially clean biogas samples were calculated from the First Tier Chemical analyses and are summarized in Table 20. The partially clean biogas samples have an average heating value of 599 Btu/ft^3 with a range from 387 Btu/ft^3 to 700 Btu/ft^3. The average value is only slightly lower than that observed from the raw biogas samples but much lower than the heating value typically associated with natural gas (minimum values range from 900 – 1000 Btu/scf and maximum values range from 1075 – 1200 Btu/scf) [31].

Table 20. Average Gas Properties from 7 Partially Clean Biogas Samples

Sample Type	Average Value	Standard Deviation	Min Value	Max Value
Compressibility Factor [z] (Dry)	0.9972	0.00046	0.99688	0.9981
Compressibility Factor [z] (Sat.)	0.9969	0.00048	0.9965	0.9979
Specific Gravity	0.9071	0.0390	0.8	0.9588
Gross HV (Dry) (Btu/ft^3)	598.7	98.7	386.9	699.6
Gross HV (Sat.) (Btu/ft^3)	588.5	97.0	380.3	687.7
Wobbe Index	630.4	113.0	395.1	760.0
Net HV (Dry) (Btu/ft^3)	539.1	88.9	348.3	629.9
Net HV (Sat.) (Btu/ft^3)	529.9	87.4	342.4	619.2
Real Gas Density (lbs/ft^3)	0.069	0.0030	0.065	0.073

[31] American Gas Association. Transmission Measurement Committee. AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008

Major Components

The results from the major component analysis are presented in Table 21 which lists only those compounds that had concentrations above the detection limit. The compounds analyzed but not presented in Table 21 had concentrations below the detection limit for all seven partially clean biogas samples. A full profile of the analytical results is presented in Appendix B.

In comparison to the raw biogas samples, the partially clean biogas samples have slightly lower levels of carbon dioxide (35.5% vs. 32.3%), but on average these samples also have a slightly lower percentage of methane (60.4% vs. 58.9%). Six out of the seven samples contained 59% or greater of methane and only one sample contained 38% methane which is the reason for the lower than expected average value. The sample that contained 38% methane was collected from Dairy Farm 3 in February. Another sample was collected from this farm during a second sampling event that occurred in March and that sample had 59% methane. The difference in methane concentration may be due to sampling error, such as the unintentional introduction of air into the Tedlar bag during the sampling process.

Sulfur Compounds

Although the majority of the partially clean biogas is comprised of methane, in some instances there was a fairly high amount of total sulfur present as well, ranging from 0.148 grains/100 scf to 267 grains/100 scf. Table 22 presents the results from the sulfur analysis. Compared to raw biogas, the partially clean biogas has a lower average total sulfur concentration (2832 ppmv or 168 grains/100 scf vs. 1821 ppmv or 108 grains/100scf). On average, the partial clean-up process for biogas removes about 1/3 of total sulfur from raw biogas. As mentioned previously, the total sulfur concentrations typically found in pipeline tariffs range form 0.5 - 20 grains/100 scf [32].

Table 21. Results from Major Components Analysis for 7 Partially Clean Biogas Samples

Compound	Samples Above Detection Limit	Detection Limit (Mol%)	Average (Mol%)	Standard Deviation (Mol%)	Min (Mol%)	Max (Mol%)
Carbon Dioxide	7	0.03	32.3	5.16	24.61	37.63
Oxygen/Argon	7	0.03	1.64	2.82	0.28	7.94
Nitrogen	7	0.03	7.06	10.16	1.38	29.30
Methane	7	0.002	58.86	9.67	38.15	68.91
Hexane Plus	4	0.0001	0.0001	0.0001	0.0001	0.0002
Hydrogen Sulfide	6	0.000005	0.2118	0.2164	0.000005	0.45
Carbonyl Sulfide	7	0.000005	0.000138	0.000136	0.000009	0.000419

[32] American Gas Association. Transmission Measurement Committee. AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008

Table 22. Results from Sulfur Analysis for 7 Partially Clean Biogas Samples

Compound	Samples Above Detection Limit	Detection Limit (ppmv)	Average (ppmv)	Standard Deviation	Min (ppmv)	Max (ppmv)
Hydrogen Sulfide	6	0.05	2118	2165	0.05	4500
Sulfur Dioxide	4	0.05	0.76	0.95	0.10	2.13
Carbonyl Sulfide	7	0.05	1.38	1.35	0.09	4.19
Carbon Disulfide	4	0.05	0.11	0.074	0.03	0.2
Methyl Mercaptan	6	0.05	1.81	3.05	0.10	7.88
Ethyl Mercaptan	4	0.05	0.13	0.086	0.05	0.23
i-Propyl Mercaptan	5	0.05	0.37	0.34	0.08	0.76
t-Butyl Mercaptan	1	0.05	0.05	NA	0.00	0.05
Dimethyl Sulfide	4	0.05	0.54	0.32	0.05	0.94
Dimethyl Disulfide	1	0.05	0.13	NA	0.13	0.13
Thiophene	1	0.05	0.25	NA	0.25	0.25
C2-thiophenes	1	0.05	0.05	NA	0.05	0.05
Total Sulfur (ppm)	7	NA	1821	2136	2.49	4510
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	7	NA	108	127	0.148	267

Metals

Of the seven partially clean biogas samples, two samples were found to contain mercury. One sample was collected from Dairy Farm 5 with a concentration of 0.06 µg/m^3 (0.007 ppbv) and another sample was collected from Dairy Farm 3 with a concentration of 0.02 µg/m^3. No other metals (arsenic, cadmium, copper, lead, molybdenum and selenium) were detected in any of the partially clean biogas samples. The results from the metals testing is presented in Appendix B.

Halocarbons, Extended Hydrocarbons and Siloxanes

The partially clean biogas samples were also subjected to testing for halocarbons, extended hydrocarbons and siloxanes. The results from these tests were all below the detection limit for the halocarbon and siloxane testing. Four out of the seven partially clean biogas samples were found to contain trace amounts of extended hydrocarbons ranging from 0.0001% to 0.0003%. The other three samples had extended hydrocarbon concentrations all below the detection limit. A complete set of the results for these tests is presented in Appendix B.

Second Tier Chemical Testing

Seven partially clean biogas samples were collected for the Second Tier chemical testing and each sample was subjected to four types of analysis.

Volalite and Semi-volatile Organic Compounds

Overall, the raw biogas samples had low concentrations of VOCs/SVOCs. Only 30 of the 115 target compounds had concentrations above the detection limit as shown in Table 23. The maximum concentration observed in the partially clean biogas samples was 0.179 ppmv of benzyl alcohol from a sample collected from Dairy Farm 4. Exposure limits have not been established by OSHA or NIOSH for benzyl alcohol. However the AIHA (American Industrial Hygiene Association) Workplace Environmental Exposure Level for benzyl alcohol is 10 ppm (time weighted average over an eight hour workday). Therefore the observed concentration for benzyl alcohol in the partially clean biogas sample is 2 orders of magnitude lower than the AIHA exposure limit. The compounds that were detected the most often in the partially clean biogas samples were carbon tetrachloride, toluene, ethylbenzene, bis(2-Ethylhexyl)phthalate, benzene, m/p-xylenes, o-xylene, 1,2,4-trimethylbenzene, p-isopropyltoluene, phenol, naphthalene, and di-n-butylphthalate. Carbon tetrachloride was formerly used as a pesticide but was banned in 1970 due to its severe health effects; however it is currently still used to manufacture some refrigerants. Benzene, toluene, xylene and ethylbenzene (BTEX) are compounds typically associated with petroleum products which may be used in farming operations. Phthalates are man-made plasticizer compounds ubiquitously used in many common consumer products. A complete set of the analytical data for the VOCs/SVOCs is presented in Appendix C.

Table 23. Results from VOCs/SVOCs Analysis for 7 Partially Clean Biogas Samples

Compound	Samples Above Detection Limit	Average (ppbv)	Standard Deviation	Min (ppbv)	Max (ppbv)
Benzene	6	5.85	5.49	0.84	12.74
Carbon Tetrachloride	7	1.35	0.54	0.70	2.12
Toluene	7	22.25	12.25	7.03	40.35
1,1,2-Trichloroethane	3	24.19	22.52	6.78	49.62
Tetrachloroethene	1	1.61	NA	1.61	1.61
Chlorobenzene	1	1.48	NA	1.48	1.48
Ethylbenzene	7	9.75	9.01	1.67	22.76
m/p-Xylenes	6	2.98	2.05	0.86	5.54
Styrene	3	1.28	0.30	1.09	1.63
o-Xylene	6	2.24	1.64	0.74	5.10
1,1,2,2-Tetrachloroethane	1	0.68	NA	0.68	0.68
Isopropylbenzene	1	1.11	NA	1.11	1.11
n-Propylbenzene	2	1.42	0.39	1.14	1.69
1,3,5-Trimethylbenzene	4	1.61	0.53	1.01	2.18
tert-Butylbenzene	1	1.02	NA	1.02	1.02
1,2,4-Trimethylbenzene	6	3.08	3.08	0.71	7.79
sec-Butylbenzene	2	0.96	0.87	0.35	1.58
Phenol	5	10.53	11.34	1.46	29.38
Aniline	2	12.87	16.59	1.14	24.60
2-Chlorophenol	1	1.05	NA	1.05	1.05
p-Isopropyltoluene	6	20.13	43.40	0.55	108.52
Benzyl Alcohol	4	46.26	88.55	1.12	179.07
3,4-Methylphenol (o,p-cresol)	3	7.45	9.71	1.12	18.64
bis(2-chloroisopropyl)ether	1	3.15	NA	3.15	3.15
n-Butylbenzene	2	1.36	1.09	0.60	2.13
N-nitroso-di-n-propylamine	1	0.64	NA	0.64	0.64
Naphthalene	5	0.90	0.31	0.50	1.36
Diethylphthalate	1	0.23	NA	0.23	0.23
Di-n-butylphthalate	5	0.74	0.35	0.38	1.19
bis(2-Ethylhexyl)phthalate	7	0.83	1.31	0.16	3.80

Pesticides

The results from the pesticides analysis of the partially clean biogas samples is summarized in Table 24. The table includes only the target compounds that had concentrations above the detection limit. Most of samples did not contain pesticides with concentrations above the detection limit. The maximum concentration observed from the pesticides analysis performed on the entire set of partially clean biogas samples was 0.188 ppbv of Methoxyclor which was from a sample that was collected from Dairy Farm 3. Coincidentally the raw biogas sample collected from this same farm also had the highest concentration from the entire set of raw biogas samples. Methoxychlor is also the compound that was detected the most often in the partially clean biogas (5 out of 7 samples) samples. The OSHA REL for methoxychlor is 1062 ppb, which is 4 orders of magnitude higher than the highest observed concentration in the partially clean biogas samples. The complete set of analytical data for the pesticides is presented in Appendix C.

Table 24. Results from Pesticides Analysis for 7 Partially Clean Biogas Samples

Compound	Samples Above Detection Limit	Average (ppbv)	Standard Deviation	Min (ppbv)	Max (ppbv)
Heptachlor	1	0.0133	NA	0.0133	0.0133
Heptachlor epoxide	1	0.0341	NA	0.0341	0.0341
Endosulfan I	1	0.00797	NA	0.00797	0.0080
Endosulfan II	2	0.00996	0.00347	0.00750	0.0124
4,4'-DDD	2	0.0182	0.00994	0.0111	0.0252
Endrin aldehyde	1	0.0208	NA	0.0209	0.0208
Endosulfan sulfate	1	0.0104	NA	0.0103	0.0104
4,4'-DDT	2	0.0114	0.00396	0.00857	0.0142
Methoxychlor	5	0.0462	0.0814	0.00357	0.1890

Polychlorinated Biphenyls and Pharmaceuticals

The partially clean biogas samples were also subjected to testing for PCBs and pharmaceuticals. The results from these tests were all below the detection limit. The analytical data for these tests is presented in Appendix C.

Biological Testing

Seven partially clean biogas samples from five dairy farms in the midwestern, eastern and western regions of the U.S. were collected for biological testing. The results are summarized in Table 25.

Only six of the seven samples were analyzed for total bacteria and corrosion-causing bacteria because the integrity of one sample (collected from Dairy Farm 5) was compromised as the genomic material was lost during sample isolation. Six partially cleaned biogas samples contained about 2.29E+06 heterogeneous bacteria/100 scf, similar to the average bacteria number observed in the raw biogas samples. In addition, both raw biogas and partially clean biogas contained similar average numbers of corrosion-causing bacteria (APB, IOB, and SRB) for the samples with positive detection. However, the partially clean biogas contained a higher average number of corrosion-causing bacteria compared to the natural gas sample from GTI and the ambient air sample from Dairy Farm 1. Since live bacteria or spores are of greater concern to pipeline integrity and consumer safety, attention focused on: 1) number of samples that showed positive detection, and, 2) number of live bacteria and spores in the samples after they have been subjected to a partial cleanup process. The results in Table 25 showed that while the average number of live bacteria or spores were similar to the numbers in the raw biogas, the incidence of samples which showed positive detection of live bacteria dropped significantly (10/11 and 9/11 in raw biogas vs. 3/7 and 1/7 in partially clean biogas for aerobes and anaerobes, respectively). This may indicate that the partial cleanup process is effective, at least in some cases, in killing the live bacteria in raw biogas. The partial cleanup process apparently did not affect spore counts, as shown by the presence of spores in the partially clean biogas samples. A preliminary screening found that the major spore-forming bacteria detected in the partially clean biogas are *Bacillus licheniformis,* various other *Bacillus* species and *Paenibacillus* species through Genbank testing. Specific pathogenic species were not queried.

Table 25. Results from Biological Analysis for 7 Partially Clean Biogas Samples

	Live Aerobic Bacteria	Live Anaerobic Bacteria	Viable Spores	Total Bacteria	Total Acid-producing Bacteria	Total Iron-oxidizing Bacteria	Total Sulfate-reducing Bacteria
CFU/100 scf or #/100 scf							
Mean	2.18E+02	2.04E+04	4.04E+02	2.29E+06	1.47E+04	2.56E+03	1.94E+02
Standard Deviation	2.91E+00	NA	3.68E+00	1.97E+00	6.02E+00	2.50E+00	NA
Minimum	6.67E+01	2.04E+04	1.24E+02	1.37E+06	7.38E+02	8.90E+02	1.94E+02
Maximum	5.32E+02	2.04E+04	2.26E+03	5.73E+06	6.16E+04	4.67E+03	1.94E+02
Samples Above the Detection Limit	3	1	5	6	5	3	1
Natural Gas from Dairy Farm 5	924.7	82.2	616.4	3.5E+06	BDL	4.3E+03	BDL
Natural Gas from GTI Lab	negative	negative	not detected	6.5E+05	1.4E+04	BDL	BDL
Air from Dairy Farm 1	negative	41.3	not detected	7.9E+05	2.3E+03	BDL	BDL

Results for Biomethane Samples

A total of 23 biomethane samples were collected from two dairy farms in the western and midwestern regions of the U.S. GTI performed a search of candidate sites for the collection of biomethane samples. The search resulted in only five dairy farms that were upgrading biogas to biomethane and of those five, only two agreed to participate in this project. Therefore, 10 samples were collected from Dairy Farm 1 and 13 samples were collected from Dairy Farm 2.

The average gas composition of the biomethane samples that were collected as a part of this project were within the range of tariff values for natural gas, as shown in Table 26, and within the tariff requirements for the specific biomethane product, not shown here. More detailed information regarding the constituents present in biomethane is presented in the following sections.

Table 26. Gas Composition of Natural Gas[33] vs. Biomethane

Gas Property	Range of Tariff Values for Natural Gas	Average	Minimum	Maximum
Heat Content (dry)	900 – 1000 Btu/scf (min) 1075 – 1200 Btu/scf (max)	987 Btu/scf	906.1	1011 Btu/scf
Hydrogen Sulfide (H_2S)	0.25 - 1 grain per 100 scf	<.002 grains per 100 scf	<.002 grains per 100 scf	<.002 grains per 100 scf
Mercaptans (RSH)	0.2 – 2 grains per 100 scf	< 0.05 ppmv	< 0.05 ppmv	< 0.05 ppmv
Total Sulfur Compounds, as sulfur	0.5 - 20 grains per 100 scf	0.04 grains per 100 scf	0.003 grains per 100 scf	0.31 grains per 100 scf
Oxygen (O_2)	0.001 - 1% (max)	0.91%	0.39%	1.99%
Nitrogen (N_2)	1 - 4% (max)	1.80%	0.20%	7.81%
Carbon Dioxide (CO_2)	1 - 3% (max)	0.54%	0.06%	0.95%

[33] American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

First Tier Chemical Testing

Gas Properties

The average gas property values for 23 biomethane samples were calculated from the First Tier analyses and summarized in Table 27. For all samples tested as part of this program (which were collected from 2 representative farms each using different biogas cleanup technologies), biomethane was shown to have an average heating value of 987 Btu/ft^3 with a range from 906.1 Btu/scf to 1011 Btu/ft^3. All 13 biomethane samples from Dairy Farm 2 met the required heating value (>985 Btu/scf) set by the local natural gas distribution company, Intermountain Gas Company, who entered into an agreement with this Dairy Farm to test and verify the quality of their product biomethane before introduction into their existing natural gas pipelines. Dairy Farm 1 also has an existing contract with a natural gas transmission company to deliver their product biomethane into their existing transmission pipelines. Dairy Farm 1 has consistently met the contract requirements of the transmission company as they have been delivering their product biomethane into their pipelines for over 6 months. All 10 biomethane samples that were collected as a part of this project from Dairy Farm 1 fell within the range of typical natural gas tariff heating values[34] which was previously presented in Table 26.

Table 27. Average Gas Properties for 23 Biomethane Samples

Sample Type	Samples Tested from Dairy Farm 1	Samples Tested from Dairy Farm 2	Average Value	Standard Deviation	Min Value	Max Value	Dairy Farm 1 Average	Dairy Farm 2 Average
Compressibility Factor [z] (Dry)	10	13	0.9981	5.22E-05	0.9980	0.9982	0.99810	0.99802
Compressibility Factor [z] (Sat.)	10	13	0.9977	5.53E-05	0.9977	0.9979	0.99779	0.99770
Specific Gravity	10	13	0.5697	0.0143	0.6	0.6065	0.5839	0.5588
Gross HV (Dry) (Btu/ft^3)	10	13	986.7	29.5	906.1	1011.4	958.1	1008.7
Gross HV (Sat.) (Btu/ft^3)	10	13	969.8	29.0	890.6	994.1	941.7	991.5
Wobbe Index	10	13	1308.0	54.7	1163.5	1354.5	1254.1	1349.4
Net HV (Dry) (Btu/ft^3)	10	13	888.4	26.6	815.9	910.7	862.6	908.2
Net HV (Sat.) (Btu/ft^3)	10	13	873.2	26.1	801.9	895.1	847.9	892.7
Real Gas Density (lbs/ft^3)	10	6	0.044	0.0011	0.043	0.046	0.045	0.043

[34]American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

Major Components

The results from the major component analysis are presented in Table 28 which lists only those compounds that had concentrations above the detection limit. The compounds analyzed but not presented in Table 28 had concentrations below the detection limit for all 23 biomethane samples. A breakdown of the results from Dairy Farm 1 and 2 are summarized in Table 31. A full profile of the analytical results is presented in Appendix B.

The samples collected from Dairy Farm 2 consistently had a methane composition of greater than 99% while the samples from Dairy Farm 1 ranged from 89% to greater than 96% methane. Eight of the ten samples from Dairy Farm 1 had methane levels of 94% or greater and the remaining two samples had compositions of 89% and 92% methane. The difference in the methane content for these two samples may be due to their higher content of carbon dioxide, nitrogen and oxygen.

Sulfur Compounds

The results from the sulfur analysis are presented in Table 30 which lists only those compounds that had concentrations above the detection limit. The further breakdown of these results from Dairy Farm 1 and 2 are presented in Table 31. This table reveals that the biomethane samples have an average total sulfur concentration of 0.71 ppmv (0.04 grains/100scf) with higher concentrations found in biomethane samples from Dairy Farm 2. However, the biomethane samples from Dairy Farm 2 did meet the sulfur requirements set by Intermountain Gas Company. Furthermore, sulfur compounds were effectively removed from the biomethane cleaning process, reaching a level lower level than that typically observed in natural gas (0.5 - 20 grains/100 scf)[35].

Table 28. Results from Major Components Analysis for 23 Biomethane Samples

Compound	Samples Above Detection Limit	Detection Limit(Mol%)	Average (Mol%)	Standard Deviation (Mol%)	Min (Mol%)	Max(Mol%)
Carbon Dioxide	23	0.03	0.54	0.35	0.06	0.95
Oxygen/Argon	10	0.03	0.91	0.51	0.39	1.99
Nitrogen	23	0.03	1.80	2.08	0.20	7.81
Methane	23	0.002	97.26	2.89	89.35	99.63
Ethane	1	0.002	0.11	NA	0.111	0.11
propane	1	0.002	0.028	NA	0.028	0.028
i-Butane	1	0.002	0.005	NA	0.005	0.005
n-Butane	1	0.002	0.005	NA	0.005	0.005
i-pentane	1	0.002	0.002	NA	0.002	0.002
Hexane Plus	1	0.0001	0.0021	NA	0.0021	0.000021
Carbonyl Sulfide	13	0.000005	0.000013	0.000016	0.000005	0.000053

[35]American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

Table 29. Results from Major Components Analysis of Biomethane Samples from Dairy Farms 1 and 2

Compound	Samples Tested from Dairy Farm 1	Samples Tested from Dairy Farm 2	Samples Above Detection Limit from Dairy Farm 1	Samples Above Detection Limit from Dairy Farm 2	Dairy Farm 1 Average	Dairy Farm 2 Average	Intermountain Gas Co. Requirements for Dairy Farm 2
Carbon Dioxide	10	13	10	13	0.88%	0.28%	<2%
Oxygen/Argon	10	13	10	0	0.91%	NA	<2%
Nitrogen	10	13	10	13	3.75%	0.29%	<3%
Methane	10	13	10	13	94.46%	99.42%	Not specified
Ethane	10	13	0	1	NA	0.11%	Not specified
Propane	10	13	0	1	NA	0.03%	Not specified
i-Butane	10	13	0	1	NA	0.01%	Not specified
n-Butane	10	13	0	1	NA	0.01%	Not specified
i-pentane	10	13	0	1	NA	0.002%	Not specified
Hexane Plus	10	13	0	1	NA	0.0021%	Not specified
Carbonyl Sulfide	10	13	9	4	0.000005%	0.000031%	Not specified

Table 30. Results from Sulfur Analysis for 23 Biomethane Samples

Compound	Samples Tested	Samples Above Detection Limit	Detection Limit (ppmv)	Average (ppmv)	Standard Deviation	Min (ppmv)	Max (ppmv)
Carbonyl Sulfide	23	20	0.05	0.71	1.40	0.05	5.28
Total Sulfur (ppm)	23	20	NA	0.71	1.40	0.05	5.28
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	23	20	NA	0.04	0.08	0.0030	0.31

Table 31. Results from Sulfur Analysis for Biomethane Samples from Dairy Farm 1 and 2

Compound	Samples Tested from Dairy Farm 1	Samples Tested from Dairy Farm 2	Samples Above Detection Limit from Dairy Farm 1	Samples Above Detection Limit from Dairy Farm 2	Dairy Farm 1 Average	Dairy Farm 2 Average	Intermountain Gas Co. Requirements for Dairy Farm 2
Carbonyl Sulfide (ppm)	10	13	9	11	0.053	1.245	Not specified
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	10	13	9	11	0.003	0.074	<20

Metals

Of the 23 biomethane samples, none of the samples contained any of the following metals - arsenic, cadmium, copper, lead, molybdenum, selenium, and mercury, above the detection limit. The results from the metals testing is presented in Appendix B.

Halocarbons, Siloxanes, and Extended Hydrocarbons

The biomethane samples were also subjected to testing for halocarbons, extended hydrocarbons and siloxanes. The results from the halocarbons and siloxanes testing were below the detection limit for all 23 samples. Only one sample collected from Dairy Farm 2 contained trace amounts of extended hydrocarbons which ranged from the 0.0001% to 0.0006% (1 – 2 ppmv). The results from the halocarbons, extended hydrocarbons, and siloxanes analyses is presented in Appendix B.

Second Tier Chemical Testing

Thirteen (eight from Dairy Farm 1 and five from Dairy Farm 2) biomethane samples were collected for the Second Tier chemical testing and each sample was subjected to four types of analysis.

Volatile and Semi-volatile Organic Compounds

Overall, the biomethane samples had very low concentrations of VOCs/SVOCs as shown in Table 32. Only 13 of the 115 target compounds were detected in the biomethane samples compared to 30 target compounds that were detected in the partially clean biogas samples and 36 in the raw biogas samples. The maximum concentration observed in the biomethane samples was 0.11 ppmv of toluene from a sample that was taken from Dairy Farm 2. The OSHA REL (recommended exposure limit) for toluene is 200 ppm and the NIOSH REL is 100 ppm. Therefore the observed concentration for toluene in this biomethane sample is 3 orders of magnitude lower than both recommended exposure limits. Toluene, phthalate, carbon tetrachloride and m/p-xylenes were the most often detected VOCs/SVOCs in the biomethane samples. A complete set of the analytical data for the VOCs/SVOCs is presented in Appendix C.

Table 32. Results from VOCs/SVOCs Analysis for 13 Biomethane Samples

Compound	Samples Above Detection Limit	Average (ppbv)	Standard Deviation	Min (ppbv)	Max (ppbv)
Benzene	1	27.09	NA	27.09	27.09
Carbon Tetrachloride	12	1.24	0.50	0.66	2.01
Toluene	13	12.52	28.91	1.67	107.54
Ethylbenzene	4	1.83	1.10	0.53	3.04
m/p-Xylenes	12	2.60	3.03	1.17	11.25
o-Xylene	5	1.54	1.30	0.48	3.36
1,3,5-Trimethylbenzene	1	0.69	NA	0.69	0.69
1,2,4-Trimethylbenzene	1	0.71	NA	0.71	0.71
Benzyl Alcohol	1	2.10	NA	2.10	2.10
N-nitroso-di-n-propylamine	7	2.92	0.75	1.45	3.60
Naphthalene	4	1.19	0.70	0.41	2.06
Di-n-butylphthalate	12	0.96	0.69	0.22	2.29
bis(2-Ethylhexyl)phthalate	13	0.44	0.19	0.20	0.81

Pesticides

Twelve of the 13 samples did not contain any pesticides concentrations above the detection limit. Only one sample collected from Dairy Farm 1 showed a result above the detection limit. This sample contained 0.52 ppbv of gamma-chlordane. The OSHA REL for gamma-chlordane is 30 ppb, which is 2 orders of magnitude higher than the highest observed concentration in the biomethane samples. The analytical data for the pesticides is presented in Appendix C.

Polychlorniated Biphenyls and Pharmaceuticals

The biomethane samples were also subjected to testing for PCBs and pharmaceuticals. The results from these tests were all below the detection limit. The analytical data for these tests is presented in Appendix C.

Biological Testing

Twenty two (nine from Dairy Farm 1 and 13 from Dairy Farm 2) biomethane samples from two dairy farms in the midwestern and western regions of the U.S. were collected for biological testing. In addition two natural gas samples and one indoor air sample was collected. One natural gas sample was collected from Dairy Farm 5 from a pipeline that delivers natural gas to an electric generator however it is unclear as to the history of usage for this pipeline, specifically it is unknown whether it had been used in the past to deliver biogas to the generator. The other natural gas sample was collected from a natural gas line within GTI's environmental laboratory. The indoor air sample was collected from a building that housed the biogas clean up unit at Dairy Farm 1. The results are summarized in Table 33.

All 22 biomethane samples contained an average of 3.87E+05 heterogeneous bacteria/100 scf, lower than the average (2.29E+06) bacteria in partially clean biogas, indicating that a thorough cleanup process of biogas may somewhat reduce the number of bacteria (whether alive or dead) carried over from raw biogas to the final biomethane product. The incidence of positive detection of APB and IOB in the biomethane samples also decreased when compared to the partially clean biogas samples. Comparing the partially clean biogas to biomethane, it is noted that the incidence of positive detection of anaerobes increased significantly (1/7 in partially clean biogas vs. 10/22 in biomethane samples). The results suggest that it is likely that bacteria, especially anaerobic bacteria, in some cases have started to grow and accumulate in the biomethane cleanup unit parts. Some systems provide a highly favorable environment for microbial growth. Therefore, microbes may be living and growing within cleanup unit parts and carried over to the resulting biomethane. However, the positive detection of spores in biomethane samples was lower (4 out of 22) compared to the partially clean biogas samples (5 out of 7). A preliminary screening found that the major spore-forming bacteria detected in the biomethane samples are *Bacillus licheniformis, Bacillus pumilus*, and *Paenibacillus glucanolyticus* through Genbank testing. Specific pathogenic species were not queried.

Natural gas samples that were collected for this project also contained bacteria; total bacterial counts were determined but the profiles were dramatically different. One sample, originating from the GTI laboratory, showed the presence of total bacteria 6.5E+05, but none were alive. Of these dead bacteria, only one was identified as bacteria that cause corrosion in

gas pipeline networks. No spores were present in this sample. The line sampled for this test was located in the Environmental Science & Forensic Chemistry Center laboratories and this line was, to the best available historical knowledge, used for distribution of natural gas only

The other natural gas sample was retrieved from Dairy Farm 5 and historical use of this line is unclear. In this sample, total bacteria included live and dead microbes, corrosion-causing bacteria and spores. Since the data set pertaining to natural gas biological testing natural gas was limited (2 samples), conclusions in terms of the number and types of bacteria and spores generally present in natural gas samples across the United States cannot be made. A more robust effort towards this end is recommended.

A sample from ambient air retrieved from Dairy Farm 1 was also collected and analyzed similarly. Results show that both live and dead bacteria were present, with very low numbers of live anaerobic bacteria. Of those which were present but dead, only acid producing bacteria were counted. No spores were recorded.

Table 33. Biological Results from 22 Biomethane Samples and 2 Natural Gas Samples

	Live Aerobic Bacteria	Live Anaerobic Bacteria	Spores	Total Bacteria	Total Acid-producing Bacteria	Total Iron-oxidizing Bacteria	Total Sulfate-reducing Bacteria
CFU/100 scf or #/100 scf							
Biomethane							
Mean	6.05E+02	2.52E+02	7.59E+02	3.87E+05	7.30E+03	1.53E+03	1.65E+02
Standard Deviation	1.22E+01	6.46E+00	8.03E+00	2.13E+01	5.72E+00	2.08E+00	NA
Minimum	5.74E+01	6.17E+01	1.24E+02	3.28E+03	9.69E+01	6.90E+02	1.65E+02
Maximum	3.55E+04	3.55E+04	1.37E+04	1.02E+07	9.80E+04	3.99E+03	1.65E+02
Samples Above the Detection Limit	7	10	4	22	18	6	1
Natural Gas and Ambient Air							
Natural Gas from Dairy Farm 5	924.7	82.2	616.4	3.5E+06	BDL	4.3E+03	BDL
Natural Gas from GTI Lab	negative	negative	not detected	6.5E+05	1.4E+04	BDL	BDL
Ambient Air from Dairy Farm 1	negative	41.3	not detected	7.9E+05	2.3E+03	BDL	BDL

Variability of Biogas Quality

Flush Dairy Farms vs. Scrape Dairy Farms

Samples were collected from 14 different dairy farms throughout the U.S. Three dairy farms (Dairy Farms 6, 7, 13) used a "Flush" manure management method while the remaining nine dairy farms used a "Scrape" manure management method. The three flush dairies were also the only three dairies that used a covered lagoon for their biogas production system. The scrape dairies used either a complete mix or plug and flow digester for producing biogas. Three raw biogas samples and two partially clean biogas samples were collected from flush dairy farms and nine raw biogas samples and seven partially clean biogas samples were collected from scrape dairy farms. All 23 biomethane samples were collected from scrape dairy farm operations. Although the sample set for the flush dairy farms is much smaller than that of the scrape dairy farms, several observations can be made in regards to the gas quality of the resulting product gas from each type of manure collection system.

Gas Properties

Table 34 presents the average gas property values for the biogas samples collected from flush and scrape dairies. The limited data set suggests flush dairies can produce raw and partially clean biogas with a higher heating content than scrape dairies can produce.

Table 34. Average Gas Properties for Biogas Samples Collected from Flush Dairies vs. Scrape Dairies

	Flush Dairy Farms				Scrape Dairy Farms			
	Raw Biogas Samples Tested	Raw Biogas Average	Partially Clean Biogas Samples Tested	Partially Clean Biogas Average	Raw Biogas Samples Tested	Raw Biogas Average	Partially Clean Biogas Samples Tested	Partially Clean Biogas Average
Compressibility Factor [z] (Dry)	3	0.99720	2	0.99732	9	0.99693	7	0.99720
Compressibility Factor [z] (Sat.)	3	0.99685	2	0.99697	9	0.99657	7	0.99685
Specific Gravity	3	0.8521	2	0.8571	9	0.9395	7	0.9272
Gross HV (Dry) (Btu/ft^3)	3	687.4	2	663.8	9	591.2	7	572.6
Gross HV (Sat.) (Btu/ft^3)	3	675.7	2	652.5	9	581.2	7	562.8
Wobbe Index	3	744.8	2	717.3	9	610.3	7	595.7
Net HV (Dry) (Btu/ft^3)	3	619.0	2	597.7	9	532.4	7	515.6
Net HV (Sat.) (Btu/ft^3)	3	608.4	2	587.5	9	523.3	7	506.8
Real Gas Density (lbs/ft^3)	3	0.065	2	0.066	9	0.072	7	0.071

Major Components

Table 35 presents a comparison of the major components present in raw or partially clean biogas samples collected from flush dairies versus those collected from scrape dairies. This data suggests that the methane content is on average higher in raw and partially clean biogas produced from the scrape dairies that use anaerobic digesters than in the flush dairies that use covered lagoons. Conversely, concentrations of other components such as carbon dioxide, oxygen/argon, nitrogen, etc. are lower in both raw and partially cleaned biogas from flush dairy farm operations than scrape dairy farms operations.

Table 35. Results from Major Components Analysis of Biogas Samples Collected from Flush and Scrape Dairy Farms

	Flush Dairy Farms (Tested 3 Raw and 2 Partially Clean Biogas Samples)				Scrape Dairy Farms (Tested 9 Raw and 5 Partially Clean Biogas Samples)			
	Raw Biogas Samples Above Detection Limit	Raw Biogas Average	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Average	Raw Biogas Samples Above Detection Limit	Raw Biogas Average	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Average
Carbon Dioxide	3	29.22%	2	28.35%	9	37.57%	5	33.82%
Oxygen/Argon	3	0.28%	2	0.98%	9	0.89%	5	1.91%
Nitrogen	3	2.72%	2	5.27%	9	3.20%	5	7.78%
Methane	**3**	**67.61%**	**2**	**65.38%**	**9**	**58.02%**	**5**	**56.24%**
Hexane Plus	0	NA	0	NA	7	0.0002%	3	0.0002%
Ammonia	0	NA	0	NA	1	0.0043%	0	NA
Hydrogen Sulfide	3	0.17%	2	0.02%	8	0.36%	4	0.31%
Carbonyl Sulfide	3	0.000111%	2	0.000053%	9	0.000168%	5	0.000172%

Total Sulfur

On average the raw biogas samples and partially clean biogas collected from scrape dairies contained higher concentrations of total sulfur than those collected from flush dairies. The average total sulfur concentrations from the scrape dairies are 190 grains/100 scf (3205 ppm) and 145 grains/100 scf (2453 ppm) for raw biogas and partially clean biogas, respectively, compared to 102 grains/100 scf (1713 ppm) for raw biogas and 14 grains/100 scf (241 ppm) for partially clean biogas from flush dairies.

Extended Hydrocarbons, Halocarbons, Siloxanes and Metals

Extended hydrocarbons with concentrations all in the single digit ppmv range were detected in seven raw biogas samples and four partially clean biogas samples which were all collected from scrape dairies. Extended hydrocarbons were not detected in any of the samples collected from the flush dairies. In addition, halocarbons and siloxanes were not detected in any of the raw or partially clean biogas samples collected from the either the flush or scrape dairies. One raw biogas sample collected from a scrape dairy (Dairy Farm 9) contained 0.02 $\mu g/m^3$ mercury and 2 $\mu g/m^3$ molybenum; however, none of the other raw biogas samples collected from flush or scrape dairies contained any metals. Only two partially clean biogas samples collected from scrape dairies contained mercury with an average concentration of 0.04 $\mu g/m^3$ while the other partially clean biogas samples from scrape dairies did not contain any metals above the detection limit.

Volatile and Semi-volatile Organic Compounds

In total, 36 VOC/SVOCs were detected in samples collected from the flush and scrape dairies as shown in Table 36. Although the individual compounds and their concentrations that were detected in each sample were quite variable, on average the total VOC/SVOC concentration was greater in the biogas samples (both raw and partially clean) collected from scrape dairies than from those collected from flush dairies. This data suggests that the operations involved with using the scrape method for manure collection either: 1) introduces more VOC/SVOCs into the manure which is eventually carried over into the product biogas, or, 2) VOC/SVOCs are removed (volatilized) through exposure to air through the process of flush dairy processing of waste.

Pesticides, PCBs and Pharmaceuticals

The suite of pesticides selected for testing were detected only in the biogas (raw and partially clean) samples collected from scrape dairies with concentrations all less than 1 ppbv. PCB species and all pharmaceuticals selected for testing were not detected above the detection limit for any of the samples. Other unidentified pesticides and pharmaceutical compounds may have been present, but were not identified in resulting spectra per se.

Biological Testing

Table 37 presents the results from the biological testing of raw and partially clean biogas samples collected from flush and scrape dairy farms. Live aerobic and anaerobic bacteria were detected more often in the raw biogas samples that were collected from scrape dairies compared to those from flush dairies. The results were also similar for the partially clean biogas samples in that live aerobic and anaerobic bacteria was detected more often in the partially clean biogas samples collected from scrape dairies versus flush dairies.

Table 36. Results from VOC/SVOCs Analysis of Biogas Samples Collected from Flush and Scrape Dairy Farms

	Flush Dairy Farms (Tested 3 Raw and 2 Partially Clean Biogas Samples)				Scrape Dairy Farms (Tested 7 Raw and 5 Partially Clean Biogas Samples)			
Compound	Raw Biogas Samples Above Detection Limit	Raw Biogas Samples –Average (ppbv)	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Samples – Average (ppbv)	Raw Biogas Samples Above Detection Limit	Raw Biogas Samples – Average (ppbv)	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Samples – Average (ppbv)
Benzene	3	1.21	1	0.92	7	5.48	5	6.84
Carbon Tetrachloride	3	1.03	2	1.00	5	1.46	5	1.49
Pyridine	0	NA	0	NA	1	1.49	0	NA
Toluene	3	65.86	2	14.72	7	33.60	5	25.27
1,1,2-Trichloroethane	0	NA	0	NA	4	31.62	3	24.19
Tetrachloroethene	0	NA	0	NA	2	1.26	1	1.61
Chlorobenzene	0	NA	0	NA	0	NA	1	1.48
1,1,1,2-Tetrachloroethane	0	NA	0	NA	0	NA	0	NA
Ethylbenzene	3	3.23	2	1.93	6	14.80	5	12.88
m/p-Xylenes	2	1.16	1	0.86	6	12.69	5	3.41
Styrene	0	NA	0	NA	1	0.45	3	1.28
o-Xylene	2	1.03	1	0.74	6	10.13	5	2.54
1,1,2,2-Tetrachloroethane	0	NA	0	NA	0	NA	1	0.68
Isopropylbenzene	0	NA	0	NA	3	3.56	1	1.11
n-Propylbenzene	0	NA	0	NA	4	5.74	2	1.42
1,3,5-Trimethylbenzene	3	1.54	2	1.17	4	7.11	2	2.04
tert-Butylbenzene	0	NA	0	NA	3	3.26	1	1.02
1,2,4-	2	1.28	1	0.71	6	15.59	5	3.56

Trimethylbenzene								
sec-Butylbenzene	0	NA	0	NA	6	3.83	2	0.96
Phenol	0	NA	0	NA	6	9.68	5	10.53
Aniline	0	NA	0	NA	2	21.34	2	12.87
2-Chlorophenol	0	NA	0	NA	2	0.85	1	1.05
p-Isopropyltoluene	3	2.34	1	0.78	6	3.72	5	24.00
Benzyl Alcohol	1	1.02	2	2.37	2	7.11	2	90.16
3,4-Methylphenol (o,p-cresol)	3	1.12	1	1.12	4	30.60	2	10.62
bis(2-chloroisopropyl)ether	0	NA	0	NA	1	3.35	1	3.15
n-Butylbenzene	0	NA	0	NA	5	3.55	2	1.36
N-nitroso-di-n-propylamine	0	NA	0	NA	1	0.68	1	0.64
Nitrobenzene	0	NA	0	NA	2	0.55	0	NA
Isophorone	0	NA	0	NA	0		0	NA
Naphthalene	1	1.36	0	NA	5	1.67	5	0.90
2-Methylnaphthalene	0	NA	0	NA	3	2.20	0	NA
1-Methylnaphthalene	0	NA	0	NA	1	3.08	0	NA
Diethylphthalate	0	NA	0	NA	1	0.21	1	0.23
Phenanthrene	0	NA	0	NA	1	1.09	0	NA
Di-n-butylphthalate	3	0.75	2	0.79	5	0.76	3	0.71
Fluoranthene	0	NA	0	NA	1	0.43	0	
bis(2-Ethylhexyl)phthalate	3	0.25	2	0.22	7	0.44	5	1.08
Total	0	83.18	0	27.33	0	243.37	0	249.08

Table 37. Results from Biological Testing of Biogas Samples Collected from Flush and Scrape Dairy Farms

	Flush Dairy Farms (Tested 3 Raw and 2 Partially Clean Biogas Samples)				Scrape Dairy Farms (Tested 9 Raw and 5 Partially Clean Biogas Samples)			
	Raw Biogas Samples Above Detection Limit	Raw Biogas Average	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Average	Raw Biogas Samples Above Detection Limit	Raw Biogas Average	Partially Clean Biogas Samples Above Detection Limit	Partially Clean Biogas Average
Live Aerobic Bacteria (#/100 scf)	2	156.3	1	66.7	8	748.9	2	412.1
Live Anaerobic Bacteria (#/100 scf)	3	462.6	0	NA	6	127.0	4	5454.5
Spores (#/100 scf)	0	NA	0	NA	0	593.0	5	772.5

Effectiveness of Clean Up Technologies

In efforts to evaluate the effectiveness of biogas clean up technologies, GTI attempted to collect both raw biogas samples and post biogas clean up samples (which included either partially clean or biomethane samples) from the same dairy farm to determine what compounds were effectively removed during the cleanup process. GTI was able to collect two sample pairs that consisted of a raw biogas sample and a biomethane sample (post clean-up) from the same dairy farms. Three additional sample pairs that consisted of a raw biogas sample and a partially clean biogas sample (post clean up) were also collected.

Performance of Biogas Partial Cleanup Technologies

Three sample pairs (six total samples) were collected that consisted of a raw biogas sample and a partially clean biogas sample (post cleanup) from the same dairy farm. These samples were collected from Dairy Farms 3, 6 and 7. The specific types of cleanup technologies used at these farms will not be disclosed in this report; however most of them were specific for sulfur removal. The following sections present the results obtained from these six samples and only the tests that had concentrations above the detection limit are discussed.

Major Components

Overall, the cleanup technologies used to produce the partially clean biogas samples were most effective in reducing the hydrogen sulfide concentrations as shown in Appendix E. The other major components present such as methane and carbon dioxide were present in similar amounts both in the pre-(raw biogas) and post cleanup (partially clean biogas) samples. However, the sample pairs collected from Dairy Farm 3 and 7 had higher nitrogen concentrations in the post cleanup samples compared to the pre-cleanup raw biogas samples.

Sulfur Compounds

The biogas cleanup technologies used to produce the partially clean biogas samples were very effective in reducing the total sulfur content in the post cleanup biogas. The pre-cleanup biogas samples contained total sulfur concentrations ranging from 108 grains/100 scf to 237 grains/100 scf. The corresponding post cleanup samples contained sulfur concentrations ranging from 0.15 grains/100 scf to 27.8 grains/100 scf.

Extended Hydrocarbons

Only one sample of the six collected (for the pre- and post biogas cleanup sample set) contained an extended hydrocarbon above the detection limit. This sample was a raw biogas sample collected form Dairy Farm 3 with a hexanes concentration of 0.0001%. The corresponding post cleanup sample did not contain any extended hydrocarbons above the detection limit.

Volatile and Semi-volatile Organic Compounds

Overall, VOCs/SVOCs concentrations are very low in both raw and partially clean biogas samples, and the highest detected concentration is usually many magnitudes lower than limit set by various regulatory organizations. Partial cleanup process appears to reduce concentrations of some VOCs/SVOCs, but may concentrate others (which are highlighted in blue in Table 38).

Table 38. Summary of Results of VOCs/SVOCs for Samples Collected from Pre and Post Partial Cleanup Technologies

Sample	Partially Clean	Raw Biogas	Partially Clean	Raw Biogas	Partially Clean	Raw Biogas
Dairy Farm	3	3	6	6	7	7
Sampling Date	02/05/08	02/05/08	05/14/08	05/14/08	05/15/08	05/16/08
Concentration (ppbv)						
Benzene	10.80	13.65	0.92	1.46	BDL	1.09
Carbon Tetrachloride	2.02	1.93	0.70	0.87	1.31	1.26
Toluene	40.35	41.86	22.41	36.23	7.03	14.08
Ethylbenzene	22.76	17.81	1.67	2.12	2.20	2.76
m/p-Xylenes	5.54	3.85	0.86	1.06	BDL	BDL
o-Xylene	5.10	3.72	0.74	0.90	BDL	BDL
Isopropylbenzene	1.11	BDL	BDL	BDL	BDL	BDL
n-Propylbenzene	1.69	0.99	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	1.90	1.36	1.01	1.36	1.34	1.15
1,2,4-Trimethylbenzene	6.11	4.39	0.71	0.83	BDL	BDL
sec-Butylbenzene	BDL	3.55	BDL	BDL	BDL	BDL
Phenol	29.38	28.14	BDL	BDL	BDL	BDL
p-Isopropyltoluene	8.43	3.29	BDL	0.54	0.78	0.72
Benzyl Alcohol	BDL	BDL	3.61	BDL	1.12	1.02
3,4-Methylphenol (o,p-cresol)	BDL	82.07	BDL	0.93	1.12	1.82
n-Butylbenzene	BDL	2.25	BDL	BDL	BDL	BDL
Naphthalene	0.90	1.30	BDL	1.36	BDL	BDL
Di-n-butylphthalate	BDL	BDL	0.38	1.05	1.19	0.79
bis(2-Ethylhexyl)phthalate	3.80	0.61	0.16	0.25	0.27	0.29

Pesticides

The sample pairs collected from Dairy Farms 6 and 7 did not contain any monitored pesticides above the detection limit, but the samples collected from Dairy Farm 3 did contain a few monitored pesticides in low concentrations as shown in Table 39. Overall, the monitored pesticides were detected more often in the post cleanup sample than in the raw biogas sample. One explanation is that the partial cleanup technology used may have concentrated the pesticides present in the raw biogas; however, with only two samples in the data set, it is premature to draw a firm conclusion.

Table 39. Pesticides Present in Samples Collected from Pre and Post Partial Cleanup Technologies

Sample	Partially Clean	Raw Biogas
Dairy Farm	3	3
Sampling Date	02/05/08	02/05/08
	Concentration (ppbv)	
a-BHC	BDL	BDL
b-BHC	BDL	BDL
g-BHC	BDL	BDL
d-BHC	BDL	BDL
Heptachlor	BDL	0.01
Aldrin	BDL	BDL
Heptachlor epoxide	0.03	0.01
g-Chlordane	BDL	BDL
Endosulfan I	BDL	BDL
a-Chlordane	BDL	BDL
Dieldrin	BDL	BDL
4,4'-DDE	BDL	BDL
Endrin	BDL	BDL
Endosulfan II	0.01	BDL
4,4'-DDD	0.03	BDL
Endrin aldehyde	0.02	BDL
Endosulfan sulfate	0.01	BDL
4,4'-DDT	0.01	BDL
Endrin ketone	BDL	BDL
Methocy Chlor	0.19	0.047

Biological Tests

Table 40 presents the results from the biological tests for the two pairs of raw and partially clean biogas samples. It should be noted that the raw biogas sample collected from Dairy Farm 6 was compromised during sample preparation for biological testing therefore the results from the sample pair collected from this farm are not presented in this section. Due to the small physical size of bacteria, the partial cleanup process is probably not effective in reducing the total bacteria number (live and dead) in the raw biogas stream; however, it is suggested that partial cleanup process effectively kills some live bacteria in the gas stream and hence lowers the number of live bacteria in the resulting partially clean biogas. The effect of a partial cleanup process on spore survival is not clear since the difference of pre- and post-cleanup is only detected in one sample.

Table 40. Biological Testing Results for Biogas Samples Collected from Pre and Post Partial Cleanup Technologies

Dairy Farm	Sample	Sample Date	Live Aerobic Bacteria	Live Anaerobic Bacteria	Live Spores	Total Bacteria	Total Acid-producing Bacteria	Total Iron-oxidizing Bacteria	Total Sulfate-reducing Bacteria
(CFU/100 scf or number/100 scf)									
3	Partially Clean	01/23/08	negative	negative	124.1	1.4E+06	3.1E+04	8.9E+02	BDL
3	Raw	01/22/08	173.8	99.3	not detected	1.3E+06	2.4E+04	2.5E+03	BDL
7	Partially Clean	05/14/08	negative	negative	not detected	5.2E+06	1.1E+04	BDL	BDL
7	Raw	05/14/08	214.3	595.2	not detected	1.01E+06	6.03E+04	1.62E+03	BDL

Performance of Biomethane Cleanup Technologies

Two sample pairs (raw biogas sample and post cleanup biomethane sample) were collected from Dairy Farms 1 and 2. The specific types of cleanup technologies used at these farms will not be disclosed in this report; however both technologies were designed to produce biomethane that is of pipeline quality and specific tariff requirements were imposed by the receiving gas company. The cleanup technology used at Dairy Farm 1 has been producing biomethane that has met the required gas quality parameters (tariff requirements) set by the accepting transmission pipeline. This transmission pipeline company has been accepting the biomethane on a regular basis for over 6 months.

Major Components and Sulfur Compounds

The results from these two pairs of samples suggest that the biomethane cleanup technologies were effective in removing unwanted compounds including total sulfur and producing a product gas that can meet typical and specific pipeline tariff values (Table 41 and Table 42).

Table 41. Major Components present in Samples Collected from Pre and Post Biomethane Cleanup Technologies

Sample	Detection Limit	biomethane	raw	biomethane	raw
Dairy Farm		1	1	2	2
Sampling Date		1/22/2008	1/23/2008	4/16/2008	4/16/2008
Carbon Dioxide	0.03%	0.78%	35.36%	0.06%	37.65%
Oxygen/Argon	0.03%	0.39%	2.94%	BDL	0.33%
Nitrogen	0.03%	2.96%	12.67%	0.31%	0.88%
Methane	0.002%	95.86%	49.03%	99.63%	60.48%
Hexane Plus	0.0001%	BDL	BDL	BDL	0.0002%
Hydrogen Sulfide	0.000005%	BDL	BDL	BDL	0.657000%
Carbonyl Sulfide	0.000005%	BDL	0.000034%	BDL	0.000297%

Table 42. Sulfur Content of Samples Collected from Pre and Post Biomethane Cleanup Technologies

Sample	Detection Limit	biomethane	raw	biomethane	raw
Dairy Farm		1	1	2	2
Sampling Date		1/22/2008	1/23/2008	4/16/2008	4/16/2008
Hydrogen Sulfide (ppmv)	0.05	BDL	BDL	BDL	6570
Sulfur Dioxide (ppmv)	0.05	BDL	BDL	BDL	0.19
Carbonyl Sulfide (ppmv)	0.05	BDL	0.34	BDL	2.97
Carbon Disulfide (ppmv)	0.05	BDL	BDL	BDL	0.07
Methyl Mercaptan (ppmv)	0.05	BDL	BDL	BDL	2.84
Ethyl Mercaptan (ppmv)	0.05	BDL	BDL	BDL	0.26
i-Propyl Mercaptan (ppmv)	0.05	BDL	BDL	BDL	0.35
Dimethyl Sulfide (ppmv)	0.05	BDL	BDL	BDL	1.09
Methyl Ethyl Sulfide (ppmv)	0.05	BDL	BDL	BDL	BDL
Thiophene (ppmv)	0.05	BDL	BDL	BDL	0.06
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	NA	BDL	0.02	BDL	390

Volatile and Semi-volatile Organic Compounds and Pesticides

There is only one sample pair collected for comparison of the VOC/SVOCs and selected pesticides present in a pre-cleanup raw biogas sample and post cleanup biomethane sample. The data suggests that the cleanup technology used at Diary Farm 1 is effective in removing many VOCs/SVOCs present in raw biogas (as shown in Table 43) as well as most of the monitored pesticides. Methoxychlor was the only pesticide present above the detection limit in the raw biogas samples, but the concentration was well below NIOSH and OSHA exposure limits.

Table 43. VOCs/SVOCs Present in Samples Collected from Pre and Post Biomethane Cleanup Technologies

Sample	Biomethane	Raw Biogas
Dairy Farm	1	1
Sampling Date	01/23/08	01/22/08
	Concentration (ppbv)	
Benzene	BDL	4.74
Carbon Tetrachloride	BDL	BDL
Toluene	2.52	98.23
Tetrachloroethene	BDL	1.44
Ethylbenzene	BDL	33.81
m/p-Xylenes	1.62	44.67
o-Xylene	BDL	34.22
Isopropylbenzene	BDL	2.66
n-Propylbenzene	BDL	9.54
1,3,5-Trimethylbenzene	BDL	13.58
tert-Butylbenzene	BDL	4.20
1,2,4-Trimethylbenzene	BDL	38.74
sec-Butylbenzene	BDL	2.35
Phenol	BDL	2.00
p-Isopropyltoluene	BDL	2.59
Benzyl Alcohol	BDL	BDL
3,4-Methylphenol (o,p-cresol)	BDL	BDL
n-Butylbenzene	BDL	3.02
Naphthalene	BDL	1.09
2-Methylnaphthalene	BDL	0.90
Di-n-butylphthalate	BDL	0.84
bis(2-Ethylhexyl)phthalate	0.50	0.42

Biological Materials

Table 44 presents the results from the biological tests for the one pair of raw and post cleanup biomethane samples. The bacteria present in the biomethane, total live or dead, dropped slightly compared to that in the corresponding raw biogas sample. In addition, the number of total live only bacteria also dropped slightly from the raw biogas. The cleanup technology used to produce biomethane is primarily designed to remove unwanted chemical components. It is not conclusive, due to the small sample size (one pair), whether or not the cleanup technology is effective in removing or killing bacteria present in the raw biogas. Considering the overall results from 10 raw biogas, 7 partially clean biogas, and 22 biomethane samples in this project, it is probably reasonable to conclude that biogas cleanup technologies are at least partially effective in removing or killing some bacteria present in raw biogas; however, microbes may also survive or, in fact, may thrive in the cleanup units themselves, depending upon cleanup technology of choice. However, in comparison to natural gas or ambient air, it is indicated that there are more microbes in biomethane. Whether the quantity and types of bacteria present in biomethane is significant as compared with general natural gas supplies or ambient air is still unknown. A

more robust study is therefore advised in this regard. Furthermore, the impact of a biogas cleanup technology on spore removal is probably very limited.

Table 44. Biological Materials Present in Samples Collected from Pre and Post Biomethane Cleanup Technology

Dairy Farm	Sample	Sample Date	Live Aerobic Bacteria	Live Anaerobic Bacteria	Live Spores	Total Bacteria	Total Acid-producing Bacteria	Total Iron-oxidizing Bacteria	Total Sulfate-reducing Bacteria
CFU/100 scf or #/100 scf									
1	Biomethane	01/23/08	1216.3	99.3	not detected	5.7E+05	2.9E+04	BDL	BDL
1	Raw	01/22/08	2106.9	negative	744.7	1.7E+06	1.8E+04	BDL	BDL

Comparative Analysis of All Samples

Major Components

In comparing the gas composition of the three types of biogas that were sampled for this project, it is clear that the composition is very different based on the level of clean up performed on the biogas. The values presented in Table 45 represent the average values observed from each of the following sets of samples: raw, partially clean and biomethane. The table also includes the typical composition of natural gas as derived from the data presented in AGA Report 4A[36].

Heating Content

The average heat content observed from the raw, partially clean, and biomethane samples are presented in Table 45. This table reveals that raw and partially clean biogases do not meet the typical tariff values for heat content (Btu/scf). However, the biomethane does fall within the range of typical tariff heating values and meets the tariff requirements for the systems tested.

Sulfur Concentrations

The average total sulfur concentrations observed for the raw, partially clean, and biomethane samples are presented in Table 45. The table also displays the range of tariff values for natural gas[37]. The data shows that raw and partially clean biogases do not meet the typical tariff values for total sulfur. However, the biomethane (which had a maximum total sulfur concentration of 0.31 grains/100 scf) does fall within the range of typical tariff values (5 – 20 grains/100 scf), indicating that the clean up technologies used at Dairy Farms 1 and 2 are currently producing biomethane that can meet required pipeline tariff values for total sulfur.

[36]American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

[37] American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

Table 45. Composition of Raw Biogas, Partially Clean Biogas, Biomethane, and Natural Gas

Sample Type	Raw Biogas	Partially Clean Biogas	Biomethane	Range of Tariff Values[38]
Gross HV (Dry) (Btu/ft^3)	615.3	598.7	986.7	900 – 1000 Btu/scf (min) 1075 – 1200 Btu/scf (max)
Carbon Dioxide (Mol%)	35.5	32.3	0.54	1 – 3 (max)
Oxygen/Argon (Mol%)	0.74	1.64	0.91	0.001 – 1 (max)
Nitrogen (Mol%)	3.08	7.06	1.80	1 – 4 (max)
Methane (Mol%)	60.42	58.86	97.26	Not reported
Hexane Plus (Mol%)	0.0002	0.0001	0.0021	Not reported
Ammonia (Mol%)	0.004	NA	NA	Not reported
Hydrogen Sulfide (ppmv)	3085	2118	<0.05	0.25 – 1 grain per 100 scf
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)	168	108	0.04	0.5 - 20
Total VOCs (ppbv)	221.4	189	55.83	Not reported
Total Pesticides (ppbv)	0.0675	0.17	0.52	Not reported

Volatile/Semivolatile Organic Compounds

Although volatile and semi-volatile organic compounds were present in very low levels in the raw biogas, partially clean biogas, and the biomethane samples, their presence in post cleanup samples indicates that the current biogas cleanup technologies cannot completely remove these compounds from the raw biogas. Table 46 presents the VOC/SVOCs that were detected in all the samples collected for GTI's testing program. This table also presents the average concentrations and the number of samples that contained each compound that were above the detection limit. In addition, the compounds highlighted in yellow are those that were found to be present in all three types of samples: raw biogas, partially clean biogas, and biomethane. Of interest, the maximum concentration of any one compound observed from the entire set of biogas samples was 0.179 ppmv of benzyl alcohol from a partially clean biogas sample that was collected from Dairy farm 4. Exposure limits have not been established by OSHA or NIOSH for benzyl alcohol. However the AIHA (American Industrial Hygiene Association) Workplace Environmental Exposure Level for benzyl alcohol is 10 ppm (time weighted average over an eight hour workday). Therefore the observed concentration for benzyl alcohol in the partially clean biogas sample is 2 orders of magnitude lower than the AIHA exposure limit. The VOC/SVOC concentrations observed from GTI's testing program were very low, but monitoring of these compounds may be of interest to ensure that there is no build up or accumulation to levels that may pose health or safety concerns.

[38]American Gas Association. Transmission Measurement Committee.AGA Report No. 4A, Natural Gas Contract Measurement and Quality Clauses – 2008 DRAFT. Washington, DC: American Gas Association, 2008.

Table 46. VOCs/SVOCs detected in Raw Biogas, Partially Clean Biogas and Biomethane

Compound	Raw Samples Above Detection Limit	Raw Biogas Average (ppbv)	Partially Clean Samples Above Detection Limit	Partially Clean Biogas Average (ppbv)	Biomethane Samples Above Detection Limit	Biomethane Sample Average (ppbv)	OSHA Recommended Exposure Limit (ppbv)	NIOSH Recommended Exposure Limit (ppbv)
Benzene	10	4.20	6	5.85	1	27.09	1000	100
Carbon Tetrachloride	8	1.30	7	1.35	12	1.24	10000	2000
Pyridine	1	1.49	0	NA	0	NA	5000	5000
Toluene	10	43.27	7	22.25	13	12.52	200000	100000
1,1,2-Trichloroethane	4	31.62	3	24.19	0	NA	10000	10000
Tetrachloroethene	2	1.26	1	1.61	0	NA	100000	NA
Chlorobenzene	0	NA	1	1.48	0	NA	75000	75000
Ethylbenzene	9	10.94	7	9.75	4	1.83	100000	100000
m/p-Xylenes	8	9.80	6	2.98	12	2.60	100000	100000
Styrene	1	0.45	3	1.28	0	NA	100000	50000
o-Xylene	8	7.86	6	2.24	5	1.54	100000	100000
1,1,2,2-Tetrachloroethane	0	NA	1	0.68	0	NA	5000	1000
Isopropylbenzene	3	3.56	1	1.11	0	NA	50000	50000
n-Propylbenzene	4	5.74	2	1.42	0	NA	NA	NA
1,3,5-Trimethylbenzene	7	4.72	4	1.61	1	0.69	NA	25000
tert-Butylbenzene	3	3.26	1	1.02	0	NA	NA	NA
1,2,4-Trimethylbenzene	8	12.02	6	3.08	1	0.71	25000	NA
sec-Butylbenzene	6	3.83	2	0.96	0	NA	NA	NA
Phenol	6	9.68	5	10.53	0	NA	5000	5000
Aniline	2	21.34	2	12.87	0	NA	5000	NA
2-Chlorophenol	2	0.85	1	1.05	0	NA	NA	NA
p-Isopropyltoluene	9	3.26	6	20.13	0	NA	NA	NA
Benzyl Alcohol	3	5.08	4	46.26	1	2.10	NA	NA
3,4-Methylphenol (o,p-	7	17.97	3	7.45	0	NA	NA	NA

cresol)								
bis(2-chloroisopropyl)ether	1	3.35	1	3.15	0	NA	NA	NA
n-Butylbenzene	5	3.55	2	1.36	0	NA	NA	NA
N-nitroso-di-n-propylamine	1	0.68	1	0.64	7	2.92	NA	NA
Nitrobenzene	2	0.55	5	0.90	0	NA	1000	1000
Naphthalene	6	1.62	1	3.15	4	1.19	10000	10000
2-Methylnaphthalene	3	2.20	0	NA	0	NA	NA	NA
1-Methylnaphthalene	1	3.08	0	NA	0	NA	NA	NA
Diethylphthalate	1	0.21	1	0.23	0	NA	NA	550
Phenanthrene	1	1.09	0	NA	0	NA	27	14
Di-n-butylphthalate	8	0.75	5	0.74	12	0.96	440	440
Fluoranthene	1	0.43	0	NA	0	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	0.39	7	0.83	13	0.44	313	313

Biological Materials

In total, 43 samples were subjected to biological testing. Table 47 presents the average average total bacteria (live and dead), the average live bacteria, the average live spores and the average corrosion causing bacteria for each sample type collected as a part of this Task 2 Biogas Testing Program.

The results indicate that the raw biogas samples have an average of 2.72E+06 dead or live heterogeneous bacteria per 100 scf from anaerobic digestion. The results also reveal that APB and IOB were two main types of corrosion-causing bacteria (dead or live) present within raw biogas. On average, raw biogas with positive detection of live bacteria, contains approximately 6 CFU of bacteria per scf of biogas. The cleanup technology used for biomethane production seems to be more effective in reducing the number of bacteria carried over from raw biogas; however, the incidence of positive detection of live bacteria in biomethane, while still lower than that in raw biogas, is significantly higher in partially clean biogas, natural gas samples or ambient air.

A separate study, conducted with one biomethane producing facility, experimented with the use of parallel filters for the removal of live bacteria from the biomethane gas. Results of this effort, not detailed here, indicate successful removal of live bacteria. Spore removal was not tested. The filter system included parallel 1 micron, .3 micron and .2 micron filters. This system may be applicable for sufficient microbe removal, but further and more in-depth testing is required.

Only four of the ten raw biogas samples tested positive for spores with an average spore number of 537 spores /100 scf. Partial treatment of biogas or cleanup technologies used in biomethane production may have little impact on spore removal. A preliminary screening of spores found that the majority of spore-forming bacteria were *Bacillus licheniformis*, *Bacillus pumilus,* various other *Bacillus* species, and *Paenibacillus* species.

Table 47. Summary of Results from Biological Testing of Raw Biogas, Partially Clean Biogas, Biomethane and Natural Gas Samples

	Raw Biogas Samples	Partially Clean Biogas Samples	Biomethane Samples	Natural Gas from Dairy Farm 5	Natural Gas from GTI Lab	Air from Dairy Farm 1
Average Values (CFU/100 scf or #/100 scf)						
Live Aerobic Bacteria	4.04E+02	2.18E+02	6.05E+02	924.7	negative	NA
Live Anaerob. Bacteria	1.45E+02	2.04E+04	2.52E+02	82.2	negative	41.3
Live Spores	5.37E+02	4.04E+02	7.59E+02	616.4	not detected	NA
Total Bacteria	2.72E+06	2.29E+06	3.87E+05	3.50E+06	6.50E+05	7.90E+05
Total Acid-produce Bacteria	1.82E+04	1.47E+04	7.30E+03	BDL	1.40E+04	2.30E+03
Total Iron-oxidizing Bacteria	2.52E+03	2.56E+03	1.53E+03	4.30E+03	BDL	BDL
Total Sulfate-reducing Bacteria	1.10E+02	1.94E+02	1.65E+02	BDL	BDL	BDL
Live Aerobic Bacteria	4.04E+02	2.18E+02	6.05E+02	negative	negative	NA
Live Anaerob. Bacteria	1.45E+02	2.04E+04	2.52E+02	924.7	negative	NA

Conclusions

GTI's Task 2 Laboratory Testing and Analysis Program focused on the analysis of key analytical and biological parameters in raw biogas, partially cleaned biogas and biomethane. The results for the testing program were compared to typical tariff and contract constituent considerations outlined in AGA Report 4A, which compiles pipeline tariffs of natural gas companies in North America. The objective of Task 2 was two-fold: 1) to verify that discreet biomethane samples supplied to the study could meet overall quality natural gas parameters, and, 2) to verify that the supplied biomethane samples could meet the specific requirements of their contract to the specific pipeline company. As such, required gas quality between the two biomethane suppliers was different. This study also provides supportive information regarding constituents outside of the set of gas quality parameters covered in AGA Report 4A. These data provide input to recommendations included in the Guidance Document (Task 3) as part of this project: *Pipeline Quality Biomethane: North American Guidance Document for Introduction of Dairy Waste Derived Biomethane Into Existing Natural Gas Networks.*

The results from the testing program show that raw biogas, as well as biogas that has been subjected to partial cleanup, cannot provide an analytical profile consistent with typical tariff and contract constituent considerations profiled in AGA Report 4A, 2001. For example, the concentrations for major components such as carbon dioxide, nitrogen, oxygen and hydrogen sulfide are significantly higher than what is specified in typical pipeline tariffs and natural gas contracts. In addition, the biogas samples were found to contain other hydrocarbons, volatile/semi-volatile organic compounds, metals and pesticides. Although mostly present in the parts per billion by volume range, these are constituents not typically found in natural gas.

Results also indicated that average gas quality of the biomethane samples tested in this project were within the range of typical tariff values for constituents cited in AGA Report 4A. The biomethane samples, compared to biogas samples, contained much lower concentrations (in some cases up to four times lower in some cases) of the other constituents not typically found in natural gas.

Overall, the data resulting from testing of biomethane samples demonstrates that this type of renewable gas can exhibit a chemical profile which is consistent with typical tariff and contract constituent considerations cited in AGA Report 4A. In addition, the other target compounds, specifically those not commonly found in natural gas, that were detected in the biomethane samples were present in very low concentrations (parts per billion). These concentrations were compared against NIOSH and OSHA exposure limits as well as other reference concentrations. When compared against NIOSH and OSHA exposure limits, it may be concluded that specific trace concentrations of the compounds in biomethane generated from the digestion of dairy waste and from the systems tested by GTI are far below actionable levels. The data from the biomethane samples demonstrates that the gas treatment technologies used can effectively treat biodigestion outputs to remove undesirable components to levels within the bounds of typical natural gas pipeline tariffs and specific contract values assigned to the biomethane supplier.

In this project, the total bacteria and total corrosion-causing bacteria (APB, IOB, and SRB), including both dead and live bacteria, were determined by a genetic method by targeting specific genes present in the target microorganisms. This data quantifies dead and live microbes in the gas sample. Possible explanations which account for the presence of dead microbes in the raw biogas include: 1) Dead microbial bodies are passed from the original biomass material

(manure, etc.) through digester and into the resulting biogas, 2) Live microbes entering the digester were killed through the digester process and were carried into the resulting biogas, 3) Live microbes present in the digester (liquid phase) are carried to the resulting biogas, but do not survive, and, 4) Live microbes originating from the digester and entrained in the raw biogas, are killed as they are trapped on the sample filter (succumb to desiccation). Of these possibilities, drying of microbes (Number 4) is most likely. Therefore, the live bacteria or spores that were detected in this testing program only represent a small portion of the total microorganism population in the biogas/biomethane. However, due to the fact that these microbes are viable, they may be of greater concern to the pipeline integrity and health risk of consumers. Consequently, it is recommended that appropriate filters/biocides/microbe removal processes be used to prevent the transfer of these microorganisms from the raw biogas to the product biomethane.

The results also indicated that most raw biogas samples have an average of 2.72E+06 (total live and dead) heterogeneous bacteria per 100 scf which is most likely the result of microbial carry over from the anaerobic digestion process. In addition, acid-producing bacteria and iron oxidizing bacteria were the two main types of corrosion-causing bacteria present in these samples. Due to the small size of microorganisms, the partial cleanup of biogas does not seem to be effective in reducing the bacteria number in the raw biogas stream. However, it is indicated that the partial cleanup process can effectively kill some live bacteria in raw biogas and consequently decreases the number of live bacteria present within the biogas.

The cleanup technology used for biomethane production seems to be more effective in reducing the number of bacteria carried over from raw biogas. However, the incidence of live bacteria, while still lower than that in raw biogas, is significantly higher in biomethane than in partially clean biogas. It is possible that bacteria, especially anaerobic bacteria, maybe thriving in the cleanup unit or in parts of the system post-cleanup unit. These microbes may then be carried into the gas stream to the test filter.

Only four of the ten raw biogas samples tested positive for spores with an average spore number of 537 spores /100 scf. Partial treatment of the biogas or cleanup technologies used in biomethane production may have little impact on spore removal. A preliminary screening of spores found that the majority of spore-forming bacteria were *Bacillus licheniformis*, *Bacillus pumilus,* various other *Bacillus* species, and *Paenibacillus* species through Genbank testing. Specific pathogenic species were not queried.

Analyzing natural gas samples was not originally part of the project scope. Two natural gas samples were analyzed; they resulted in very different profiles pertaining to microbial counts. One sample, retrieved from the GTI laboratories, did not contain any viable (live) bacteria, although dead bacteria were present. The other sample, retrieved from Dairy Farm 5 contained both live and dead microbes, including APB and IOB types. Since the data set pertaining to natural gas biological testing was limited (2 samples), conclusions in terms of the number and types of bacteria and spores generally present in natural gas samples across the United States cannot be made. An ambient air sample tested showed negligible live bacteria and no spores. Counts of total bacteria (live and dead) were similar between all natural gas, ambient air and biomethane samples. A more robust effort towards better understanding is recommended.

A preliminary screening of spores found in one natural gas sample also indicates that the majority of spore-forming bacteria were *Bacillus licheniformis*, and other *Bacillus* species.

In a separate and limited study, the use of parallel filters (1 micron, .3 micron, .2 micron) indicated removal of live bacteria from the biomethane. This method, as well as other bactericide programs, may be applicable for microbe removal and spore removal.

In summary, it is concluded and demonstrated that dairy waste based biomethane of high quality may be produced within tolerance specifications for introduction with natural gas supplies. Biogas needs to be conditioned, cleaned and/or filtered depending on the specifics of the on-farm digester and the biomass digested.

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List of Acronyms

Acronym	Description
AAS	Atomic Absorption Spectroscopy
AGA	American Gas Association
AIHA	American Industrial Hygiene Association
ASTM	American Society for Testing and Materials
BDL	Below Detection Limit
Btu	British Thermal Units
COC	Chain of Custody
EPA	Environmental Protect Agency
FERC	Federal Energy Regulatory Commission
GCAED	Gas Chromatography Atomic Emission Detection
GCELCD	Gas Chromatography Electrolytic Conductivity Detection
GCFID	Gas Chromatography Flame Ionization Detection
GCMS	Gas Chromatography Mass Spectrometry
GTI	Gas Technology Institute
HV	Heating Value
ICP	Inductively coupled plasma
ITR	Intrepid Technology Resources
LCMS	Liquid Chromatography Mass Spectrometry
MPN	Most Probably Number
NAPIAP	National Pesticide Impact Assessment Program
NASA	Aeronautics and Space Administration
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
ppb	parts per billion
ppbv	parts per billion by volume
PPE	Personal Protective Equipment
ppmv	parts per million by volume
psi	pounds per square inch
psia	pounds per square inch absolute
qPCR	Quantitative Polymerase Chain Reaction
REL	Recommended Exposure Limit
scf	standard cubic foot
SVOC	Semi-volatile Organic Compounds
VOC	Volatile Organic Compounds

Appendices

Appendix A – Sampling Methods

Appendix B – Results from First Tier Chemical Testing

Appendix C – Results from Second Tier Chemical Testing

Appendix D – Results from Biological Testing

Appendix E – Comparison of Pre-Cleanup Raw Biogas vs. Post Cleanup Biogas

Appendix F – Detection Limits for Second Tier Chemical Testing

Task 2 – Appendices

Appendix A – Sampling Methods

ANALYTICAL SAMPLING PROCEDURE

Sampling for Biological Materials, specifically microorganisms and spore.

Two filters will be placed inside of a stainless steel container (length: 6.3 in, diameter: 2.3 in). The filters that will be used are as follows:

Pall Life Sciences Cat#28150-021, TF 200, 0.2 µm, 47 mm
Pall Life Sciences Cat#28139-244, Zefluor, 2 µm, 47 mm

1. In the direction of the gas flow, the O-ring, filter and metal screen should be placed in the MIC sampler container, placing the 2.0 µm filter followed by the 0.2 µm filter in second stainless steel container.
2. Attach the MIC sampling container securely to the sampling line using appropriate connections. At other end of MIC sampler container, attach to dry test meter. Take note of dry test meter reading, ambient temperature and pressure. Downstream from the dry test meter, attach personal sampling pump to flow at fastest rate by turning the screw on the bottom left of the sampling pump completely clockwise.
3. Open the sample line valve fully and check all fittings for leakage. Correct any leaks found. Make note of start time. Allow approximately 400L of samples gas to pass through the container. Turn off personal sampling pump, and then close the sample line shut-off valve. Record stop time and dry test meter reading. Cautiously loosen the tubing connection at the cylinder inlet valve and allow the residual gas in the sampling line to bleed off.

Note: There will still be gas at full system pressure trapped in the interconnecting tubing if MIC sampler container is connected directly to sampling port.

4. Disconnect the tubing from the inlet valve. Remove the filters from the sampling container. The filter will be folded with sample side inward, and placed in a zip-lock bag. The filter sample can be stored temporarily in refrigerator, and should be shipped to GTI as soon as practical with overnight delivery with ice in the package.

ANALYTICAL SAMPLING PROCEDURE

GILDED SILICA SORBENT TUBES FOR MERCURY ANALYSIS

1. Ascertain that the sample can be obtained at a pressure not exceeding 10 psig and a flow of at least 1.0 liter per minute, and that these conditions can be maintained over the entire sampling period. Pressure- and flow-control devices may be required. The sampling pressure should be kept as low as possible at the specified flow rate. A total flow volume measurement device, such as a dry test meter, can be used to record the exact amounts of gas sampled for more accurate sampling.

   Note: Any sampling lines or control devices should be constructed from materials that are inert and non-sorbing to mercury.

2. The distance from the sampling point to the sampler should be minimized because mercury is easily absorbed on tubing lines and sampling equipment. **The entire sampling system must be passivated with the sample gas prior to any sampling, especially if low levels of mercury are expected.** Stainless tubing must be used for connections upstream of the pressure regulator. High density Teflon or stainless steel tubing is preferred for connections downstream of the regulator. Flexible silicone tubing may be used to make short connections to sampling tubes. Any pumps, metering valves, etc. or other flow- and pressure-controlling devices should be located downstream of the sampler. The entire sampling line should be heated to prevent condensation, especially when a pressure reduction device is used to step down the pressure for sampling.

3. Using a calibrated rotameter, determine an approximate flow control setting for a 1.0 liter per minute flow at the applied pressure. This will save time when actually setting up the first sorbent tube, and will start to passivate the sampling system.

4. Please mark all sorbent tubes with an arrow, front to back, on their sides in the direction of flow of the sample gas through the tubes.

5. Attach a short piece of stainless steel tubing to the inlet of the rotameter and place a short piece of white silicone tubing on the bare end of the stainless tube. Configure the sampling point with a short piece of the silicone tubing as well for attaching the sorbent tubes.

6. For each sampling, use two of the packed sorbent tubes in series. Join the two tubes end-to-end with a short piece of silicone tubing.

7. When you are ready to sample, connect the end of one of the sorbent tubes to the silicone tubing on the inlet of the rotameter, then connect the other end of the tubes to the sampling point. The rotameter should be downstream from the sampling tubes so that the sample gas passes through the tubes first. When all connections are secure, carefully open the sampling valve and quickly adjust the flow control (and pressure if necessary) to obtain the requested flowrate. Record the time and flow data (rotameter reading) at the start of sampling.

8. Flow the sample through the sorbent tubes for a specified amount of time periodically verifying the flow rate and making adjustments if necessary.

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ANALYTICAL SAMPLING PROCEDURE

GILDED SILICA SORBENT TUBES FOR MERCURY ANALYSIS

9. At the end of the sampling period, record the time and flow data, disconnect both tubes, and place each tube in its individual packing assembly. Label each of the tubes used for each test, labeling the first tube as "A" and the second tube (connected to the rotameter) as "B". Securely attach a label to the tube, making sure the sample flow direction is clearly marked with an arrow. Also include the actual flow rate, sampling time and any other descriptive information on the label for later identification.

10. Package the tubes securely to guard against breakage in transit and return all tubes, supplied equipment, and sampling data to GTI for analysis.

NOTES: This sampling procedure is provided only as a guide to sampling gas from a sampling port. It assumes a representative sample flow of the source gas can be obtained. It is the sampler's responsibility to ensure a representative sample. Any historical information regarding the sample would aid us in better analyzing your sample. This would include previous results of laboratory or field screening analyses.

It is the sampler's responsibility to ensure sampling is performed in a safe manner. Neither GTI nor any person acting on behalf of GTI assumes any liability with respect to the use of, or for damages resulting from the use of, any information presented in this procedure.

An extra tube is included in the package. It will serve as a field blank and is included in the analysis price.

GTI recommends that duplicate samples be taken at each sample site. Two samplings with different duration can cover a larger mercury concentration range.

SAMPLING PROCEDURE
LIQUID SORBENT FOR TRACE METALS

Equipment Needed:

Gas transfer lines	Gas impingers (gas bubblers) - 3 per sample
Rotameter	5% HNO_3 / 10% H_2O_2 solution, 100 ml per impinger
Dry test meter (optional)	Sample shipping bottles - 2 per sample plus a blank

1) Ascertain that the sample can be obtained at a pressure not exceeding 10 psig and a flow of 1-2 liters per minute, and that these conditions can be maintained over the entire sampling period. Pressure- and flow-control devices may be required. The sampling pressure should be kept as low as possible at the specified flow rate. A total flow volume measurement device, such as a dry test meter, can be used to record the exact amounts of gas sampled for more accurate sampling.

Note: Any sampling lines or control devices should be constructed from materials that are inert and non-sorbing to metals. The distance from the sampling point to the sampler should be minimized.

2) High density Teflon is preferred for connections downstream of the regulator. Flexible silicone tubing may be used to make short connections to sampling tubes. Any pumps, metering valves, etc. or other flow- and pressure-controlling devices should be located downstream of the sampler if possible. The entire sampling line should be heated to prevent condensation, especially where a pressure reduction device is used to step down the pressure for sampling. Leak check connections using methanol or a thermal conductivity leak detector.

3) Prepare a 5% HNO_3 / 10% H_2O_2 solution in deionized water. (50 ml Ultrex grade concentrated nitric acid + 617 ml deionized water + 333 ml Ultrex grade 30% H_2O_2). Add 100 ml to each of two gas impingers. The third will remain empty and act as a spray trap.

4) Connect the inlet of the first impinger to the regulated outlet of the sample gas. Connect the inlet of the second impinger to the outlet of the first, and the inlet of the third (empty) impinger to the outlet of the second, for a series of three impingers.

5) Connect the outlet of the third impinger to the inlet (bottom) of the rotameter. Connect the outlet (top) of the rotameter to the inlet of the dry test meter (if used). Connect the outlet of the dry test meter to a vent line.

6) Record the initial dry test meter setting, and ambient temperature and pressure if available. Flow the sample through the impingers for a specified amount of time periodically checking that the flow is staying close to what it was when you started sampling and adjusting it if necessary.

7) At the end of the sampling period, record the time, flow data, and final dry test meter reading. Transfer each impinger solution to separate bottles using deionized water. Securely attach a label to the bottle, and indicate which sample was first in the series and which was second. Also save 100 ml of unused sparger solution for use as a blank.

8) Package the bottles securely to guard against leakage in transit.

ANALYTICAL SAMPLING PROCEDURE

TEDLAR GAS SAMPLE BAGS

1. Prepare to attach the Tedlar bag securely to the sampling line using appropriate connections. **If necessary,** a stainless steel needle-type metering valve can be connected to the sampling line to accurately control the sampling flow. For sampling at low pressures a metering valve may not be necessary. High sampling pressure or flow may require the use of a metering valve.

   Note: Keep all bags at a normal indoor air temperature until just before sampling in cold weather. Any sampling lines or control devices should be constructed from materials that are inert and non-sorbing. Teflon or 316 stainless steel (if not testing for sulfur) is to be preferred. Plastic or rubber tubing should never be used when sampling for trace level components such as moisture, oxygen, etc. All bags supplied for sampling are empty, and shipped with closed valves.

2. Ensure that all components of the sampling line have been well purged and flushed with sample gas. Close down the metering valve (if used) and open the sample line valve. Open the valve on the Tedlar bag by turning one half to one turn. Attach the outlet from the metering valve (if used) to this valve using a short piece of silicone or Teflon tubing. A hose clamp may also be necessary.

3. Using the metering valve or sample line valve for control, adjust the sample flow until the bag slowly inflates. Just before the bag fills completely, remove it and gently squeeze the bag to empty it of gas. When the bag is nearly empty, reattach it and let it fill again.

   Note: Do not attempt to fill a bag completely; it is best to leave room for expansion.

4. When the bag has filled the second time, and while it is still connected to the sampling line, close the tedlar bag valve until it is snug and remove the silicone tubing.

5. Securely attach a label to the filled bag, indicating the date, time and any other relevant descriptive information for later identification.

6. Repack the bag in an appropriate shipping container, and return it to GTI for analysis.

   Gas Technology Institute
   1700 S. Mt. Prospect Rd.
   Des Plaines, IL 60018
   ATTN: Russell Bora

NOTES: This sampling procedure is provided only as a guide to sampling gas from a sampling port. It assumes a representative sample flow of the source gas can be obtained. It is the sampler's responsibility to ensure a representative sample. Any historical information regarding the sample would aid us in better analyzing your sample. This would include previous results of laboratory or field screening analyses.

It is the sampler's responsibility to ensure sampling is performed in a safe manner. Neither GTI nor any person acting on behalf of GTI assumes any liability with respect to the use of, or for damages resulting from the use of, any information presented in this procedure.

ANALYTICAL SAMPLING PROCEDURE

XAD-2 Resin for PAH, SVOCs, PCBs, Pesticides, and Herbicides Analyses or
Porapak-R for Pharmaceuticals/Animal Care Products Analyses

1. Ascertain that the sample can be obtained at a pressure not exceeding 10 psig and a flow of at least **1.0 liter per minute**, and that these conditions can be maintained over the entire sampling period. Pressure- and flow-control devices may be required. The sampling pressure should be kept as low as possible at the specified flow rate.
2. The distance from the sampling point to the sampler should be minimized because certain chemicals can easily be absorbed on tubing lines and sampling equipment. Stainless tubing must be used for connections upstream of the pressure regulator. High density Teflon or stainless steel tubing is preferred for connections downstream of the regulator. Flexible silicone tubing may be used to make short connections to sampling tubes. Any pumps, metering valves, etc. or other flow- and pressure-controlling devices should be located downstream of the sampler.
3. Please place all sorbent tubes with the arrow in the direction of the flow of the sample gas through the tubes.
4. Attach a short piece of white silicone tubing to the inlet of the pump. Configure the sampling point with a short piece of the silicone tubing and/or Teflon tubing for attaching the sorbent tubes.
5. For each sampling, use two of the packed sorbent tubes in series. Join the two tubes end-to-end with a short piece of silicone tubing.
6. Using a personal passive sampling pump, determine an approximate flow control setting for a **1.0 liter per minute flow for the Proapak-R** sorbent tubes and **2.0 liters per minute flow for the XAD-2 Resin** sorbent tubes at the applied pressure. Calibrate the sampling pumps by attaching sorbent tubes to the sampling pump and placing the outlet tubing in the outlet port of the calibrator. Press and HOLD the READ button. Adjust flow to desired flow rate by turning the screw on the bottom left of the sampling pump. This will save time when actually setting up the first sorbent tube, and will start to passivate the sampling system.
7. When you are ready to sample, connect the end of one of the sorbent tubes to the silicone tubing on the inlet of the pump, then connect the other end of the tubes to the sampling point. Cover the sorbent tubes with foil to prevent photodegradation. The pump should be downstream from the sampling tubes so that the sample gas passes through the tubes first. When all connections are secure, carefully open the sampling valve and quickly adjust the flow control (and pressure if necessary) to obtain the requested flowrate. Record the time and flow data at the start of sampling, as well as the sorbent tube numbers on each sorbent tube.
8. Flow the sample through the sorbent tubes for **4 hours** periodically verifying the flow rate and making adjustments if necessary.

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ANALYTICAL SAMPLING PROCEDURE

XAD-2 Resin for PAH, SVOCs, PCBs, Pesticides, and Herbicides Analyses or
Porapak-R for Pharmaceuticals/Animal Care Products Analyses

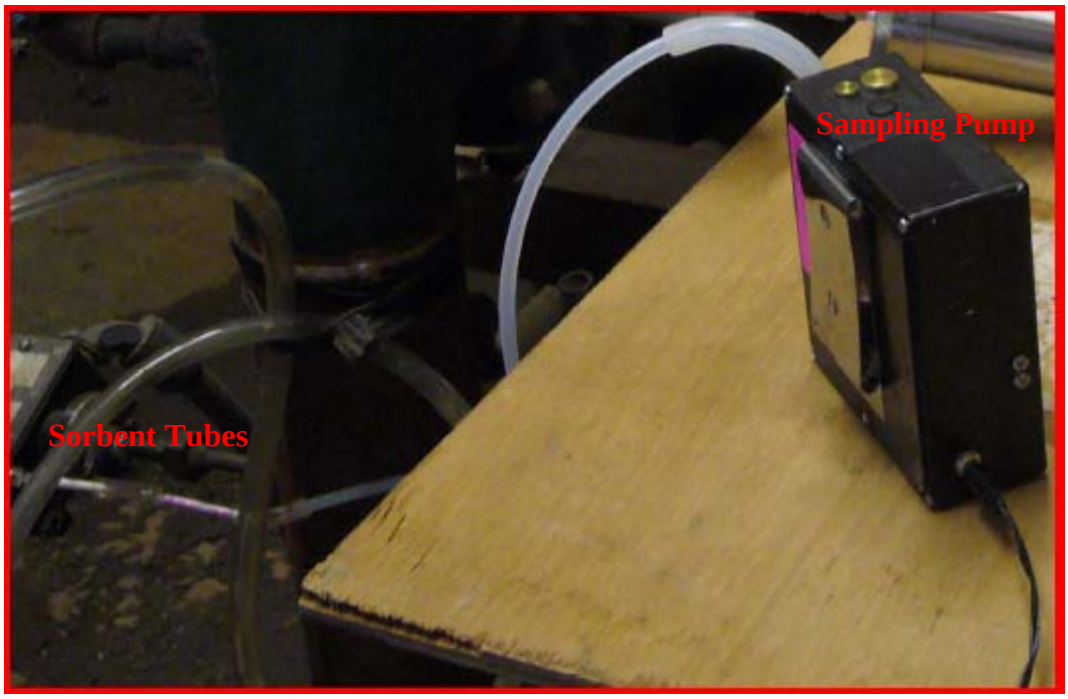
9. At the end of the sampling period, record the time and flow data, disconnect both tubes, and place each tube in its individual packing assembly. Label each of the tubes used for each test, labeling the first tube as "A" and the second tube (connected to the pump) as "B".
10. Package the tubes securely and covered in foil to guard against breakage in transit and return all tubes, supplied equipment, and sampling data to GTI for analysis.

NOTES: This sampling procedure is provided only as a guide to sampling gas from a sampling port. It assumes a representative sample flow of the source gas can be obtained. It is the sampler's responsibility to ensure a representative sample. Any historical information regarding the sample would aid us in better analyzing your sample. This would include previous results of laboratory or field screening analyses.

It is the sampler's responsibility to ensure sampling is performed in a safe manner. Neither GTI nor any person acting on behalf of GTI assumes any liability with respect to the use of, or for damages resulting from the use of, any information presented in this procedure.

An extra tube is included in the package. It will serve as a field blank.

Figure 1.0 Sampling Setup



Appendix B – Results from First Tier Chemical Testing

Gas Properties - per ASTM D3588-98(03)

Biogas Type	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm	1	1	1	1	1	1	1	1
Sample ID	081048-001	081215-001	081215-002	081215-003	081215-004	081215-005	081215-006	081215-007
Sampling Date	1/22/2008	4/7/2008	4/7/2008	4/8/2008	4/8/2008	4/9/2008	4/9/2008	4/10/2008
Calculated Real Gas Properties								
Compressibility Factor [z] (Dry)	0.99807	0.99806	0.99805	0.99805	0.99809	0.99809	0.99811	0.99821
Compressibility Factor [z] (Sat.)	0.99776	0.99775	0.99774	0.99774	0.99778	0.99778	0.99780	0.99791
Specific Gravity	0.5768	0.5767	0.5756	0.5757	0.5821	0.5832	0.5860	0.6065
Gross HV (Dry) (Btu/ft3)	972.3	975.5	977.8	977.8	962.4	960.1	953.6	906.1
Gross HV (Sat.) (Btu/ft3)	955.7	958.8	961.1	961.0	945.9	943.7	937.3	890.6
Wobbe Index	1280.2	1284.6	1288.8	1288.7	1261.4	1257.3	1245.6	1163.5
Net HV (Dry) (Btu/ft3)	875.5	878.3	880.4	880.4	866.5	864.5	858.6	815.9
Net HV (Sat.) (Btu/ft3)	860.5	863.3	865.4	865.3	851.7	849.7	843.9	801.9
Real Gas Density (lbs/ft3)	0.044	0.044	0.044	0.044	0.045	0.045	0.045	0.046

Gas Properties - per ASTM D3588-98(03)

Biogas Type	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm	1	1	2	2	2	2	2	2
Sample ID	081215-008	081215-009	071592-001	071635-001	071659-001	071693-001	071726-001	071759-001
Sampling Date	4/10/2008	4/10/2008	9/18/2007	10/2/2007	10/16/2007	10/30/2007	11/13/2007	11/27/2007
Calculated Real Gas Properties								
Compressibility Factor [z] (Dry)	0.99809	0.99815	0.99802	0.99802	0.99802	0.99802	0.99802	0.99800
Compressibility Factor [z] (Sat.)	0.99778	0.99785	0.99771	0.99771	0.99771	0.99770	0.99770	0.99769
Specific Gravity	0.5832	0.5937	0.5575	0.5584	0.5571	0.5590	0.5575	0.5655
Gross HV (Dry) (Btu/ft3)	960.1	935.0	1010.1	1008.6	1010.4	1008.1	1010.4	1000.9
Gross HV (Sat.) (Btu/ft3)	943.7	919.0	992.8	991.4	993.1	990.8	993.1	983.8
Wobbe Index	1257.3	1213.5	1352.8	1349.7	1353.7	1348.3	1353.2	1331.0
Net HV (Dry) (Btu/ft3)	864.5	841.9	909.5	908.2	909.8	907.7	909.8	901.2
Net HV (Sat.) (Btu/ft3)	849.7	827.5	894.0	892.6	894.2	892.2	894.2	885.8
Real Gas Density (lbs/ft3)	0.045	0.045						

Gas Properties - per ASTM D3588-98(03)

Biogas Type	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	partially clean
Dairy Farm	2	2	2	2	2	2	2	3
Sample ID	071789-001	081168-001	081220-001	081227-002	081247-001	081266-001	081290-001	081079-001
Sampling Date	12/11/2007	3/18/2008	3/18/2008	4/16/2008	4/23/2008	4/30/2008	5/14/2008	2/5/2008
Calculated Real Gas Properties								
Compressibility Factor [z] (Dry)	0.99802	0.99802	0.99802	0.99802	0.99802	0.99801	0.99802	0.99694
Compressibility Factor [z] (Sat.)	0.99770	0.99771	0.99771	0.99771	0.99770	0.99770	0.99770	0.99658
Specific Gravity	0.5598	0.5587	0.5572	0.5567	0.5586	0.5589	0.5591	0.9344
Gross HV (Dry) (Btu/ft3)	1007.0	1008.5	1010.1	1010.6	1008.8	1011.4	1008.4	598.9
Gross HV (Sat.) (Btu/ft3)	989.7	991.3	992.9	993.3	991.6	994.1	991.1	588.7
Wobbe Index	1345.9	1349.2	1353.3	1354.5	1349.8	1352.8	1348.6	619.6
Net HV (Dry) (Btu/ft3)	906.7	908.0	909.5	909.9	908.3	910.7	907.9	539.3
Net HV (Sat.) (Btu/ft3)	891.2	892.5	894.0	894.4	892.8	895.1	892.4	530.1
Real Gas Density (lbs/ft3)		0.043	0.043	0.043	0.043	0.043	0.043	0.072

Gas Properties - per ASTM D3588-98(03)

Biogas Type	partially clean	partially clean	partially clean	partially clean	partially clean	partially clean	raw	raw
Dairy Farm	3	4	5	5	6	7	1	2
Sample ID	081181-001	081082-001	081241-001	081165-001	081289-001	081302-001	081048-004	081227-001
Sampling Date	3/25/2008	2/7/2008	4/22/2008	3/20/2008	5/14/2008	5/15/2008	1/23/2008	4/16/2008
Calculated Real Gas Properties								
Compressibility Factor [z] (Dry)	0.99817	0.99688	0.99701	0.99699	0.99717	0.99748	0.99734	0.99683
Compressibility Factor [z] (Sat.)	0.99787	0.99652	0.99665	0.99662	0.99681	0.99714	0.99700	0.99646
Specific Gravity	0.9588	0.9307	0.9049	0.9073	0.8474	0.8667	0.9665	0.9297
Gross HV (Dry) (Btu/ft3)	386.9	611.0	633.4	632.9	699.6	628.0	497.7	618.4
Gross HV (Sat.) (Btu/ft3)	380.3	600.6	622.6	622.1	687.7	617.3	489.2	607.9
Wobbe Index	395.1	633.3	665.8	664.4	760.0	674.6	506.3	641.4
Net HV (Dry) (Btu/ft3)	348.3	550.2	570.4	569.9	629.9	565.5	448.1	556.9
Net HV (Sat.) (Btu/ft3)	342.4	540.8	560.6	560.2	619.2	555.8	440.5	547.4
Real Gas Density (lbs/ft3)	0.073	0.071	0.069	0.069	0.065	0.066	0.074	0.071

Gas Properties - per ASTM D3588-98(03)

Biogas Type	raw	Raw	Raw	raw	raw	raw	raw	raw
Dairy Farm	3	6	7	8	9	10	11	12
Sample ID	081079-003	081289-003	081303-001	081055-001	081182-001	081188-002	081189-001	081242-001
Sampling Date	2/5/2008	5/14/2008	5/15/2008	1/24/2008	3/26/2008	3/27/2008	3/27/2008	4/23/2008
Calculated Real Gas Properties								
Compressibility Factor [z] (Dry)	0.99687	0.99714	0.99725	0.99682	0.99675	0.99675	0.99711	0.99690
Compressibility Factor [z] (Sat.)	0.99650	0.99679	0.99690	0.99645	0.99638	0.99638	0.99675	0.99654
Specific Gravity	0.9369	0.8532	0.8585	0.9392	0.9530	0.9533	0.9233	0.9137
Gross HV (Dry) (Btu/ft3)	603.6	693.7	671.5	606.4	594.8	594.1	593.5	634.2
Gross HV (Sat.) (Btu/ft3)	593.3	681.9	660.0	596.1	584.7	584.0	583.4	623.4
Wobbe Index	623.6	751.0	724.7	625.8	609.3	608.5	617.7	663.5
Net HV (Dry) (Btu/ft3)	543.5	624.6	604.6	546.1	535.6	535.0	534.5	571.1
Net HV (Sat.) (Btu/ft3)	534.3	614.0	594.3	536.8	526.5	525.9	525.4	561.4
Real Gas Density (lbs/ft3)	0.072	0.065	0.066	0.072	0.073	0.073	0.071	0.070

Biogas Type	Raw	raw
Dairy Farm	13	14
Sample ID	081288-001	071735-001
Sampling Date	5/13/2008	11/16/2007
Calculated Real Gas Properties		
Compressibility Factor [z] (Dry)	0.99722	0.99704
Compressibility Factor [z] (Sat.)	0.99686	0.99668
Specific Gravity	0.8444	0.9397
Gross HV (Dry) (Btu/ft3)	697.1	578.2
Gross HV (Sat.) (Btu/ft3)	685.2	568.3
Wobbe Index	758.6	596.5
Net HV (Dry) (Btu/ft3)	627.7	520.6
Net HV (Sat.) (Btu/ft3)	617.0	511.8
Real Gas Density (lbs/ft3)	0.065	0.072

Major Components Analysis -
ASTM D1945/D1946

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	1	1	1	1	1	1	1	1
Sample ID		081048-001	081215-001	081215-002	081215-003	081215-004	081215-005	081215-006	081215-007	081215-008	081215-009
Sampling Date		1/22/2008	4/7/2008	4/7/2008	4/8/2008	4/8/2008	4/9/2008	4/9/2008	4/10/2008	4/10/2008	4/10/2008
Major Components (Mol%)	Detection Limit (Mol%)										
Helium	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	0.78%	0.94%	0.95%	0.95%	0.79%	0.89%	0.89%	0.85%	0.93%	0.83%
Oxygen/Argon	0.03%	0.39%	0.52%	0.46%	0.45%	1.16%	0.93%	1.05%	1.99%	0.77%	1.38%
Nitrogen	0.03%	2.96%	2.36%	2.19%	2.20%	3.16%	3.52%	4.04%	7.81%	3.64%	5.61%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	95.86%	96.17%	96.40%	96.40%	94.89%	94.66%	94.02%	89.35%	94.66%	92.19%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen Sulfide	0.000005%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbonyl Sulfide	0.000005%	BDL	0.000006%	0.000005%	0.000005%	0.000005%	0.000005%	0.000005%	0.000005%	0.000006%	0.000006%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Major Components Analysis -
ASTM D1945/D1946

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		2	2	2	2	2	2	2	2	2	2	2	2	2
Sample ID		081227-002	071592-001	071635-001	071659-001	071693-001	071726-001	071759-001	071789-001	081168-001	081220-001	081247-001	081266-001	081290-001
Sampling Date		4/16/2008	9/18/2007	10/2/2007	10/16/2007	10/30/2007	11/13/2007	11/27/2007	12/11/2007	3/18/2008	3/18/2008	4/23/2008	4/30/2008	5/14/2008
Major Components (Mol%)	Detection Limit (Mol%)													
Helium	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	0.06%	0.17%	0.23%	0.13%	0.30%	0.19%	0.94%	0.35%	0.27%	0.12%	0.28%	0.21%	0.32%
Oxygen/Argon	0.03%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrogen	0.03%	0.31%	0.24%	0.33%	0.26%	0.32%	0.20%	0.38%	0.38%	0.31%	0.30%	0.26%	0.24%	0.27%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	99.63%	99.58%	99.44%	99.61%	99.38%	99.61%	98.68%	99.27%	99.42%	99.59%	99.46%	99.39%	99.41%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.111%	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.028%	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.005%	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.005%	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.002%	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.0021%	BDL
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen Sulfide	0.000005%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbonyl Sulfide	0.000005%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.000020%	BDL	0.000053%	0.000007%	0.000045%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Biogas Type		**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**
Dairy Farm		**3**	**3**	**4**	**5**	**5**	**6**	**7**
Sample ID		**081079-001**	**081181-001**	**081082-001**	**081241-001**	**081165-001**	**081289-001**	**081302-001**
Sampling Date		**2/5/2008**	**3/25/2008**	**2/7/2008**	**4/22/2008**	**3/20/2008**	**5/14/2008**	**5/15/2008**
Major Components (Mol%)	Detection Limit (Mol%)							
Helium	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	37.63%	24.61%	37.51%	34.42%	34.93%	29.42%	27.28%
Oxygen/Argon	0.03%	0.34%	7.94%	0.42%	0.57%	0.28%	0.29%	1.67%
Nitrogen	0.03%	3.04%	29.30%	1.77%	2.46%	2.32%	1.38%	9.16%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	58.98%	38.15%	59.92%	62.10%	62.08%	68.91%	61.85%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	BDL	0.0003%	0.0001%	0.0001%	BDL	BDL
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen Sulfide	0.000005%	BDL	0.000005%	0.378000%	0.450000%	0.395000%	0.001330%	0.046700%
Carbonyl Sulfide	0.000005%	0.000148%	0.000141%	0.000419%	0.000145%	0.000009%	0.000045%	0.000060%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Major Components Analysis -
ASTM D1945/D1946

Biogas Type		raw	raw	raw	Raw	Raw	raw	raw	raw	raw	raw	Raw	raw
Dairy Farm		1	2	3	6	7	8	9	10	11	12	13	14
Sample ID		081048-004	081227-001	081079-003	081289-003	081303-001	081055-001	081182-001	081188-002	081189-001	081242-001	081288-001	071735-001
Sampling Date		1/23/2008	4/16/2008	2/5/2008	5/14/2008	5/15/2008	1/24/2008	3/26/2008	3/27/2008	3/27/2008	4/23/2008	5/13/2008	11/16/2007
Major Components (Mol%)	Detection Limit (Mol%)												
Helium	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	35.36%	37.65%	38.04%	29.89%	29.20%	38.80%	40.39%	40.33%	34.68%	36.20%	28.57%	36.65%
Oxygen/Argon	0.03%	2.94%	0.33%	0.49%	0.22%	0.31%	0.34%	0.28%	0.23%	1.54%	0.54%	0.31%	1.35%
Nitrogen	0.03%	12.67%	0.88%	1.88%	1.50%	4.27%	1.05%	0.64%	0.79%	5.19%	0.70%	2.39%	4.98%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	49.03%	60.48%	59.19%	68.21%	66.03%	59.54%	58.35%	58.23%	58.26%	62.27%	68.58%	56.83%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	0.0002%	0.0001%	BDL	BDL	BDL	0.0002%	0.0004%	0.0003%	0.0002%	BDL	0.0003%
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.004%	BDL	BDL
Hydrogen Sulfide	0.000005%	BDL	0.657000%	0.399000%	0.183000%	0.183000%	0.272000%	0.335000%	0.419000%	0.322000%	0.292000%	0.148000%	0.184000%
Carbonyl Sulfide	0.000005%	0.000034%	0.000297%	0.000141%	0.000071%	0.000075%	0.000111%	0.000135%	0.000174%	0.000092%	0.000117%	0.000188%	0.000409%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Extended Hydrocarbon Analysis - GC/FID

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	1	1	1	1	1	1
Sample ID		081048-001	081215-001	081215-002	081215-003	081215-004	081215-005	081215-006	081215-007
Sampling Date		1/22/2008	4/7/2008	4/7/2008	4/8/2008	4/8/2008	4/9/2008	4/9/2008	4/10/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)								
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)									
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)									
Hexanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	2	2	2	2	2
Sample ID		081215-008	081215-009	071592-001	071635-001	071659-001	071693-001	071726-001
Sampling Date		4/10/2008	4/10/2008	9/18/2007	10/2/2007	10/16/2007	10/30/2007	11/13/2007
Cycloalkanes (Mol%)	Detection Limit (Mol%)							
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)								
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)								
Hexanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Extended Hydrocarbon Analysis - GC/FID

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		2	2	2	2	2	2	2	2
Sample ID		071759-001	071789-001	081168-001	081220-001	081227-002	081247-001	081266-001	081290-001
Sampling Date		11/27/2007	12/11/2007	3/18/2008	3/18/2008	4/16/2008	4/23/2008	4/30/2008	5/14/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)								
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0004%	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0002%	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0003%	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0002%	BDL
Aromatics (Mol%)									
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)									
Hexanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0006%	BDL
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0021%	BDL

Extended Hydrocarbon Analysis - GC/FID

Biogas Type		partially clean	partially clean	partially clean	partially clean	partially clean	partially clean	partially clean
Dairy Farm		3	3	4	5	5	6	7
Sample ID		081079-001	081181-001	081082-001	081241-001	081165-001	081289-001	081302-001
Sampling Date		2/5/2008	3/25/2008	2/7/2008	4/22/2008	3/20/2008	5/14/2008	5/15/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)							
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)								
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)								
Hexanes	0.0001%	BDL	BDL	0.0002%	0.0001%	0.0001%	BDL	BDL
Heptanes	0.0001%	BDL	BDL	0.0001%	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	BDL	0.0003%	0.0001%	0.0001%	BDL	BDL

Biogas Type		raw	raw	raw	Raw	Raw	raw	raw	raw
Dairy Farm		1	2	3	6	7	8	9	10
Sample ID		081048-004	081227-001	081079-003	081289-003	081303-001	081055-001	081182-001	081188-002
Sampling Date		1/23/2008	4/16/2008	2/5/2008	5/14/2008	5/15/2008	1/24/2008	3/26/2008	3/27/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)								
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)									
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	0.000%	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%	0.0001%
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)			BDL						
Hexanes	0.0001%	BDL	0.000%	0.0001%	BDL	BDL	BDL	0.0001%	0.0001%
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.0001%
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	0.0002%	0.0001%	BDL	BDL	BDL	0.0002%	0.0004%

Biogas Type		raw	raw	Raw	raw
Dairy Farm		11	12	13	14
Sample ID		081189-001	081242-001	081288-001	071735-001
Sampling Date		3/27/2008	4/23/2008	5/13/2008	11/16/2007
Cycloalkanes (Mol%)	Detection Limit (Mol%)				
Cyclopentane	0.0001%	0.0001%	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL
Aromatics (Mol%)					
Benzene	0.0001%	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL
Paraffins (Mol%)					
Hexanes	0.0001%	0.0001%	0.0002%	BDL	0.0002%
Heptanes	0.0001%	0.0001%	BDL	BDL	0.0001%
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	0.0003%	0.0002%	BDL	0.0003%

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	1	1	1	1	1	1
Sample ID		081048-001	081215-001	081215-002	081215-003	081215-004	081215-005	081215-006	081215-007
Sampling Date		1/22/2008	4/7/2008	4/7/2008	4/8/2008	4/8/2008	4/9/2008	4/9/2008	4/10/2008
Sulfur (ppmv)	Detection Limit (ppmv)								
Hydrogen Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sulfur Dioxide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbonyl Sulfide	0.05	BDL	0.06	0.05	0.05	0.05	0.05	0.05	0.05
Carbon Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none	none	none
Total Sulfur (ppmv)		BDL	0.06	0.05	0.05	0.05	0.05	0.05	0.05
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		BDL	0.004	0.003	0.003	0.003	0.003	0.003	0.003

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	2	2	2	2	2
Sample ID		081215-008	081215-009	071592-001	071635-001	071659-001	071693-001	071726-001
Sampling Date		4/10/2008	4/10/2008	9/18/2007	10/2/2007	10/16/2007	10/30/2007	11/13/2007
Sulfur (ppmv)	Detection Limit (ppmv)							
Hydrogen Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sulfur Dioxide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbonyl Sulfide	0.05	0.06	0.06	0.56	1.11	0.32	0.63	0.47
Carbon Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none	none
Total Sulfur (ppmv)		0.06	0.06	0.56	1.11	0.32	0.63	0.47
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		0.004	0.004	0.03	0.07	0.02	0.04	0.03

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		2	2	2	2	2	2	2	2
Sample ID		071759-001	071789-001	081168-001	081220-001	081227-002	081247-001	081266-001	081290-001
Sampling Date		11/27/2007	12/11/2007	3/18/2008	3/18/2008	4/16/2008	4/23/2008	4/30/2008	5/14/2008
Sulfur (ppmv)	Detection Limit (ppmv)								
Hydrogen Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sulfur Dioxide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbonyl Sulfide	0.05	5.28	4.07	0.20	BDL	BDL	0.53	0.07	0.45
Carbon Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none	none	none
Total Sulfur (ppmv)		5.28	4.07	0.20	BDL	BDL	0.53	0.07	0.45
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		0.31	0.24	0.01	BDL	BDL	0.03	0.004	0.03

Biogas Type		partially clean	partially clean	partially clean	partially clean	partially clean	partially clean	partially clean
Dairy Farm		3	3	4	5	5	6	7
Sample ID		081079-001	081181-001	081082-001	081241-001	081165-001	081289-001	081302-001
Sampling Date		2/5/2008	3/25/2008	2/7/2008	4/22/2008	3/20/2008	5/14/2008	5/15/2008
Sulfur (ppmv)	Detection Limit (ppmv)							
Hydrogen Sulfide	0.05	BDL	0.05	3780	4500	3950	13.3	467
Sulfur Dioxide	0.05	BDL	BDL	2.13	0.67	0.12	BDL	0.10
Carbonyl Sulfide	0.05	1.48	1.41	4.19	1.45	0.09	0.45	0.60
Carbon Disulfide	0.05	0.07	0.20	BDL	0.13	BDL	BDL	0.03
Methyl Mercaptan	0.05	0.14	BDL	7.88	1.95	0.10	0.15	0.66
Ethyl Mercaptan	0.05	BDL	BDL	0.23	0.16	BDL	0.05	0.06
i-Propyl Mercaptan	0.05	0.12	BDL	0.72	0.76	BDL	0.08	0.18
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
t-Butyl Mercaptan	0.05	BDL	BDL	0.05	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	0.42	0.63	0.94	0.18	BDL	BDL	BDL
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	0.13	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	0.25	BDL	BDL	BDL	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	0.05	BDL	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none	none
Total Sulfur (ppmv)		2.61	2.49	3800	4510	3950	14.0	469
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		0.15	0.15	225	267	234	0.83	27.8

Biogas Type		raw	raw	raw	Raw	Raw	raw	raw
Dairy Farm		1	2	3	6	7	8	9
Sample ID		081048-004	081227-001	081079-003	081289-003	081303-001	081055-001	081182-001
Sampling Date		1/23/2008	4/16/2008	2/5/2008	5/14/2008	5/15/2008	1/24/2008	3/26/2008
Sulfur (ppmv)	Detection Limit (ppmv)							
Hydrogen Sulfide	0.05	BDL	6570	3990	1830	1830	2720	3350
Sulfur Dioxide	0.05	BDL	0.19	1.34	0.09	0.13	0.54	2.29
Carbonyl Sulfide	0.05	0.34	2.97	1.41	0.71	0.75	1.11	1.35
Carbon Disulfide	0.05	BDL	0.07	BDL	BDL	0.17	BDL	BDL
Methyl Mercaptan	0.05	BDL	2.84	6.12	0.25	0.59	0.65	2.23
Ethyl Mercaptan	0.05	BDL	0.26	0.30	0.08	0.07	0.16	0.23
i-Propyl Mercaptan	0.05	BDL	0.35	0.78	0.09	0.22	0.38	0.40
n-Propyl Mercaptan	0.05	BDL	BDL	0.07	BDL	BDL	BDL	0.08
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	0.13	0.60
Dimethyl Sulfide	0.05	BDL	1.09	0.48	BDL	BDL	0.16	0.24
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	0.15	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	0.06	0.21	BDL	BDL	0.10	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none	none
Total Sulfur (ppmv)		0.34	6580	4000	1830	1830	2720	3360
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		0.02	390	237	108	108	161	199

Biogas Type		raw	raw	raw	Raw	raw
Dairy Farm		10	11	12	13	14
Sample ID		081188-002	081189-001	081242-001	081288-001	071735-001
Sampling Date		3/27/2008	3/27/2008	4/23/2008	5/13/2008	11/16/2007
Sulfur (ppmv)	Detection Limit (ppmv)					
Hydrogen Sulfide	0.05	4190	3220	2920	1480	1840
Sulfur Dioxide	0.05	0.40	0.32	0.07	BDL	7.73
Carbonyl Sulfide	0.05	1.74	0.92	1.17	1.88	4.09
Carbon Disulfide	0.05	BDL	BDL	BDL	0.03	BDL
Methyl Mercaptan	0.05	0.80	0.54	0.74	1.92	5.29
Ethyl Mercaptan	0.05	0.22	0.23	0.20	0.25	0.20
i-Propyl Mercaptan	0.05	0.49	1.35	0.96	0.17	0.90
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	0.09	0.06
t-Butyl Mercaptan	0.05	0.05	BDL	BDL	BDL	0.28
Dimethyl Sulfide	0.05	0.16	0.09	0.09	0.31	0.10
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	0.32
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	0.13	0.26	0.14	BDL	0.12
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none
Total Sulfur (ppmv)		4190	3220	2920	1480	1860
Total Sulfur (As Grains/100 SCF @ 14.73 psia, 60°F)		248	191	173	88	110

Biogas Type		biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane	biomethane
Dairy Farm		1	1	1	1	1	1	1	1
Sample ID		081048-001	081215-001	081215-002	081215-003	081215-004	081215-005	081215-006	081215-007
Sampling Date		1/22/2008	4/7/2008	4/7/2008	4/8/2008	4/8/2008	4/9/2008	4/9/2008	4/10/2008
Halocarbons (ppmv)	Detection Limit (ppmv)								
Dichlorodifluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorotetrafluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichlorofluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dichloromethane (Methylene Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethene (Vinyl Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,2-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Chloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromomethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachloro-1,3-butadiene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total TO-14 Halocarbon Components:	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**1**	**1**	**2**	**2**	**2**	**2**	**2**
Sample ID		**081215-008**	**081215-009**	**071592-001**	**071635-001**	**071659-001**	**071693-001**	**071726-001**
Sampling Date		**4/10/2008**	**4/10/2008**	**9/18/2007**	**10/2/2007**	**10/16/2007**	**10/30/2007**	**11/13/2007**
Halocarbons (ppmv)	Detection Limit (ppmv)							
Dichlorodifluoromethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2-Dichlorotetrafluoroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
Trichlorofluoromethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
Chloromethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
Dichloromethane (Methylene Chloride)	0.10	BDL	BDL	NA	NA	NA	NA	NA
Chloroform	0.10	BDL	BDL	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.10	BDL	BDL	NA	NA	NA	NA	NA
Chloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
Chloroethene (Vinyl Chloride)	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,1-Dichloroethene	0.10	BDL	BDL	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.10	BDL	BDL	NA	NA	NA	NA	NA
Trichloroethene	0.10	BDL	BDL	NA	NA	NA	NA	NA
Tetrachloroethene	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.10	BDL	BDL	NA	NA	NA	NA	NA
3-Chloropropene	0.10	BDL	BDL	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	0.10	BDL	BDL	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	0.10	BDL	BDL	NA	NA	NA	NA	NA
Bromomethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2-Dibromoethane	0.10	BDL	BDL	NA	NA	NA	NA	NA
Chlorobenzene	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	0.10	BDL	BDL	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.10	BDL	BDL	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	0.10	BDL	BDL	NA	NA	NA	NA	NA
Total TO-14 Halocarbon Components:	0.10	BDL	BDL	NA	NA	NA	NA	NA

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Sample ID		**071759-001**	**071789-001**	**081168-001**	**081220-001**	**081227-002**	**081247-001**	**081266-001**	**081290-001**
Sampling Date		**11/27/2007**	**12/11/2007**	**3/18/2008**	**3/18/2008**	**4/16/2008**	**4/23/2008**	**4/30/2008**	**5/14/2008**
Halocarbons (ppmv)	Detection Limit (ppmv)								
Dichlorodifluoromethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorotetrafluoroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Trichlorofluoromethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Chloromethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Dichloromethane (Methylene Chloride)	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethene (Vinyl Chloride)	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,2-Dichloroethene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
3-Chloropropene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Bromomethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Hexachloro-1,3-butadiene	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL
Total TO-14 Halocarbon Components:	0.10	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**raw**
Dairy Farm		**3**	**3**	**4**	**5**	**5**	**6**	**7**	**1**
Sample ID		**081079-001**	**081181-001**	**081082-001**	**081241-001**	**081165-001**	**081289-001**	**081302-001**	**081048-004**
Sampling Date		**2/5/2008**	**3/25/2008**	**2/7/2008**	**4/22/2008**	**3/20/2008**	**5/14/2008**	**5/15/2008**	**1/23/2008**
Halocarbons (ppmv)	Detection Limit (ppmv)								
Dichlorodifluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorotetrafluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichlorofluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dichloromethane (Methylene Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethene (Vinyl Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,2-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Chloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromomethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachloro-1,3-butadiene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total TO-14 Halocarbon Components:	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		raw	raw	Raw	Raw	raw	raw	raw	raw
Dairy Farm		2	3	6	7	8	9	10	11
Sample ID		081227-001	081079-003	081289-003	081303-001	081055-001	081182-001	081188-002	081189-001
Sampling Date		4/16/2008	2/5/2008	5/14/2008	5/15/2008	1/24/2008	3/26/2008	3/27/2008	3/27/2008
Halocarbons (ppmv)	Detection Limit (ppmv)								
Dichlorodifluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorotetrafluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichlorofluoromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloromethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dichloromethane (Methylene Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethene (Vinyl Chloride)	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,2-Dichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Chloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromomethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachloro-1,3-butadiene	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total TO-14 Halocarbon Components:	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**raw**	**Raw**	**raw**
Dairy Farm		**12**	**13**	**14**
Sample ID		**081242-001**	**081288-001**	**071735-001**
Sampling Date		**4/23/2008**	**5/13/2008**	**11/16/2007**
Halocarbons (ppmv)	Detection Limit (ppmv)			
Dichlorodifluoromethane	0.10	BDL	BDL	BDL
1,2-Dichlorotetrafluoroethane	0.10	BDL	BDL	BDL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.10	BDL	BDL	BDL
Trichlorofluoromethane	0.10	BDL	BDL	BDL
Chloromethane	0.10	BDL	BDL	BDL
Dichloromethane (Methylene Chloride)	0.10	BDL	BDL	BDL
Chloroform	0.10	BDL	BDL	BDL
Carbon Tetrachloride	0.10	BDL	BDL	BDL
Chloroethane	0.10	BDL	BDL	BDL
1,1-Dichloroethane	0.10	BDL	BDL	BDL
1,2-Dichloroethane	0.10	BDL	BDL	BDL
1,1,1-Trichloroethane	0.10	BDL	BDL	BDL
1,1,2-Trichloroethane	0.10	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	0.10	BDL	BDL	BDL
Chloroethene (Vinyl Chloride)	0.10	BDL	BDL	BDL
1,1-Dichloroethene	0.10	BDL	BDL	BDL
cis-1,2-Dichloroethene	0.10	BDL	BDL	BDL
Trichloroethene	0.10	BDL	BDL	BDL
Tetrachloroethene	0.10	BDL	BDL	BDL
1,2-Dichloropropane	0.10	BDL	BDL	BDL
3-Chloropropene	0.10	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.10	BDL	BDL	BDL
trans-1,3-Dichloropropene	0.10	BDL	BDL	BDL
Bromomethane	0.10	BDL	BDL	BDL
1,2-Dibromoethane	0.10	BDL	BDL	BDL
Chlorobenzene	0.10	BDL	BDL	BDL
1,2-Dichlorobenzene	0.10	BDL	BDL	BDL
1,3-Dichlorobenzene	0.10	BDL	BDL	BDL
1,4-Dichlorobenzene	0.10	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.10	BDL	BDL	BDL
Hexachloro-1,3-butadiene	0.10	BDL	BDL	BDL
Total TO-14 Halocarbon Components:	0.10	BDL	BDL	BDL

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Sample ID		**081048-001**	**081215-001**	**081215-002**	**081215-003**	**081215-004**	**081215-005**	**081215-006**	**081215-007**
Sampling Date		**1/22/2008**	**4/7/2008**	**4/7/2008**	**4/8/2008**	**4/8/2008**	**4/9/2008**	**4/9/2008**	**4/10/2008**
Siloxanes (ppmv)	Detection Limit								
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Sample ID		**071759-001**	**071789-001**	**081168-001**	**081220-001**	**081227-002**	**081247-001**	**081266-001**	**081290-001**
Sampling Date		**11/27/2007**	**12/11/2007**	**3/18/2008**	**3/18/2008**	**4/16/2008**	**4/23/2008**	**4/30/2008**	**5/14/2008**
Siloxanes (ppmv)	Detection Limit								
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**
Dairy Farm		**3**	**3**	**4**	**5**	**5**	**6**	**7**
Sample ID		**081079-001**	**081181-001**	**081082-001**	**081241-001**	**081165-001**	**081289-001**	**081302-001**
Sampling Date		**2/5/2008**	**3/25/2008**	**2/7/2008**	**4/22/2008**	**3/20/2008**	**5/14/2008**	**5/15/2008**
Siloxanes (ppmv)	Detection Limit							
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**raw**	**raw**	**raw**	**Raw**	**Raw**	**raw**
Dairy Farm		**1**	**2**	**3**	**6**	**7**	**8**
Sample ID		**081048-004**	**081227-001**	**081079-003**	**081289-003**	**081303-001**	**081055-001**
Sampling Date		**1/23/2008**	**4/16/2008**	**2/5/2008**	**5/14/2008**	**5/15/2008**	**1/24/2008**
Siloxanes (ppmv)	Detection Limit						
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type		**raw**	**raw**	**raw**	**raw**	**Raw**	**raw**
Dairy Farm		**9**	**10**	**11**	**12**	**13**	**14**
Sample ID		**081182-001**	**081188-002**	**081189-001**	**081242-001**	**081288-001**	**071735-001**
Sampling Date		**3/26/2008**	**3/27/2008**	**3/27/2008**	**4/23/2008**	**5/13/2008**	**11/16/2007**
Siloxanes (ppmv)	Detection Limit						
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	BDL	BDL	BDL	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Sample ID		**081048-001**	**081215-001**	**081215-002**	**081215-003**	**081215-004**	**081215-005**	**081215-006**	**081215-007**
Sampling Date		**1/22/2008**	**4/7/2008**	**4/7/2008**	**4/8/2008**	**4/8/2008**	**4/9/2008**	**4/9/2008**	**4/10/2008**
	Detection Limit								
Metals (µg/M^3)	(µg/M^3)								
Mercury	0.02	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Molybdenum	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**1**	**1**	**2**	**2**	**2**	**2**	**2**
Sample ID		**081215-008**	**081215-009**	**071592-001**	**071635-001**	**071659-001**	**071693-001**	**071726-001**
Sampling Date		**4/10/2008**	**4/10/2008**	**9/18/2007**	**10/2/2007**	**10/16/2007**	**10/30/2007**	**11/13/2007**
	Detection Limit							
Metals (µg/M^3)	(µg/M^3)							
Mercury	0.02	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic	20	BDL	not tested	BDL	BDL	BDL	BDL	BDL
Cadmium	2	BDL	not tested	BDL	BDL	BDL	BDL	BDL
Copper	20	BDL	not tested	BDL	BDL	BDL	BDL	BDL
Lead	20	BDL	not tested	BDL	BDL	BDL	BDL	BDL
Molybdenum	2	BDL	not tested	BDL	BDL	BDL	BDL	BDL
Selenium	20	BDL	not tested	BDL	BDL	BDL	BDL	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Sample ID		**071759-001**	**071789-001**	**081168-001**	**081220-001**	**081227-002**	**081247-001**	**081266-001**	**081290-001**
Sampling Date		**11/27/2007**	**12/11/2007**	**3/18/2008**	**3/18/2008**	**4/16/2008**	**4/23/2008**	**4/30/2008**	**5/14/2008**
	Detection Limit								
Metals (µg/M^3)	(µg/M^3)								
Mercury	0.02	BDL	BDL	not tested	BDL	not tested	BDL	BDL	BDL
Arsenic	20	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested
Cadmium	2	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested
Copper	20	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested
Lead	20	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested
Molybdenum	2	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested
Selenium	20	BDL	BDL	not tested	not tested	not tested	BDL	BDL	not tested

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**	**partially clean**
Dairy Farm		**3**	**3**	**4**	**5**	**5**	**6**	**7**
Sample ID		**081079-001**	**081181-001**	**081082-001**	**081241-001**	**081165-001**	**081289-001**	**081302-001**
Sampling Date		**2/5/2008**	**3/25/2008**	**2/7/2008**	**4/22/2008**	**3/20/2008**	**5/14/2008**	**5/15/2008**
	Detection Limit							
Metals (µg/M^3)	(µg/M^3)							
Mercury	0.02	BDL	0.02	BDL	BDL	0.06	BDL	BDL
Arsenic	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Molybdenum	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium	20	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**raw**	**raw**	**raw**	**Raw**	**Raw**	**raw**	**raw**
Dairy Farm		**1**	**2**	**3**	**6**	**7**	**8**	**9**
Sample ID		**081048-004**	**081227-001**	**081079-003**	**081289-003**	**081303-001**	**081055-001**	**081182-001**
Sampling Date		**1/23/2008**	**4/16/2008**	**2/5/2008**	**5/14/2008**	**5/15/2008**	**1/24/2008**	**3/26/2008**
	Detection Limit							
Metals (µg/M^3)	(µg/M^3)							
Mercury	0.02	BDL	not tested	BDL	BDL	BDL	BDL	0.02
Arsenic	20	BDL	not tested	BDL	BDL	BDL	not tested	BDL
Cadmium	2	BDL	not tested	BDL	BDL	BDL	not tested	BDL
Copper	20	BDL	not tested	BDL	BDL	BDL	not tested	BDL
Lead	20	BDL	not tested	BDL	BDL	BDL	not tested	BDL
Molybdenum	2	BDL	not tested	BDL	BDL	BDL	not tested	2
Selenium	20	BDL	not tested	BDL	BDL	BDL	not tested	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**raw**	**raw**	**raw**	**Raw**	**raw**
Dairy Farm		**10**	**11**	**12**	**13**	**14**
Sample ID		**081188-002**	**081189-001**	**081242-001**	**081288-001**	**071735-001**
Sampling Date		**3/27/2008**	**3/27/2008**	**4/23/2008**	**5/13/2008**	**11/16/2007**
	Detection Limit					
Metals (µg/M^3)	(µg/M^3)					
Mercury	0.02	BDL	BDL	BDL	BDL	BDL
Arsenic	20	BDL	BDL	BDL	BDL	not tested
Cadmium	2	BDL	BDL	BDL	BDL	not tested
Copper	20	BDL	BDL	BDL	60	not tested
Lead	20	BDL	BDL	BDL	BDL	not tested
Molybdenum	2	BDL	BDL	BDL	BDL	not tested
Selenium	20	BDL	BDL	BDL	BDL	not tested

Biogas Type		**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**	**biomethane**
Dairy Farm		**1**	**1**	**2**	**2**	**2**	**2**	**2**
Sample ID		**081215-008**	**081215-009**	**071592-001**	**071635-001**	**071659-001**	**071693-001**	**071726-001**
Sampling Date		**4/10/2008**	**4/10/2008**	**9/18/2007**	**10/2/2007**	**10/16/2007**	**10/30/2007**	**11/13/2007**
Siloxanes (ppmv)	Detection Limit							
1,1,3,3-Tetramethyldisiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Pentamethyldisiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Hexamethyldisilane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Hexamethyldisiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Octamethyltrisiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Octamethylcyclotetrasiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Decamethyltetrasiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Decamethylcyclopentasiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL
Dodecamethylpentasiloxane	0.5 ppmv Si	BDL	BDL	NA	NA	NA	NA	BDL

Appendix C – Results from Second Tier Chemical Testing

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	BDL	1.18	2.01	1.05	1.55	1.88	1.65	1.69	0.67	0.82
1,2-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromomethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromodichloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyridine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
N-nitrosodimethylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	2.52	1.67	2.09	1.77	2.11	2.57	1.88	7.65	5.60	5.44
trans-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromochloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1,2-Tetrachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.37	0.53
m/p-Xylenes	1.62	1.17	1.31	BDL	1.29	1.56	1.23	1.35	6.01	1.34
Bromoform	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
o-Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.36	0.55
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Isopropylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
tert-Butylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trimethylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
sec-Butylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
1,3-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
p-Isopropyltoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzyl Alcohol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Methylphenol (m-cresol)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3,4-Methylphenol (o,p-cresol)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-chloroisopropyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Butylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
N-nitroso-di-n-propylamine	BDL	3.42	3.49	2.53	2.99	3.60	2.98	1.45	BDL	BDL
Hexachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromo-3-Chloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Isophorone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dimethylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Chloroethoxy)methane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	BDL	0.91	2.06	1.38	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobutadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloro-3-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorocyclopentadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Azobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,6-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dinitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenzofuran	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,4,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,5,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chlorophenyl-phenylether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,6-Dinitro-2-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Nitrosodiphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Bromophenyl phenyl ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbazole	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-butylphthalate	BDL	1.91	0.52	1.16	1.89	2.29	0.44	0.48	0.60	0.22
Bis(2-ethylhexyl) adipate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Butylbenzylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benz[a]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Ethylhexyl)phthalate	0.50	0.40	0.60	0.61	0.67	0.81	0.41	0.44	0.30	0.22
Di-n-octylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[b]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[k]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[a]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno[1,2,3-cd]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz[a,h]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[g,h,i]perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	27.09	BDL	10.80	8.62	12.74	0.84	1.18	0.92	BDL
Carbon Tetrachloride	0.66	0.69	1.01	2.02	1.06	2.12	1.34	0.92	0.70	1.31
1,2-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromomethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromodichloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyridine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
N-nitrosodimethylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	3.43	107.54	18.56	40.35	21.68	36.18	11.58	16.54	22.41	7.03
trans-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	BDL	BDL	BDL	BDL	49.62	BDL	6.78	16.18	BDL	BDL
1,3-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromochloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.61	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	BDL	BDL	1.48	BDL	BDL	BDL	BDL
1,1,1,2-Tetrachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	3.04	1.39	22.76	6.90	22.27	4.58	7.88	1.67	2.20
m/p-Xylenes	1.25	11.25	1.85	5.54	0.95	5.30	2.97	2.28	0.86	BDL
Bromoform	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	BDL	BDL	BDL	1.09	BDL	1.63	BDL	1.12	BDL	BDL
o-Xylene	0.48	2.47	0.85	5.10	0.86	3.10	1.84	1.82	0.74	BDL
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	0.68	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Isopropylbenzene	BDL	BDL	BDL	1.11	BDL	BDL	BDL	BDL	BDL	BDL
Bromobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propylbenzene	BDL	BDL	BDL	1.69	BDL	1.14	BDL	BDL	BDL	BDL
4-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	BDL	BDL	0.69	1.90	BDL	2.18	BDL	BDL	1.01	1.34
tert-Butylbenzene	BDL	BDL	BDL	BDL	BDL	1.02	BDL	BDL	BDL	BDL
1,2,4-Trimethylbenzene	BDL	BDL	0.71	6.11	0.93	7.79	0.85	2.10	0.71	BDL
sec-Butylbenzene	BDL	BDL	BDL	BDL	0.35	1.58	BDL	BDL	BDL	BDL
Phenol	BDL	BDL	BDL	29.38	3.38	5.85	1.46	12.56	BDL	BDL
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aniline	BDL	BDL	BDL	BDL	24.60	BDL	1.14	BDL	BDL	BDL
2-Chlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.05	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
1,3-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
p-Isopropyltoluene	BDL	BDL	BDL	8.43	1.18	108.52	0.55	1.32	BDL	0.78
Benzyl Alcohol	BDL	BDL	2.10	BDL	BDL	179.07	1.24	BDL	3.61	1.12
2-Methylphenol (m-cresol)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3,4-Methylphenol (o,p-cresol)	BDL	BDL	BDL	BDL	BDL	2.60	18.64	BDL	BDL	1.12
bis(2-chloroisopropyl)ether	BDL	BDL	BDL	BDL	3.15	BDL	BDL	BDL	BDL	BDL
n-Butylbenzene	BDL	BDL	BDL	BDL	0.60	2.13	BDL	BDL	BDL	BDL
N-nitroso-di-n-propylamine	BDL	BDL	BDL	BDL	0.64	BDL	BDL	BDL	BDL	BDL
Hexachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromo-3-Chloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Isophorone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dimethylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Chloroethoxy)methane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	BDL	0.41	BDL	0.90	1.36	0.93	0.50	0.80	BDL	BDL
2,4-Dichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobutadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloro-3-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorocyclopentadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Azobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,6-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dinitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenzofuran	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,4,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,5,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	0.23	BDL	BDL	BDL
4-Chlorophenyl-phenylether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,6-Dinitro-2-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Nitrosodiphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Bromophenyl phenyl ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbazole	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-butylphthalate	0.48	0.67	0.89	BDL	0.39	BDL	0.90	0.85	0.38	1.19
Bis(2-ethylhexyl) adipate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Butylbenzylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benz[a]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Ethylhexyl)phthalate	0.21	0.20	0.34	3.80	0.30	0.64	0.35	0.32	0.16	0.27
Di-n-octylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[b]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[k]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[a]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno[1,2,3-cd]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz[a,h]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[g,h,i]perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	4.74	13.65	1.46	1.09	4.60	9.18	2.64	2.25	1.30	1.07
Carbon Tetrachloride	BDL	1.93	0.87	1.26	BDL	1.13	1.61	1.52	1.09	0.97
1,2-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromomethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromodichloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyridine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
N-nitrosodimethylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	98.23	41.86	36.23	14.08	16.66	23.08	30.81	11.63	12.90	147.26
trans-1,3-Dichloropropene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	BDL	BDL	BDL	BDL	BDL	52.82	20.20	30.16	23.29	BDL
1,3-Dichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromochloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromoethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene	1.44	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.09	BDL
Chlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1,2-Tetrachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	33.81	17.81	2.12	2.76	BDL	7.35	2.15	10.14	17.51	4.81
m/p-Xylenes	44.67	3.85	1.06	BDL	BDL	1.01	1.06	8.97	16.55	1.26
Bromoform	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.45	BDL	BDL
o-Xylene	34.22	3.72	0.90	BDL	BDL	0.91	0.65	5.90	15.39	1.16
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Isopropylbenzene	2.66	BDL	BDL	BDL	BDL	BDL	BDL	0.68	7.35	BDL
Bromobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Propylbenzene	9.54	0.99	BDL	BDL	BDL	BDL	BDL	1.41	11.03	BDL
4-Chlorotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	13.58	1.36	1.36	1.15	BDL	BDL	BDL	2.40	11.09	2.11
tert-Butylbenzene	4.20	BDL	BDL	BDL	BDL	BDL	BDL	0.93	4.65	BDL
1,2,4-Trimethylbenzene	38.74	4.39	0.83	BDL	BDL	0.99	0.67	7.25	41.53	1.73
sec-Butylbenzene	2.35	3.55	BDL	BDL	BDL	0.37	1.55	1.77	13.36	BDL
Phenol	2.00	28.14	BDL	BDL	BDL	3.60	8.92	12.78	2.63	BDL
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aniline	BDL	BDL	BDL	BDL	BDL	26.18	BDL	BDL	16.50	BDL
2-Chlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.53	1.17	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
1,3-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
p-Isopropyltoluene	2.59	3.29	0.54	0.72	BDL	1.26	4.62	2.41	8.17	5.77
Benzyl Alcohol	BDL	BDL	BDL	1.02	BDL	BDL	BDL	0.46	13.76	BDL
2-Methylphenol (m-cresol)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3,4-Methylphenol (o,p-cresol)	BDL	82.07	0.93	1.82	BDL	BDL	0.54	1.56	38.23	0.62
bis(2-chloroisopropyl)ether	BDL	BDL	BDL	BDL	BDL	3.35	BDL	BDL	BDL	BDL
n-Butylbenzene	3.02	2.25	BDL	BDL	BDL	0.63	BDL	0.88	10.99	BDL
N-nitroso-di-n-propylamine	BDL	BDL	BDL	BDL	BDL	0.68	BDL	BDL	BDL	BDL
Hexachloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dibromo-3-Chloropropane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	0.57	0.53	BDL	BDL
Isophorone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dimethylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Chloroethoxy)methane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene	1.09	1.30	1.36	BDL	BDL	1.45	BDL	1.02	3.47	BDL
2,4-Dichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobutadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-Trichlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Chloro-3-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Methylnaphthalene	0.90	BDL	BDL	BDL	BDL	BDL	BDL	0.43	5.28	BDL
1-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.08	BDL
Hexachlorocyclopentadiene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Azobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dimethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,6-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dinitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-Dinitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitrophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenzofuran	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,4-dinitrotoluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,4,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2,3,5,6-Tetrachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Diethylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.21	BDL	BDL
4-Chlorophenyl-phenylether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Nitroaniline	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,6-Dinitro-2-methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
n-Nitrosodiphenylamine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-Bromophenyl phenyl ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pentachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.09	BDL
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbazole	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-butylphthalate	0.84	BDL	1.05	0.79	BDL	0.42	0.65	0.81	1.06	0.41
Bis(2-ethylhexyl) adipate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.43	BDL
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Butylbenzylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benz[a]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
bis(2-Ethylhexyl)phthalate	0.42	0.61	0.25	0.29	0.65	0.32	0.40	0.34	0.39	0.21
Di-n-octylphthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[b]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[k]fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[a]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno[1,2,3-cd]pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz[a,h]anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo[g,h,i]perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
a-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
b-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
g-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
d-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor epoxide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
g-Chlordane	BDL	BDL	0.52	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan I	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
a-Chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dieldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan II	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endrin aldehyde	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan sulfate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endrin ketone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methoxychlor	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
a-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
b-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
g-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
d-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor	BDL	BDL	BDL	BDL	BDL	0.01	BDL	BDL	BDL	BDL
Aldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor epoxide	BDL	BDL	BDL	0.03	BDL	BDL	BDL	BDL	BDL	BDL
g-Chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan I	BDL	BDL	BDL	BDL	BDL	0.01	BDL	BDL	BDL	BDL
a-Chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dieldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan II	BDL	BDL	BDL	0.01	BDL	0.01	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	0.03	BDL	0.01	BDL	BDL	BDL	BDL
Endrin aldehyde	BDL	BDL	BDL	0.02	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan sulfate	BDL	BDL	BDL	0.01	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	0.01	BDL	BDL	0.01	BDL	BDL	BDL
Endrin ketone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methoxychlor	BDL	BDL	BDL	0.19	3.57E-03	0.04	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
a-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
b-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
g-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
d-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor	BDL	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor epoxide	BDL	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
g-Chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan I	BDL	BDL	BDL	BDL	BDL	BDL	1.52E-03	BDL	BDL	BDL
a-Chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dieldrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endrin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Endosulfan II	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.42E-03	BDL	BDL
Endrin aldehyde	BDL	BDL	BDL	BDL	BDL	BDL	0.01	2.38E-03	BDL	BDL
Endosulfan sulfate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL	BDL	BDL	0.02	0.01	BDL	BDL
Endrin ketone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methoxychlor	0.01	4.71E-02	BDL	BDL	BDL	3.81E-03	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
PCB1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 18	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 17	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 27	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 32	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 29	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 54	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 26	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 25	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 31	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 28	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 53	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 45	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 46	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 69	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
PCB 73	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 49	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 47	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 48	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 75	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 104	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 35	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 44	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 59	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 37	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 42	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 71	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 41	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 64	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 103	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 67	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 63	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 74	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 70	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 66	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 93	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 95	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 91	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 56	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 60	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 92	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 84	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 90	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 101	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 99	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 119	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 83	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 97	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 117	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 81	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 87	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 115	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 85	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 136	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 77	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 110	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 154	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 82	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 151	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 135	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 144	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 124	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 147	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 107	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 123	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
PCB 149	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 118	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 134	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 114	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 131	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 122	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 165	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 146	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 188	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 153	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 132	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 105	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 141	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 179	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 137	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 176	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 130	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 138	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 163	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 164	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 158	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 129	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 178	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 175	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 187	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 183	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 128	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 167	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 185	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 174	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 177	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 202	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 171	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 156	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 173	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 157	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 201	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 172	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 197	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 180	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 193	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 191	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 170	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 190	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 199	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 196	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 203	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 189	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 208	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 195	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 207	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 194	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 205	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 206	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 209	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 18	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 17	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 27	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 32	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 29	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 54	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 26	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 25	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 31	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 28	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 53	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 45	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 46	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 69	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB 73	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 49	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 47	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 48	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 75	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 104	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 35	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 44	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 59	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 37	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 42	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 71	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 41	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 64	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 103	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 67	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 63	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 74	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 70	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 66	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 93	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 95	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 91	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 56	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 60	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 92	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 84	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 90	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 101	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 99	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 119	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 83	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 97	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 117	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 81	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 87	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 115	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 85	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 136	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 77	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 110	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 154	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 82	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 151	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 135	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 144	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 124	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 147	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 107	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 123	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB 149	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 118	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 134	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 114	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 131	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 122	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 165	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 146	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 188	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 153	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 132	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 105	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 141	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 179	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 137	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 176	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 130	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 138	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 163	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 164	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 158	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 129	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 178	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 175	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 187	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 183	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 128	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 167	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 185	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 174	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 177	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 202	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 171	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 156	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 173	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 157	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 201	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 172	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 197	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 180	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 193	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 191	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 170	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 190	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 199	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 196	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 203	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 189	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 208	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 195	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 207	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 194	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 205	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 206	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 209	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 18	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 17	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 27	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 32	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 29	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 54	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 26	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 25	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 31	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 28	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 53	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 45	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 46	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 69	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB 73	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 49	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 47	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 48	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 75	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 104	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 35	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 44	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 59	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 37	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 42	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 71	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 41	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 64	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 103	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 67	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 63	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 74	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 70	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 66	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 93	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 95	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 91	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 56	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 60	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 92	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 84	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 90	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 101	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 99	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 119	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 83	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 97	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 117	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 81	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 87	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 115	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 85	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 136	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 77	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 110	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 154	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 82	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 151	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 135	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 144	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 124	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 147	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 107	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 123	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB 149	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 118	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 134	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 114	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 131	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 122	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 165	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 146	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 188	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 153	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 132	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 105	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 141	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 179	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 137	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 176	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 130	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 138	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 163	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 164	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 158	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 129	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 178	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 175	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 187	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 183	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 128	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 167	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 185	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 174	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 177	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 202	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 171	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 156	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 173	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 157	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 201	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 172	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 197	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 180	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 193	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 191	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 170	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 190	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 199	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 196	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 203	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 189	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 208	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 195	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 207	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 194	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 205	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 206	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PCB 209	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Pharmaceuticals (ppbv)

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08	04/16/08
Sample ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02	GT080430-01a
Ampicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Amoxicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Oxytocin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Florfenicol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tripelennamine hydrochloride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ceftiofur	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tilmicosin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Furosemide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Flunixin meglumine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fenbendazol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Doramectin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Biomethane	Biomethane	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	2	2	3	3	4	5	5	6	7
Sampling Date	04/23/08	04/30/08	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
Sample ID	GT080430-02a	GT080530-12	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
Ampicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Amoxicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Oxytocin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Florfenicol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tripelennamine hydrochloride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ceftiofur	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tilmicosin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Furosemide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Flunixin meglumine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fenbendazol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Doramectin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9	10	11	12	13
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
Sample ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
Ampicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Amoxicillin Trihydrate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Oxytocin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Florfenicol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tripelennamine hydrochloride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ceftiofur	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tilmicosin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Furosemide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Flunixin meglumine	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fenbendazol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Doramectin	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Appendix D – Results from Biological Testing

Detection of Live Bacteria and Spores

Dairy Farm	Gas Type	GTI Log#	Sample Date	Pore Size (µm)	Live Aerobic Bacteria (#/100 scf)	Live Anaerobic Bacteria (#/100 scf)	Spores (#/100 scf)
1	Air	041408-09	04/11/08	0.2	negative	41.3	not detected
1	Biomethane	012508-03	01/23/08	0.2	1216.3	99.3	not detected
1	Biomethane	041408-01	04/08/08	0.2	92.7	negative	not detected
1	Biomethane	041408-02	04/08/08	0.2	negative	negative	124.1
1	Biomethane	041408-03	04/09/08	0.2	negative	77.3	not detected
1	Biomethane	041408-04	04/09/08	0.2	negative	negative	not detected
1	Biomethane	041408-05	04/10/08	0.2	negative	94.6	not detected
1	Biomethane	041408-06	04/10/08	0.2	negative	61.7	not detected
1	Biomethane	041408-07	04/11/08	0.2	negative	147.4	not detected
1	Biomethane	041408-08	04/11/08	0.2	57.4	76.5	not detected
2	Biomethane	041108-01	04/10/08	0.2	negative	negative	not detected
2	Biomethane	041108-02	04/10/08	0.2	164.7	164.7	823.5
2	Biomethane	042208-01	04/16/08	0.2	35461.0	425.5	236.4
2	Biomethane	042508-01	04/23/08	0.2	11820.3	35461.0	13711.6
2	Biomethane	052008-01	05/14/08	0.2	189.1	425.5	not detected
2	Biomethane	Intrepid 111407	11/14/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 112107	11/21/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 112807	11/28/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 120507	12/05/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 121207	12/12/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 122007	12/20/07	0.2	not tested	negative	not detected
2	Biomethane	Intrepid 010308	01/01/08	0.2	not tested	negative	not detected
2	Biomethane	052908-02	05/29/08	0.2	425.5	188.2	not detected
5	Natural Gas	040108-02	03/20/08	0.2	924.7	82.2	616.4
GTI	Natural Gas	041508-01	04/15/08	0.2	negative	negative	not detected
7	Partially Clean	052008-04	05/15/08	0.2	negative	negative	not detected
5	Partially Clean	040108-01	03/20/08	0.2	531.9	negative	1063.829787
5	Partially Clean	042408-01	04/22/08	0.2	negative	20430.1	2258.1
3	Partially Clean	021108-03	02/05/08	0.2	negative	negative	124.1
3	Partially Clean	040108-04	03/25/08	0.2	292.2	negative	292.2
6	Partially Clean	052008-03	05/14/08	0.2	66.7	negative	not detected

Detection of Live Bacteria and Spores

Dairy Farm	Gas Type	GTI Log#	Sample Date	Pore Size (µm)	Live Aerobic Bacteria (#/100 scf)	Live Anaerobic Bacteria (#/100 scf)	Spores (#/100 scf)
4	Partially Clean	021108-06	02/05/08	0.2	negative	negative	124.1
1	Raw	012508-01	01/22/08	0.2	2106.9	negative	744.7
3	Raw	021108-01	02/05/08	0.2	173.8	99.3	not detected
7	Raw	052308-01	05/16/08	0.2	214.3	595.2	not detected
8	Raw	012508-05	01/24/08	0.2	1117.0	negative	248.2
8	Raw	041408-10	04/07/08	0.2	153.1	87.5	not detected
9	Raw	040108-03	03/26/08	0.2	528.2	190.1	528.2
10	Raw	040108-05	03/27/08	0.2	957.4	148.9	851.0638298
11	Raw	040108-06	03/28/08	0.2	245.6	122.8	not detected
12	Raw	042408-02	04/23/08	0.2	709.2	113.5	not detected
13	Raw	052008-02	05/13/08	0.2	98.2	98.2	not detected

*negative = tested negative for the presence of live bacteria

**Intrepid samples that were collected in 2007 and January 2008 were collected for a separate project funded by Intermountain Gas

Total Bacteria and Corrosion Causing Bacteria

Dairy Farm	Type	Sample ID	Sample Date	Pore size (µm)	Total Bacteria (living and dead)	Total acid-producing bacteria (APB)	Total iron-oxidizing bacteria (IOB)	Total sulfate-reducing bacteria (SRB)
					bacteria/100 scf			
3	Partially Clean	040108-04	03/25/08	0.2	1.7E+06	BDL	4.7E+03	BDL
5	Partially Clean	042408-01*	04/22/08	0.2		BDL	BDL	BDL
6	Partially Clean	052008-03	05/14/08	0.2	5.7E+06	7.4E+02	BDL	1.9E+02
7	Partially Clean	052008-04	05/15/08	0.2	5.2E+06	1.1E+04	BDL	BDL
1	Raw	012508-01	01/22/08	0.2	1.7E+06	1.8E+04	BDL	BDL
3	Raw	021108-01	02/05/08	0.2	1.3E+06	2.4E+04	2.5E+03	BDL
7	Raw	052308-01	05/16/08	0.2	1.01E+06	6.03E+04	1.62E+03	BDL
8	Raw	012508-05	01/24/08	0.2	5.8E+05	2.4E+04	1.0E+03	BDL
8	Raw	041408-10	04/07/08	0.2	3.2E+06	1.4E+04	BDL	BDL
9	Raw	040108-03	03/26/08	0.2	3.8E+07	5.0E+04	3.7E+03	BDL
10	Raw	040108-05	03/27/08	0.2	2.2E+06	4.8E+04	5.1E+03	BDL
11	Raw	040108-06	03/28/08	0.2	3.2E+06	BDL	3.4E+03	BDL
12	Raw	042408-02	04/23/08	0.2	5.1E+06	8.6E+03	2.9E+03	BDL
13	Raw	052008-02	05/13/08	0.2	4.1E+06	1.2E+03	2.1E+03	1.1E+02

Note: 042408-01: Genomic DNA is probably lost during isolation

Dairy Farm	Type	Sample ID	Sample Date	Pore size (µm)	Total Bacteria (living and dead)	Total acid-producing bacteria (APB)	Total iron-oxidizing bacteria (IOB)	Total sulfate-reducing bacteria (SRB)
					bacteria/100 scf			
1	Air	041408-09	04/11/08	0.2	7.9E+05	2.3E+03	BDL	BDL
1	Biomethane	012508-03	01/23/08	0.2	5.7E+05	2.9E+04	BDL	BDL
1	Biomethane	041408-01	04/08/08	0.2	1.6E+06	1.1E+04	BDL	BDL
1	Biomethane	041408-02	04/08/08	0.2	4.9E+06	5.9E+03	BDL	BDL
1	Biomethane	041408-03	04/09/08	0.2	5.0E+06	1.2E+04	3.0E+03	BDL
1	Biomethane	041408-04	04/09/08	0.2	2.5E+06	4.2E+03	1.1E+03	BDL
1	Biomethane	041408-05	04/10/08	0.2	3.7E+06	1.2E+04	BDL	BDL
1	Biomethane	041408-06	04/10/08	0.2	3.3E+06	3.5E+03	BDL	BDL
1	Biomethane	041408-07	04/11/08	0.2	2.2E+06	7.0E+03	BDL	BDL
1	Biomethane	041408-08	04/11/08	0.2	1.7E+06	9.5E+03	BDL	BDL
2	Biomethane	041108-01	04/10/08	0.2	1.3E+04	9.7E+01	BDL	BDL
2	Biomethane	041108-02	04/10/08	0.2	2.9E+06	1.2E+04	BDL	BDL
2	Biomethane	042208-01	04/16/08	0.2	4.6E+06	2.6E+04	4.0E+03	BDL
2	Biomethane	042508-01	04/23/08	0.2	8.2E+06	4.4E+04	7.5E+02	BDL
2	Biomethane	052008-01	05/14/08	0.2	1.0E+07	2.2E+04	1.9E+03	1.7E+02
2	Biomethane	Intrepid 111407	11/04/07	0.2	4.1E+03	4.1E+02	BDL	BDL
2	Biomethane	Intrepid 112107	11/21/07	0.2	2.3E+06	2.1E+04	BDL	BDL
2	Biomethane	Intrepid 112807	11/28/07	0.2	3.5E+03	5.2E+02	BDL	BDL
2	Biomethane	Intrepid 120507	12/05/07	0.2	6.9E+03	BDL	BDL	BDL
2	Biomethane	Intrepid 121207	12/12/07	0.2	6.5E+03	BDL	BDL	BDL
2	Biomethane	Intrepid 122007	12/20/07	0.2	5.1E+03	BDL	BDL	BDL
2	Biomethane	Intrepid 010308	01/03/08	0.2	3.3E+03	BDL	BDL	BDL
2	Biomethane	052908-02		0.2	1.03E+06	9.80E+04	6.90E+02	BDL
5	Natural Gas	040108-02	03/20/08	0.2	3.5E+06	BDL	4.3E+03	BDL
GTI	Natural Gas	041508-01	04/15/08	0.2	6.5E+05	1.4E+04	BDL	BDL
3	Partially Clean	021108-03	02/05/08	0.2	1.4E+06	3.1E+04	8.9E+02	BDL
4	Partially Clean	021108-05	02/05/08	0.2	1.5E+06	4.4E+04	BDL	BDL
5	Partially Clean	040108-01	03/20/08	0.2	1.4E+06	6.2E+04	4.0E+03	BDL

Appendix E – Comparison of Pre-Cleanup and Post Cleanup Biogas Samples

Major Components Analysis -
ASTM D1945/D1946

Biogas Type		**clean**	**raw**	**clean**	**raw**	**partially clean**
Dairy Farm		**1**	**1**	**2**	**2**	**3**
Sample ID		**081048-001**	**081048-004**	**081227-002**	**081227-001**	**081079-001**
Sampling Date		**1/22/2008**	**1/23/2008**	**4/16/2008**	**4/16/2008**	**2/5/2008**
Major Components (Mol%)	Detection Limit (Mol%)					
Helium	0.10%	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	0.78%	35.36%	0.06%	37.65%	37.63%
Oxygen/Argon	0.03%	0.39%	2.94%	BDL	0.33%	0.34%
Nitrogen	0.03%	2.96%	12.67%	0.31%	0.88%	3.04%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	95.86%	49.03%	99.63%	60.48%	58.98%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	BDL	BDL	0.0002%	BDL
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL
Hydrogen Sulfide	0.000005%	BDL	BDL	BDL	0.657000%	BDL
Carbonyl Sulfide	0.000005%	BDL	0.000034%	BDL	0.000297%	0.000148%
Total		100.00%	100.00%	100.00%	100.00%	100.00%

Major Components Analysis -
ASTM D1945/D1946

Biogas Type		**raw**	**partially clean**	**Raw**	**partially clean**	**Raw**
Dairy Farm		**3**	**6**	**6**	**7**	**7**
Sample ID		**081079-003**	**081289-001**	**081289-003**	**081302-001**	**081303-001**
Sampling Date		**2/5/2008**	**5/14/2008**	**5/14/2008**	**5/15/2008**	**5/15/2008**
Major Components (Mol%)	Detection Limit (Mol%)					
Helium	0.10%	BDL	BDL	BDL	BDL	BDL
Hydrogen	0.10%	BDL	BDL	BDL	BDL	BDL
Carbon Dioxide	0.03%	38.04%	29.42%	29.89%	27.28%	29.20%
Oxygen/Argon	0.03%	0.49%	0.29%	0.22%	1.67%	0.31%
Nitrogen	0.03%	1.88%	1.38%	1.50%	9.16%	4.27%
Carbon Monoxide	0.025%	BDL	BDL	BDL	BDL	BDL
Methane	0.002%	59.19%	68.91%	68.21%	61.85%	66.03%
Ethane	0.002%	BDL	BDL	BDL	BDL	BDL
Ethene	0.002%	BDL	BDL	BDL	BDL	BDL
Ethyne	0.002%	BDL	BDL	BDL	BDL	BDL
Propane	0.002%	BDL	BDL	BDL	BDL	BDL
Propene	0.002%	BDL	BDL	BDL	BDL	BDL
Propadiene	0.002%	BDL	BDL	BDL	BDL	BDL
Propyne	0.002%	BDL	BDL	BDL	BDL	BDL
i-Butane	0.002%	BDL	BDL	BDL	BDL	BDL
n-Butane	0.002%	BDL	BDL	BDL	BDL	BDL
1-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
i-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
trans-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
cis-2-Butene	0.002%	BDL	BDL	BDL	BDL	BDL
1,3-Butadiene	0.002%	BDL	BDL	BDL	BDL	BDL
i-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
n-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
neo-Pentane	0.002%	BDL	BDL	BDL	BDL	BDL
Pentenes	0.002%	BDL	BDL	BDL	BDL	BDL
Hexane Plus	0.0001%	BDL	BDL	BDL	BDL	BDL
Ammonia	0.001%	BDL	BDL	BDL	BDL	BDL
Hydrogen Sulfide	0.000005%	0.399000%	0.001330%	0.183000%	0.046700%	0.183000%
Carbonyl Sulfide	0.000005%	0.000141%	0.000045%	0.000071%	0.000060%	0.000075%
Total		100.00%	100.00%	100.00%	100.00%	100.00%

Expanded Hydrocarbon Analysis - GC/FID

Biogas Type		biomethane	raw	biomethane	raw	partially clean
Dairy Farm		1	1	2	2	3
Sample ID		081048-001	081048-004	081227-002	081227-001	081079-001
Sampling Date		1/22/2008	1/23/2008	4/16/2008	4/16/2008	2/5/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)					
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)						
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)						
Hexanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	BDL	BDL	BDL	BDL	BDL

Expanded Hydrocarbon Analysis - GC/FID

Biogas Type		raw	partially clean	Raw	partially clean	Raw
Dairy Farm		3	6	6	7	7
Sample ID		081079-003	081289-001	081289-003	081302-001	081303-001
Sampling Date		2/5/2008	5/14/2008	5/14/2008	5/15/2008	5/15/2008
Cycloalkanes (Mol%)	Detection Limit (Mol%)					
Cyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Methylcyclopentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Cyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL
Methylcyclohexane	0.0001%	BDL	BDL	BDL	BDL	BDL
Aromatics (Mol%)						
Benzene	0.0001%	BDL	BDL	BDL	BDL	BDL
Toluene	0.0001%	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	0.0001%	BDL	BDL	BDL	BDL	BDL
m,p-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL
Styrene	0.0001%	BDL	BDL	BDL	BDL	BDL
o-Xylene	0.0001%	BDL	BDL	BDL	BDL	BDL
C3 Benzenes	0.0001%	BDL	BDL	BDL	BDL	BDL
Naphthalene	0.0001%	BDL	BDL	BDL	BDL	BDL
C1 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL
C2 Naphthalenes	0.0001%	BDL	BDL	BDL	BDL	BDL
Paraffins (Mol%)						
Hexanes	0.0001%	0.0001%	BDL	BDL	BDL	BDL
Heptanes	0.0001%	BDL	BDL	BDL	BDL	BDL
2,2,4-Trimethylpentane	0.0001%	BDL	BDL	BDL	BDL	BDL
Octanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Nonanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Decanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Undecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Dodecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Tridecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Tetradecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Pentadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Hexadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Heptadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Octadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Nonadecanes	0.0001%	BDL	BDL	BDL	BDL	BDL
Eicosanes +	0.0001%	BDL	BDL	BDL	BDL	BDL
Total from Cyclopentane and Eicosanes+ (Mol%)	0.0001%	0.0001%	BDL	BDL	BDL	BDL

Biogas Type		biomethane	raw	biomethane	raw	partially clean	raw
Dairy Farm		1	1	2	2	3	3
Sample ID		081048-001	081048-004	081227-002	081227-001	081079-001	081079-003
Sampling Date		1/22/2008	1/23/2008	4/16/2008	4/16/2008	2/5/2008	2/5/2008
Sulfur (ppmv)	Detection Limit (ppmv)						
Hydrogen Sulfide	0.05	BDL	BDL	BDL	6570	BDL	3990
Sulfur Dioxide	0.05	BDL	BDL	BDL	0.19	BDL	1.34
Carbonyl Sulfide	0.05	BDL	0.34	BDL	2.97	1.48	1.41
Carbon Disulfide	0.05	BDL	BDL	BDL	0.07	0.07	BDL
Methyl Mercaptan	0.05	BDL	BDL	BDL	2.84	0.14	6.12
Ethyl Mercaptan	0.05	BDL	BDL	BDL	0.26	BDL	0.30
i-Propyl Mercaptan	0.05	BDL	BDL	BDL	0.35	0.12	0.78
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	0.07
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	BDL	BDL	BDL	1.09	0.42	0.48
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL	0.13	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	0.15
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	BDL	0.06	BDL	0.21
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL	0.05	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none	none	none
Total Sulfur (ppmv)		BDL	0.34	BDL	6580	2.61	4000

Biogas Type		**partially clean**	**Raw**	**partially clean**	**Raw**
Dairy Farm		**6**	**6**	**7**	**7**
Sample ID		**081289-001**	**081289-003**	**081302-001**	**081303-001**
Sampling Date		**5/14/2008**	**5/14/2008**	**5/15/2008**	**5/15/2008**
Sulfur (ppmv)	Detection Limit (ppmv)				
Hydrogen Sulfide	0.05	13.3	1830	467	1830
Sulfur Dioxide	0.05	BDL	0.09	0.10	0.13
Carbonyl Sulfide	0.05	0.45	0.71	0.60	0.75
Carbon Disulfide	0.05	BDL	BDL	0.03	0.17
Methyl Mercaptan	0.05	0.15	0.25	0.66	0.59
Ethyl Mercaptan	0.05	0.05	0.08	0.06	0.07
i-Propyl Mercaptan	0.05	0.08	0.09	0.18	0.22
n-Propyl Mercaptan	0.05	BDL	BDL	BDL	BDL
t-Butyl Mercaptan	0.05	BDL	BDL	BDL	BDL
Dimethyl Sulfide	0.05	BDL	BDL	BDL	BDL
Methyl Ethyl Sulfide	0.05	BDL	BDL	BDL	BDL
Diethyl Sulfide	0.05	BDL	BDL	BDL	BDL
Di-t-Butyl Sulfide	0.05	BDL	BDL	BDL	BDL
Dimethyl Disulfide	0.05	BDL	BDL	BDL	BDL
Methyl Ethyl Disulfide	0.05	BDL	BDL	BDL	BDL
Methyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
Diethyl Disulfide	0.05	BDL	BDL	BDL	BDL
Methyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
Methyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL
Ethyl i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
Ethyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
Ethyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL
Di-i-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
i-Propyl n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
Di-n-Propyl Disulfide	0.05	BDL	BDL	BDL	BDL
i-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL
n-Propyl t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL
Di-t-Butyl Disulfide	0.05	BDL	BDL	BDL	BDL
Dimethyl Trisulfide	0.05	BDL	BDL	BDL	BDL
Diethyl Trisulfide	0.05	BDL	BDL	BDL	BDL
Di-t-Butyl Trisulfide	0.05	BDL	BDL	BDL	BDL
Thiophene	0.05	BDL	BDL	BDL	BDL
C1-Thiophenes	0.05	BDL	BDL	BDL	BDL
C2-Thiophenes	0.05	BDL	BDL	BDL	BDL
C3-Thiophenes	0.05	BDL	BDL	BDL	BDL
Benzothiophene	0.05	BDL	BDL	BDL	BDL
C1-Benzothiophenes	0.05	BDL	BDL	BDL	BDL
C2-Benzothiophenes	0.05	BDL	BDL	BDL	BDL
Thiophane	0.05	BDL	BDL	BDL	BDL
Thiophenol	0.05	BDL	BDL	BDL	BDL
Individual Unidentified Sulfur Compounds (all as monosulfides)	0.05	none	none	none	none
Total Sulfur (ppmv)		14.0	1830	469	1830

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**biomethane**	**raw**	**biomethane**	**raw**	**partially clean**
Dairy Farm		**1**	**1**	**2**	**2**	**3**
Sample ID		**081048-001**	**081048-004**	**081227-002**	**081227-001**	**081079-001**
Sampling Date		**1/22/2008**	**1/23/2008**	**4/16/2008**	**4/16/2008**	**2/5/2008**
Metals (µg/M^3)	Detection Limit (µg/M^3)					
Mercury	0.02	BDL	BDL	not tested	not tested	BDL
Arsenic	20	BDL	BDL	not tested	not tested	BDL
Cadmium	2	BDL	BDL	not tested	not tested	BDL
Copper	20	BDL	BDL	not tested	not tested	BDL
Lead	20	BDL	BDL	not tested	not tested	BDL
Molybdenum	2	BDL	BDL	not tested	not tested	BDL
Selenium	20	BDL	BDL	not tested	not tested	BDL

Mercury Analysis - ASTM D5954
Metals Analysis - ICP EPA Method 29 Mod.

Biogas Type		**raw**	**partially clean**	**Raw**	**partially clean**	**Raw**
Dairy Farm		**3**	**6**	**6**	**7**	**7**
Sample ID		**081079-003**	**081289-001**	**081289-003**	**081302-001**	**081303-001**
Sampling Date		**2/5/2008**	**5/14/2008**	**5/14/2008**	**5/15/2008**	**5/15/2008**
Metals (µg/M^3)	Detection Limit (µg/M^3)					
Mercury	0.02	BDL	BDL	BDL	BDL	BDL
Arsenic	20	BDL	BDL	BDL	BDL	BDL
Cadmium	2	BDL	BDL	BDL	BDL	BDL
Copper	20	BDL	BDL	BDL	BDL	BDL
Lead	20	BDL	BDL	BDL	BDL	BDL
Molybdenum	2	BDL	BDL	BDL	BDL	BDL
Selenium	20	BDL	BDL	BDL	BDL	BDL

Biogas Type			Biomethane	Raw	Partially Clean	Raw
Dairy Farm			1	1	3	3
Sampling Date			01/23/08	01/22/08	02/05/08	02/05/08
GTI Lab ID	Detection Limit Min (ppbv)	Detection Limit Max (ppbv)	GT080129-03	GT080129-04	GT080213-02	GT080213-01
1,1,1-Trichloroethane	0.33	2.31	BDL	BDL	BDL	BDL
1,2-Dichloroethane	0.45	3.12	BDL	BDL	BDL	BDL
1,1-Dichloropropene	0.40	2.78	BDL	BDL	BDL	BDL
Benzene	0.57	3.95	BDL	4.74	10.80	13.65
Carbon Tetrachloride	0.29	2.00	BDL	BDL	2.02	1.93
1,2-Dichloropropane	0.39	2.73	BDL	BDL	BDL	BDL
Trichloroethene	0.34	2.35	BDL	BDL	BDL	BDL
Dibromomethane	0.25	1.77	BDL	BDL	BDL	BDL
Bromodichloromethane	0.27	1.88	BDL	BDL	BDL	BDL
Pyridine	0.56	3.90	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	0.40	2.78	BDL	BDL	BDL	BDL
N-nitrosodimethylamine	0.60	4.16	BDL	BDL	BDL	BDL
Toluene	0.48	3.35	2.52	98.23	40.35	41.86
trans-1,3-Dichloropropene	0.40	2.78	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	0.33	2.31	BDL	BDL	BDL	BDL
1,3-Dichloropropane	0.39	2.73	BDL	BDL	BDL	BDL
Dibromochloromethane	0.21	1.48	BDL	BDL	BDL	BDL
1,2-Dibromoethane	0.24	1.64	BDL	BDL	BDL	BDL
Tetrachloroethene	0.27	1.86	BDL	1.44	BDL	BDL
Chlorobenzene	0.39	2.74	BDL	BDL	BDL	BDL
1,1,1,2-Tetrachloroethane	0.26	1.84	BDL	BDL	BDL	BDL
Ethylbenzene	0.42	2.90	BDL	33.81	22.76	17.81
m/p-Xylenes	0.42	2.90	1.62	44.67	5.54	3.85
Bromoform	0.18	1.22	BDL	BDL	BDL	BDL
Styrene	0.43	2.96	BDL	BDL	1.09	BDL
o-Xylene	0.42	2.90	BDL	34.22	5.10	3.72
1,1,2,2-Tetrachloroethane	0.26	1.84	BDL	BDL	0.68	BDL
1,2,3-Trichloropropane	0.30	2.09	BDL	BDL	BDL	BDL
Isopropylbenzene	0.37	2.56	BDL	2.66	1.11	BDL
Bromobenzene	0.28	1.96	BDL	BDL	BDL	BDL
2-Chlorotoluene	0.35	2.44	BDL	BDL	BDL	BDL
n-Propylbenzene	0.37	2.56	BDL	9.54	1.69	0.99
4-Chlorotoluene	0.35	2.44	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	0.37	2.56	BDL	13.58	1.90	1.36
tert-Butylbenzene	0.33	2.30	BDL	4.20	BDL	BDL
1,2,4-Trimethylbenzene	0.37	2.56	BDL	38.74	6.11	4.39
sec-Butylbenzene	0.33	2.30	BDL	2.35	BDL	3.55
Phenol	0.47	3.28	BDL	2.00	29.38	28.14
bis(2-Chloroethyl)ether	0.31	2.16	BDL	BDL	BDL	BDL
Aniline	0.48	3.31	BDL	BDL	BDL	BDL

Biogas Type			Biomethane	Raw	Partially Clean	Raw
Dairy Farm			1	1	3	3
Sampling Date			01/23/08	01/22/08	02/05/08	02/05/08
GTI Lab ID	Detection Limit Min (ppbv)	Detection Limit Max (ppbv)	GT080129-03	GT080129-04	GT080213-02	GT080213-01
2-Chlorophenol	0.34	2.40	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	0.30	2.10	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	0.30	2.10	BDL	BDL	BDL	BDL
p-Isopropyltoluene	0.33	2.30	BDL	2.59	8.43	3.29
Benzyl Alcohol	0.41	2.85	BDL	BDL	BDL	BDL
2-Methylphenol (m-cresol)	0.41	2.85	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	0.30	2.10	BDL	BDL	BDL	BDL
3,4-Methylphenol (o,p-cresol)	0.41	2.85	BDL	BDL	BDL	82.07
bis(2-chloroisopropyl)ether	0.26	1.80	BDL	BDL	BDL	BDL
n-Butylbenzene	0.33	2.30	BDL	3.02	BDL	2.25
N-nitroso-di-n-propylamine	0.34	2.37	BDL	BDL	BDL	BDL
Hexachloroethane	0.19	1.30	BDL	BDL	BDL	BDL
1,2-Dibromo-3-Chloropropane	0.19	1.30	BDL	BDL	BDL	BDL
Nitrobenzene	0.36	2.50	BDL	BDL	BDL	BDL
Isophorone	0.32	2.23	BDL	BDL	BDL	BDL
2-Nitrophenol	0.32	2.22	BDL	BDL	BDL	BDL
2,4-Dimethylphenol	0.36	2.52	BDL	BDL	BDL	BDL
bis(2-Chloroethoxy)methane	0.26	1.78	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	0.24	1.70	BDL	BDL	BDL	BDL
Naphthalene	0.35	2.41	BDL	1.09	0.90	1.30
2,4-Dichlorophenol	0.27	1.89	BDL	BDL	BDL	BDL
4-Chloroaniline	0.35	2.42	BDL	BDL	BDL	BDL
Hexachlorobutadiene	0.17	1.18	BDL	BDL	BDL	BDL
1,2,3-Trichlorobenzene	0.24	1.70	BDL	BDL	BDL	BDL
4-Chloro-3-methylphenol	0.31	2.16	BDL	BDL	BDL	BDL
2-Methylnaphthalene	0.31	2.17	BDL	0.90	BDL	BDL
1-Methylnaphthalene	0.31	2.17	BDL	BDL	BDL	BDL
Hexachlorocyclopentadiene	0.16	1.13	BDL	BDL	BDL	BDL
2,4,6-Trichlorophenol	0.22	1.56	BDL	BDL	BDL	BDL
2,4,5-Trichlorophenol	0.22	1.56	BDL	BDL	BDL	BDL
Diphenylamine	0.26	1.82	BDL	BDL	BDL	BDL
Azobenzene	0.24	1.69	BDL	BDL	BDL	BDL
2-Chloronaphthalene	0.27	1.90	BDL	BDL	BDL	BDL
2-Nitroaniline	0.32	2.23	BDL	BDL	BDL	BDL
1,4-Dinitrobenzene	0.26	1.83	BDL	BDL	BDL	BDL
Dimethylphthalate	0.23	1.59	BDL	BDL	BDL	BDL
1,3-Dinitrobenzene	0.26	1.83	BDL	BDL	BDL	BDL

Biogas Type			Biomethane	Raw	Partially Clean	Raw
Dairy Farm			1	1	3	3
Sampling Date			01/23/08	01/22/08	02/05/08	02/05/08
GTI Lab ID	Detection Limit Min (ppbv)	Detection Limit Max (ppbv)	GT080129-03	GT080129-04	GT080213-02	GT080213-01
Acenaphthylene	0.29	2.03	BDL	BDL	BDL	BDL
2,6-dinitrotoluene	0.24	1.69	BDL	BDL	BDL	BDL
1,2-Dinitrobenzene	0.26	1.83	BDL	BDL	BDL	BDL
3-Nitroaniline	0.32	2.23	BDL	BDL	BDL	BDL
Acenaphthene	0.29	2.00	BDL	BDL	BDL	BDL
2,4-Dinitrophenol	0.24	1.67	BDL	BDL	BDL	BDL
4-Nitrophenol	0.32	2.22	BDL	BDL	BDL	BDL
Dibenzofuran	0.26	1.83	BDL	BDL	BDL	BDL
2,4-dinitrotoluene	0.24	1.69	BDL	BDL	BDL	BDL
2,3,4,6-Tetrachlorophenol	0.19	1.33	BDL	BDL	BDL	BDL
2,3,5,6-Tetrachlorophenol	0.19	1.33	BDL	BDL	BDL	BDL
Diethylphthalate	0.20	1.39	BDL	BDL	BDL	BDL
4-Chlorophenyl-phenylether	0.22	1.51	BDL	BDL	BDL	BDL
Fluorene	0.27	1.85	BDL	BDL	BDL	BDL
4-Nitroaniline	0.32	2.23	BDL	BDL	BDL	BDL
4,6-Dinitro-2-methylphenol	0.22	1.56	BDL	BDL	BDL	BDL
n-Nitrosodiphenylamine	0.22	1.56	BDL	BDL	BDL	BDL
4-Bromophenyl phenyl ether	0.18	1.24	BDL	BDL	BDL	BDL
Hexachlorobenzene	0.16	1.08	BDL	BDL	BDL	BDL
Pentachlorophenol	0.17	1.16	BDL	BDL	BDL	BDL
Phenanthrene	0.25	1.73	BDL	BDL	BDL	BDL
Anthracene	0.25	1.73	BDL	BDL	BDL	BDL
Carbazole	0.26	1.84	BDL	BDL	BDL	BDL
Di-n-butylphthalate	0.16	1.11	BDL	0.84	BDL	BDL
Bis(2-ethylhexyl) adipate	0.12	0.83	BDL	BDL	BDL	BDL
Fluoranthene	0.22	1.52	BDL	BDL	BDL	BDL
Pyrene	0.22	1.52	BDL	BDL	BDL	BDL
Butylbenzylphthalate	0.14	0.99	BDL	BDL	BDL	BDL
Benz[a]anthracene	0.19	1.35	BDL	BDL	BDL	BDL
Chrysene	0.19	1.35	BDL	BDL	BDL	BDL
bis(2-Ethylhexyl)phthalate	0.11	0.79	0.50	0.42	3.80	0.61
Di-n-octylphthalate	0.11	0.79	BDL	BDL	BDL	BDL
Benzo[b]fluoranthene	0.18	1.22	BDL	BDL	BDL	BDL
Benzo[k]fluoranthene	0.18	1.22	BDL	BDL	BDL	BDL
Benzo[a]pyrene	0.18	1.22	BDL	BDL	BDL	BDL
Indeno[1,2,3-cd]pyrene	0.16	1.12	BDL	BDL	BDL	BDL
Dibenz[a,h]anthracene	0.16	1.11	BDL	BDL	BDL	BDL
Benzo[g,h,i]perylene	0.16	1.12	BDL	BDL	BDL	BDL

Biogas Type	Partially Clean	Raw	Partially Clean	Raw
Dairy Farm	6	6	7	7
Sampling Date	05/14/08	05/14/08	05/15/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-06	GT080530-08	GT080530-10
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL
1,2-Dichloroethane	BDL	BDL	BDL	BDL
1,1-Dichloropropene	BDL	BDL	BDL	BDL
Benzene	0.92	1.46	BDL	1.09
Carbon Tetrachloride	0.70	0.87	1.31	1.26
1,2-Dichloropropane	BDL	BDL	BDL	BDL
Trichloroethene	BDL	BDL	BDL	BDL
Dibromomethane	BDL	BDL	BDL	BDL
Bromodichloromethane	BDL	BDL	BDL	BDL
Pyridine	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropene	BDL	BDL	BDL	BDL
N-nitrosodimethylamine	BDL	BDL	BDL	BDL
Toluene	22.41	36.23	7.03	14.08
trans-1,3-Dichloropropene	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	BDL	BDL	BDL	BDL
1,3-Dichloropropane	BDL	BDL	BDL	BDL
Dibromochloromethane	BDL	BDL	BDL	BDL
1,2-Dibromoethane	BDL	BDL	BDL	BDL
Tetrachloroethene	BDL	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	BDL
1,1,1,2-Tetrachloroethane	BDL	BDL	BDL	BDL
Ethylbenzene	1.67	2.12	2.20	2.76
m/p-Xylenes	0.86	1.06	BDL	BDL
Bromoform	BDL	BDL	BDL	BDL
Styrene	BDL	BDL	BDL	BDL
o-Xylene	0.74	0.90	BDL	BDL
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	BDL
1,2,3-Trichloropropane	BDL	BDL	BDL	BDL
Isopropylbenzene	BDL	BDL	BDL	BDL
Bromobenzene	BDL	BDL	BDL	BDL
2-Chlorotoluene	BDL	BDL	BDL	BDL
n-Propylbenzene	BDL	BDL	BDL	BDL
4-Chlorotoluene	BDL	BDL	BDL	BDL
1,3,5-Trimethylbenzene	1.01	1.36	1.34	1.15
tert-Butylbenzene	BDL	BDL	BDL	BDL
1,2,4-Trimethylbenzene	0.71	0.83	BDL	BDL
sec-Butylbenzene	BDL	BDL	BDL	BDL
Phenol	BDL	BDL	BDL	BDL
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL
Aniline	BDL	BDL	BDL	BDL

Biogas Type	Partially Clean	Raw	Partially Clean	Raw
Dairy Farm	6	6	7	7
Sampling Date	05/14/08	05/14/08	05/15/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-06	GT080530-08	GT080530-10
2-Chlorophenol	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene	BDL	BDL	BDL	BDL
p-Isopropyltoluene	BDL	0.54	0.78	0.72
Benzyl Alcohol	3.61	BDL	1.12	1.02
2-Methylphenol (m-cresol)	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene	BDL	BDL	BDL	BDL
3,4-Methylphenol (o,p-cresol)	BDL	0.93	1.12	1.82
bis(2-chloroisopropyl)ether	BDL	BDL	BDL	BDL
n-Butylbenzene	BDL	BDL	BDL	BDL
N-nitroso-di-n-propylamine	BDL	BDL	BDL	BDL
Hexachloroethane	BDL	BDL	BDL	BDL
1,2-Dibromo-3-Chloropropane	BDL	BDL	BDL	BDL
Nitrobenzene	BDL	BDL	BDL	BDL
Isophorone	BDL	BDL	BDL	BDL
2-Nitrophenol	BDL	BDL	BDL	BDL
2,4-Dimethylphenol	BDL	BDL	BDL	BDL
bis(2-Chloroethoxy)methane	BDL	BDL	BDL	BDL
1,2,4-Trichlorobenzene	BDL	BDL	BDL	BDL
Naphthalene	BDL	1.36	BDL	BDL
2,4-Dichlorophenol	BDL	BDL	BDL	BDL
4-Chloroaniline	BDL	BDL	BDL	BDL
Hexachlorobutadiene	BDL	BDL	BDL	BDL
1,2,3-Trichlorobenzene	BDL	BDL	BDL	BDL
4-Chloro-3-methylphenol	BDL	BDL	BDL	BDL
2-Methylnaphthalene	BDL	BDL	BDL	BDL
1-Methylnaphthalene	BDL	BDL	BDL	BDL
Hexachlorocyclopentadiene	BDL	BDL	BDL	BDL
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL
Diphenylamine	BDL	BDL	BDL	BDL
Azobenzene	BDL	BDL	BDL	BDL
2-Chloronaphthalene	BDL	BDL	BDL	BDL
2-Nitroaniline	BDL	BDL	BDL	BDL
1,4-Dinitrobenzene	BDL	BDL	BDL	BDL
Dimethylphthalate	BDL	BDL	BDL	BDL
1,3-Dinitrobenzene	BDL	BDL	BDL	BDL

Biogas Type	Partially Clean	Raw	Partially Clean	Raw
Dairy Farm	6	6	7	7
Sampling Date	05/14/08	05/14/08	05/15/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-06	GT080530-08	GT080530-10
Acenaphthylene	BDL	BDL	BDL	BDL
2,6-dinitrotoluene	BDL	BDL	BDL	BDL
1,2-Dinitrobenzene	BDL	BDL	BDL	BDL
3-Nitroaniline	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL
2,4-Dinitrophenol	BDL	BDL	BDL	BDL
4-Nitrophenol	BDL	BDL	BDL	BDL
Dibenzofuran	BDL	BDL	BDL	BDL
2,4-dinitrotoluene	BDL	BDL	BDL	BDL
2,3,4,6-Tetrachlorophenol	BDL	BDL	BDL	BDL
2,3,5,6-Tetrachlorophenol	BDL	BDL	BDL	BDL
Diethylphthalate	BDL	BDL	BDL	BDL
4-Chlorophenyl-phenylether	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL
4-Nitroaniline	BDL	BDL	BDL	BDL
4,6-Dinitro-2-methylphenol	BDL	BDL	BDL	BDL
n-Nitrosodiphenylamine	BDL	BDL	BDL	BDL
4-Bromophenyl phenyl ether	BDL	BDL	BDL	BDL
Hexachlorobenzene	BDL	BDL	BDL	BDL
Pentachlorophenol	BDL	BDL	BDL	BDL
Phenanthrene	BDL	BDL	BDL	BDL
Anthracene	BDL	BDL	BDL	BDL
Carbazole	BDL	BDL	BDL	BDL
Di-n-butylphthalate	0.38	1.05	1.19	0.79
Bis(2-ethylhexyl) adipate	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL
Pyrene	BDL	BDL	BDL	BDL
Butylbenzylphthalate	BDL	BDL	BDL	BDL
Benz[a]anthracene	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL
bis(2-Ethylhexyl)phthalate	0.16	0.25	0.27	0.29
Di-n-octylphthalate	BDL	BDL	BDL	BDL
Benzo[b]fluoranthene	BDL	BDL	BDL	BDL
Benzo[k]fluoranthene	BDL	BDL	BDL	BDL
Benzo[a]pyrene	BDL	BDL	BDL	BDL
Indeno[1,2,3-cd]pyrene	BDL	BDL	BDL	BDL
Dibenz[a,h]anthracene	BDL	BDL	BDL	BDL
Benzo[g,h,i]perylene	BDL	BDL	BDL	BDL

Pesticides (ppbv) EPA Method 8081

Biogas Type			Biomethane	Raw	Partially Clean	Raw
Dairy Farm			1	1	3	3
Sampling Date			01/23/08	01/22/08	02/05/08	02/05/08
GTI Lab ID	Detection Limit Min (ppbv)	Detection Limit Max (ppbv)	GT080129-03	GT080129-04	GT080213-02	GT080213-01
a-BHC	1.68E-04	7.57E-04	BDL	BDL	BDL	BDL
b-BHC	1.68E-04	7.57E-04	BDL	BDL	BDL	BDL
g-BHC	1.68E-04	7.57E-04	BDL	BDL	BDL	BDL
d-BHC	1.68E-04	7.57E-04	BDL	BDL	BDL	BDL
Heptachlor	1.31E-04	5.90E-04	BDL	BDL	BDL	0.01
Aldrin	1.34E-04	6.03E-04	BDL	BDL	BDL	BDL
Heptachlor epoxide	1.26E-04	5.66E-04	BDL	BDL	0.03	0.01
g-Chlordane	1.19E-04	5.37E-04	BDL	BDL	BDL	BDL
Endosulfan I	1.20E-04	5.41E-04	BDL	BDL	BDL	BDL
a-Chlordane	1.19E-04	5.37E-04	BDL	BDL	BDL	BDL
Dieldrin	1.28E-04	5.78E-04	BDL	BDL	BDL	BDL
4,4'-DDE	1.54E-04	6.92E-04	BDL	BDL	BDL	BDL
Endrin	1.28E-04	5.78E-04	BDL	BDL	BDL	BDL
Endosulfan II	1.20E-04	5.41E-04	BDL	BDL	0.01	BDL
4,4'-DDD	1.53E-04	6.88E-04	BDL	BDL	0.03	BDL
Endrin aldehyde	1.28E-04	5.78E-04	BDL	BDL	0.02	BDL
Endosulfan sulfate	1.16E-04	5.21E-04	BDL	BDL	0.01	BDL
4,4'-DDT	1.38E-04	6.21E-04	BDL	BDL	0.01	BDL
Endrin ketone	1.28E-04	5.78E-04	BDL	BDL	BDL	BDL
Methoxychlor	1.42E-04	6.37E-04	BDL	0.01	0.19	0.047

Pesticides (ppbv) EPA Method 8081

Biogas Type	Partially Clean	Raw	Partially Clean	Raw
Dairy Farm	6	6	7	7
Sampling Date	05/14/08	05/14/08	05/15/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-06	GT080530-08	GT080530-10
a-BHC	BDL	BDL	BDL	BDL
b-BHC	BDL	BDL	BDL	BDL
g-BHC	BDL	BDL	BDL	BDL
d-BHC	BDL	BDL	BDL	BDL
Heptachlor	BDL	BDL	BDL	BDL
Aldrin	BDL	BDL	BDL	BDL
Heptachlor epoxide	BDL	BDL	BDL	BDL
g-Chlordane	BDL	BDL	BDL	BDL
Endosulfan I	BDL	BDL	BDL	BDL
a-Chlordane	BDL	BDL	BDL	BDL
Dieldrin	BDL	BDL	BDL	BDL
4,4'-DDE	BDL	BDL	BDL	BDL
Endrin	BDL	BDL	BDL	BDL
Endosulfan II	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL
Endrin aldehyde	BDL	BDL	BDL	BDL
Endosulfan sulfate	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL
Endrin ketone	BDL	BDL	BDL	BDL
Methoxychlor	BDL	BDL	BDL	BDL

Detection of Live Bacteria and Spores

Dairy Farm	Gas Type	GTI Log#	Sample Date	Pore Size (µm)	Live Aerobic Bacteria (#/100 scf)	Live Anaerobic Bacteria (#/100 scf)	Spores (#/100 scf)
1	Clean	012508-03	01/23/08	0.2	1216.3	99.3	not detected
1	Raw	012508-01	01/22/08	0.2	2106.9	negative	744.7
3	Partially Clean	021108-03	02/05/08	0.2	negative	negative	124.1
3	Raw	021108-01	02/05/08	0.2	173.8	99.3	not detected
6	Partially Clean	052008-03	05/14/08	0.2	66.7	negative	not detected
6	raw	052908-01	05/14/08	0.2	negative	694.4	not detected
7	Partially Clean	052008-04	05/15/08	0.2	negative	negative	not detected
7	Raw	052308-01	05/16/08	0.2	214.3	595.2	not detected

*negative = tested negative for the presence of live bacteria

**Intrepid samples that were collected in 2007 and January 2008 were collected for a separate project funded by Intermountain Gas

Total Bacteria and Corrosion Causing Bacteria

Dairy Farm	Type	Sample ID	Sample Date	Pore size (µm)	Total Bacteria (living and dead)	Total acid-producing bacteria (APB)	Total iron-oxidizing bacteria (IOB)	Total sulfate-reducing bacteria (SRB)
					bacteria/100 scf			
1	Biomethane	012508-03	01/23/08	0.2	5.7E+05	2.9E+04	BDL	BDL
1	Raw	012508-01	01/22/08	0.2	1.7E+06	1.8E+04	BDL	BDL
3	Partially Clean	021108-03	02/05/08	0.2	1.4E+06	3.1E+04	8.9E+02	BDL
3	Raw	021108-01	02/05/08	0.2	1.3E+06	2.4E+04	2.5E+03	BDL
6	Partially Clean	052008-03	05/14/08	0.2	5.7E+06	7.4E+02	BDL	1.9E+02
6	Raw	052908-01	05/14/08	0.2	4.52E+05	1.38E+09	1.76E+03	BDL
7	Partially Clean	052008-04	05/15/08	0.2	5.2E+06	1.1E+04	BDL	BDL
7	Raw	052308-01	05/16/08	0.2	1.01E+06	6.03E+04	1.62E+03	BDL

Appendix F – Detection Limits for Second Tier Chemical Testing

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
1,1,1-Trichloroethane	1.16	0.73	0.96	0.82	0.87	1.05
1,2-Dichloroethane	1.57	0.98	1.30	1.11	1.17	1.42
1,1-Dichloropropene	1.40	0.88	1.16	0.99	1.05	1.26
Benzene	1.98	1.25	1.65	1.40	1.48	1.80
Carbon Tetrachloride	1.01	0.63	0.84	0.71	0.75	0.91
1,2-Dichloropropane	1.37	0.86	1.14	0.97	1.03	1.24
Trichloroethene	1.18	0.74	0.98	0.83	0.88	1.07
Dibromomethane	0.89	0.56	0.74	0.63	0.67	0.81
Bromodichloromethane	0.95	0.59	0.78	0.67	0.71	0.86
Pyridine	1.96	1.23	1.62	1.38	1.47	1.77
cis-1,3-Dichloropropene	1.40	0.88	1.16	0.99	1.05	1.26
N-nitrosodimethylamine	2.09	1.31	1.73	1.48	1.57	1.89
Toluene	1.68	1.06	1.39	1.19	1.26	1.52
trans-1,3-Dichloropropene	1.40	0.88	1.16	0.99	1.05	1.26
1,1,2-Trichloroethane	1.16	0.73	0.96	0.82	0.87	1.05
1,3-Dichloropropane	1.37	0.86	1.14	0.97	1.03	1.24
Dibromochloromethane	0.74	0.47	0.62	0.53	0.56	0.67
1,2-Dibromoethane	0.82	0.52	0.68	0.58	0.62	0.75
Tetrachloroethene	0.93	0.59	0.77	0.66	0.70	0.85
Chlorobenzene	1.38	0.87	1.14	0.97	1.03	1.25
1,1,1,2-Tetrachloroethane	0.92	0.58	0.77	0.65	0.69	0.84
Ethylbenzene	1.46	0.92	1.21	1.03	1.09	1.32
m/p-Xylenes	1.46	0.92	1.21	1.03	1.09	1.32
Bromoform	0.61	0.39	0.51	0.43	0.46	0.56
Styrene	1.49	0.94	1.23	1.05	1.11	1.35
o-Xylene	1.46	0.92	1.21	1.03	1.09	1.32
1,1,2,2-Tetrachloroethane	0.92	0.58	0.77	0.65	0.69	0.84
1,2,3-Trichloropropane	1.05	0.66	0.87	0.74	0.79	0.95
Isopropylbenzene	1.29	0.81	1.07	0.91	0.96	1.17
Bromobenzene	0.99	0.62	0.82	0.70	0.74	0.89
2-Chlorotoluene	1.22	0.77	1.02	0.86	0.92	1.11
n-Propylbenzene	1.29	0.81	1.07	0.91	0.97	1.17
4-Chlorotoluene	1.22	0.77	1.02	0.86	0.92	1.11
1,3,5-Trimethylbenzene	1.29	0.81	1.07	0.91	0.97	1.17
tert-Butylbenzene	1.15	0.73	0.96	0.81	0.86	1.05
1,2,4-Trimethylbenzene	1.29	0.81	1.07	0.91	0.97	1.17
sec-Butylbenzene	1.15	0.73	0.96	0.81	0.86	1.05
Phenol	1.65	1.04	1.37	1.16	1.23	1.49
bis(2-Chloroethyl)ether	1.08	0.68	0.90	0.76	0.81	0.98
Aniline	1.66	1.05	1.38	1.17	1.25	1.51
2-Chlorophenol	1.20	0.76	1.00	0.85	0.90	1.09

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
1,3-Dichlorobenzene	1.05	0.66	0.87	0.74	0.79	0.95
1,4-Dichlorobenzene	1.05	0.66	0.87	0.74	0.79	0.95
p-Isopropyltoluene	1.15	0.73	0.96	0.81	0.86	1.05
Benzyl Alcohol	1.43	0.90	1.19	1.01	1.07	1.30
2-Methylphenol (m-cresol)	1.43	0.90	1.19	1.01	1.07	1.30
1,2-Dichlorobenzene	1.05	0.66	0.87	0.74	0.79	0.95
3,4-Methylphenol (o,p-cresol)	1.43	0.90	1.19	1.01	1.07	1.30
bis(2-chloroisopropyl)ether	0.91	0.57	0.75	0.64	0.68	0.82
n-Butylbenzene	1.15	0.73	0.96	0.81	0.86	1.05
N-nitroso-di-n-propylamine	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Hexachloroethane	0.65	0.41	0.54	0.46	0.49	0.59
1,2-Dibromo-3-Chloropropane	0.66	0.41	0.54	0.46	0.49	0.59
Nitrobenzene	1.26	0.79	1.04	0.89	0.94	1.14
Isophorone	1.12	0.70	0.93	0.79	0.84	1.02
2-Nitrophenol	1.11	0.70	0.92	0.79	0.83	1.01
2,4-Dimethylphenol	1.27	0.80	1.05	0.90	0.95	1.15
bis(2-Chloroethoxy)methane	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1,2,4-Trichlorobenzene	0.85	0.54	0.71	0.60	0.64	0.77
Naphthalene	1.21	0.76	1.00	0.85	0.90	1.09
2,4-Dichlorophenol	0.95	0.60	0.79	0.67	0.71	0.86
4-Chloroaniline	1.21	0.76	1.01	0.86	0.91	1.10
Hexachlorobutadiene	0.59	0.37	0.49	0.42	0.44	0.54
1,2,3-Trichlorobenzene	0.85	0.54	0.71	0.60	0.64	0.77
4-Chloro-3-methylphenol	1.09	0.68	0.90	0.77	0.81	0.98
2-Methylnaphthalene	1.09	0.69	0.90	0.77	0.82	0.99
1-Methylnaphthalene	1.09	0.69	0.90	0.77	0.82	0.99
Hexachlorocyclopentadiene	0.57	0.36	0.47	0.40	0.43	0.51
2,4,6-Trichlorophenol	0.78	0.49	0.65	0.55	0.59	0.71
2,4,5-Trichlorophenol	0.78	0.49	0.65	0.55	0.59	0.71
Diphenylamine	0.92	0.58	0.76	0.65	0.69	0.83
Azobenzene	0.85	0.53	0.71	0.60	0.64	0.77
2-Chloronaphthalene	0.95	0.60	0.79	0.67	0.71	0.86
2-Nitroaniline	1.12	0.71	0.93	0.79	0.84	1.02
1,4-Dinitrobenzene	0.92	0.58	0.76	0.65	0.69	0.83
Dimethylphthalate	0.80	0.50	0.66	0.56	0.60	0.72
1,3-Dinitrobenzene	0.92	0.58	0.76	0.65	0.69	0.83

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
Acenaphthylene	1.02	0.64	0.84	0.72	0.76	0.92
2,6-dinitrotoluene	0.85	0.53	0.71	0.60	0.64	0.77
1,2-Dinitrobenzene	0.92	0.58	0.76	0.65	0.69	0.83
3-Nitroaniline	1.12	0.71	0.93	0.79	0.84	1.02
Acenaphthene	1.00	0.63	0.83	0.71	0.75	0.91
2,4-Dinitrophenol	0.84	0.53	0.70	0.59	0.63	0.76
4-Nitrophenol	1.11	0.70	0.92	0.79	0.83	1.01
Dibenzofuran	0.92	0.58	0.76	0.65	0.69	0.83
2,4-dinitrotoluene	0.85	0.53	0.71	0.60	0.64	0.77
2,3,4,6-Tetrachlorophenol	0.67	0.42	0.55	0.47	0.50	0.61
2,3,5,6-Tetrachlorophenol	0.67	0.42	0.55	0.47	0.50	0.61
Diethylphthalate	0.70	0.44	0.58	0.49	0.52	0.63
4-Chlorophenyl-phenylether	0.76	0.48	0.63	0.53	0.57	0.69
Fluorene	0.93	0.59	0.77	0.66	0.70	0.84
4-Nitroaniline	1.12	0.71	0.93	0.79	0.84	1.02
4,6-Dinitro-2-methylphenol	0.78	0.49	0.65	0.55	0.59	0.71
n-Nitrosodiphenylamine	0.78	0.49	0.65	0.55	0.59	0.71
4-Bromophenyl phenyl ether	0.62	0.39	0.52	0.44	0.47	0.56
Hexachlorobenzene	0.54	0.34	0.45	0.38	0.41	0.49
Pentachlorophenol	0.58	0.37	0.48	0.41	0.44	0.53
Phenanthrene	0.87	0.55	0.72	0.61	0.65	0.79
Anthracene	0.87	0.55	0.72	0.61	0.65	0.79
Carbazole	0.93	0.58	0.77	0.65	0.69	0.84
Di-n-butylphthalate	0.56	0.35	0.46	0.39	0.42	0.50
Bis(2-ethylhexyl) adipate	0.42	0.26	0.35	0.30	0.31	0.38
Fluoranthene	0.77	0.48	0.64	0.54	0.57	0.69
Pyrene	0.77	0.48	0.64	0.54	0.57	0.69
Butylbenzylphthalate	0.50	0.31	0.41	0.35	0.37	0.45
Benz[a]anthracene	0.68	0.43	0.56	0.48	0.51	0.61
Chrysene	0.68	0.43	0.56	0.48	0.51	0.61
bis(2-Ethylhexyl)phthalate	0.40	0.25	0.33	0.28	0.30	0.36
Di-n-octylphthalate	0.40	0.25	0.33	0.28	0.30	0.36
Benzo[b]fluoranthene	0.61	0.39	0.51	0.43	0.46	0.56
Benzo[k]fluoranthene	0.61	0.39	0.51	0.43	0.46	0.56
Benzo[a]pyrene	0.61	0.39	0.51	0.43	0.46	0.56
Indeno[1,2,3-cd]pyrene	0.56	0.35	0.46	0.40	0.42	0.51
Dibenz[a,h]anthracene	0.56	0.35	0.46	0.39	0.42	0.50
Benzo[g,h,i]perylene	0.56	0.35	0.46	0.40	0.42	0.51
	7.34					

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12
1,1,1-Trichloroethane	0.88	0.95	0.38	0.38	0.38	0.38
1,2-Dichloroethane	1.19	1.28	0.51	0.51	0.51	0.51
1,1-Dichloropropene	1.06	1.14	0.46	0.46	0.46	0.46
Benzene	1.50	1.62	0.65	0.65	0.65	0.65
Carbon Tetrachloride	0.76	0.82	0.33	0.33	0.33	0.33
1,2-Dichloropropane	1.04	1.12	0.45	0.45	0.45	0.45
Trichloroethene	0.89	0.96	0.39	0.39	0.39	0.39
Dibromomethane	0.68	0.73	0.29	0.29	0.29	0.29
Bromodichloromethane	0.72	0.77	0.31	0.31	0.31	0.31
Pyridine	1.48	1.60	0.64	0.64	0.64	0.64
cis-1,3-Dichloropropene	1.06	1.14	0.46	0.46	0.46	0.46
N-nitrosodimethylamine	1.58	1.71	0.69	0.69	0.69	0.69
Toluene	1.27	1.38	0.55	0.55	0.55	0.55
trans-1,3-Dichloropropene	1.06	1.14	0.46	0.46	0.46	0.46
1,1,2-Trichloroethane	0.88	0.95	0.38	0.38	0.38	0.38
1,3-Dichloropropane	1.04	1.12	0.45	0.45	0.45	0.45
Dibromochloromethane	0.56	0.61	0.24	0.24	0.24	0.24
1,2-Dibromoethane	0.62	0.67	0.27	0.27	0.27	0.27
Tetrachloroethene	0.71	0.76	0.31	0.31	0.31	0.31
Chlorobenzene	1.04	1.13	0.45	0.45	0.45	0.45
1,1,1,2-Tetrachloroethane	0.70	0.76	0.30	0.30	0.30	0.30
Ethylbenzene	1.11	1.19	0.48	0.48	0.48	0.48
m/p-Xylenes	1.11	1.19	0.48	0.48	0.48	0.48
Bromoform	0.46	0.50	0.20	0.20	0.20	0.20
Styrene	1.13	1.22	0.49	0.49	0.49	0.49
o-Xylene	1.11	1.19	0.48	0.48	0.48	0.48
1,1,2,2-Tetrachloroethane	0.70	0.76	0.30	0.30	0.30	0.30
1,2,3-Trichloropropane	0.80	0.86	0.35	0.35	0.35	0.35
Isopropylbenzene	0.98	1.05	0.42	0.42	0.42	0.42
Bromobenzene	0.75	0.81	0.32	0.32	0.32	0.32
2-Chlorotoluene	0.93	1.00	0.40	0.40	0.40	0.40
n-Propylbenzene	0.98	1.05	0.42	0.42	0.42	0.42
4-Chlorotoluene	0.93	1.00	0.40	0.40	0.40	0.40
1,3,5-Trimethylbenzene	0.98	1.05	0.42	0.42	0.42	0.42
tert-Butylbenzene	0.87	0.94	0.38	0.38	0.38	0.38
1,2,4-Trimethylbenzene	0.98	1.05	0.42	0.42	0.42	0.42
sec-Butylbenzene	0.87	0.94	0.38	0.38	0.38	0.38
Phenol	1.25	1.35	0.54	0.54	0.54	0.54
bis(2-Chloroethyl)ether	0.82	0.89	0.36	0.36	0.36	0.36
Aniline	1.26	1.36	0.55	0.55	0.55	0.55
2-Chlorophenol	0.91	0.99	0.40	0.40	0.40	0.40

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12
1,3-Dichlorobenzene	0.80	0.86	0.35	0.35	0.35	0.35
1,4-Dichlorobenzene	0.80	0.86	0.35	0.35	0.35	0.35
p-Isopropyltoluene	0.87	0.94	0.38	0.38	0.38	0.38
Benzyl Alcohol	1.09	1.17	0.47	0.47	0.47	0.47
2-Methylphenol (m-cresol)	1.09	1.17	0.47	0.47	0.47	0.47
1,2-Dichlorobenzene	0.80	0.86	0.35	0.35	0.35	0.35
3,4-Methylphenol (o,p-cresol)	1.09	1.17	0.47	0.47	0.47	0.47
bis(2-chloroisopropyl)ether	0.69	0.74	0.30	0.30	0.30	0.30
n-Butylbenzene	0.87	0.94	0.38	0.38	0.38	0.38
N-nitroso-di-n-propylamine	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Hexachloroethane	0.50	0.54	0.21	0.21	0.21	0.21
1,2-Dibromo-3-Chloropropane	0.50	0.54	0.22	0.22	0.22	0.22
Nitrobenzene	0.95	1.03	0.41	0.41	0.41	0.41
Isophorone	0.85	0.92	0.37	0.37	0.37	0.37
2-Nitrophenol	0.84	0.91	0.37	0.37	0.37	0.37
2,4-Dimethylphenol	0.96	1.04	0.42	0.42	0.42	0.42
bis(2-Chloroethoxy)methane	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1,2,4-Trichlorobenzene	0.65	0.70	0.28	0.28	0.28	0.28
Naphthalene	0.92	0.99	0.40	0.40	0.40	0.40
2,4-Dichlorophenol	0.72	0.78	0.31	0.31	0.31	0.31
4-Chloroaniline	0.92	0.99	0.40	0.40	0.40	0.40
Hexachlorobutadiene	0.45	0.49	0.20	0.20	0.20	0.20
1,2,3-Trichlorobenzene	0.65	0.70	0.28	0.28	0.28	0.28
4-Chloro-3-methylphenol	0.82	0.89	0.36	0.36	0.36	0.36
2-Methylnaphthalene	0.83	0.89	0.36	0.36	0.36	0.36
1-Methylnaphthalene	0.83	0.89	0.36	0.36	0.36	0.36
Hexachlorocyclopentadiene	0.43	0.46	0.19	0.19	0.19	0.19
2,4,6-Trichlorophenol	0.59	0.64	0.26	0.26	0.26	0.26
2,4,5-Trichlorophenol	0.59	0.64	0.26	0.26	0.26	0.26
Diphenylamine	0.69	0.75	0.30	0.30	0.30	0.30
Azobenzene	0.64	0.70	0.28	0.28	0.28	0.28
2-Chloronaphthalene	0.72	0.78	0.31	0.31	0.31	0.31
2-Nitroaniline	0.85	0.92	0.37	0.37	0.37	0.37
1,4-Dinitrobenzene	0.70	0.75	0.30	0.30	0.30	0.30
Dimethylphthalate	0.60	0.65	0.26	0.26	0.26	0.26
1,3-Dinitrobenzene	0.70	0.75	0.30	0.30	0.30	0.30

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12
Acenaphthylene	0.77	0.83	0.33	0.33	0.33	0.33
2,6-dinitrotoluene	0.64	0.70	0.28	0.28	0.28	0.28
1,2-Dinitrobenzene	0.70	0.75	0.30	0.30	0.30	0.30
3-Nitroaniline	0.85	0.92	0.37	0.37	0.37	0.37
Acenaphthene	0.76	0.82	0.33	0.33	0.33	0.33
2,4-Dinitrophenol	0.64	0.69	0.28	0.28	0.28	0.28
4-Nitrophenol	0.84	0.91	0.37	0.37	0.37	0.37
Dibenzofuran	0.70	0.75	0.30	0.30	0.30	0.30
2,4-dinitrotoluene	0.64	0.70	0.28	0.28	0.28	0.28
2,3,4,6-Tetrachlorophenol	0.51	0.55	0.22	0.22	0.22	0.22
2,3,5,6-Tetrachlorophenol	0.51	0.55	0.22	0.22	0.22	0.22
Diethylphthalate	0.53	0.57	0.23	0.23	0.23	0.23
4-Chlorophenyl-phenylether	0.57	0.62	0.25	0.25	0.25	0.25
Fluorene	0.71	0.76	0.31	0.31	0.31	0.31
4-Nitroaniline	0.85	0.92	0.37	0.37	0.37	0.37
4,6-Dinitro-2-methylphenol	0.59	0.64	0.26	0.26	0.26	0.26
n-Nitrosodiphenylamine	0.59	0.64	0.26	0.26	0.26	0.26
4-Bromophenyl phenyl ether	0.47	0.51	0.20	0.20	0.20	0.20
Hexachlorobenzene	0.41	0.45	0.18	0.18	0.18	0.18
Pentachlorophenol	0.44	0.48	0.19	0.19	0.19	0.19
Phenanthrene	0.66	0.71	0.29	0.29	0.29	0.29
Anthracene	0.66	0.71	0.29	0.29	0.29	0.29
Carbazole	0.70	0.76	0.30	0.30	0.30	0.30
Di-n-butylphthalate	0.42	0.46	0.18	0.18	0.18	0.18
Bis(2-ethylhexyl) adipate	0.32	0.34	0.14	0.14	0.14	0.14
Fluoranthene	0.58	0.63	0.25	0.25	0.25	0.25
Pyrene	0.58	0.63	0.25	0.25	0.25	0.25
Butylbenzylphthalate	0.38	0.41	0.16	0.16	0.16	0.16
Benz[a]anthracene	0.51	0.56	0.22	0.22	0.22	0.22
Chrysene	0.51	0.56	0.22	0.22	0.22	0.22
bis(2-Ethylhexyl)phthalate	0.30	0.32	0.13	0.13	0.13	0.13
Di-n-octylphthalate	0.30	0.32	0.13	0.13	0.13	0.13
Benzo[b]fluoranthene	0.47	0.50	0.20	0.20	0.20	0.20
Benzo[k]fluoranthene	0.47	0.50	0.20	0.20	0.20	0.20
Benzo[a]pyrene	0.47	0.50	0.20	0.20	0.20	0.20
Indeno[1,2,3-cd]pyrene	0.42	0.46	0.18	0.18	0.18	0.18
Dibenz[a,h]anthracene	0.42	0.46	0.18	0.18	0.18	0.18
Benzo[g,h,i]perylene	0.42	0.46	0.18	0.18	0.18	0.18

Biogas Type	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	3	3	4	5	5
Sampling Date	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08
GTI Lab ID	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a
1,1,1-Trichloroethane	0.38	0.78	0.28	0.82	0.34	0.59
1,2-Dichloroethane	0.51	1.05	0.38	1.10	0.46	0.80
1,1-Dichloropropene	0.46	0.93	0.34	0.98	0.41	0.71
Benzene	0.65	1.33	0.48	1.40	0.58	1.01
Carbon Tetrachloride	0.33	0.67	0.24	0.71	0.29	0.51
1,2-Dichloropropane	0.45	0.92	0.33	0.96	0.40	0.70
Trichloroethene	0.39	0.79	0.29	0.83	0.34	0.60
Dibromomethane	0.29	0.60	0.22	0.63	0.26	0.45
Bromodichloromethane	0.31	0.63	0.23	0.67	0.28	0.48
Pyridine	0.64	1.31	0.47	1.38	0.57	1.00
cis-1,3-Dichloropropene	0.46	0.93	0.34	0.98	0.41	0.71
N-nitrosodimethylamine	0.69	1.40	0.51	1.47	0.61	1.06
Toluene	0.55	1.12	0.41	1.18	0.49	0.85
trans-1,3-Dichloropropene	0.46	0.93	0.34	0.98	0.41	0.71
1,1,2-Trichloroethane	0.38	0.78	0.28	0.82	0.34	0.59
1,3-Dichloropropane	0.45	0.92	0.33	0.96	0.40	0.70
Dibromochloromethane	0.24	0.50	0.18	0.52	0.22	0.38
1,2-Dibromoethane	0.27	0.55	0.20	0.58	0.24	0.42
Tetrachloroethene	0.31	0.63	0.23	0.66	0.27	0.48
Chlorobenzene	0.45	0.92	0.33	0.97	0.40	0.70
1,1,1,2-Tetrachloroethane	0.30	0.62	0.22	0.65	0.27	0.47
Ethylbenzene	0.48	0.98	0.35	1.03	0.43	0.74
m/p-Xylenes	0.48	0.98	0.35	1.03	0.43	0.74
Bromoform	0.20	0.41	0.15	0.43	0.18	0.31
Styrene	0.49	0.99	0.36	1.05	0.44	0.76
o-Xylene	0.48	0.98	0.35	1.03	0.43	0.74
1,1,2,2-Tetrachloroethane	0.30	0.62	0.22	0.65	0.27	0.47
1,2,3-Trichloropropane	0.35	0.70	0.25	0.74	0.31	0.53
Isopropylbenzene	0.42	0.86	0.31	0.91	0.38	0.66
Bromobenzene	0.32	0.66	0.24	0.69	0.29	0.50
2-Chlorotoluene	0.40	0.82	0.30	0.86	0.36	0.62
n-Propylbenzene	0.42	0.86	0.31	0.91	0.38	0.66
4-Chlorotoluene	0.40	0.82	0.30	0.86	0.36	0.62
1,3,5-Trimethylbenzene	0.42	0.86	0.31	0.91	0.38	0.66
tert-Butylbenzene	0.38	0.77	0.28	0.81	0.34	0.59
1,2,4-Trimethylbenzene	0.42	0.86	0.31	0.91	0.38	0.66
sec-Butylbenzene	0.38	0.77	0.28	0.81	0.34	0.59
Phenol	0.54	1.10	0.40	1.16	0.48	0.84
bis(2-Chloroethyl)ether	0.36	0.72	0.26	0.76	0.32	0.55
Aniline	0.55	1.11	0.40	1.17	0.49	0.85
2-Chlorophenol	0.40	0.81	0.29	0.85	0.35	0.61

Biogas Type	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	3	3	4	5	5
Sampling Date	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08
GTI Lab ID	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a
1,3-Dichlorobenzene	0.35	0.70	0.26	0.74	0.31	0.54
1,4-Dichlorobenzene	0.35	0.70	0.26	0.74	0.31	0.54
p-Isopropyltoluene	0.38	0.77	0.28	0.81	0.34	0.59
Benzyl Alcohol	0.47	0.96	0.35	1.01	0.42	0.73
2-Methylphenol (m-cresol)	0.47	0.96	0.35	1.01	0.42	0.73
1,2-Dichlorobenzene	0.35	0.70	0.26	0.74	0.31	0.54
3,4-Methylphenol (o,p-cresol)	0.47	0.96	0.35	1.01	0.42	0.73
bis(2-chloroisopropyl)ether	0.30	0.61	0.22	0.64	0.26	0.46
n-Butylbenzene	0.38	0.77	0.28	0.81	0.34	0.59
N-nitroso-di-n-propylamine	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Hexachloroethane	0.21	0.44	0.16	0.46	0.19	0.33
1,2-Dibromo-3-Chloropropane	0.22	0.44	0.16	0.46	0.19	0.33
Nitrobenzene	0.41	0.84	0.31	0.89	0.37	0.64
Isophorone	0.37	0.75	0.27	0.79	0.33	0.57
2-Nitrophenol	0.37	0.74	0.27	0.78	0.33	0.57
2,4-Dimethylphenol	0.42	0.85	0.31	0.89	0.37	0.64
bis(2-Chloroethoxy)methane	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1,2,4-Trichlorobenzene	0.28	0.57	0.21	0.60	0.25	0.43
Naphthalene	0.40	0.81	0.29	0.85	0.35	0.61
2,4-Dichlorophenol	0.31	0.64	0.23	0.67	0.28	0.48
4-Chloroaniline	0.40	0.81	0.29	0.85	0.36	0.62
Hexachlorobutadiene	0.20	0.40	0.14	0.42	0.17	0.30
1,2,3-Trichlorobenzene	0.28	0.57	0.21	0.60	0.25	0.43
4-Chloro-3-methylphenol	0.36	0.73	0.26	0.76	0.32	0.55
2-Methylnaphthalene	0.36	0.73	0.26	0.77	0.32	0.55
1-Methylnaphthalene	0.36	0.73	0.26	0.77	0.32	0.55
Hexachlorocyclopentadiene	0.19	0.38	0.14	0.40	0.17	0.29
2,4,6-Trichlorophenol	0.26	0.52	0.19	0.55	0.23	0.40
2,4,5-Trichlorophenol	0.26	0.52	0.19	0.55	0.23	0.40
Diphenylamine	0.30	0.61	0.22	0.64	0.27	0.47
Azobenzene	0.28	0.57	0.21	0.60	0.25	0.43
2-Chloronaphthalene	0.31	0.64	0.23	0.67	0.28	0.48
2-Nitroaniline	0.37	0.75	0.27	0.79	0.33	0.57
1,4-Dinitrobenzene	0.30	0.62	0.22	0.65	0.27	0.47
Dimethylphthalate	0.26	0.53	0.19	0.56	0.23	0.41
1,3-Dinitrobenzene	0.30	0.62	0.22	0.65	0.27	0.47

Biogas Type	Biomethane	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	2	3	3	4	5	5
Sampling Date	05/14/08	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08
GTI Lab ID	GT080530-14	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a
Acenaphthylene	0.33	0.68	0.25	0.72	0.30	0.52
2,6-dinitrotoluene	0.28	0.57	0.21	0.60	0.25	0.43
1,2-Dinitrobenzene	0.30	0.62	0.22	0.65	0.27	0.47
3-Nitroaniline	0.37	0.75	0.27	0.79	0.33	0.57
Acenaphthene	0.33	0.67	0.24	0.71	0.29	0.51
2,4-Dinitrophenol	0.28	0.56	0.20	0.59	0.25	0.43
4-Nitrophenol	0.37	0.74	0.27	0.78	0.33	0.57
Dibenzofuran	0.30	0.62	0.22	0.65	0.27	0.47
2,4-dinitrotoluene	0.28	0.57	0.21	0.60	0.25	0.43
2,3,4,6-Tetrachlorophenol	0.22	0.45	0.16	0.47	0.20	0.34
2,3,5,6-Tetrachlorophenol	0.22	0.45	0.16	0.47	0.20	0.34
Diethylphthalate	0.23	0.47	0.17	0.49	0.20	0.35
4-Chlorophenyl-phenylether	0.25	0.51	0.18	0.53	0.22	0.38
Fluorene	0.31	0.62	0.23	0.66	0.27	0.47
4-Nitroaniline	0.37	0.75	0.27	0.79	0.33	0.57
4,6-Dinitro-2-methylphenol	0.26	0.52	0.19	0.55	0.23	0.40
n-Nitrosodiphenylamine	0.26	0.52	0.19	0.55	0.23	0.40
4-Bromophenyl phenyl ether	0.20	0.42	0.15	0.44	0.18	0.32
Hexachlorobenzene	0.18	0.36	0.13	0.38	0.16	0.28
Pentachlorophenol	0.19	0.39	0.14	0.41	0.17	0.30
Phenanthrene	0.29	0.58	0.21	0.61	0.25	0.44
Anthracene	0.29	0.58	0.21	0.61	0.25	0.44
Carbazole	0.30	0.62	0.22	0.65	0.27	0.47
Di-n-butylphthalate	0.18	0.37	0.13	0.39	0.16	0.28
Bis(2-ethylhexyl) adipate	0.14	0.28	0.10	0.29	0.12	0.21
Fluoranthene	0.25	0.51	0.19	0.54	0.22	0.39
Pyrene	0.25	0.51	0.19	0.54	0.22	0.39
Butylbenzylphthalate	0.16	0.33	0.12	0.35	0.15	0.25
Benz[a]anthracene	0.22	0.45	0.16	0.48	0.20	0.35
Chrysene	0.22	0.45	0.16	0.48	0.20	0.35
bis(2-Ethylhexyl)phthalate	0.13	0.27	0.10	0.28	0.12	0.20
Di-n-octylphthalate	0.13	0.27	0.10	0.28	0.12	0.20
Benzo[b]fluoranthene	0.20	0.41	0.15	0.43	0.18	0.31
Benzo[k]fluoranthene	0.20	0.41	0.15	0.43	0.18	0.31
Benzo[a]pyrene	0.20	0.41	0.15	0.43	0.18	0.31
Indeno[1,2,3-cd]pyrene	0.18	0.38	0.14	0.39	0.16	0.29
Dibenz[a,h]anthracene	0.18	0.37	0.13	0.39	0.16	0.28
Benzo[g,h,i]perylene	0.18	0.37	0.14	0.39	0.16	0.29

Biogas Type	Partially Clean	Partially Clean	Raw	Raw	Raw	Raw
Dairy Farm	6	7	1	3	6	7
Sampling Date	05/14/08	05/15/08	01/22/08	02/05/08	05/14/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-08	GT080129-04	GT080213-01	GT080530-06	GT080530-10
1,1,1-Trichloroethane	0.45	0.5519	0.84	0.85	0.47	0.58
1,2-Dichloroethane	0.60	0.7439	1.14	1.15	0.63	0.78
1,1-Dichloropropene	0.54	0.6634	1.01	1.02	0.56	0.69
Benzene	0.76	0.9425	1.44	1.45	0.80	0.99
Carbon Tetrachloride	0.39	0.4786	0.73	0.74	0.40	0.50
1,2-Dichloropropane	0.53	0.6516	1.00	1.00	0.55	0.68
Trichloroethene	0.45	0.5603	0.86	0.86	0.47	0.59
Dibromomethane	0.34	0.4235	0.65	0.65	0.36	0.44
Bromodichloromethane	0.36	0.4494	0.69	0.69	0.38	0.47
Pyridine	0.75	0.9307	1.42	1.43	0.79	0.97
cis-1,3-Dichloropropene	0.54	0.6634	1.01	1.02	0.56	0.69
N-nitrosodimethylamine	0.81	0.9938	1.52	1.53	0.84	1.04
Toluene	0.65	0.7990	1.22	1.23	0.67	0.84
trans-1,3-Dichloropropene	0.54	0.6634	1.01	1.02	0.56	0.69
1,1,2-Trichloroethane	0.45	0.5519	0.84	0.85	0.47	0.58
1,3-Dichloropropane	0.53	0.6516	1.00	1.00	0.55	0.68
Dibromochloromethane	0.29	0.3535	0.54	0.54	0.30	0.37
1,2-Dibromoethane	0.32	0.3919	0.60	0.60	0.33	0.41
Tetrachloroethene	0.36	0.4440	0.68	0.68	0.37	0.46
Chlorobenzene	0.53	0.6541	1.00	1.01	0.55	0.68
1,1,1,2-Tetrachloroethane	0.36	0.4386	0.67	0.68	0.37	0.46
Ethylbenzene	0.56	0.6934	1.06	1.07	0.58	0.73
m/p-Xylenes	0.56	0.6934	1.06	1.07	0.58	0.73
Bromoform	0.24	0.2913	0.45	0.45	0.25	0.30
Styrene	0.57	0.7069	1.08	1.09	0.60	0.74
o-Xylene	0.56	0.6934	1.06	1.07	0.58	0.73
1,1,2,2-Tetrachloroethane	0.36	0.4386	0.67	0.68	0.37	0.46
1,2,3-Trichloropropane	0.40	0.4994	0.76	0.77	0.42	0.52
Isopropylbenzene	0.50	0.6125	0.94	0.94	0.52	0.64
Bromobenzene	0.38	0.4689	0.72	0.72	0.40	0.49
2-Chlorotoluene	0.47	0.5816	0.89	0.90	0.49	0.61
n-Propylbenzene	0.50	0.6125	0.94	0.94	0.52	0.64
4-Chlorotoluene	0.47	0.5816	0.89	0.90	0.49	0.61
1,3,5-Trimethylbenzene	0.50	0.6125	0.94	0.94	0.52	0.64
tert-Butylbenzene	0.44	0.5485	0.84	0.84	0.46	0.57
1,2,4-Trimethylbenzene	0.50	0.6125	0.94	0.94	0.52	0.64
sec-Butylbenzene	0.44	0.5485	0.84	0.84	0.46	0.57
Phenol	0.63	0.7823	1.20	1.20	0.66	0.82
bis(2-Chloroethyl)ether	0.42	0.5148	0.79	0.79	0.43	0.54
Aniline	0.64	0.7905	1.21	1.22	0.67	0.83
2-Chlorophenol	0.46	0.5727	0.87	0.88	0.48	0.60

Biogas Type	Partially Clean	Partially Clean	Raw	Raw	Raw	Raw
Dairy Farm	6	7	1	3	6	7
Sampling Date	05/14/08	05/15/08	01/22/08	02/05/08	05/14/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-08	GT080129-04	GT080213-01	GT080530-06	GT080530-10
1,3-Dichlorobenzene	0.41	0.5008	0.77	0.77	0.42	0.52
1,4-Dichlorobenzene	0.41	0.5008	0.77	0.77	0.42	0.52
p-Isopropyltoluene	0.44	0.5485	0.84	0.84	0.46	0.57
Benzyl Alcohol	0.55	0.6808	1.04	1.05	0.57	0.71
2-Methylphenol (m-cresol)	0.55	0.6808	1.04	1.05	0.57	0.71
1,2-Dichlorobenzene	0.41	0.5008	0.77	0.77	0.42	0.52
3,4-Methylphenol (o,p-cresol)	0.55	0.6808	1.04	1.05	0.57	0.71
bis(2-chloroisopropyl)ether	0.35	0.4304	0.66	0.66	0.36	0.45
n-Butylbenzene	0.44	0.5485	0.84	0.84	0.46	0.57
N-nitroso-di-n-propylamine	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Hexachloroethane	0.25	0.3110	0.48	0.48	0.26	0.33
1,2-Dibromo-3-Chloropropane	0.25	0.3115	0.48	0.48	0.26	0.33
Nitrobenzene	0.48	0.5980	0.91	0.92	0.50	0.63
Isophorone	0.43	0.5327	0.81	0.82	0.45	0.56
2-Nitrophenol	0.43	0.5292	0.81	0.82	0.45	0.55
2,4-Dimethylphenol	0.49	0.6027	0.92	0.93	0.51	0.63
bis(2-Chloroethoxy)methane	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1,2,4-Trichlorobenzene	0.33	0.4057	0.62	0.62	0.34	0.42
Naphthalene	0.47	0.5744	0.88	0.88	0.48	0.60
2,4-Dichlorophenol	0.37	0.4517	0.69	0.70	0.38	0.47
4-Chloroaniline	0.47	0.5771	0.88	0.89	0.49	0.60
Hexachlorobutadiene	0.23	0.2823	0.43	0.43	0.24	0.30
1,2,3-Trichlorobenzene	0.33	0.4057	0.62	0.62	0.34	0.42
4-Chloro-3-methylphenol	0.42	0.5163	0.79	0.80	0.44	0.54
2-Methylnaphthalene	0.42	0.5177	0.79	0.80	0.44	0.54
1-Methylnaphthalene	0.42	0.5177	0.79	0.80	0.44	0.54
Hexachlorocyclopentadiene	0.22	0.2699	0.41	0.42	0.23	0.28
2,4,6-Trichlorophenol	0.30	0.3729	0.57	0.57	0.31	0.39
2,4,5-Trichlorophenol	0.30	0.3729	0.57	0.57	0.31	0.39
Diphenylamine	0.35	0.4351	0.66	0.67	0.37	0.46
Azobenzene	0.33	0.4040	0.62	0.62	0.34	0.42
2-Chloronaphthalene	0.37	0.4527	0.69	0.70	0.38	0.47
2-Nitroaniline	0.43	0.5330	0.81	0.82	0.45	0.56
1,4-Dinitrobenzene	0.36	0.4379	0.67	0.67	0.37	0.46
Dimethylphthalate	0.31	0.3791	0.58	0.58	0.32	0.40
1,3-Dinitrobenzene	0.36	0.4379	0.67	0.67	0.37	0.46

Biogas Type	Partially Clean	Partially Clean	Raw	Raw	Raw	Raw
Dairy Farm	6	7	1	3	6	7
Sampling Date	05/14/08	05/15/08	01/22/08	02/05/08	05/14/08	05/16/08
GTI Lab ID	GT080530-04	GT080530-08	GT080129-04	GT080213-01	GT080530-06	GT080530-10
Acenaphthylene	0.39	0.4837	0.74	0.75	0.41	0.51
2,6-dinitrotoluene	0.33	0.4042	0.62	0.62	0.34	0.42
1,2-Dinitrobenzene	0.36	0.4379	0.67	0.67	0.37	0.46
3-Nitroaniline	0.43	0.5330	0.81	0.82	0.45	0.56
Acenaphthene	0.39	0.4774	0.73	0.74	0.40	0.50
2,4-Dinitrophenol	0.32	0.3999	0.61	0.62	0.34	0.42
4-Nitrophenol	0.43	0.5292	0.81	0.82	0.45	0.55
Dibenzofuran	0.35	0.4377	0.67	0.67	0.37	0.46
2,4-dinitrotoluene	0.33	0.4042	0.62	0.62	0.34	0.42
2,3,4,6-Tetrachlorophenol	0.26	0.3175	0.49	0.49	0.27	0.33
2,3,5,6-Tetrachlorophenol	0.26	0.3175	0.49	0.49	0.27	0.33
Diethylphthalate	0.27	0.3313	0.51	0.51	0.28	0.35
4-Chlorophenyl-phenylether	0.29	0.3597	0.55	0.55	0.30	0.38
Fluorene	0.36	0.4429	0.68	0.68	0.37	0.46
4-Nitroaniline	0.43	0.5330	0.81	0.82	0.45	0.56
4,6-Dinitro-2-methylphenol	0.30	0.3716	0.57	0.57	0.31	0.39
n-Nitrosodiphenylamine	0.30	0.3714	0.57	0.57	0.31	0.39
4-Bromophenyl phenyl ether	0.24	0.2955	0.45	0.46	0.25	0.31
Hexachlorobenzene	0.21	0.2585	0.39	0.40	0.22	0.27
Pentachlorophenol	0.22	0.2764	0.42	0.43	0.23	0.29
Phenanthrene	0.33	0.4131	0.63	0.64	0.35	0.43
Anthracene	0.33	0.4131	0.63	0.64	0.35	0.43
Carbazole	0.36	0.4403	0.67	0.68	0.37	0.46
Di-n-butylphthalate	0.21	0.2645	0.40	0.41	0.22	0.28
Bis(2-ethylhexyl) adipate	0.16	0.1987	0.30	0.31	0.17	0.21
Fluoranthene	0.30	0.3640	0.56	0.56	0.31	0.38
Pyrene	0.30	0.3640	0.56	0.56	0.31	0.38
Butylbenzylphthalate	0.19	0.2357	0.36	0.36	0.20	0.25
Benz[a]anthracene	0.26	0.3225	0.49	0.50	0.27	0.34
Chrysene	0.26	0.3225	0.49	0.50	0.27	0.34
bis(2-Ethylhexyl)phthalate	0.15	0.1885	0.29	0.29	0.16	0.20
Di-n-octylphthalate	0.15	0.1885	0.29	0.29	0.16	0.20
Benzo[b]fluoranthene	0.24	0.2918	0.45	0.45	0.25	0.31
Benzo[k]fluoranthene	0.24	0.2918	0.45	0.45	0.25	0.31
Benzo[a]pyrene	0.24	0.2918	0.45	0.45	0.25	0.31
Indeno[1,2,3-cd]pyrene	0.22	0.2664	0.41	0.41	0.22	0.28
Dibenz[a,h]anthracene	0.21	0.2645	0.40	0.41	0.22	0.28
Benzo[g,h,i]perylene	0.22	0.2664	0.41	0.41	0.22	0.28

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	8	9	10	11	12	13
Sampling Date	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
1,1,1-Trichloroethane	1.91	0.35	0.42	0.37	0.62	0.43
1,2-Dichloroethane	2.57	0.47	0.57	0.50	0.83	0.59
1,1-Dichloropropene	2.29	0.42	0.51	0.44	0.74	0.52
Benzene	3.26	0.60	0.72	0.63	1.06	0.74
Carbon Tetrachloride	1.65	0.30	0.36	0.32	0.54	0.38
1,2-Dichloropropane	2.25	0.41	0.50	0.44	0.73	0.51
Trichloroethene	1.94	0.35	0.43	0.38	0.63	0.44
Dibromomethane	1.46	0.27	0.32	0.28	0.47	0.33
Bromodichloromethane	1.55	0.28	0.34	0.30	0.50	0.35
Pyridine	3.22	0.59	0.71	0.62	1.04	0.73
cis-1,3-Dichloropropene	2.29	0.42	0.51	0.44	0.74	0.52
N-nitrosodimethylamine	3.44	0.63	0.76	0.67	1.11	0.78
Toluene	2.76	0.51	0.61	0.53	0.89	0.63
trans-1,3-Dichloropropene	2.29	0.42	0.51	0.44	0.74	0.52
1,1,2-Trichloroethane	1.91	0.35	0.42	0.37	0.62	0.43
1,3-Dichloropropane	2.25	0.41	0.50	0.44	0.73	0.51
Dibromochloromethane	1.22	0.22	0.27	0.24	0.40	0.28
1,2-Dibromoethane	1.35	0.25	0.30	0.26	0.44	0.31
Tetrachloroethene	1.53	0.28	0.34	0.30	0.50	0.35
Chlorobenzene	2.26	0.41	0.50	0.44	0.73	0.52
1,1,1,2-Tetrachloroethane	1.52	0.28	0.33	0.29	0.49	0.35
Ethylbenzene	2.40	0.44	0.53	0.46	0.78	0.55
m/p-Xylenes	2.40	0.44	0.53	0.46	0.78	0.55
Bromoform	1.01	0.18	0.22	0.20	0.33	0.23
Styrene	2.44	0.45	0.54	0.47	0.79	0.56
o-Xylene	2.40	0.44	0.53	0.46	0.78	0.55
1,1,2,2-Tetrachloroethane	1.52	0.28	0.33	0.29	0.49	0.35
1,2,3-Trichloropropane	1.73	0.32	0.38	0.33	0.56	0.39
Isopropylbenzene	2.12	0.39	0.47	0.41	0.69	0.48
Bromobenzene	1.62	0.30	0.36	0.31	0.53	0.37
2-Chlorotoluene	2.01	0.37	0.44	0.39	0.65	0.46
n-Propylbenzene	2.12	0.39	0.47	0.41	0.69	0.48
4-Chlorotoluene	2.01	0.37	0.44	0.39	0.65	0.46
1,3,5-Trimethylbenzene	2.12	0.39	0.47	0.41	0.69	0.48
tert-Butylbenzene	1.90	0.35	0.42	0.37	0.61	0.43
1,2,4-Trimethylbenzene	2.12	0.39	0.47	0.41	0.69	0.48
sec-Butylbenzene	1.90	0.35	0.42	0.37	0.61	0.43
Phenol	2.70	0.49	0.60	0.52	0.88	0.62
bis(2-Chloroethyl)ether	1.78	0.33	0.39	0.34	0.58	0.41
Aniline	2.73	0.50	0.60	0.53	0.89	0.62
2-Chlorophenol	1.98	0.36	0.44	0.38	0.64	0.45

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	8	9	10	11	12	13
Sampling Date	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
1,3-Dichlorobenzene	1.73	0.32	0.38	0.34	0.56	0.39
1,4-Dichlorobenzene	1.73	0.32	0.38	0.34	0.56	0.39
p-Isopropyltoluene	1.90	0.35	0.42	0.37	0.61	0.43
Benzyl Alcohol	2.35	0.43	0.52	0.46	0.76	0.54
2-Methylphenol (m-cresol)	2.35	0.43	0.52	0.46	0.76	0.54
1,2-Dichlorobenzene	1.73	0.32	0.38	0.34	0.56	0.39
3,4-Methylphenol (o,p-cresol)	2.35	0.43	0.52	0.46	0.76	0.54
bis(2-chloroisopropyl)ether	1.49	0.27	0.33	0.29	0.48	0.34
n-Butylbenzene	1.90	0.35	0.42	0.37	0.61	0.43
N-nitroso-di-n-propylamine	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Hexachloroethane	1.08	0.20	0.24	0.21	0.35	0.25
1,2-Dibromo-3-Chloropropane	1.08	0.20	0.24	0.21	0.35	0.25
Nitrobenzene	2.07	0.38	0.46	0.40	0.67	0.47
Isophorone	1.84	0.34	0.41	0.36	0.60	0.42
2-Nitrophenol	1.83	0.33	0.40	0.35	0.59	0.42
2,4-Dimethylphenol	2.08	0.38	0.46	0.40	0.67	0.47
bis(2-Chloroethoxy)methane	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1,2,4-Trichlorobenzene	1.40	0.26	0.31	0.27	0.45	0.32
Naphthalene	1.99	0.36	0.44	0.38	0.64	0.45
2,4-Dichlorophenol	1.56	0.29	0.34	0.30	0.51	0.36
4-Chloroaniline	1.99	0.37	0.44	0.39	0.65	0.45
Hexachlorobutadiene	0.98	0.18	0.21	0.19	0.32	0.22
1,2,3-Trichlorobenzene	1.40	0.26	0.31	0.27	0.45	0.32
4-Chloro-3-methylphenol	1.78	0.33	0.39	0.35	0.58	0.41
2-Methylnaphthalene	1.79	0.33	0.39	0.35	0.58	0.41
1-Methylnaphthalene	1.79	0.33	0.39	0.35	0.58	0.41
Hexachlorocyclopentadiene	0.93	0.17	0.21	0.18	0.30	0.21
2,4,6-Trichlorophenol	1.29	0.24	0.28	0.25	0.42	0.29
2,4,5-Trichlorophenol	1.29	0.24	0.28	0.25	0.42	0.29
Diphenylamine	1.50	0.28	0.33	0.29	0.49	0.34
Azobenzene	1.40	0.26	0.31	0.27	0.45	0.32
2-Chloronaphthalene	1.56	0.29	0.34	0.30	0.51	0.36
2-Nitroaniline	1.84	0.34	0.41	0.36	0.60	0.42
1,4-Dinitrobenzene	1.51	0.28	0.33	0.29	0.49	0.35
Dimethylphthalate	1.31	0.24	0.29	0.25	0.42	0.30
1,3-Dinitrobenzene	1.51	0.28	0.33	0.29	0.49	0.35

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	8	9	10	11	12	13
Sampling Date	01/24/08	03/26/08	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080129-06	GT080402-04	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
Acenaphthylene	1.67	0.31	0.37	0.32	0.54	0.38
2,6-dinitrotoluene	1.40	0.26	0.31	0.27	0.45	0.32
1,2-Dinitrobenzene	1.51	0.28	0.33	0.29	0.49	0.35
3-Nitroaniline	1.84	0.34	0.41	0.36	0.60	0.42
Acenaphthene	1.65	0.30	0.36	0.32	0.53	0.38
2,4-Dinitrophenol	1.38	0.25	0.30	0.27	0.45	0.32
4-Nitrophenol	1.83	0.33	0.40	0.35	0.59	0.42
Dibenzofuran	1.51	0.28	0.33	0.29	0.49	0.34
2,4-dinitrotoluene	1.40	0.26	0.31	0.27	0.45	0.32
2,3,4,6-Tetrachlorophenol	1.10	0.20	0.24	0.21	0.36	0.25
2,3,5,6-Tetrachlorophenol	1.10	0.20	0.24	0.21	0.36	0.25
Diethylphthalate	1.15	0.21	0.25	0.22	0.37	0.26
4-Chlorophenyl-phenylether	1.24	0.23	0.27	0.24	0.40	0.28
Fluorene	1.53	0.28	0.34	0.30	0.50	0.35
4-Nitroaniline	1.84	0.34	0.41	0.36	0.60	0.42
4,6-Dinitro-2-methylphenol	1.28	0.24	0.28	0.25	0.42	0.29
n-Nitrosodiphenylamine	1.28	0.23	0.28	0.25	0.42	0.29
4-Bromophenyl phenyl ether	1.02	0.19	0.23	0.20	0.33	0.23
Hexachlorobenzene	0.89	0.16	0.20	0.17	0.29	0.20
Pentachlorophenol	0.96	0.17	0.21	0.19	0.31	0.22
Phenanthrene	1.43	0.26	0.31	0.28	0.46	0.33
Anthracene	1.43	0.26	0.31	0.28	0.46	0.33
Carbazole	1.52	0.28	0.34	0.29	0.49	0.35
Di-n-butylphthalate	0.91	0.17	0.20	0.18	0.30	0.21
Bis(2-ethylhexyl) adipate	0.69	0.13	0.15	0.13	0.22	0.16
Fluoranthene	1.26	0.23	0.28	0.24	0.41	0.29
Pyrene	1.26	0.23	0.28	0.24	0.41	0.29
Butylbenzylphthalate	0.81	0.15	0.18	0.16	0.26	0.19
Benz[a]anthracene	1.11	0.20	0.25	0.22	0.36	0.25
Chrysene	1.11	0.20	0.25	0.22	0.36	0.25
bis(2-Ethylhexyl)phthalate	0.65	0.12	0.14	0.13	0.21	0.15
Di-n-octylphthalate	0.65	0.12	0.14	0.13	0.21	0.15
Benzo[b]fluoranthene	1.01	0.18	0.22	0.20	0.33	0.23
Benzo[k]fluoranthene	1.01	0.18	0.22	0.20	0.33	0.23
Benzo[a]pyrene	1.01	0.18	0.22	0.20	0.33	0.23
Indeno[1,2,3-cd]pyrene	0.92	0.17	0.20	0.18	0.30	0.21
Dibenz[a,h]anthracene	0.91	0.17	0.20	0.18	0.30	0.21
Benzo[g,h,i]perylene	0.92	0.17	0.20	0.18	0.30	0.21

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02
a-BHC	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0002
b-BHC	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0002
g-BHC	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0002
d-BHC	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0002
Heptachlor	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
Aldrin	0.0002	0.0003	0.0004	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
Heptachlor epoxide	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
g-Chlordane	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0001
Endosulfan I	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0001
a-Chlordane	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0001
Dieldrin	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
4,4'-DDE	0.0002	0.0003	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0002
Endrin	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
Endosulfan II	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0001
4,4'-DDD	0.0002	0.0003	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0002
Endrin aldehyde	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
Endosulfan sulfate	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0001
4,4'-DDT	0.0002	0.0003	0.0004	0.0003	0.0003	0.0004	0.0003	0.0004	0.0001
Endrin ketone	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0001
Methoxychlor	0.0002	0.0003	0.0004	0.0003	0.0003	0.0004	0.0003	0.0004	0.0001

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	2	2	2	2
Sampling Date	04/16/08	04/23/08	04/30/08	05/14/08
GTI Lab ID	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
a-BHC	0.0002	0.0002	0.0002	0.0002
b-BHC	0.0002	0.0002	0.0002	0.0002
g-BHC	0.0002	0.0002	0.0002	0.0002
d-BHC	0.0002	0.0002	0.0002	0.0002
Heptachlor	0.0001	0.0001	0.0001	0.0001
Aldrin	0.0001	0.0001	0.0001	0.0001
Heptachlor epoxide	0.0001	0.0001	0.0001	0.0001
g-Chlordane	0.0001	0.0001	0.0001	0.0001
Endosulfan I	0.0001	0.0001	0.0001	0.0001
a-Chlordane	0.0001	0.0001	0.0001	0.0001
Dieldrin	0.0001	0.0001	0.0001	0.0001
4,4'-DDE	0.0002	0.0002	0.0002	0.0002
Endrin	0.0001	0.0001	0.0001	0.0001
Endosulfan II	0.0001	0.0001	0.0001	0.0001
4,4'-DDD	0.0002	0.0002	0.0002	0.0002
Endrin aldehyde	0.0001	0.0001	0.0001	0.0001
Endosulfan sulfate	0.0001	0.0001	0.0001	0.0001
4,4'-DDT	0.0001	0.0001	0.0001	0.0001
Endrin ketone	0.0001	0.0001	0.0001	0.0001
Methoxychlor	0.0001	0.0001	0.0001	0.0001

Detection Limits for Pesticides (ppbv) EPA Method 8081

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
a-BHC	0.0004	0.0002	0.0004	0.0002	0.0003	0.0002	0.0003
b-BHC	0.0004	0.0002	0.0004	0.0002	0.0003	0.0002	0.0003
g-BHC	0.0004	0.0002	0.0004	0.0002	0.0003	0.0002	0.0003
d-BHC	0.0004	0.0002	0.0004	0.0002	0.0003	0.0002	0.0003
Heptachlor	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Aldrin	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Heptachlor epoxide	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
g-Chlordane	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endosulfan I	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
a-Chlordane	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Dieldrin	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
4,4'-DDE	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endrin	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endosulfan II	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
4,4'-DDD	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endrin aldehyde	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endosulfan sulfate	0.0002	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
4,4'-DDT	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Endrin ketone	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002
Methoxychlor	0.0003	0.0001	0.0003	0.0001	0.0002	0.0001	0.0002

Detection Limits for Pesticides (ppbv) EPA Method 8081

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
a-BHC	0.0002	0.0004	0.0002	0.0002	0.0004	0.0002
b-BHC	0.0002	0.0004	0.0002	0.0002	0.0004	0.0002
g-BHC	0.0002	0.0004	0.0002	0.0002	0.0004	0.0002
d-BHC	0.0002	0.0004	0.0002	0.0002	0.0004	0.0002
Heptachlor	0.0002	0.0003	0.0002	0.0002	0.0003	0.0001
Aldrin	0.0002	0.0003	0.0002	0.0002	0.0003	0.0001
Heptachlor epoxide	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
g-Chlordane	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
Endosulfan I	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
a-Chlordane	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
Dieldrin	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
4,4'-DDE	0.0002	0.0003	0.0002	0.0002	0.0004	0.0001
Endrin	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
Endosulfan II	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
4,4'-DDD	0.0002	0.0003	0.0002	0.0002	0.0004	0.0001
Endrin aldehyde	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
Endosulfan sulfate	0.0001	0.0003	0.0001	0.0002	0.0003	0.0001
4,4'-DDT	0.0002	0.0003	0.0002	0.0002	0.0004	0.0001
Endrin ketone	0.0001	0.0003	0.0002	0.0002	0.0003	0.0001
Methoxychlor	0.0002	0.0003	0.0002	0.0002	0.0004	0.0001

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
a-BHC	0.0002	0.0002	0.0002	0.0002
b-BHC	0.0002	0.0002	0.0002	0.0002
g-BHC	0.0002	0.0002	0.0002	0.0002
d-BHC	0.0002	0.0002	0.0002	0.0002
Heptachlor	0.0002	0.0001	0.0002	0.0001
Aldrin	0.0002	0.0001	0.0002	0.0001
Heptachlor epoxide	0.0001	0.0001	0.0002	0.0001
g-Chlordane	0.0001	0.0001	0.0002	0.0001
Endosulfan I	0.0001	0.0001	0.0002	0.0001
a-Chlordane	0.0001	0.0001	0.0002	0.0001
Dieldrin	0.0001	0.0001	0.0002	0.0001
4,4'-DDE	0.0002	0.0002	0.0002	0.0002
Endrin	0.0001	0.0001	0.0002	0.0001
Endosulfan II	0.0001	0.0001	0.0002	0.0001
4,4'-DDD	0.0002	0.0002	0.0002	0.0001
Endrin aldehyde	0.0001	0.0001	0.0002	0.0001
Endosulfan sulfate	0.0001	0.0001	0.0001	0.0001
4,4'-DDT	0.0002	0.0001	0.0002	0.0001
Endrin ketone	0.0001	0.0001	0.0002	0.0001
Methoxychlor	0.0002	0.0001	0.0002	0.0001

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
PCB1	0.008	0.005	0.007	0.006	0.006	0.007
PCB 2	0.008	0.005	0.007	0.006	0.006	0.007
PCB 3	0.008	0.005	0.007	0.006	0.006	0.007
PCB 4	0.007	0.004	0.006	0.005	0.005	0.006
PCB 10	0.007	0.004	0.006	0.005	0.005	0.006
PCB 7	0.007	0.004	0.006	0.005	0.005	0.006
PCB 9	0.007	0.004	0.006	0.005	0.005	0.006
PCB 6	0.007	0.004	0.006	0.005	0.005	0.006
PCB 8	0.007	0.004	0.006	0.005	0.005	0.006
PCB 5	0.007	0.004	0.006	0.005	0.005	0.006
PCB 19	0.006	0.004	0.005	0.004	0.005	0.005
PCB 12	0.007	0.004	0.006	0.005	0.005	0.006
PCB 13	0.007	0.004	0.006	0.005	0.005	0.006
PCB 18	0.006	0.004	0.005	0.004	0.005	0.005
PCB 17	0.006	0.004	0.005	0.004	0.005	0.005
PCB 15	0.007	0.004	0.006	0.005	0.005	0.006
PCB 24	0.006	0.004	0.005	0.004	0.005	0.005
PCB 27	0.006	0.004	0.005	0.004	0.005	0.005
PCB 16	0.006	0.004	0.005	0.004	0.005	0.005
PCB 32	0.006	0.004	0.005	0.004	0.005	0.005
PCB 34	0.006	0.004	0.005	0.004	0.005	0.005
PCB 29	0.006	0.004	0.005	0.004	0.005	0.005
PCB 54	0.005	0.003	0.004	0.004	0.004	0.005
PCB 26	0.006	0.004	0.005	0.004	0.005	0.005
PCB 25	0.006	0.004	0.005	0.004	0.005	0.005
PCB 31	0.006	0.004	0.005	0.004	0.005	0.005
PCB 50	0.005	0.003	0.004	0.004	0.004	0.005
PCB 28	0.006	0.004	0.005	0.004	0.005	0.005
PCB 20	0.006	0.004	0.005	0.004	0.005	0.005

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
PCB 33	0.006	0.004	0.005	0.004	0.005	0.005
PCB 53	0.005	0.003	0.004	0.004	0.004	0.005
PCB 51	0.005	0.003	0.004	0.004	0.004	0.005
PCB 22	0.006	0.004	0.005	0.004	0.005	0.005
PCB 45	0.005	0.003	0.004	0.004	0.004	0.005
PCB 46	0.005	0.003	0.004	0.004	0.004	0.005
PCB 69	0.005	0.003	0.004	0.004	0.004	0.005
PCB 52	0.005	0.003	0.004	0.004	0.004	0.005
PCB 73	0.005	0.003	0.004	0.004	0.004	0.005
PCB 49	0.005	0.003	0.004	0.004	0.004	0.005
PCB 47	0.005	0.003	0.004	0.004	0.004	0.005
PCB 48	0.005	0.003	0.004	0.004	0.004	0.005
PCB 75	0.005	0.003	0.004	0.004	0.004	0.005
PCB 104	0.005	0.003	0.004	0.003	0.004	0.004
PCB 35	0.006	0.004	0.005	0.004	0.005	0.005
PCB 44	0.005	0.003	0.004	0.004	0.004	0.005
PCB 59	0.005	0.003	0.004	0.004	0.004	0.005
PCB 37	0.006	0.004	0.005	0.004	0.005	0.005
PCB 42	0.005	0.003	0.004	0.004	0.004	0.005
PCB 71	0.005	0.003	0.004	0.004	0.004	0.005
PCB 41	0.005	0.003	0.004	0.004	0.004	0.005
PCB 64	0.005	0.003	0.004	0.004	0.004	0.005
PCB 40	0.005	0.003	0.004	0.004	0.004	0.005
PCB 103	0.005	0.003	0.004	0.003	0.004	0.004
PCB 67	0.005	0.003	0.004	0.004	0.004	0.005
PCB 100	0.005	0.003	0.004	0.003	0.004	0.004
PCB 63	0.005	0.003	0.004	0.004	0.004	0.005
PCB 74	0.005	0.003	0.004	0.004	0.004	0.005
PCB 70	0.005	0.003	0.004	0.004	0.004	0.005
PCB 66	0.005	0.003	0.004	0.004	0.004	0.005
PCB 93	0.005	0.003	0.004	0.003	0.004	0.004
PCB 95	0.005	0.003	0.004	0.003	0.004	0.004
PCB 91	0.005	0.003	0.004	0.003	0.004	0.004
PCB 56	0.005	0.003	0.004	0.004	0.004	0.005
PCB 60	0.005	0.003	0.004	0.004	0.004	0.005
PCB 92	0.005	0.003	0.004	0.003	0.004	0.004
PCB 84	0.005	0.003	0.004	0.003	0.004	0.004
PCB 90	0.005	0.003	0.004	0.003	0.004	0.004
PCB 101	0.005	0.003	0.004	0.003	0.004	0.004
PCB 99	0.005	0.003	0.004	0.003	0.004	0.004
PCB 119	0.005	0.003	0.004	0.003	0.004	0.004
PCB 83	0.005	0.003	0.004	0.003	0.004	0.004
PCB 97	0.005	0.003	0.004	0.003	0.004	0.004
PCB 117	0.005	0.003	0.004	0.003	0.004	0.004
PCB 81	0.005	0.003	0.004	0.004	0.004	0.005
PCB 87	0.005	0.003	0.004	0.003	0.004	0.004
PCB 115	0.005	0.003	0.004	0.003	0.004	0.004
PCB 85	0.005	0.003	0.004	0.003	0.004	0.004
PCB 136	0.004	0.003	0.004	0.003	0.003	0.004
PCB 77	0.005	0.003	0.004	0.004	0.004	0.005
PCB 110	0.005	0.003	0.004	0.003	0.004	0.004
PCB 154	0.004	0.003	0.004	0.003	0.003	0.004
PCB 82	0.005	0.003	0.004	0.003	0.004	0.004
PCB 151	0.004	0.003	0.004	0.003	0.003	0.004

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
PCB 135	0.004	0.003	0.004	0.003	0.003	0.004
PCB 144	0.004	0.003	0.004	0.003	0.003	0.004
PCB 124	0.005	0.003	0.004	0.003	0.004	0.004
PCB 147	0.004	0.003	0.004	0.003	0.003	0.004
PCB 107	0.005	0.003	0.004	0.003	0.004	0.004
PCB 123	0.005	0.003	0.004	0.003	0.004	0.004
PCB 149	0.004	0.003	0.004	0.003	0.003	0.004
PCB 118	0.005	0.003	0.004	0.003	0.004	0.004
PCB 134	0.004	0.003	0.004	0.003	0.003	0.004
PCB 114	0.005	0.003	0.004	0.003	0.004	0.004
PCB 131	0.004	0.003	0.004	0.003	0.003	0.004
PCB 122	0.005	0.003	0.004	0.003	0.004	0.004
PCB 165	0.004	0.003	0.004	0.003	0.003	0.004
PCB 146	0.004	0.003	0.004	0.003	0.003	0.004
PCB 188	0.004	0.002	0.003	0.003	0.003	0.004
PCB 153	0.004	0.003	0.004	0.003	0.003	0.004
PCB 132	0.004	0.003	0.004	0.003	0.003	0.004
PCB 105	0.005	0.003	0.004	0.003	0.004	0.004
PCB 141	0.004	0.003	0.004	0.003	0.003	0.004
PCB 179	0.004	0.002	0.003	0.003	0.003	0.004
PCB 137	0.004	0.003	0.004	0.003	0.003	0.004
PCB 176	0.004	0.002	0.003	0.003	0.003	0.004
PCB 130	0.004	0.003	0.004	0.003	0.003	0.004
PCB 138	0.004	0.003	0.004	0.003	0.003	0.004
PCB 163	0.004	0.003	0.004	0.003	0.003	0.004
PCB 164	0.004	0.003	0.004	0.003	0.003	0.004
PCB 158	0.004	0.003	0.004	0.003	0.003	0.004
PCB 129	0.004	0.003	0.004	0.003	0.003	0.004
PCB 178	0.004	0.002	0.003	0.003	0.003	0.004
PCB 175	0.004	0.002	0.003	0.003	0.003	0.004
PCB 187	0.004	0.002	0.003	0.003	0.003	0.004
PCB 183	0.004	0.002	0.003	0.003	0.003	0.004
PCB 128	0.004	0.003	0.004	0.003	0.003	0.004
PCB 167	0.004	0.003	0.004	0.003	0.003	0.004
PCB 185	0.004	0.002	0.003	0.003	0.003	0.004
PCB 174	0.004	0.002	0.003	0.003	0.003	0.004
PCB 177	0.004	0.002	0.003	0.003	0.003	0.004
PCB 202	0.004	0.002	0.003	0.003	0.003	0.003
PCB 171	0.004	0.002	0.003	0.003	0.003	0.004
PCB 156	0.004	0.003	0.004	0.003	0.003	0.004
PCB 173	0.004	0.002	0.003	0.003	0.003	0.004
PCB 157	0.004	0.003	0.004	0.003	0.003	0.004
PCB 201	0.004	0.002	0.003	0.003	0.003	0.003
PCB 172	0.004	0.002	0.003	0.003	0.003	0.004
PCB 197	0.004	0.002	0.003	0.003	0.003	0.003
PCB 180	0.004	0.002	0.003	0.003	0.003	0.004
PCB 193	0.004	0.002	0.003	0.003	0.003	0.004
PCB 191	0.004	0.002	0.003	0.003	0.003	0.004
PCB 200	0.004	0.002	0.003	0.003	0.003	0.003
PCB 170	0.004	0.002	0.003	0.003	0.003	0.004
PCB 190	0.004	0.002	0.003	0.003	0.003	0.004
PCB 199	0.004	0.002	0.003	0.003	0.003	0.003
PCB 196	0.004	0.002	0.003	0.003	0.003	0.003
PCB 203	0.004	0.002	0.003	0.003	0.003	0.003

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08
GTI Lab ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12
PCB 189	0.004	0.002	0.003	0.003	0.003	0.004
PCB 208	0.003	0.002	0.003	0.002	0.002	0.003
PCB 195	0.004	0.002	0.003	0.003	0.003	0.003
PCB 207	0.003	0.002	0.003	0.002	0.002	0.003
PCB 194	0.004	0.002	0.003	0.003	0.003	0.003
PCB 205	0.004	0.002	0.003	0.003	0.003	0.003
PCB 206	0.003	0.002	0.003	0.002	0.002	0.003
PCB 209	0.003	0.002	0.003	0.002	0.002	0.003

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08	05/14/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
PCB1	0.006	0.007	0.003	0.003	0.003	0.0003	0.0003
PCB 2	0.006	0.007	0.003	0.003	0.003	0.0003	0.0003
PCB 3	0.006	0.007	0.003	0.003	0.003	0.0003	0.0003
PCB 4	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 10	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 7	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 9	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 6	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 8	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 5	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 19	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 12	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 13	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 18	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 17	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 15	0.005	0.006	0.002	0.002	0.002	0.0002	0.0002
PCB 24	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 27	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 16	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 32	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 34	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 29	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 54	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 26	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 25	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 31	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 50	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 28	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 20	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08	05/14/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
PCB 33	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 53	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 51	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 22	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 45	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 46	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 69	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 52	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 73	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 49	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 47	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 48	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 75	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 104	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 35	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 44	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 59	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 37	0.005	0.005	0.002	0.002	0.002	0.0002	0.0002
PCB 42	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 71	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 41	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 64	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 40	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 103	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 67	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 100	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 63	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 74	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 70	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 66	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 93	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 95	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 91	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 56	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 60	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 92	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 84	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 90	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 101	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 99	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 119	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 83	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 97	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 117	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 81	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 87	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 115	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 85	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 136	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 77	0.004	0.004	0.002	0.002	0.002	0.0002	0.0002
PCB 110	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 154	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 82	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 151	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08	05/14/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
PCB 135	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 144	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 124	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 147	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 107	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 123	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 149	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 118	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 134	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 114	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 131	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 122	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 165	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 146	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 188	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 153	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 132	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 105	0.004	0.004	0.002	0.002	0.002	0.0001	0.0001
PCB 141	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 179	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 137	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 176	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 130	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 138	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 163	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 164	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 158	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 129	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 178	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 175	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 187	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 183	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 128	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 167	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 185	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 174	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 177	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 202	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 171	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 156	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 173	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 157	0.003	0.004	0.001	0.001	0.001	0.0001	0.0001
PCB 201	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 172	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 197	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 180	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 193	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 191	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 200	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 170	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 190	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 199	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 196	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 203	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	2	2	2	2	2
Sampling Date	04/10/08	04/11/08	04/09/08	04/16/08	04/23/08	04/30/08	05/14/08
GTI Lab ID	GT80416-14	GT80416-16	GT080416-02	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
PCB 189	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 208	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 195	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 207	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 194	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 205	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 206	0.003	0.003	0.001	0.001	0.001	0.0001	0.0001
PCB 209	0.002	0.003	0.001	0.001	0.001	0.0001	0.0001

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB1	0.005	0.002	0.006	0.002	0.004	0.0003	0.0004
PCB 2	0.005	0.002	0.006	0.002	0.004	0.0003	0.0004
PCB 3	0.005	0.002	0.006	0.002	0.004	0.0003	0.0004
PCB 4	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 10	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 7	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 9	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 6	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 8	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 5	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 19	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 12	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 13	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 18	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 17	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 15	0.005	0.002	0.005	0.002	0.004	0.0002	0.0004
PCB 24	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 27	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 16	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 32	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 34	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 29	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 54	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 26	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 25	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 31	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 50	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 28	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 20	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB 33	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 53	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 51	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 22	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 45	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 46	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 69	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 52	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 73	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 49	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 47	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 48	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 75	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 104	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 35	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 44	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 59	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 37	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 42	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 71	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 41	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 64	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 40	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 103	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 67	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 100	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 63	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 74	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 70	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 66	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 93	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 95	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 91	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 56	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 60	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 92	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 84	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 90	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 101	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 99	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 119	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 83	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 97	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 117	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 81	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 87	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 115	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 85	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 136	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 77	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
PCB 110	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 154	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 82	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 151	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB 135	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 144	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 124	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 147	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 107	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 123	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 149	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 118	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 134	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 114	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 131	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 122	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 165	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 146	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 188	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 153	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 132	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 105	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
PCB 141	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 179	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 137	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 176	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 130	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 138	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 163	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 164	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 158	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 129	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 178	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 175	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 187	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 183	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 128	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 167	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 185	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 174	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 177	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 202	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 171	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 156	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 173	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 157	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 201	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 172	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 197	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 180	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 193	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 191	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 200	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 170	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 190	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 199	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 196	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 203	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
GTI Lab ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
PCB 189	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 208	0.002	0.001	0.002	0.001	0.002	0.0001	0.0002
PCB 195	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 207	0.002	0.001	0.002	0.001	0.002	0.0001	0.0002
PCB 194	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 205	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
PCB 206	0.002	0.001	0.002	0.001	0.002	0.0001	0.0002
PCB 209	0.002	0.001	0.002	0.001	0.002	0.0001	0.0002

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
PCB1	0.006	0.006	0.0004	0.0004	0.013	0.002
PCB 2	0.006	0.006	0.0004	0.0004	0.013	0.002
PCB 3	0.006	0.006	0.0004	0.0004	0.013	0.002
PCB 4	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 10	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 7	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 9	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 6	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 8	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 5	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 19	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 12	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 13	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 18	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 17	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 15	0.005	0.005	0.0003	0.0003	0.011	0.002
PCB 24	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 27	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 16	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 32	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 34	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 29	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 54	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 26	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 25	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 31	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 50	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 28	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 20	0.004	0.004	0.0003	0.0003	0.010	0.002

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
PCB 33	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 53	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 51	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 22	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 45	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 46	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 69	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 52	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 73	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 49	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 47	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 48	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 75	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 104	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 35	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 44	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 59	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 37	0.004	0.004	0.0003	0.0003	0.010	0.002
PCB 42	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 71	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 41	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 64	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 40	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 103	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 67	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 100	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 63	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 74	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 70	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 66	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 93	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 95	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 91	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 56	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 60	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 92	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 84	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 90	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 101	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 99	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 119	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 83	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 97	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 117	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 81	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 87	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 115	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 85	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 136	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 77	0.004	0.004	0.0003	0.0003	0.009	0.002
PCB 110	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 154	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 82	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 151	0.003	0.003	0.0002	0.0002	0.007	0.001

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
PCB 135	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 144	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 124	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 147	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 107	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 123	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 149	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 118	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 134	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 114	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 131	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 122	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 165	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 146	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 188	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 153	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 132	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 105	0.003	0.003	0.0002	0.0002	0.008	0.001
PCB 141	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 179	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 137	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 176	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 130	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 138	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 163	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 164	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 158	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 129	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 178	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 175	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 187	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 183	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 128	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 167	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 185	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 174	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 177	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 202	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 171	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 156	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 173	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 157	0.003	0.003	0.0002	0.0002	0.007	0.001
PCB 201	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 172	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 197	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 180	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 193	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 191	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 200	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 170	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 190	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 199	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 196	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 203	0.003	0.003	0.0002	0.0002	0.006	0.001

Detection Limits for Polychlorinated Biphenyls (ppbv) EPA Method 8082

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
GTI Lab ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
PCB 189	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 208	0.002	0.002	0.0002	0.0002	0.005	0.001
PCB 195	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 207	0.002	0.002	0.0002	0.0002	0.005	0.001
PCB 194	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 205	0.003	0.003	0.0002	0.0002	0.006	0.001
PCB 206	0.002	0.002	0.0002	0.0002	0.005	0.001
PCB 209	0.002	0.002	0.0001	0.0002	0.005	0.001

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB1	0.003	0.003	0.004	0.0003
PCB 2	0.003	0.003	0.004	0.0003
PCB 3	0.003	0.003	0.004	0.0003
PCB 4	0.003	0.002	0.004	0.0002
PCB 10	0.003	0.002	0.004	0.0002
PCB 7	0.003	0.002	0.004	0.0002
PCB 9	0.003	0.002	0.004	0.0002
PCB 6	0.003	0.002	0.004	0.0002
PCB 8	0.003	0.002	0.004	0.0002
PCB 5	0.003	0.002	0.004	0.0002
PCB 19	0.002	0.002	0.003	0.0002
PCB 12	0.003	0.002	0.004	0.0002
PCB 13	0.003	0.002	0.004	0.0002
PCB 18	0.002	0.002	0.003	0.0002
PCB 17	0.002	0.002	0.003	0.0002
PCB 15	0.003	0.002	0.004	0.0002
PCB 24	0.002	0.002	0.003	0.0002
PCB 27	0.002	0.002	0.003	0.0002
PCB 16	0.002	0.002	0.003	0.0002
PCB 32	0.002	0.002	0.003	0.0002
PCB 34	0.002	0.002	0.003	0.0002
PCB 29	0.002	0.002	0.003	0.0002
PCB 54	0.002	0.002	0.003	0.0002
PCB 26	0.002	0.002	0.003	0.0002
PCB 25	0.002	0.002	0.003	0.0002
PCB 31	0.002	0.002	0.003	0.0002
PCB 50	0.002	0.002	0.003	0.0002
PCB 28	0.002	0.002	0.003	0.0002
PCB 20	0.002	0.002	0.003	0.0002

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB 33	0.002	0.002	0.003	0.0002
PCB 53	0.002	0.002	0.003	0.0002
PCB 51	0.002	0.002	0.003	0.0002
PCB 22	0.002	0.002	0.003	0.0002
PCB 45	0.002	0.002	0.003	0.0002
PCB 46	0.002	0.002	0.003	0.0002
PCB 69	0.002	0.002	0.003	0.0002
PCB 52	0.002	0.002	0.003	0.0002
PCB 73	0.002	0.002	0.003	0.0002
PCB 49	0.002	0.002	0.003	0.0002
PCB 47	0.002	0.002	0.003	0.0002
PCB 48	0.002	0.002	0.003	0.0002
PCB 75	0.002	0.002	0.003	0.0002
PCB 104	0.002	0.002	0.003	0.0001
PCB 35	0.002	0.002	0.003	0.0002
PCB 44	0.002	0.002	0.003	0.0002
PCB 59	0.002	0.002	0.003	0.0002
PCB 37	0.002	0.002	0.003	0.0002
PCB 42	0.002	0.002	0.003	0.0002
PCB 71	0.002	0.002	0.003	0.0002
PCB 41	0.002	0.002	0.003	0.0002
PCB 64	0.002	0.002	0.003	0.0002
PCB 40	0.002	0.002	0.003	0.0002
PCB 103	0.002	0.002	0.003	0.0001
PCB 67	0.002	0.002	0.003	0.0002
PCB 100	0.002	0.002	0.003	0.0001
PCB 63	0.002	0.002	0.003	0.0002
PCB 74	0.002	0.002	0.003	0.0002
PCB 70	0.002	0.002	0.003	0.0002
PCB 66	0.002	0.002	0.003	0.0002
PCB 93	0.002	0.002	0.003	0.0001
PCB 95	0.002	0.002	0.003	0.0001
PCB 91	0.002	0.002	0.003	0.0001
PCB 56	0.002	0.002	0.003	0.0002
PCB 60	0.002	0.002	0.003	0.0002
PCB 92	0.002	0.002	0.003	0.0001
PCB 84	0.002	0.002	0.003	0.0001
PCB 90	0.002	0.002	0.003	0.0001
PCB 101	0.002	0.002	0.003	0.0001
PCB 99	0.002	0.002	0.003	0.0001
PCB 119	0.002	0.002	0.003	0.0001
PCB 83	0.002	0.002	0.003	0.0001
PCB 97	0.002	0.002	0.003	0.0001
PCB 117	0.002	0.002	0.003	0.0001
PCB 81	0.002	0.002	0.003	0.0002
PCB 87	0.002	0.002	0.003	0.0001
PCB 115	0.002	0.002	0.003	0.0001
PCB 85	0.002	0.002	0.003	0.0001
PCB 136	0.002	0.001	0.002	0.0001
PCB 77	0.002	0.002	0.003	0.0002
PCB 110	0.002	0.002	0.003	0.0001
PCB 154	0.002	0.001	0.002	0.0001
PCB 82	0.002	0.002	0.003	0.0001
PCB 151	0.002	0.001	0.002	0.0001

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB 135	0.002	0.001	0.002	0.0001
PCB 144	0.002	0.001	0.002	0.0001
PCB 124	0.002	0.002	0.003	0.0001
PCB 147	0.002	0.001	0.002	0.0001
PCB 107	0.002	0.002	0.003	0.0001
PCB 123	0.002	0.002	0.003	0.0001
PCB 149	0.002	0.001	0.002	0.0001
PCB 118	0.002	0.002	0.003	0.0001
PCB 134	0.002	0.001	0.002	0.0001
PCB 114	0.002	0.002	0.003	0.0001
PCB 131	0.002	0.001	0.002	0.0001
PCB 122	0.002	0.002	0.003	0.0001
PCB 165	0.002	0.001	0.002	0.0001
PCB 146	0.002	0.001	0.002	0.0001
PCB 188	0.001	0.001	0.002	0.0001
PCB 153	0.002	0.001	0.002	0.0001
PCB 132	0.002	0.001	0.002	0.0001
PCB 105	0.002	0.002	0.003	0.0001
PCB 141	0.002	0.001	0.002	0.0001
PCB 179	0.001	0.001	0.002	0.0001
PCB 137	0.002	0.001	0.002	0.0001
PCB 176	0.001	0.001	0.002	0.0001
PCB 130	0.002	0.001	0.002	0.0001
PCB 138	0.002	0.001	0.002	0.0001
PCB 163	0.002	0.001	0.002	0.0001
PCB 164	0.002	0.001	0.002	0.0001
PCB 158	0.002	0.001	0.002	0.0001
PCB 129	0.002	0.001	0.002	0.0001
PCB 178	0.001	0.001	0.002	0.0001
PCB 175	0.001	0.001	0.002	0.0001
PCB 187	0.001	0.001	0.002	0.0001
PCB 183	0.001	0.001	0.002	0.0001
PCB 128	0.002	0.001	0.002	0.0001
PCB 167	0.002	0.001	0.002	0.0001
PCB 185	0.001	0.001	0.002	0.0001
PCB 174	0.001	0.001	0.002	0.0001
PCB 177	0.001	0.001	0.002	0.0001
PCB 202	0.001	0.001	0.002	0.0001
PCB 171	0.001	0.001	0.002	0.0001
PCB 156	0.002	0.001	0.002	0.0001
PCB 173	0.001	0.001	0.002	0.0001
PCB 157	0.002	0.001	0.002	0.0001
PCB 201	0.001	0.001	0.002	0.0001
PCB 172	0.001	0.001	0.002	0.0001
PCB 197	0.001	0.001	0.002	0.0001
PCB 180	0.001	0.001	0.002	0.0001
PCB 193	0.001	0.001	0.002	0.0001
PCB 191	0.001	0.001	0.002	0.0001
PCB 200	0.001	0.001	0.002	0.0001
PCB 170	0.001	0.001	0.002	0.0001
PCB 190	0.001	0.001	0.002	0.0001
PCB 199	0.001	0.001	0.002	0.0001
PCB 196	0.001	0.001	0.002	0.0001
PCB 203	0.001	0.001	0.002	0.0001

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
GTI Lab ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
PCB 189	0.001	0.001	0.002	0.0001
PCB 208	0.001	0.001	0.002	0.0001
PCB 195	0.001	0.001	0.002	0.0001
PCB 207	0.001	0.001	0.002	0.0001
PCB 194	0.001	0.001	0.002	0.0001
PCB 205	0.001	0.001	0.002	0.0001
PCB 206	0.001	0.001	0.002	0.0001
PCB 209	0.001	0.001	0.002	0.0001

Detection Limits for Pharmaceuticals (ppbv)

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	1	1	1	1	1	1	1	1	2
Sampling Date	01/23/08	04/07/08	04/08/08	04/08/08	04/09/08	04/09/08	04/10/08	04/11/08	04/09/08
Sample ID	GT080129-03	GT080416-04	GT80416-06	GT080416-8	GT080416-10	GT80416-12	GT80416-14	GT80416-16	GT080416-02
Ampicillin Trihydrate	0.004	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.001
Amoxicillin Trihydrate	0.004	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.001
Oxytocin	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Florfenicol	0.004	0.003	0.004	0.003	0.003	0.004	0.003	0.004	0.001
Tripelennamine hydrochloride	0.005	0.003	0.004	0.004	0.004	0.005	0.004	0.004	0.002
Ceftiofur	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.001
Tilmicosin	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Furosemide	0.005	0.003	0.004	0.003	0.004	0.004	0.004	0.004	0.002
Flunixin meglumine	0.003	0.002	0.003	0.002	0.002	0.003	0.002	0.003	0.001
Fenbendazol	0.005	0.003	0.004	0.004	0.004	0.005	0.004	0.004	0.002
Doramectin	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001

Biogas Type	Biomethane	Biomethane	Biomethane	Biomethane
Dairy Farm	2	2	2	2
Sampling Date	04/16/08	04/23/08	04/30/08	05/14/08
Sample ID	GT080430-01a	GT080430-02a	GT080530-12	GT080530-14
Ampicillin Trihydrate	0.001	0.001	0.0001	0.0001
Amoxicillin Trihydrate	0.001	0.001	0.0001	0.0001
Oxytocin	0.001	0.001	0.0000	0.0000
Florfenicol	0.001	0.001	0.0001	0.0001
Tripelennamine hydrochloride	0.002	0.002	0.0002	0.0002
Ceftiofur	0.001	0.001	0.0001	0.0001
Tilmicosin	0.001	0.001	0.0001	0.0001
Furosemide	0.002	0.002	0.0001	0.0001
Flunixin meglumine	0.001	0.001	0.0001	0.0001
Fenbendazol	0.002	0.002	0.0002	0.0002
Doramectin	0.001	0.001	0.0001	0.0001

Detection Limits for Pharmaceuticals (ppbv)

Biogas Type	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean	Partially Clean
Dairy Farm	3	3	4	5	5	6	7
Sampling Date	02/05/08	03/25/08	02/07/08	03/20/08	04/22/08	05/14/08	05/15/08
Sample ID	GT080213-02	GT080402-04-C	GT080213-05	GT080402-02	GT080430-03a	GT080530-04	GT080530-08
Ampicillin Trihydrate	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
Amoxicillin Trihydrate	0.002	0.001	0.003	0.001	0.002	0.0001	0.0002
Oxytocin	0.001	0.000	0.001	0.000	0.001	0.0000	0.0001
Florfenicol	0.003	0.001	0.003	0.001	0.002	0.0001	0.0002
Tripelennamine hydrochloride	0.004	0.001	0.004	0.002	0.003	0.0002	0.0003
Ceftiofur	0.002	0.001	0.002	0.001	0.001	0.0001	0.0001
Tilmicosin	0.001	0.000	0.001	0.001	0.001	0.0001	0.0001
Furosemide	0.003	0.001	0.003	0.001	0.002	0.0002	0.0002
Flunixin meglumine	0.002	0.001	0.002	0.001	0.002	0.0001	0.0002
Fenbendazol	0.003	0.001	0.004	0.002	0.003	0.0002	0.0003
Doramectin	0.001	0.000	0.001	0.001	0.001	0.0001	0.0001

Detection Limits for Pharmaceuticals (ppbv)

Biogas Type	Raw	Raw	Raw	Raw	Raw	Raw
Dairy Farm	1	3	6	7	8	9
Sampling Date	01/22/08	02/05/08	05/14/08	05/16/08	01/24/08	03/26/08
Sample ID	GT080129-04	GT080213-01	GT080530-06	GT080530-10	GT080129-06	GT080402-04
Ampicillin Trihydrate	0.003	0.003	0.0002	0.0002	0.006	0.001
Amoxicillin Trihydrate	0.003	0.003	0.0002	0.0002	0.006	0.001
Oxytocin	0.001	0.001	0.0001	0.0001	0.003	0.000
Florfenicol	0.003	0.003	0.0002	0.0002	0.007	0.001
Tripelennamine hydrochloride	0.004	0.004	0.0003	0.0003	0.009	0.002
Ceftiofur	0.002	0.002	0.0001	0.0001	0.005	0.001
Tilmicosin	0.001	0.001	0.0001	0.0001	0.003	0.001
Furosemide	0.003	0.003	0.0002	0.0002	0.008	0.001
Flunixin meglumine	0.002	0.002	0.0001	0.0002	0.005	0.001
Fenbendazol	0.004	0.004	0.0002	0.0003	0.009	0.002
Doramectin	0.001	0.001	0.0001	0.0001	0.003	0.001

Detection Limits for Pharmaceuticals (ppbv)

Biogas Type	Raw	Raw	Raw	Raw
Dairy Farm	10	11	12	13
Sampling Date	03/27/08	03/28/08	04/23/08	05/13/08
Sample ID	GT080402-08	GT080402-06	GT080430-04a	GT080530-02
Ampicillin Trihydrate	0.001	0.001	0.002	0.0001
Amoxicillin Trihydrate	0.001	0.001	0.002	0.0001
Oxytocin	0.001	0.000	0.001	0.0000
Florfenicol	0.002	0.001	0.002	0.0001
Tripelennamine hydrochloride	0.002	0.002	0.003	0.0002
Ceftiofur	0.001	0.001	0.002	0.0001
Tilmicosin	0.001	0.001	0.001	0.0001
Furosemide	0.002	0.001	0.003	0.0001
Flunixin meglumine	0.001	0.001	0.002	0.0001
Fenbendazol	0.002	0.002	0.003	0.0002
Doramectin	0.001	0.001	0.001	0.0001