Compliance Test Report
Determination of
Tier 2
Non-methane Organic Compound Concentrations

Central Sanitary Landfill
Pierson, Michigan

REPUBLIC SERVICES

Prepared for:

Central Sanitary Landfill
21545 Cannonsville Road
Pierson. MI 49339

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AIR QUALITY DIVISION

Prepared by:

Environmental Information Logistics, LLC
130 E. Main Street
Caledonia, MI 49316

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1.0 INTRODUCTION

Environmental Information Logistics, LLC (EIL) was retained by Central Sanitary Landfill to perform Tier 2 landfill gas sampling and analysis at the site located in Pierson, Michigan. 40 CFR 60.754(a)(3)(iii) requires the landfill owner to retest the site-specific NMOC concentration every five years. The previous test occurred on March 31st, 2016. USEPA allowed the site to conduct an additional round of testing.

A Tier 2 re-testing workplan was submitted to the Michigan Department of Environmental Quality (MDEQ) on February 19, 2018. The Tier 2 re-test was conducted on March 21st, 2018.

2.0 REGULATORY BACKGROUND

The facility is subject to the New Source Performance Standards (NSPS), 40 CFR 60 Subpart WWW. Central Sanitary Landfill performed the Tier 2 landfill gas sampling and analysis to show the facility NMOC emissions may be less than the 50 Mg/year NSPS emission threshold. The Tier 2 NMOC value must be retested every 5 years.

The last Tier Two test was conducted on March 31, 2016. The facility determined a site-specific NMOC concentration in accordance with the requirements of 40 CFR 60.754(a)(3) and 40 CFR 60.757(c)(1) to calculate an NMOC emissions rate that was more specific to site conditions. Since NMOC emissions were greater than 50 Mg/year using the LandGEM model, the facility submitted an NSPS Landfill Gas Collection and Control System Design Plan to MDEQ for approval. The facility then petitioned USPEA Region 5 to allow for the use of site-specific flow data and the equation in 40 CFR 60.754(b) to determine a site specific NMOC Tier 2 emissions rate. USEPA concurred with the use of the equation and site-specific flow data but required additional performance demonstrations for the gas collection system such as determination of negative pressures the day of the test, and an NSPS-type surface scan to demonstrate that the gas system meets the performance requirements of the NSPS. MDEQ concurred with the USEPA requirements in a letter dated March 15, 2018. The USEPA and MDEQ approval letters are provided in Appendix A of the report. The requested GCCS performance metrics are included in Appendix B. Hand-written field notes are included with this submittal at the request of MDEQ.

In accordance with the IEPA approval letter, the facility calculated an NMOC emissions value by using the actual flowrate data measured from the header of its GCCS. The average measured NMOC concentration from the three samples collected at the main header was 208 ppm NMOC as hexane. As shown in Figure 1, the gas collection system is installed in all the constructed landfill cells. Therefore, the Tier 2 sample probe procedures were not required for any areas.

Calculation methodology is provided in Appendix C. Laboratory results are provided in Appendix D and summarized in Table 2. The results indicate that the NMOC emissions rate from the landfill is 9.29 Mg/year.

The facility also elected to run the LandGEM model since the NMOC concentration was more than 100 ppm lower than in 2016. NMOC emissions are not estimated to exceed 50 Mg/yr for the next five years. Pursuant to 40 CFR 60.757(b)(1)(ii), the landfill owner or operator may submit a five year report in lieu of annual reports, as long as the actual waste volumes received in subsequent years are less than the estimated projections.

Based on the sampling results provided in this report, gas collection and control requirements are still not applicable to the facility, since NMOC emissions using the new Tier 2 value do not exceed 50 Mg/yr.

The Tier 2 testing results are valid for five years according to 40 CFR 60.754. A new site-specific NMOC concentration will have to be obtained within five years of the original March 31, 2016 test date; i.e. on or before March 31st, 2021.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Sample Locations

The NSPS requires collection of two samples per hectare of landfill surface area in which waste has been in-place for a minimum of two years. At the Central Sanitary Landfill, approximately 60.7 acres of waste have been in place at least two years and were subject to Tier 2 sampling.

As shown in Figure 1, the existing gas collection system covers all the landfill cells eligible for Tier 2 sampling. Gas is directed to a utility flare owned and operated by the site. Three (3) samples from the main header to the utility flare were collected for Tier 2 sampling.

3.2 Sampling and Analysis

Each four (4) liter sample canister was pre-filled with less than 2 liters of helium. The attached Table 1 contains the information for each sample point including collection times, beginning and ending cylinder vacuums, barometric pressure and ambient temperatures as required by Method 25C. The sample flow rate was set between 100 - 200 cc/min (100 - 200 ml/min) and was adjusted as necessary during the sampling to maintain a constant sample flow rate. Field measurements of methane, carbon dioxide, and oxygen levels in the sample probes were measured with a Landtec™ GEM gas analyzer to assure the

samples were valid in the field (less than 5 percent O_2 or 20 percent N_2). Landfill gas flow measurements were also obtained from the flares flow meter before and after each sample was collected. This data is also included in Table 1.

Analysis was performed at the laboratory with gas chromatography equipped with a flame ionization detector (GC/FID) for 25C and gas chromatography equipped with a thermal conductivity detector (GC/TCD) for 3C. All three samples were analyzed for oxygen and nitrogen (following Method 3C). Each sample was also analyzed for NMOC (following Method 25C). NMOC results are reported as carbon, and must be divided by six to obtain NMOC values as hexane for use in the emissions equation. A schematic of the Method 25C sampling train is found in Figure 2.

3.3 Additional Gas System Performance Metrics

The USEPA published a "MSW Landfill NSPS and EG Questions and Answers" guidance document on their Air Toxics Website for MSW Landfills in November, 1998. The guidance document was last updated in May, 2002. On page 20 of the document, a question was asked on how to calculate NMOC emissions from a landfill that has a gas collection system already in place (such as Central Sanitary Landfill). The USEPA responded that to determine NMOC emissions for NSPS applicability from a site that has a collection system in place, it would be appropriate to use the equation and NMOC concentration measurement procedures in 40 CFR 60.754(b), which requires measurement of the NMOC at the common header pipe of the collection system prior to the control device. The equation from 60.754(b) is:

$$M_{NMOC} = 1.89 \times 10^{-3} Q_{LFG} C_{NMOC}$$

where,
M_{NMOC} = *mass emission rate of NMOC, megagrams per year*
Q_{LFG} = *flow rate of landfill gas, cubic meters per minute*
C_{NMOC} = *NMOC concentration, parts per million by volume as hexane*

In order to utilize this equation, the actual gas flow rate to the system at the time of the Tier 2 test was obtained. The technician collecting the samples manually recorded the actual gas flow rates on the display panel prior to and after the collection of each gas sample, for a total of six (6) flow readings. Recorded data from the site's flow meter was also be downloaded/obtained for comparison purposes

during the sample collection time frame. The flow meter has a current calibration certificate. The average value measured during the sample collection time was 835 cfm.

Field recordings of flow data are provided in Table 1. Recorded flow data is included in Table 2. A calibration certificate for the flow meter is included in Appendix E.

USEPA Region 5 indicated that in order for Central Sanitary Landfill to use the actual gas flow rates from the collection system to calculate NMOC emissions for Tier 2 tests, sufficient data must be gathered the date of the Tier 2 test to prove that the alternative calculation method and "voluntary" gas collection and control system (GCCS) "is effectively equivalent to a system that would be used to comply with the Landfill NSPS". USEPA stated that a successful demonstration for the use of gas system flow data and the equation in 40 CFR 60.754(b)) would consist of the following additional tasks to be conducted the date of the Tier 2 test:

- Verification that the "voluntary" GCCS is effective at ensuring that negative pressure is maintained at all wellheads without excess air infiltration;
- Surface monitoring data, collected pursuant to §40 CFR 60.753(d) and 60.755(c) demonstrating that the voluntary GCCS maintains surface methane concentrations below 500 ppm; and
- Verification that the voluntary GCCS is effectively collecting landfill gas from all gas producing areas of the landfill in conformance with the provisions for active systems at 40 CFR 60.752(b)(2)(a) and 40 CFR 60.759.

This additional data was collected the morning of the test. Pressure readings from wellhead measurements are provided in Appendix B. The surface scan monitoring report is also included in Appendix B. For the last item, Figure 2 demonstrates that the combination of vertical wells, connections to leachate cleanout risers and horizontal collectors is removing gas from all gas producing areas of the site.

4.0 RESULTS

Samples cannot contain oxygen and nitrogen above the acceptable thresholds (i.e. greater than 5% oxygen or greater than 20% nitrogen). All samples were acceptable for use in the calculations. A summary of laboratory results is shown in Table 2.

The average NMOC value for the site was 208 parts per million (ppm) as hexane. The equation provided in 40 CFR 60.754(b) and the actual landfill gas flow rate was used to calculate the 2018 NMOC

emissions rate of 9.29 Mg/year. Additionally, EPA's LandGEM Model (Version 3.02) was used to calculate the 2018 NMOC emissions rate and the five year projection. Both were under 50 Mg/year. All NMOC calculations are provided in Appendix C.

Since both NMOC emissions rates were below the 50 Mg/year, the site is not yet subject to the NSPS requirement to install and operate a Landfill Gas Collection and Control System. As indicated previously, a new Tier 2 test will be conducted five years from the date of the original Tier 2 test; i.e. on or before March 31, 2021.

Laboratory Quality Control/Quality Assurance reports and chain-of-custody records are included with the analytical report in Appendix D.

Table 1: Central Sanitary Landfill
2018 Tier 2 Sampling Field Data
Pierson, Michigan

Sample ID	Date	Sample Time Start	Sample Time End	Sample PSI Range ("Hg) Start	Sample PSI Range ("Hg) End	Sample PSI Volumn ("Hg) Total	Ambient Temp (deg F.)	Barometric Pressure (inches w.c.)	Methane (CH_4)	Carbon Dioxide (CO_2)	Oxygen (O_2)	Nitrogen (N_2)	Total % Gas Concentration	Tank ID	Gas Flow Flare and Pilot SCFM (pre-post)
C-1	3/21/2018	7:13 PM	7:24 PM	-17.00	-5.00	-12.00	37	29.04	52.2	36.5	0.8	10.5	100	N441	842.0-845.6
C-2	3/21/2018	7:27 PM	7:38 PM	-17.00	-5.50	-11.50	37	29.04	52.0	37.0	0.7	10.3	100	N256	837.5-840.6
C-3	3/21/2018	7:42 PM	7:52 PM	-17.00	-5.00	-12.00	37	29.04	52.5	37.5	0.5	9.5	100	N337	845.1-831.7
C-4	3/21/2018	7:55 PM	8:05 PM	-17.00	-5.50	-15.00	37	29.04	52.4	37.6	0.5	9.5	100	N6	842.9-837.7

TABLE 2

SUMMARY OF METHOD 25C AND METHOD 3C DATA

Central Sanitary Landfill
Pierson, Michigan

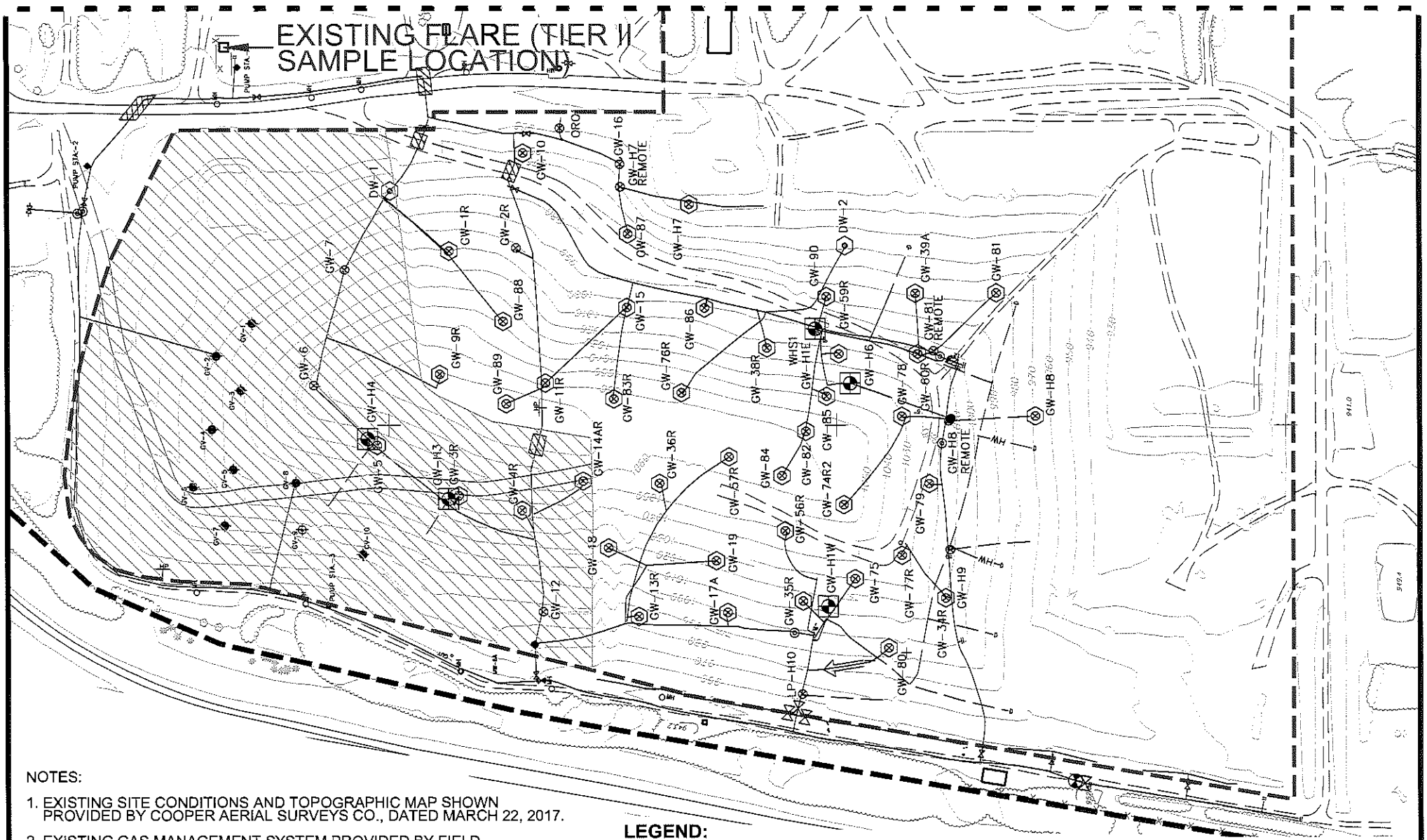
Sample ID Number	Sample Location	Date Sampled	CH4 (%)	CO2 (%)	O2 (%)	N2 (%)	NMOC (ppm as carbon)	NMOC (ppm as hexane)
C-1	Flare header Upstream of Blower	3/21/2018	51.0	37.5	1.0	12.8	1,079.0	180
C-2			51.0	37.5	0.9	12.4	1,152.0	192
C-3			51.4	37.8	0.8	12.1	1,521.0	254
		Average	**51.1**	**37.6**	**0.9**	**12.4**	**1250.7**	**208.4**

CH4: methane (From Method 3C results)
CO2: carbon dioxide (From Method 3C results)
O2: oxygen
N2: nitrogen
NMOC as hexane: Non Methane Organic Compounds as hexane (NMOC as carbon divided by six)

Table 3
Electronic Flare Flow Data For Period of NMOC Samples
Central Tier 2 - March 21, 2018

		Ch. Tag Tag No. Unit	CH102 Flare Flow SCFM		CH103 Flare Total kSCF	
Date	Time	sec	MIN	MAX	MIN	MAX
2018/03/21	19:14:00	0.000	827	845	173549	173550
2018/03/21	19:16:00	0.000	827	847	173550	173552
2018/03/21	19:18:00	0.000	831	852	173552	173554
2018/03/21	19:20:00	0.000	838	852	173554	173555
2018/03/21	19:22:00	0.000	835	854	173555	173557
2018/03/21	19:24:00	0.000	838	854	173557	173559
2018/03/21	19:26:00	0.000	829	847	173559	173560
2018/03/21	19:28:00	0.000	827	847	173560	173562
2018/03/21	19:30:00	0.000	823	843	173562	173564
2018/03/21	19:32:00	0.000	827	841	173564	173565
2018/03/21	19:34:00	0.000	823	843	173565	173567
2018/03/21	19:36:00	0.000	825	838	173567	173569
2018/03/21	19:38:00	0.000	830	843	173569	173570
2018/03/21	19:40:00	0.000	825	841	173570	173572
2018/03/21	19:42:00	0.000	825	843	173572	173574
2018/03/21	19:44:00	0.000	825	839	173574	173575
2018/03/21	19:46:00	0.000	826	839	173575	173577
2018/03/21	19:48:00	0.000	826	841	173577	173579
2018/03/21	19:50:00	0.000	824	846	173579	173580
2018/03/21	19:52:00	0.000	828	839	173580	173582
2018/03/21	19:54:00	0.000	823	839	173582	173584
2018/03/21	19:56:00	0.000	826	843	173584	173585
2018/03/21	19:58:00	0.000	822	841	173585	173587
2018/03/21	20:00:00	0.000	824	844	173587	173589
2018/03/21	20:02:00	0.000	822	837	173589	173590
2018/03/21	20:04:00	0.000	824	844	173590	173592
2018/03/21	20:06:00	0.000	815	841	173592	173594

Average Flow: **835**



NOTES:

1. EXISTING SITE CONDITIONS AND TOPOGRAPHIC MAP SHOWN PROVIDED BY COOPER AERIAL SURVEYS CO., DATED MARCH 22, 2017.
2. EXISTING GAS MANAGEMENT SYSTEM PROVIDED BY FIELD TECHNOLOGY SERVICES, DRAWING ENTITLED "CENTRAL SANITARY LANDFILL DISCHARGE SYSTEM SITE MAP (ACTIVE), DATED SEPTEMBER 20, 2017.
3. FOR CLARITY, NOT ALL SITE FEATURES ARE SHOWN.

LEGEND:

- PROPERTY BOUNDARY
- SOLID WASTE BOUNDARY
- EXISTING TOPO (10' CONTOUR)
- EXISTING FENCE
- EXISTING ROAD (GRAVEL)
- GV-8 GAS VENT
- GAS HEADER ACCESS RISER
- GAS COMBO WELL
- EXISTING HEADER
- LFG EXTRACTION WELL
- HORIZONTAL GAS WELL
- LFG HORIZONTAL EXTRACTION WELL HEAD
- CONDENSATE DRIPLEG
- UNDERGROUND CONTROL VALVE
- LIMIT OF FML CLOSED AREA

0' 150' 300'

PREPARED BY
EIL ENVIRONMENTAL INFORMATION LOGISTICS, LLC

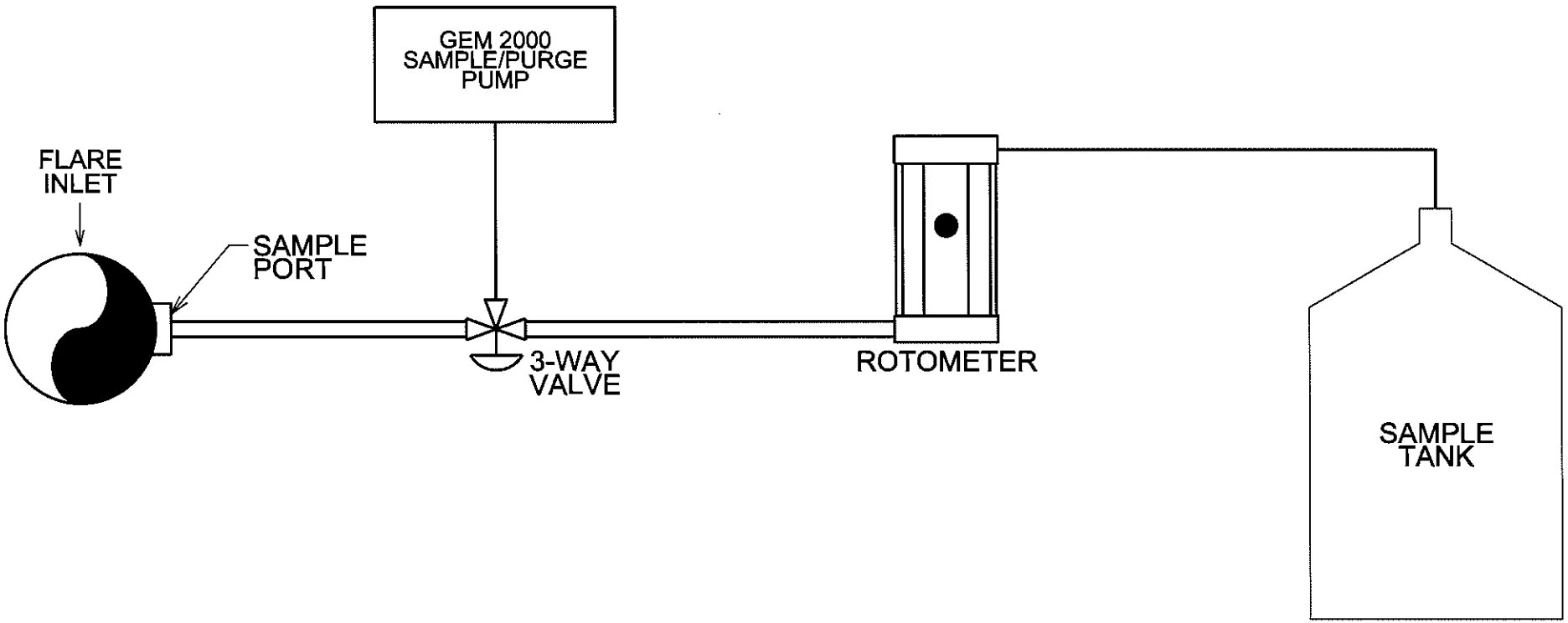
PREPARED FOR
REPUBLIC SERVICES, INC.

FIGURE 1

TIER II SAMPLE LOCATION PLAN

CENTRAL SANITARY LANDFILL
PIERSON, MONTCALM COUNTY, MICHIGAN

170102



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EIL ENVIRONMENTAL INFORMATION LOGISTICS, LLC

PREPARED FOR

REPUBLIC SERVICES, INC.

FIGURE 2

METHOD 25 & 3C TOTAL NMOC SAMPLING TRAIN
CENTRAL SANITARY LANDFILL
PIERSON, MICHIGAN

MARCH 2018