

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION**

December 26, 2018

**PERMIT TO INSTALL
19-17B**

ISSUED TO
Advanced Disposal Services Arbor Hills Landfill, Inc.

LOCATED AT
10690 West Six Mile Road
Salem Township, Michigan

IN THE COUNTY OF
Washtenaw

STATE REGISTRATION NUMBER
N2688

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: December 18, 2018	
DATE PERMIT TO INSTALL APPROVED: December 26, 2018	SIGNATURE:
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

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Common Abbreviations / Acronyms

Common Acronyms		Pollutant / Measurement Abbreviations	
AQD	Air Quality Division	acfm	Actual cubic feet per minute
BACT	Best Available Control Technology	BTU	British Thermal Unit
CAA	Clean Air Act	°C	Degrees Celsius
CAM	Compliance Assurance Monitoring	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	CO _{2e}	Carbon Dioxide Equivalent
CFR	Code of Federal Regulations	dscf	Dry standard cubic foot
COM	Continuous Opacity Monitoring	dscm	Dry standard cubic meter
Department/ department	Michigan Department of Environmental Quality	°F	Degrees Fahrenheit
EU	Emission Unit	gr	Grains
FG	Flexible Group	HAP	Hazardous Air Pollutant
GACS	Gallons of Applied Coating Solids	Hg	Mercury
GC	General Condition	hr	Hour
GHGs	Greenhouse Gases	HP	Horsepower
HVLP	High Volume Low Pressure*	H ₂ S	Hydrogen Sulfide
ID	Identification	kW	Kilowatt
IRSL	Initial Risk Screening Level	lb	Pound
ITSL	Initial Threshold Screening Level	m	Meter
LAER	Lowest Achievable Emission Rate	mg	Milligram
MACT	Maximum Achievable Control Technology	mm	Millimeter
MAERS	Michigan Air Emissions Reporting System	MM	Million
MAP	Malfunction Abatement Plan	MW	Megawatts
MDEQ	Michigan Department of Environmental Quality	NMOC	Non-methane Organic Compounds
MSDS	Material Safety Data Sheet	NO _x	Oxides of Nitrogen
NA	Not Applicable	ng	Nanogram
NAAQS	National Ambient Air Quality Standards	PM	Particulate Matter
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM10	Particulate Matter equal to or less than 10 microns in diameter
NSPS	New Source Performance Standards	PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
NSR	New Source Review	pph	Pounds per hour
PS	Performance Specification	ppm	Parts per million
PSD	Prevention of Significant Deterioration	ppmv	Parts per million by volume
PTE	Permanent Total Enclosure	ppmw	Parts per million by weight
PTI	Permit to Install	psia	Pounds per square inch absolute
RACT	Reasonable Available Control Technology	psig	Pounds per square inch gauge
ROP	Renewable Operating Permit	scf	Standard cubic feet
SC	Special Condition	sec	Seconds
SCR	Selective Catalytic Reduction	SO ₂	Sulfur Dioxide
SNCR	Selective Non-Catalytic Reduction	TAC	Toxic Air Contaminant
SRN	State Registration Number	Temp	Temperature
TEQ	Toxicity Equivalence Quotient	THC	Total Hydrocarbons
USEPA/EPA	United States Environmental Protection Agency	tpy	Tons per year
VE	Visible Emissions	µg	Microgram
		µm	Micrometer or Micron
		VOC	Volatile Organic Compounds
		yr	Year

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**
2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909-7760, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**
3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R 336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**
4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**
5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to R 336.1219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of R 336.1219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environmental Quality. **(R 336.1219)**
6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**
7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**
8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.
9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.
10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R 336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R 336.1303. **(R 336.1301)**
 - a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
 - b) A visible emission limit specified by an applicable federal new source performance standard.
 - c) A visible emission limit specified as a condition of this Permit to Install.

12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R 336.1370(2). **(R 336.1370)**

13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R 336.2001 and R 336.2003, under any of the conditions listed in R 336.2001. **(R 336.2001)**

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SPECIAL CONDITIONS

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
EUOPENFLARE_TEMP	A temporary open flare (an open combustor without enclosure or shroud) used for controlling excess landfill gas. This flare will be removed from the site by January 31, 2019 or 60 days from the initiation of operation of the permanent flare.	February 2017	NA

Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1291.

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The following conditions apply to:
EUOPENFLARE_TEMP

DESCRIPTION: A temporary open flare (an open combustor without enclosure or shroud) used for controlling excess landfill gas. This flare will be removed from the site by January 31, 2019 or 60 days from the initiation of operation of the permanent flare.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT: NA

I. EMISSION LIMITS

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Testing / Monitoring Method	Underlying Applicable Requirements
1. Visible Emissions	0 percent Opacity	Test Protocol*	EUOPENFLARE_TEMP	SC V.2, SC V.3	R 336.1301, 40 CFR 60.18(c)(1)
2. SO ₂	35.4 tpy ^a	12 months	EUOPENFLARE_TEMP	SC V.4, SC VI.9	R 336.1205(3)
3. CO	89 tpy ^b	12 months	EUOPENFLARE_TEMP	SC VI.10	R 336.1205(3)

^a The SO₂ limit is based on the sulfur content of 500 ppmv in the landfill gas operating 8760 hours per year.
^b The CO limit is based on an emission factor of 0.37 lb MMBtu and the amount of landfill gas flared.

II. MATERIAL LIMITS

Material	Limit	Time Period / Operating Scenario	Equipment	Testing / Monitoring Method	Underlying Applicable Requirements
1. Net heating value of landfill gas	≥ 200 Btu/scf for non-assisted flares	At all times	EUOPENFLARE_TEMP	SC V.1	40 CFR 60.18(c)(1)
2. Landfill Gas	860 MMscf per year	12 months	EUOPENFLARE_TEMP	SC VI.7	R 336.1205(1)(a) & (3)

III. PROCESS/OPERATIONAL RESTRICTIONS

- The permittee shall operate EUOPENFLARE_TEMP in accordance with 40 CFR 60.18 except as noted in 40 CFR 60.754(e). **(40 CFR 60.752(b)(2)(iii)(A), 40 CFR 63.1955(a))**
- The permittee shall operate EUOPENFLARE_TEMP at all times when the collected gas is routed to it. **(40 CFR 60.753(f), 40 CFR 63.1955(a))**
- The permittee shall operate EUOPENFLARE_TEMP with a flame present at all times, as determined by the methods specified in 40 CFR 60.18(f). **(40 CFR 60.18(c)(2))**
- EUOPENFLARE_TEMP shall be used only with the net heating value of the gas being combusted of 11.2 MJ/scm (300 Btu/scf) or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted of 7.45 MJ/scm (200 Btu/scf) or greater if the flare is non-assisted. The net heating value of the gas being combusted shall be determined by the methods specified in 40 CFR 60.18(f). **(40 CFR 60.18(c)(3))**

5. Steam-assisted and non-assisted flares shall be designed for and operated with an exit velocity, as determined by the methods specified in 40 CFR 60.18(f)(4), less than 18.3 m/sec (60 ft/sec), except as provided in 40 CFR 60.18(c)(4)(ii) and (iii). **(40 CFR 60.18(c)(4)(i))**
 - a. Steam-assisted and non-assisted flares designed for and operated with an exit velocity, equal to or greater than 18.3 m/sec (60 ft/sec) but less than 122 m/sec (400 ft/sec) are allowed if the net heating value of the gas being combusted is greater than 37.3 MJ/scm (1,000 Btu/scf). **(40 CFR 60.18(c)(4)(ii))**
 - b. Steam-assisted and non-assisted flares designed for and operated with an exit velocity, as determined by the methods specified in 40 CFR 60.18(f)(4) less than the velocity, V_{max} , as determined by the method specified in 40 CFR 60.18(f)(5), and less than 122 m/sec (400 ft/sec) are allowed. **(40 CFR 60.18(c)(4)(iii))**
6. Air-assisted flares shall be designed and operated with an exit velocity less than the velocity, V_{max} , as determined by the method specified in 40 CFR 60.18(f)(6). **(40 CFR 60.18(c)(5))**
7. Flares used to comply with provisions of 40 CFR Part 60, Subpart A shall be operated at all times when emissions may be vented to them. **(40 CFR 60.18(e))**
8. The permittee shall operate the control system such that all collected gases are vented to a control system designed and operated in accordance with 40 CFR 60.752(b)(2)(iii). In the event the collection or control system is inoperable, the gas mover system shall be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere shall be closed within one hour. **(40 CFR 60.753(e), 40 CFR 63.1955(a))**

IV. DESIGN/EQUIPMENT PARAMETERS

1. The nameplate capacity of EUOPENFLARE_TEMP shall not exceed 3,000 standard cubic feet per minute (scfm) as specified by the equipment manufacturer. **(R 336.1205(1)(a), R 336.1225, R 336.1702, R 336.2803, R 336.2804)**
2. The permittee shall install, calibrate, maintain, and operate EUOPENFLARE_TEMP with a landfill gas flow monitoring device to measure the amount of landfill gas burned in the flare. **(R 336.1205(1)(a), R 336.1225, R 336.1702, R 336.2803, R 336.2804)**

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. For the performance test required in 40 CFR 60.752(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in 40 CFR 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under 40 CFR 60.18(f)(4). **(40 CFR 60.752(b)(2)(iii)(A), 40 CFR 60.754(e))**
2. Within 60 days after achieving maximum production rate, but not later than 180 days after commencement of initial startup, the permittee shall evaluate visible emissions from EUOPENFLARE_TEMP, as required by federal Standards of Performance for New Stationary Sources, at owner's expense, in accordance 40 CFR Part 60, Subparts A and WWW. Visible emission observation procedures must have prior approval by the AQD. Verification of visible emissions includes the submittal of a complete report of opacity observations to the AQD within 60 days following the last date of the evaluation. **(40 CFR Part 60, Subparts A & WWW)**
3. Method 22 of appendix A to 40 CFR Part 60 shall be used to determine the compliance of EUOPENFLARE_TEMP with the visible emission provisions of this subpart. The observation period is 2 hours and shall be used according to Method 22. **(40 CFR 60.18(f)(1), 40 CFR 60.752(b)(2)(iii)(A))**

4. The permittee shall verify the H₂S or TRS content of the landfill gas burned in EUOPENFLARE_TEMP monthly by gas sampling (e.g. Draeger Tubes, Tedlar Sampling Bags, etc) and semi-annually by gas sampling using an EPA approved method and laboratory analysis, at the owner's expense, in accordance with Department requirements. If at any time, the H₂S (TRS equivalent) concentration of the landfill gas sample exceeds 500 ppmvd, the permittee shall sample and record the H₂S (TRS equivalent) concentration of the landfill gas burned on a weekly basis and shall review all operating and maintenance activities for the landfill gas collection and treatment system along with keeping records of corrective actions taken. Once the H₂S (TRS equivalent) concentration of the landfill gas determined from the weekly samples are maintained below 500 ppmvd, for one month after an exceedance, the permittee may resume monthly monitoring and recordkeeping. No less than 60 days prior to the initial test for each type of gas sampling, the permittee shall submit a complete test plan to the AQD District Office. The AQD must approve the final plan prior to the first test for each type of gas sampling. Thereafter, the permittee shall submit a test plan upon the request of the AQD District Supervisor or if any changes are made to the approved testing protocol. The permittee shall keep all records on file at the facility and make them available to the Department upon request. **(R 336.1205(3), R 336.2001, R 336.2003, R 336.2004)**

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall monitor and record on a monthly basis the average Btu content of the landfill gas burned in EUOPENFLARE_TEMP. As an alternative, the permittee may use the monitored Btu value of the landfill gas burned in the Gas to Energy Plant. All records shall be kept on file for a period of at least five years and make them available to the Department upon request. **(R 336.1205(3), R 336.2803, R 336.2804)**
2. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling heat input calculations for EUOPENFLARE_TEMP. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R 336.1205(3), R 336.2803, R 336.2804)**
3. The permittee shall install, calibrate, maintain, and operate, according to the manufacturer's specifications, a heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame for EUOPENFLARE_TEMP. **(40 CFR 60.756(c)(1), 40 CFR 63.1955(a))**
4. Except as provided in 40 CFR 60.752(b)(2)(i)(B), the permittee shall keep up-to-date, readily accessible records for the life of EUOPENFLARE_TEMP of the data listed in SC VI.6, as measured during the initial performance test or compliance determination. Records of subsequent tests or monitoring shall be maintained for a minimum of 5 years. Records of the open flare vendor specifications shall be maintained until removal. **(40 CFR 60.758(b), 40 CFR 63.1955(a))**
5. The permittee shall maintain records regarding the flare type (i.e., steam-assisted, air-assisted, or non-assisted), all visible emission readings, heat content determination, flow rate or bypass flow rate measurements, and exit velocity determinations made during the performance test as specified in 40 CFR 60.18; continuous records of the open flare pilot flame or open flare flame monitoring and records of all periods of operations during which the pilot flame of the flare flame is absent. **(40 CFR 60.758(b)(4), 40 CFR 63.1955(a))**

6. The following records for the flare shall be maintained onsite:
 - a. Records indicating presence of flare pilot flame. **(40 CFR 60.18(f)(2))**
 - b. The net heating value of the gas being combusted in the flare shall be calculated and recorded using the equation provided in Appendix A. **(40 CFR 60.18(f)(3))**
 - c. The actual exit velocity of the flare shall be calculated and recorded by dividing the volumetric flow rate (in units of standard temperature and pressure), as determined by Federal Reference Test Methods 2, 2A, 2C, or 2D as appropriate, by the unobstructed (free) cross sectional area of the flare tip. **(40 CFR 60.18(f)(4))**
 - d. The maximum permitted velocity, V_{max} , for flares complying with 40 CFR 60.18(c)(4)(iii) shall be calculated and recorded using the equation provided in Appendix A. **(40 CFR 60.18(f)(5))**
 - e. The maximum permitted velocity, V_{max} , for air-assisted flares shall be calculated and recorded using the equation provided in Appendix A. **(40 CFR 60.18(f)(6))**
7. The permittee shall keep, in a satisfactory manner, records of the landfill gas usage and hours of operation for EUOPENFLARE_TEMP on a daily basis. The permittee shall keep all records on file at the facility and make them available to the Department upon request. **(R 336.1205(1)(a) & (3), R 336.1225, R 336.1702, R 336.1910, R 336.2803, R 336.2804)**
8. The permittee shall record all sampling data collected of the H₂S (TRS equivalent) concentration in the landfill gas. All records shall be kept on file at the facility and make them available to the Department upon request. **(R 336.1205(3)), R 336.2803, R 336.2804)**
9. The permittee shall calculate and record the monthly and 12-month SO₂ emission rate from EUOPENFLARE_TEMP using the equation in Appendix 2, or other method as approved by the AQD District Supervisor. The calculations shall utilize the actual gas usage, actual hours of operation, and the sulfur concentration from the most recent gas sampling data unless otherwise requested by the AQD. All records shall be kept on file at the facility and make them available to the Department upon request. **(R 336.1205(3)), R 336.2803, R 336.2804)**
10. The permittee shall calculate and record the monthly and 12-month CO emission rate from EUOPENFLARE_TEMP. The calculations shall utilize the actual gas usage and actual hours of operation. All records shall be kept on file at the facility and make them available to the Department upon request. **(R 336.1205(3)), R 336.2804)**

VII. REPORTING

1. The permittee shall submit to the appropriate AQD District Office semi-annual reports for the gas collection system. Reports shall be postmarked or received by appropriate AQD District Office by March 15 for reporting period July 1 to December 31 and September 15 for reporting period January 1 to June 30. For enclosed combustion devices and flares, reportable exceedances are defined under 40 CFR 60.758(c). The semi-annual report shall contain:
 - a. Value and length of time for exceedance of applicable parameters monitored under 60.756(b). **(40 CFR 60.757(f)(1), 40 CFR 63.1980(a), 40 CFR 63.1955(a))**
 - b. Description and duration of all periods when the control device was not operating for a period exceeding 1 hour and length of time the control device was not operating. **(40 CFR 60.757(f)(3), 40 CFR 63.1980(a), 40 CFR 63.1955(a))**
2. The permittee shall submit the startup, shutdown, and malfunction (SSM) report to the appropriate AQD District Office and it shall be delivered or postmarked by March 15 for reporting period July 1 to December 31 and September 15 for reporting period January 1 to June 30. **(40 CFR 63.10(a)(5), 40 CFR 63.10(d)(5))**

VIII. STACK/VENT RESTRICTIONS

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter/Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVOPENFLARE_TEMP	12	42	R 336.1225, R 336.2803, R 336.2804

IX. OTHER REQUIREMENTS

1. The duration of start-up, shutdown, or malfunction for the open flare shall not exceed 1 hour. **(40 CFR 60.755(e), 40 CFR 63.1955(a))**
2. Compliance with 40 CFR Part 63, Subpart AAAA is determined in the same way it is determined for 40 CFR Part 60, Subpart WWW, including performance testing, monitoring of the collection system, continuous parameter monitoring, and other credible evidence. In addition, continuous parameter monitoring data collected above in SC VI.1 and VI.5 are used to demonstrate compliance with the operating conditions for the open flare. The permittee shall have developed and implemented a written SSM for EUOPENFLARE_TEMP. A copy of the SSM plan shall be maintained on site. **(40 CFR 63.1960)**
3. The permittee shall comply with all applicable provisions of 40 CFR Part 60 Subpart A and WWW "Standard of Performance for Municipal Solid Waste Landfills as they apply to EUOPENFLARE_TEMP. **(40 CFR Part 60 Subpart A and WWW)**
4. The permittee shall comply with all applicable provisions of 40 CFR Part 63 Subpart A and AAAA "National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills as they apply to EUOPENFLARE_TEMP. **(40 CFR Part 63 Subpart A and AAAA)**
5. EUOPENFLARE_TEMP shall be removed from the site by January 31, 2019, and this permit shall be terminated. To continue operation of EUOPENFLARE_TEMP at this site after January 31, 2019, the permittee must apply for and receive a new PTI. **(Act 451 324.5503(c))**

Footnotes:

¹This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

APPENDIX 1 Emission Calculations

The permittee shall use the following calculations in conjunction with monitoring, testing or recordkeeping data to determine compliance with the applicable requirements referenced in EUOPENFLARE_TEMP. The permittee shall use emission factors from vendor data or from source specific testing (if test data is available, use most recent test data), as available for each emission unit. The permittee shall use emission factors contained in the most recent AP-42 (Compilation of Air Pollutant Emission Factors) or FIRE (Factor Information Retrieval) database if vendor or testing data is not available. If emission factors from other sources are used, the permittee shall obtain the approval of the AQD District Supervisor before using the emission factors to calculate emissions. The permittee shall document the source of each emission factor used in the calculations.

Calculation used to determine NMOC emissions from any nonproductive area

The following shall be used to determine if any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than one percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material shall be documented and provided to the District Supervisor upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections shall be compared to the NMOC emissions estimate for the entire landfill. Emissions from each section shall be computed using the following equation:

$$Q_i = 2 k L_o M_i (e^{-kt} - 1) (\text{CNMOC}) (3.6 \times 10^{-9}) \text{ where,}$$

Q_i = NMOC emission rate from the i th section, megagrams per year

k = methane generation rate constant, year⁻¹

L_o = methane generation potential, cubic meters per megagram solid waste

M_i = mass of the degradable solid waste in the i th section, megagram

t_i = age of the solid waste in the i th section, years

CNMOC = concentration of non-methane organic compounds, ppm by volume

3.6×10^{-9} = conversion factor

The values for k and CNMOC determined in field testing shall be used if field testing has been performed in determining the NMOC emission rate or the radii of influence (this distance from the well center to a point in the landfill where the pressure gradient applied by the blower or compressor approaches zero). If field testing has not been performed, the default values for k , L_o and CNMOC provided in 40 CFR 60.754(a)(1) or the alternative values from 40 CFR 60.754(a)(5) shall be used. The mass of non-degradable solid waste contained within the given section may be subtracted from the total mass of the section when estimating emissions provided the nature, location, age, and amount of the non-degradable material is documented as provided in 40 CFR 60.759(a)(3)(i). **(40 CFR 60.759(a)(3)(iii), 40 CFR 63.1955(a))**

Net Heating Value of the gas being combusted in the flare:

The net heating value of the gas being combusted in the flare shall be calculated and recorded using the equation provided in 40 CFR 60.18(f)(3). **(40 CFR 60.18(f)(3))**

$$H_T = K \sum_{i=1}^n C_i H_i$$

WHERE:

HT=Net heating value of the sample,

MJ/scm; where the net enthalpy per mole of offgas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 °C;

$$K = \text{Constant} \cdot \frac{1}{1.740 \times 10^{-7}} \left(\frac{1}{\text{ppm}} \right) \left(\frac{\text{g mole}}{\text{scm}} \right) \left(\frac{\text{MJ}}{\text{kcal}} \right)$$

where the standard temperature for $\left(\frac{\text{g mole}}{\text{scm}} \right)$ is 20°C;

C_i=Concentration of sample component i in ppm on a wet basis, as measured for organics by Reference Method 18 and measured for hydrogen and carbon monoxide by ASTM D1946–77 or 90 (Reapproved 1994) (Incorporated by reference as specified in 40 CFR 60.17); and

H_i=Net heat of combustion of sample component i, kcal/g mole at 25 °C and 760 mm Hg. The heats of combustion may be determined using ASTM D2382–76 or 88 or D4809–95 (incorporated by reference as specified in 40 CFR 60.17) if published values are not available or cannot be calculated.

Calculation for Vmax steam-assisted and non-assisted flares

The maximum permitted velocity, Vmax, for flares complying with 40 CFR 60.18(c)(4)(iii) shall be calculated and recorded using the equation provided in 40 CFR 60.18(f)(5). **(40 CFR 60.18(f)(5))**

$$\text{Log}_{10} (V_{\text{max}}) = (HT + 28.8) / 31.7$$

Vmax=Maximum permitted velocity, M/sec 28.8=Constant 31.7=Constant HT=The net heating value as determined above.

Calculation for Vmax for air-assisted flares

The maximum permitted velocity, Vmax, for air-assisted flares shall be calculated and recorded using the equation provided in 40 CFR 60.18(f)(6). **(40 CFR 60.18(f)(6))**

$$V_{\text{max}} = 8.706 + 0.7084 (HT)$$

Vmax=Maximum permitted velocity, m/sec 8.706=Constant 0.7084=Constant HT=The net heating value as determined above.

Calculation for SO₂ Emissions

The following calculation for SO₂ emissions shall utilize the actual gas usage, actual hours of operation, and the sulfur concentration from the most recent laboratory test sample.

$$\text{SO}_2 = [(\text{scfm}) \times (60 \text{ min/hr}) \times (H) \times (\text{ppmv}_{\text{sulfur}} * 1\text{E}-06) \times (\text{MW}_{\text{SO}_2})] \div [(R \times T)] = \text{pounds/month}$$

Where:

scfm = standard cubic feet per minute gas flow

ppmv_{sulfur} = parts per million by volume of Sulfur in the gas (based on the most recent test sample)

MW_{SO₂} = Molecular Weight of SO₂ = 64.066 lb/lb-mol

H = Actual Hours per month operated

R = Universal Gas Constant = 0.7302 atm-ft³/lb-mol-R

T = Standard Temperature (absolute) = 519 R