Veolia ES Technical Solutions, L.L.C.

Class 3 Permit Modification

Permit No. 50212

Tracking No. 30852473

Signature Page

I, Dietrich Hovener, General Manager,

(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:________________ Date: 6/25/2025

- -

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I,______________________, hereby designate ______________________

[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____

Printed or Typed Name of Operator or Principal Executive Officer

____

Signature

- -

SUBSCRIBED AND SWORN to before me by the said ______________________

On this June day of 25, 2025

My commission expires on the 1st day of October, 2028

Notary Public in and for Jefferson County, Texas

*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

Krystal Jackson

Krystal Jackson
My Commission Expires
10/1/2028
Notary ID 131511470

April 25, 2025 VIA Email

Umair Hassan
Industrial and Hazardous Waste Permits Section
Waste Permits Division (MC 130)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RE: Veolia ES Technical Solutions, L.L.C.
Jefferson County
HW Permit No: 50212
CN603069626; RN102599719
Tracking No. 30852473
Class 3 Permit Application

Dear Mr. Hassan:

In response to the Technical Notice of Deficiency (NOD) dated April 1, 2025, Veolia ES Technical Solutions, L.L.C. (Veolia) is providing answers to the following questions.

> **1**. Provide detailed calculations, including supporting data, demonstrating that the proposed increase in Mercury feed rate will comply with emission limits set forth in the permit. This should include calculations showing mercury concentration in the waste feed, total mercury feed rate (including spiking), stack gas flow rate, measured mercury concentration in stack gas, mercury emissions rate, and a clear explanation of the extrapolation basis, including assumptions and supporting data.

Veolia Response:

The attached Comprehensive Performance Test, RCRA Permit Periodic Test, and Air Permit Periodic Test Report dated January 20, 2023 (CPT Report) demonstrates that the facility complies with the emission limits set forth in the permit with the proposed increase in mercury feed rate. The maximum allowable emission rate in Table V.H.4 of Permit 50212 for mercury is 0.0191 lb/hour and 0.0837 tons/year. Also, the HWC MACT standard for mercury emissions is 130 µg/dscm, corrected to 7 % O_2. Table 1-1 of the CPT Report contains an average measured value of <0.0016 lb/hour for the mercury mass emission rate. This was calculated from the average measured mercury concentration of <11 µg/dscm. The following table with data from Table 5-19 shows the gas volume, flow rate, and results for mercury in the stack gas for all three runs:

	Run 1	**Run 2**	**Run 3**
Date	*10/13/2022*	*10/14/2022*	*10/14/2022*
Time	*0900-1730*	*0750-1005*	*1325-1540*
Volume Collected (dscf)	*90.210*	*89.416*	*88.572*
Stack Gas Flowrate (dscfm)	*41,119*	*40,621*	*40,180*
Oxygen Concentration (%)	*7.49*	*7.07*	*7.10*
Mercury Mass Found (µg)	*<64.0*	*<13.3*	*<3.88*
Mercury Stack Gas Concentration (µg/dscf)	*<0.71*	*<0.15*	*<0.044*
Mercury Stack Gas Concentration (µg/dscm, corrected to 7 % O_2)	*<26*	*<5.3*	*<1.6*
Average Mercury (µg/dscm, corrected to 7 % O_2)	*<11*		
Mercury Mass Emission Rate (lb/hr)	*<0.0039*	*<0.00080*	*<0.00023*
Average Mercury Mass Emission Rate (lb/hr)	*<0.0016*		

Discussion of extrapolation is outlined in the Test Plan for the 2021 Comprehensive Performance Test and RCRA and NSR Air Permits Periodic Testing dated December 21, 2020 and approved by the TCEQ on March 22, 2021 (CPT Test Plan)(Please see attached). Page 4-10 of the CPT Test Plan states:

> *The maximum feedrate of mercury will be established during the CPT. The 12-hour rolling average limit is the average of the test run averages. The limit demonstrated during the CPT can be extended by extrapolating the measured total feedrate of mercury and the measured emission concentration of mercury up to 80% of the applicable emission limit, or to three times the feedrate measured during the CPT.*

Also from page 4-25 of the CPT Test Plan:

> *For the HWC MACT, Veolia is planning to extrapolate the metals feedrate limits to establish the OPLs for metals feedrates; therefore, the metals feedrates during the test may not be the feedrate limits established and filed in the Notification of Compliance.*

Table 5-7 of the CPT Report contains the feed rates of mercury (including spiking) (see below). Table 5-31 of the CPT Report contains the extrapolated mercury feed rates to 80% of the MACT Standard and also three times the measured feed rate. The three times the mercury feed rate is the more conservative extrapolated value as seen below:

	Run 1	**Run 2**	**Run 3**	**Average**
Mercury Concentration in Waste Feed (mg/kg) (calculated from report)	*0.056*	*0.049*	*0.055*	*0.053*
Mercury Feedrate including spiking (lb/hr)	*0.0534*	*0.205*	*0.197*	*0.152*
Hg Emission Limit (µg/dscm, at 7% O_2)	*130*	*130*	*130*	*130*
80% of Hg Emission Limit (ug/dscm, at 7% O_2)	*104*	*104*	*104*	*104*
Hg Concentration (µg/dscm, at 7% O_2)	*<26*	*<5.3*	*<1.6*	*<11*

Hg Feedrate Extrapolated to 80% MACT Standard (lb/hr)	*>0.2*	*>4.0*	*>12.8*	*<5.7*
Hg Feedrate Extrapolated to 3 Times Measured Feedrate	*0.160*	*0.616*	*0.591*	*0.456*

The Hg feed rates extrapolated to 80% of the MACT standard for each run are calculated by the following equation (104 ug/dscm is 80% of the MACT limit):

*Extrapolated Hg Feedrate = (104/measured concentration)*actual feed rate*

However, the values for 3 times the measured feed rate are lower and thus more conservative than this method.

To calculate the mass emission rates from the extrapolated feed rates, first calculate a system removal efficiency (SRE) from each run with the following equation:

*SRE (%) = (1 - (actual metal emission rate/actual metal feed rate))*100*

The table below shows the calculated SRE for each run and the calculated extrapolated mass emission rate by applying the SRE to the extrapolated feed rate with the following equation:

*Emission Rate (extrapolated) = (1-(SRE/100)*Extrapolated Feed Rate*

	Run 1	***Run 2***	***Run 3***	***Average***
Mercury Feedrate (lb/hr)	*0.0534*	*0.205*	*0.197*	*0.152*
Mercury Mass Emission Rate (lb/hr)	*<0.0039*	*<0.00080*	*<0.00023*	*<0.0016*
SRE (%)	*92.70%*	*99.61%*	*99.88%*	*97.40%*
Hg Feedrate Extrapolated to 3 Times Measured Feedrate	*0.160*	*0.616*	*0.591*	*0.456*
Mercury Mass Emission Rate for each extrapolated feed rate (lb/hr)	*0.0117*	*0.0024*	*0.0007*	*0.0049*
Annual Emission Rate for each extrapolated feed rate assuming 8,760 hours per year (tons/year)	*0.0512*	*0.0105*	*0.0030*	*0.0216*

As you can see, each of the mass emission rates calculated from the SREs and extrapolated feed rates from each run are less than the permitted mass emission rate limit of 0.0191 lb/hr and less than the annual emission limit of 0.0837 tons/year.

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2. Provide detailed calculations, including supporting data, demonstrating that the proposed increase in pumpable hazardous waste feed rate to the secondary combustion chamber will comply with emission limits and operating requirements.

Veolia Response:

Feed rates of hazardous wastes are operating parameter limits (OPLs) required for the HWC MACT standard for destruction removal efficiency (DRE), dioxins and furans, and total hydrocarbon (THC). From section 1.2 of the CPT Report:

> *As required by §63.1209(i) of the HWC MACT, the OPLs for maximum total hazardous waste feedrates, minimum combustion chamber temperatures, and maximum stack gas flowrate, have been established from the most stringent, applicable value determined in the 2006 CPT or this subsequent CPT.*

Page 4-10 of the Test Plan states that the HRA limit for pumpable hazardous waste feeds is the average of the maximum hourly rolling averages for each run. Tables 3-1, 3-2, and 3-3 of the CPT Report contain the minimum, average, and maximum for various process data parameters for each run. These tables show that the average maximum pumpable hazardous waste feed rate to the SCC is 7,330 lb/hr. Therefore, 7,330 lb/hr is the OPL in the NOC for maximum pumpable hazardous feed rate to the SCC.

The Notification of Compliance (NOC) dated January 20, 2023 (see attached) describes the development of operating parameters from either the 2006 CPT or the 2022 CPT. The DRE OPL from the 2006 CPT for maximum pumpable hazardous waste feed rate to the SCC is 9,953 lb/hr, which is higher and less stringent than the 2022 CPT OPL of 7,330 lb/hr for dioxins/furans.

As displayed below, data from Table 5-15 of the CPT Report shows that the results for dioxin and furan emissions during each run is well below the 0.40 ng TEQ/dscm emission concentration limit. Also, THC was continuously monitored during the CPT with a continuous emission monitoring system, and the values displayed for each run in Table 5-27 of the CPT Report are far less than the 10 ppmv emission limit (see below).

	Run 1	***Run 2***	***Run 3***	***Average***
Dioxin/Furans Concentration (ng TEQ/dscm at 7% O_2)	*0.0116*	*0.0106*	*0.0126*	*0.0116*
THC (ppmvd, at 7% O_2)	*0.62*	*0.50*	*0.31*	*0.48*

Therefore, the proposed feed rate of liquid waste to the SCC respect the OPLs required for the HWC MACT standard for DRE and will not increase emissions to levels above applicable emission limits as delineated in the CPT Report.

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3. In addition to the requested increase in the mercury feed rate limit in Table V.H.3 and the requested increase in total pumpable hazardous waste feed rate, revise Table V.H.2, as necessary, to reflect the following:

I. For the increased pumpable hazardous waste feed rate clarify and justify whether the maximum combustion gas velocity of 39,701 (dscfm) in Table V.H.2 will need to be reduced based on the lower of the combustion gas velocity during the latest DRE and Ds/Fs testing.

II. For the increased mercury feed rate limit clarify and justify whether the maximum combustion gas velocity of 39,701 (dscfm) in Table V.H.2 will need to be reduced based on the combustion gas velocity used to show compliance with the mercury emission limit of 0.0191 (lb/hr) and 0.037 (tons/yr) in Table V.H.4.

III. For the increased pumpable hazardous waste feed rate clarify and justify whether the minimum secondary combustion chamber temperature of 1,954 °F will need to be increased based on the latest DRE and Ds/Fs testing which established minimum combustion chamber temperature, whichever was higher.

Veolia Response:

The site operates under multiple permits that at times have varying operating parameter limits. Veolia ensures that the DCS programmed waste feed cut offs are set for the more strict standard whether it be from the NSR Air permit, RCRA permit or PCB Approval. The OPLs established in the NOC are incorporated by reference into NSR Air Permit 42450. Therefore, when OPLs are established from a CPT, our systems are updated to comply with the most stringent standard. The site maximum combustion gas velocity is currently set at 39,605 dscfm from the NOC due to compliance with the NSR Air Permit, and the minimum secondary combustion chamber temperature is currently set at 2,012 °F from the PCB Approval reauthorized by the EPA on April 23, 2024. Operating under the lower maximum combustion gas velocity and over the higher more stringent minimum temperature will not negatively affect DRE nor increase dioxin/furan emissions.

Please let me know if you have any questions or need additional information. You may contact me at (409) 736-4128 or [redacted]

Sincerely,

Randa Coffey

Randa Coffey
Environmental Compliance Supervisor

cc: Vahab Haghighatian, TCEQ Waste Permits Division, Austin
Colin Donovan, TCEQ Waste Permits Division, Austin
Chris Shaw, TCEQ Waste Permits Division, Austin
Dietrich Hövener, Veolia ES Technical Solutions, L.L.C., Beaumont

Comprehensive Performance Test, RCRA Permit Periodic Test, and Air Permit Periodic Test of the Rotary Kiln Incinerator

Project number: 60666789

January 20, 2023

Veolia ES Technical Solutions, L.L.C.
7665 Highway 73
Beaumont, Texas 77705

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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1. Executive Summary

Veolia ES Technical Solutions, L.L.C. (Veolia) operates a hazardous waste incinerator at its facility in Port Arthur, Texas. The incinerator treats hazardous wastes under RCRA Permit HW-50212 and Air Permit 42450 issued by the Texas Commission on Environmental Quality (TCEQ), and a TSCA permit issued by the U.S. Environmental Protection Agency (EPA). The incinerator operates in compliance with the requirements of the RCRA, Air, and TSCA permits, and the Final Replacement Standards of the *National Emission Standards for Hazardous Air Pollutants (NESHAPs) from Hazardous Waste Combustors* (Title 40 of the Code of Federal Regulations, Part 63 [40 CFR Part 63], Subpart EEE) - often called the Hazardous Waste Combustor (HWC) MACT.

The previous Comprehensive Performance Test (CPT) of the Port Arthur incinerator began on December 6, 2016 with a performance of a RATA of the CO and O2 CEMS on the stack of the incinerator. The CPT/RCRA/Air Test was conducted on February 2 and 3, 2017. With completion of the test on February 3, 2017, the CPT was completed within 60 days of commencement as required by §63.1207(d)(3). A Finding of Compliance (FOC) stating that the CPT Report and NOC demonstrate compliance with the HWC MACT was issued March 14, 2019 by TCEQ. The HWC MACT, at §63.1207(d)(1) *Comprehensive performance testing* states, “you must commence testing no later than 61 months after the date of commencing the previous comprehensive performance test”. The subsequent CPT of the Port Arthur incinerator had to begin by January 6, 2022. On December 22, 2021, Veolia requested an extension to complete the stack text. Verbally on January 6, 2022, via email on January 7, and in writing on January 19, TCEQ granted the extension request for the stack test to commence on or before September 7, 2022. Veolia began the subsequent CPT on August 31, 2022, with the performance of a RATA of the CO and O2 CEMS on the stack of the incinerator. The test was completed on October 14, 2022, within 60 days of commencement as required by §63.1207(d)(3). A site-specific test plan, the Comprehensive Performance Test and Test Plan for RCRA Permit Periodic Testing and Test Plan for Air Permit Periodic Testing (i.e., the CPT/RCRA/Air Test Plan) and a Quality Assurance Project Plan (QAPjP) were initially submitted to TCEQ on December 21, 2020, and revised on February 10, 2021, and were approved by TCEQ on March 22, 2021.

Section V.H.6.b of the RCRA permit for the facility, as modified, requires that periodic testing be performed … at least every two and one-half years. The permit specifies that sampling and analysis of the waste and exhaust emissions be conducted to verify compliance with the feedrate limits in Table V.H.3.b. (of the permit) and the emission limits in Table V.H.4.b. (of the permit) and to ensure achievement of the performance standards of 40 CFR 264.343.

Special Condition 21.A. of Air Permit 42450 requires that the incinerator be tested during each CPT, and that the testing shall include emissions of total organic carbon (TOC), oxides of nitrogen (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), hydrogen chloride (HCl), elemental chlorine (Cl2), hydrogen fluoride (HF), dioxins/furans (PCDD/PCDF), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), chromium VI (Cr^{+6}), lead (Pb), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), thallium (Tl), polychlorinated biphenyls (PCBs), and principal organic hazardous constituents (POHCs).

The CPT/RCRA/Air Test of the Port Arthur incinerator demonstrated the requirements of the HWC MACT; demonstrated compliance with the feedrate and emission limits of the RCRA permit; and demonstrated compliance with emission limits in the Air permit. The CPT demonstrated compliance with the emission limits and re-established operating parameter limits (OPLs) for the HWC MACT. While the OPLs established from the 2022 CPT are included in this report, a Notification of Compliance, submitted with this report, certifies the OPLs established using the results of the 2022 CPT/RCRA/Air Test.

OPLs established from the 2022 CPT are based on process and related data from throughout each of the three test runs, determined by the initiation and completion of stack testing. The Notification of Compliance and CPT/RCRA/Air Test Report have been revised to address a request from TCEQ to develop OPLs using process and related data from the periods of time of the stack sampling for the applicable parameter (i.e., the OPLs for hydrochloric acid and chlorine gas are developed from process and related data during the stack sampling for HCl/Cl2).

1.1 Summary of Results

Veolia successfully demonstrated compliance with the permit and regulatory requirements of the HWC MACT, the RCRA permit, and the Air permit during the 2022 CPT/RCRA/Air Test. Table 1-1 summarizes these results. Triplicate runs were performed for each parameter of interest. The term “test run” refers to replicate testing periods. A complete definition of the test protocols and sampling and analysis methodologies are defined in the CPT/RCRA/Air Test Plan and QAPjP. Table 1-1 displays metals feedrates, chlorine feedrate, and ash feedrate to the SCC determined over the time of stack sampling for metals, HCl/Cl2, and PM, respectively, for each of the three test runs.

The test was designed to demonstrate compliance with the HWC MACT performance standards and emission limits with process operations at maximum hazardous waste feed rates, minimum combustion temperatures in the kiln and SCC, and at the combustion gas flow rate limit currently in the RCRA permit as well as in the NOC of the HWC MACT. The incinerator was tested while burning solid, nonpumpable wastes (bulk, or regular solids, and containers) and liquid, pumpable hazardous waste. Nonpumpable wastes were fed only to the kiln. Energetic and aqueous liquid hazardous waste streams were fed to both the kiln and the secondary combustion chamber.

The applicable standards of the HWC MACT for existing hazardous waste incinerators found at §63.1219(a), and the feedrate and emission limits of the RCRA and the emission limits of the Air permits were successfully demonstrated in the CPT/RCRA/Air Test based on the average of the three runs of the test.

1.2 Operating Parameter Limits

Operating Parameter Limits (OPLs) that were developed from the results of the 2022 CPT/RCRA/Air Test, considering *data in lieu* of the 2006 CPT, are shown in Table 1-2. These OPLs and the basis for their development are presented in the NOC submitted with this Test Report. Note that OPLs have been developed using process and related data from the period of time of the stack sampling for the applicable parameter of this subsequent CPT or the DRE testing of the 2006 CPT, whichever gives the more stringent limit. As required by §63.1209(i) of the HWC MACT, the OPLs for maximum total hazardous waste feedrates, minimum combustion chamber temperatures, and maximum stack gas flowrate, have been established from the most stringent, applicable value determined in the 2006 CPT or this subsequent CPT.

Veolia successfully demonstrated compliance with all permit and regulatory requirements of the HWC MACT, the RCRA permit, and the Air permit during the 2022 CPT/RCRA/Air Test. Select OPLs established during the 2022 CPT will require modification of the RCRA permit before implementing, e.g., the chlorine feed rate limit. Until then, the current OPL will remain in effect.

Table 1-1. Compliance Summary

Parameter or Parameter	Average Measured Value	HWC MACT Limit	RCRA Permit Maximum Allowable Feedrate in all Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Hazardous Waste Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Pumpable Feedstreams (lb/hr)[1]	RCRA Permit Emission Limit (lb/hr)[2]	Air Permit Emission Limit (lb/hr)[3]
Dioxins/Furans (ng TEQ/dscm)[4]	0.0116	0.40	--	--	--	--	--
Particulate Matter (grains/dscf)[4]	<0.00024	0.013	--	--	--	--	--
Hydrogen Chloride/Chlorine (ppmv)[4]	0.121	32	--	--	--	--	--
Semivolatile Metals (µg/dscm)[4]	<0.91	230	--	--	--	--	--
Low Volatility Metals (µg/dscm)[4]	<2.9	92	--	--	--	--	--
Mercury (µg/dscm)[4]	<11	130	--	--	--	--	--
Carbon Monoxide (ppmv)[4]	0.91	100	--	--	--	--	--
Total Hydrocarbons (ppmv)[4]	0.48	10	--	--	--	--	--
Arsenic Mass Emission Rate (lb/hr)	<0.00017	--	--	--	--	0.0271	0.0271
Beryllium Mass Emission Rate (lb/hr)	<0.0000038	--	--	--	--	0.00842	0.00842
Cadmium Mass Emission Rate (lb/hr)	<0.000018	--	--	--	--	0.0421	0.0421
Total Chromium Mass Emission Rate (lb/hr)	0.000265	--	--	--	--	0.0430	0.0430
Hexavalent Chromium Mass Emission Rate (lb/hr)	0.000030	--	--	--	--	--	0.00981
Antimony Mass Emission Rate (lb/hr)	<0.00016	--	--	--	--	2.10	2.10
Barium Mass Emission Rate (lb/hr)	0.000351	--	--	--	--	2.09	2.09
Lead Mass Emission Rate (lb/hr)	<0.00012	--	--	--	--	1.06	1.06
Mercury Mass Emission Rate (lb/hr)	<0.0016	--	--	--	--	0.0191	0.0191
Nickel Mass Emission Rate (lb/hr)	0.000199	--	--	--	--	0.323	0.323
Selenium Mass Emission Rate (lb/hr)	<0.00014	--	--	--	--	0.532	0.532
Silver Mass Emission Rate (lb/hr)	<0.000011	--	--	--	--	0.0419	0.0419
Thallium Mass Emission Rate (lb/hr)	<0.00011	--	--	--	--	0.423	0.423
Particulate Matter (grains/dscf)[4]	<0.00024	--	--	--	--	0.08	--
Particulate Matter Mass Emission Rate (lb/hr)	<0.077	--	--	--	--	--	5.00
Hydrogen Chloride Mass Emission Rate (lb/hr)	0.0124	--	--	--	--	--	4.0

Parameter or Parameter	Average Measured Value	HWC MACT Limit	RCRA Permit Maximum Allowable Feedrate in all Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Hazardous Waste Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Pumpable Feedstreams (lb/hr)[1]	RCRA Permit Emission Limit (lb/hr)[2]	Air Permit Emission Limit (lb/hr)[3]
Free Chlorine Mass Emission Rate (lb/hr)	0.0131	--	--	--	--	3.645	3.65
Volatile Organic Compounds Mass Emission Rate (lb/hr)	0.14	--	--	--	--	--	2.00
Oxides of Nitrogen Mass Emission Rate (lb/hr)	23.91	--	--	--	--	--	70.4
Oxides of Sulfur Mass Emission Rate (lb/hr)[5]	0.00	--	--	--	--	--	49.9
Carbon Monoxide Mass Emission Rate (lb/hr)	0.16	--	--	--	--	--	17.10
Hydrogen Fluoride Mass Emission Rate (lb/hr)	<0.0029	--	--	--	--	--	1.00
Dioxins Mass Emission Rate (lb/hr)	<7.28E-10	--	--	--	--	--	5.88 E-08
Furans Mass Emission Rate (lb/hr)	<1.11E-8	--	--	--	--	--	5.88 E-08
Arsenic Feedrate - Pumpable (lb/hr)[6]	0.2544	--	--	--	4.82	--	--
Arsenic Feedrate - Total (lb/hr)[7]	3.3192	--	4.82	4.82	--	--	--
Beryllium Feedrate - Pumpable (lb/hr)	0.0010	--	--	--	2.7	--	--
Beryllium Feedrate - Total (lb/hr)	0.0043	--	13.2	13.2	--	--	--
Cadmium Feedrate (lb/hr)	0.0007	--	21.6	21.6	21.6	--	--
Chromium, Total Feedrate (lb/hr)	12.2858	--	26.7	26.7	26.7	--	--
Antimony Feedrate (lb/hr)	0.0074	--	150	150	150	--	--
Barium Feedrate - Pumpable (lb/hr)	0.0142	--	--	--	57.5	--	--
Barium Feedrate - Total (lb/hr)	0.3480	--	65.6	65.6	--	--	--
Lead Feedrate - Pumpable (lb/hr)	0.0032	--	--	--	156.74	--	--
Lead Feedrate - Total (lb/hr)	50.2963	--	156.74	156.74	--	--	--
Mercury Feedrate (lb/hr)[6]	0.1519	--	0.101	0.101	0.101	--	--
Mercury Feedrate (lb/hr)[7]	0.1519	--	0.0417	0.0417	0.0417	--	--
Nickel Feedrate - Pumpable (lb/hr)	0.0138	--	131	131	113	--	--
Nickel, Feedrate - Solids (lb/hr)	0.0318	--	1042	1042	13.7	--	--
Nickel, Feedrate - Total (lb/hr)	0.0455	--	--	--	--	--	--
Selenium Feedrate (lb/hr)	0.0142	--	175	175	175	--	--

Parameter or Parameter	Average Measured Value	HWC MACT Limit	RCRA Permit Maximum Allowable Feedrate in all Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Hazardous Waste Feedstreams (lb/hr)[1]	RCRA Permit Maximum Allowable in all Pumpable Feedstreams (lb/hr)[1]	RCRA Permit Emission Limit (lb/hr)[2]	Air Permit Emission Limit (lb/hr)[3]
Silver Feedrate (lb/hr)	0.0018	--	19	19	19	--	--
Thallium Feedrate (lb/hr)	0.0109	--	75	75	75	--	--
Total Chlorine Feedrate (lb/hr)[8]	4888.4	--	3,026	--	--	--	--
Ash to Afterburner (lb/hr)	2.492	--	--	240	--	--	--

1 Taken from Table V.H.3.b of RCRA Permit 50212.

2 Taken from Table V.H.4.b from RCRA Permit 50212.

3 Taken from Air Permit 42450.

4 Value corrected to 7% oxygen.

5 Plant continuous emissions monitors (CEMS).

6 Feedrate limit when using proprietary technology to control mercury emissions.

7 Feedrate limit when not using proprietary technology to control mercury emissions.

8 See Section 5.2.3.

Table 1-2. Operating Parameter Limits

Operating Parameter	Permitting Units	Process Tag	Source of Data to Establish OPL	Operating Parameter Limit
Maximum Feedrate of Total Mercury	12-Hour Rolling Average	HRA12-056L3	2022 CPT	***0.456*** lb/hr[5]
Maximum Total Feedrate of SVM (Pb, Cd)	12-Hour Rolling Average	HRA12-056L5	2022 CPT	***150.89*** lb/hr[5]
Maximum Total Feedrate of LVM (As, Be, Cr)	12-Hour Rolling Average	HRA12-056L6	2022 CPT	***46.83*** lb/hr[5]
Maximum Pumpable Feedrate of LVM (As, Be, Cr)	12-Hour Rolling Average	HRA12-P056L6	2022 CPT	***6.78*** lb/hr[5]
Maximum Feedrate of Total Chlorine/Chloride	12-Hour Rolling Average	HRA12-051L1	2022 CPT	***4,888*** lb/hr
Minimum Combustion Chamber Temperature in the Kiln	HRA	HRA-512	2022 CPT	***1,339***°F
Minimum Combustion Chamber Temperature in the SCC	HRA	SCC-TEMP-AVG	2022 CPT	***1,948***°F
Maximum Flue Gas Flowrate	HRA	HRA-576	2022 CPT	***39,605*** dscfm
Maximum Total Hazardous Waste Feedrate to the Kiln	HRA	KILN-TOT-WST	2022 CPT	46,839 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the Kiln	HRA	KILN-LIQUID	2022 CPT	24,847 lb/hr
Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC	HRA	SCC-TOT-WASTE	2022 CPT	***7,330*** lb/hr
Operation of Waste Firing System -Minimum Burner Atomization Pressure (Air or Steam)[1]	Instantaneous		MS[2]	20 psig
Maximum Emission Concentration of HCl (continuously monitored, as a surrogate for HCl/Cl_2)	HRA	HRA-HCLPPMV	AMA[3]	32 ppmv
Minimum Liquid-to-Gas Ratio in the Absorbers	HRA	HRA-LOVG	2022 CPT	0.107
Minimum Liquid Feed Pressure to the Absorbers	HRA	HRA-PI573	MS[2]	7 psig
Minimum pH at Cooling Tower Inlet	HRA	HRA-571	2022 CPT	***3.55***
Minimum Scrubber Blowdown Rate (Blowdown to Deepwell) —OR— Maximum Conductivity of Scrubber Water	HRA	HRA 12-616 —OR— HRA-616C	2022 CPT	***88.7*** gpm —OR— ***95,807*** µmho
Voltage to the IWS	2 minutes	XA-IWS-HV	MS[2]	10 kV
Minimum Power to the WESP	HRA	HRA-KV577	2022 CPT	16.2 kVA
Minimum Tank Level in the WESP	HRA	HRA12-LI577	2022 CPT	***40***%
Maximum Pumpable Arsenic Feedrate	HRA	HRA-PO56L4	2022 CPT	0.25 lb/hr

Operating Parameter	Permitting Units	Process Tag	Source of Data to Establish OPL	Operating Parameter Limit
Control of Fugitive Emission -Operation of Shroud System —OR— -Pressure at Kiln Faceplate	Fan On —OR— Fan Off/ Instantaneous	Fan On/Off —OR— XA-544F	AMA[3]	Fan On, and greater than 0 psig for greater than 10 seconds —OR— Fan Off, greater than 0 psig on an instantaneous basis
Emission Limit for Carbon Monoxide	HRA	STACK-CO-AVG	ES 4	100 ppmv corrected to 7% O2

[1]Waste feed is automatically cut-off only to the burner that has low atomizing pressure.
[2]Limit set by manufacturer’s specification/good engineering practice.
[3]Approved by the Alternative Monitoring Application dated March 1, 2004.
[4]HWC MACT emission standard.
[5]See Section 5-5.

1.3 Deviations from the CPT/RCRA/Air Test

During the CPT/RCRA/Air Test compliance with the feedrate and emission limits of the HWC MACT and the RCRA permit, and the emission limits of the Air permit, were successfully demonstrated with no deviations to report.

1.3.1 Data Quality Objectives

Data quality objectives (DQOs) for the CPT/RCRA/Air Test were presented in Table 3-1 of the QAPjP.

1.4 Report Organization

This report presents the results of the CPT and the RCRA and Air permit periodic testing. The remainder of this report presents the following sections:

- Section 2.0 – Process Description;
- Section 3.0 – Operating Parameter Data Summary;
- Section 4.0 – Sampling and Analytical Parameters;
- Section 5.0 – Results; and
- Section 6.0 – Quality Assurance/Quality Control.

The appendices provide raw data, including chain-of-custody forms, sampling logs, laboratory reports including the Performance Evaluation of audit samples, data calculations, process data, spiking reports, and sampling equipment calibration forms.

2. Process Description

The following sections provide a description of the Veolia Port Arthur incineration system. A process flow diagram (PFD) is included as Figure 2-1. The PFD is a representation of the combustion and air pollution control systems and includes all major process flow streams.

2.1 Description of Combustion System

The incinerator at the Port Arthur facility consists of waste receiving and waste feeding equipment, rotary kiln, an ash/slag removal system, a secondary combustion chamber (SCC), a quench tower, two acid gas absorbers, four cooling towers, a four-stage ionizing wet scrubber, a wet electrostatic precipitator, an induced draft fan, an exhaust stack, and a scrubber water treatment/recycle system.

2.1.1 Description of Rotary Kiln

The shell of the rotary kiln is rolled welded carbon steel. It measures 60 feet in length and is supported by two steel trunnion assemblies located 17 feet and 16 feet from the feed and discharge ends, respectively. The slope of the kiln from inlet to ash discharge is approximately one degree. The drive for the kiln is a girth gear and gear reducer powered by a variable speed, 100-hp motor. The nominal rotation speed is one rpm with an average solids residence time of approximately one hour. In the event of mechanical failure of the main drive motor or a general power failure, a 10-hp motor, which can be powered by an auxiliary diesel generator, rotates the kiln slowly to prevent kiln and refractory damage.

The shell of the kiln is 16 feet in outside diameter and is lined with refractory material which protects the carbon steel shell from the high temperatures of incineration. The inside diameter of the kiln with the insulation in place is approximately 14 feet.

The kiln is normally operated under negative pressure maintained between zero- and one-inch water column vacuum to prevent fugitive emissions from the kiln ends. The pressure is controlled by feedback from a pressure sensor at the kiln feed end to an actuator that controls the variable speed drive of the induced draft fan. In addition, to prevent fugitive emissions from the kiln ends shrouds have been installed around the seals at both ends of the incinerator. The shrouds are continually evacuated by fan and routed to the transition duct between the rotary kiln and SCC.

The kiln temperature is measured with three thermocouples inserted through the roof of the ash dropout chamber, approximately 4 feet past the end of the kiln. The first thermocouple is on the centerline of the kiln. The other two thermocouples are 3 feet 6 inches off the centerline.

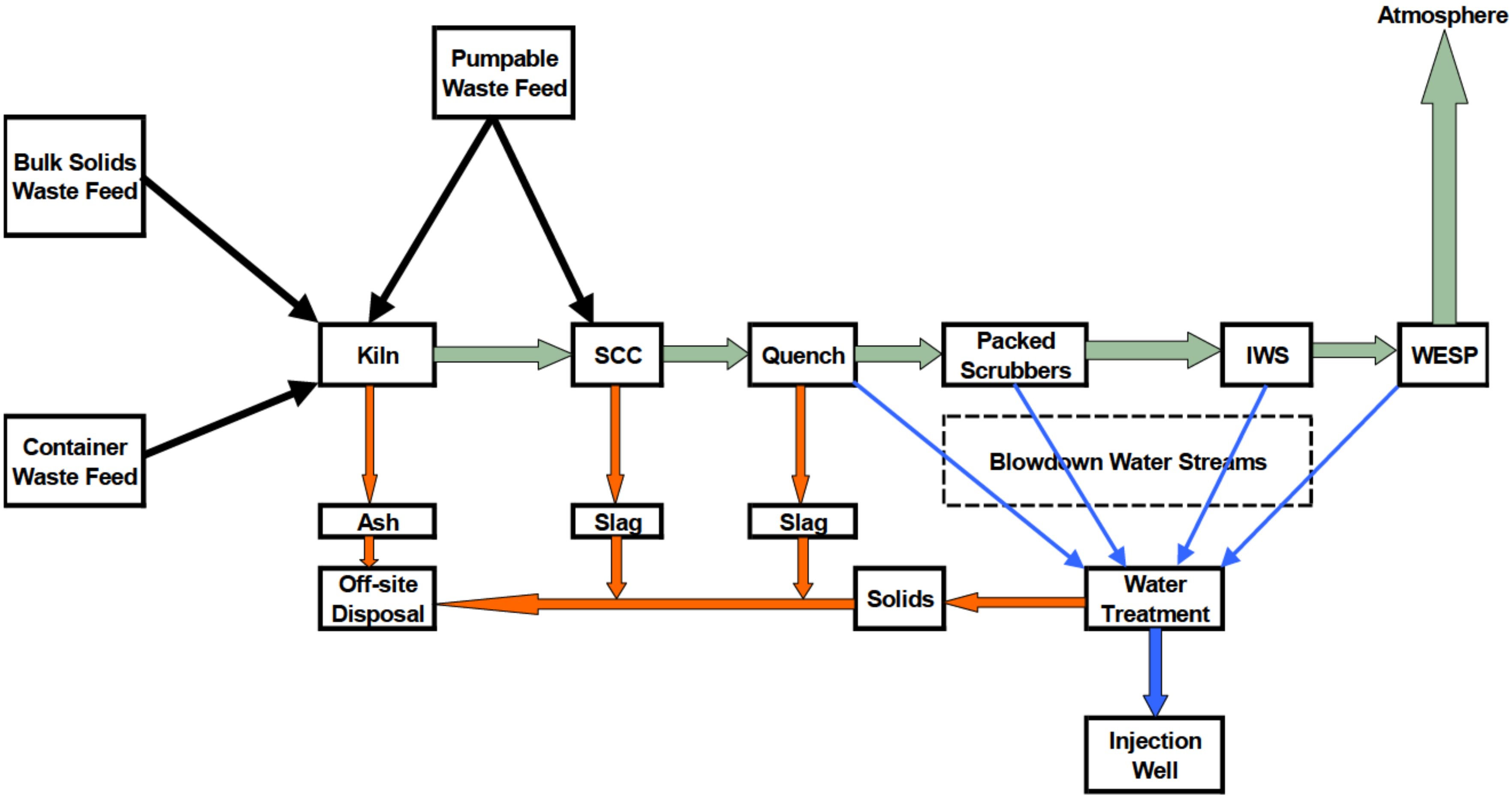


Figure 2-1. Process Flow Diagram of the Veolia Incinerator

The DCS (Distributed Control System) takes the three temperatures and averages them. Next, it computes the deviation of each temperature from the average. If any one temperature is outside an established range, it is discarded and the average of the two remaining temperatures is recorded. The thermocouple that exceeded range is then replaced with a new thermocouple. This system is used on both the kiln and SCC.

2.1.2 Secondary Combustion Chamber Design

Hot flue gases from the transition section enter the cylindrical secondary combustion chamber (SCC) approximately 14 feet above the base of the tower. The SCC is equipped with eight burners. The SCC is 78 feet tall and is fabricated of rolled, welded carbon steel plate. A nominal 12-inch firebrick composite lines the 18-foot diameter shell resulting in a cross-sectional area of 201 square feet per foot.

The combustion gases are raised to the current, minimum temperature of 2,012°F. The active volume of the SCC is defined as the space between the centerline of the burners and the first temperature measuring device located in the outlet duct. Flue gases exit from the SCC through a refractory-lined 12-foot inside diameter duct.

The roof of the SCC supports a refractory-lined, 6-foot inside diameter, 8.5-foot-tall thermal relief vent. A counterweighted cover seals the vent during normal operation. The thermal relief vent (TRV) serves to create a natural draft to allow for the evacuation of combustion gases during emergency situations such as loss of electric power or failure of the ID fan. In all instances, waste feed is automatically shut off prior to or simultaneously with the vent opening. The TRV is also used during normal shutdown to allow convective cooling of the kiln and SCC once all waste has passed out of the systems.

Eight burners are evenly arranged around the perimeter of the SCC tower. The burners, which fire tangentially, are rated at 15 million Btu/hr each. The burners are dual fuel burners and have the capability to fire waste liquid and/or fossil fuel. The burners are equipped with external steam and air atomizers and natural gas fired pilot lights. A forced-draft combustion air fan delivers a nominal 24,000 SCFM of ambient air to the eight burners.

Two of the eight burners operate independently of the other six and of one another. The two burners are piped separately to allow independent firing of fossil fuel and/or waste liquids and gases. The two independent burners are also piped to be able to fire aqueous waste and direct feed liquids from containers. The remaining six burners, known as the ring of six, are fed energetic liquid waste or a mixture of energetic and aqueous wastes from a single control valve upstream of the burner ring feed pipe. Likewise, the ring of six burners is also fed fossil fuel from a single control valve upstream of a separate burner ring feed pipe for fossil fuel. Direct feeding to the SCC from tanker trucks, drums, and tote bins is performed for materials that are not suitable for placing into tankage.

A compressed gas cylinder feed system is designed to feed waste gases to the secondary combustion chamber. The compressed gas feed system has a complete enclosure and engineering controls are utilized to safely introduce gases into the SCC.

The SCC temperature is measured with three thermocouples inserted through the top of the hot cross-over duct between the SCC and quench, approximately 7.5 feet downstream of the SCC. The first thermocouple is on the centerline of the duct. The other two thermocouples are 2 feet 6 inches off the centerline.

The DCS takes the three temperatures and averages them. Next, it computes the deviation of each temperature from the average. If any one temperature is outside an established range, it is discarded and the average of the two remaining temperatures is recorded. The thermocouple that exceeded the range is then replaced with a new thermocouple. This system is used on both the kiln and SCC.

2.1.3 Quench Tower

Cooling of the combustion gases occurs in the quench tower. Flue gases exit from the SCC through a refractory-lined 12-foot inside diameter duct. The gas stream enters the top center of a 20-foot outside diameter quench tower. The quench tower is constructed of rolled, welded carbon steel plate and is lined with acid-proof brick. Three rows of water spray nozzles are arranged around the circumference of the tower and spray water directly into the hot combustion gas. As the gas flows downward, it is cooled to an adiabatic saturation temperature of about 185°F. Water is supplied from the scrubber water recycle loops and from clean process water. A caustic solution is added to the quench water for initial neutralization of acid gases. The ash particulate collected by the water sprays falls to the bottom of the quench tower. The bottom of the tower is sloped to direct these solids to an auger which removes the solids from the tower.

2.1.4 Feed Systems

The incinerator is used for commercial purposes and the physical and chemical properties of the waste feed vary considerably. To facilitate operations, wastes are categorized as energetic and aqueous liquids, pumpable sludge, solids, and contained gaseous wastes. The wastes treated at the Veolia incinerator include:

- Household hazardous waste;
- Waste generated by commercial establishments (e.g., dry cleaners, mechanic shops, printing offices);
- Waste generated by industrial facilities (e.g., petroleum refining and petrochemical plants, pulp and paper mills, semiconductor plants);
- PCB waste;
- Containerized gases; and
- Non-hazardous industrial solid waste.

Wastes which the facility will <u>not</u> accept are:

- Radioactive wastes;
- Explosive material as defined by Department of Transportation (DOT) under 49 CFR Part 173; and
- Municipal garbage.

2.1.5 Kiln Solids Feed Systems

Bulk and containerized solids are currently charged to the kiln through systems which feed through the faceplate.

The incinerator train receives bulk solids such as contaminated soil, solid, and sludge process waste and plant trash. The Bulk Materials Handling Building has been constructed to modernize bulk solids and container feed handling systems. The Bulk Materials Handling Building was put into service in January 2004. Containerized waste is also fed into the kiln through the kiln container ram feeder.

The Bulk Material Handling Building consists of five miscellaneous units (two mixing pits, a blender, and two shredders) and two container storage areas (the north and south drum staging areas).

All suitable wastes authorized for receipt at the Port Arthur facility may be processed within the Bulk Material Handling Building excepted for F-listed dioxin waste. Typically, operations in this building will be performed in conjunction with subsequent feeding of the resultant waste blends to the incinerator. Based on analytical information for the wastes, a blend plan will be prepared for mixing/shredding to achieve the desired waste blend characteristics. The building also supports the mixing of wastes for incineration at a later time and the transloading of wastes from customer bulk carriers into site roll-off boxes. The Bulk Material Handling Building has two separate waste feed trains: one for ignitable wastes, also referred to as “low-flash” wastes (closed cup flash point less than 140°F); and one for non-ignitable wastes, also referred to as “regular wastes” (closed cup flash point greater than or equal to 140°F).

In the non-ignitable waste feed train, bulk solids can be off-loaded into the Regular Waste Pit which has a nominal capacity of 840 cubic yards. Non-ignitable, containerized waste to be bulked will typically be staged in the South Drum Staging Area on pallets. Pallets of containers can be moved by forklift onto a conveyor, transferred from the conveyor to a drum lift, and hoisted via the drum lift to the shredder conveyor. The shredder conveyor feeds directly to a shear shredder. The container conveying and shredding system accommodates pallets containing four drums. Shredded materials discharge via a chute into the Regular Waste Pit.

Mixing and movement of bulk materials and shredding operations are remotely controlled by operators in an enclosed room, assisted by video cameras. Operators, using a remotely operated arm mounted grapple clam bucket, mix wastes in the Regular Waste Pit. A bridge crane and clamshell serve as the primary means for transferring the blended waste feed mix to an apron conveyor feed hopper; the hopper discharges to an apron conveyor, which is an enclosed conveyor that moves waste from the building to the bulk solids feed chute at the kiln. The bridge crane and clamshell can also be used by the operator to move materials from the pit to the shredder hopper. In the event of an automatic waste feed cutoff for the kiln, the apron conveyor is interlocked to stop waste feed to the weigh hopper. The weigh hopper feeder is also interlocked to stop bulk waste feed in the event of an automatic waste feed cutoff.

The bulk solid waste passes through the feed hopper onto a weigh gate where a predetermined amount of the solid waste is accumulated. The waste is then fed through an isolation gate to the kiln feed chute.

The kiln feed chute is constructed from a heat resistant alloy installed at a 60-degree angle from horizontal. The tongue of the chute extends through the kiln faceplate an additional two feet. A kiln pressure relief panel is ducted from the solids feed chute to allow excessive emergency high pressure to relieve to the atmosphere at an elevated position away from operations personnel. An air intake control valve, also ducted from the kiln feed chute, will admit ambient air as necessary to supplement blower combustion air.

The ignitable (low-flash) waste feed train includes a container conveying and shredding system nearly identical to the system used in the non-ignitable waste feed train. The low-flash container conveying, and shredding system is located at the north end of the Bulk Material Handling Building. The existing conveyor for direct drum feeding is also located in this area, and the North Container Staging Area provides staging and storage capacity for both the direct drum feed and the low-flash container conveying and shredding system.

The low-flash feed train incorporates design features and process controls to allow the safe handling of ignitable wastes. In addition, this process train may be used to blend and feed non-ignitable wastes. In the regular waste mode, the ignitable waste features and controls will not be necessary for safe operation; consequently, these features and controls will not be enabled when operating in regular waste mode.

Containers of ignitable waste are conveyed to the low-flash shredder. The low-flash shredder system also accommodates pallets containing four drums. The shredder typically discharges through a chute that feeds a rotary paddle blender. The blender mixes the shredded waste with liquids and sorbent materials, as necessary, to achieve the correct consistency for the ram feeder. The ram feeder feeds the waste blend directly to the kiln faceplate through a 10-inch pipe.

The entire shredding/blending circuit, from the shredder through the ram feeder, is equipped with nitrogen blanketing. Nitrogen is added to the enclosed system to maintain oxygen content below a pre-set level. The shredding and blending are shut down if the oxygen content within the system exceeds the pre-set level.

Bulk low-flash waste is received in the Low-Flash Pit, which has a nominal capacity of 176 cubic yards. This material is fed to the low-flash shredder using a bridge crane and clamshell dedicated to the low-flash feed train. LEL monitors are located over the pit and the shredder hopper to insure adequate ventilation and safe operation of the bulk low-flash feed system.

Incompatible waste materials are scheduled for processing in a sequence that precludes mixing incompatible wastes in the processing units, thereby preventing adverse reactions.

The air space in the area where the bridge crane, clamshell, low-flash pit, and shredder feed hopper operate is segregated by partition walls, ceiling, and flooring from all other areas of the ignitable waste train processing area and the remainder of the Bulk Material Handling Building.

The low-flash waste train is isolated from the atmosphere. Both bulk and containerized waste is fed to the equipment train through double slide gate, air-lock systems. The clamshell deposits bulk waste feed into the bulk waste feed hopper for entry into a double slide gate air-lock chamber over the shredder as described above. Drum feed to the low-flash shredder initiates in the north warehouse portion of the building. Drums are conveyed to the drum lift and onto the roller conveyor that feeds the low-flash shredder. The drum feed pusher moves a pallet of containers from the roller conveyor outside the low-flash area through an external slide gate of the drum feed air-lock chamber over the shredder. Once the external air-lock slide gate has been closed, the air-lock chamber can be purged with nitrogen, and the remainder of the equipment train operates under a nitrogen blanketing system to maintain a non-ignitable atmosphere within the equipment. Oxygen content is monitored at several locations within the nitrogen-blanketed operating environment. Automatic system controls function in low-flash operating mode to allow operation only when system conditions are acceptable.

In both operating modes, the processing equipment is interlocked to prevent operation of upstream equipment when downstream equipment is not ready for upstream equipment output and when downstream equipment is not operating. In addition, in low-flash operating mode, equipment is controlled by operating conditions within the equipment, such as temperature, pressure, and oxygen content. For example, the internal slide gates in each of the air-lock chambers interlock with the external slide gates so that the external gates must be in the closed position before the internal slide gates can open. In addition, permissives for the internal slide gates only allow operation when the shredder is operational and the conditions within the shredder feed chute (oxygen and pressure) are within acceptable ranges. Similarly, automatic control logic allows operation of the shredder only when shredder feed chamber, shredder discharge chamber, and blender conditions are within acceptable ranges.

Further, the ram feeder is interlocked with the kiln automatic waste cutoff operating parameter limits to stop operation of the ram feeder at any time an automatic waste feed cutoff is initiated for the kiln. Stopping the ram feeder also stops the waste feed from the blender to the ram feeder. Operation of the low-flash system with the design features and controls described above minimize the hazards inherent in handling ignitable wastes.

Containerized materials such as off-specification products, contaminated soils, contaminated personal protective clothing and process waste liquids and sludges are fed to the incinerator. Container types vary and may include boxes, fiber, plastic, and steel drums and buckets, and 85-gallon over packs.

Containers selected for direct feeds into the kiln are moved by forklift from the container storage building to the incinerator feed staging area. The containers are transferred to a platform and then placed on a powered conveyor in accordance with the waste feed schedule. The powered conveyor transports the containers from the incinerator feed staging area to the hydraulic ram charge chamber.

After a slide gate on the kiln feed chamber opens, a hydraulic ram pushes each charge into the kiln feed chamber. The slide gate closes and a high temperature fire door between the kiln feed chamber and the kiln opens. The kiln container feed hydraulic ram traverses the length of the charge chamber and forces the container into the kiln. Containers are fed to the kiln at variable, pre-determined rates depending on the nature of the container material.

2.1.6 Kiln Pumpable Waste Feed System

All pumpable wastes are charged to the rotary kiln through various mechanisms located on the kiln faceplate. The method by which a waste is injected depends upon its physical state and caloric value. Direct feeding to the kiln from tanker trucks, drums, and tote bins is performed for materials that are not suitable for placing into tankage. The following is a discussion of each of the liquid feed mechanisms on the faceplate of the kiln.

Non-energetic sludges are fed directly to the kiln through a 3-inch diameter pipe identified as the non-energetic sludge nozzle. The nozzle extends approximately 18 inches inside the kiln faceplate and is axially centered and supported by a sleeve. Forced air flows through the sleeve of the sludge nozzle to cool the inner pipe. The waste typically fed through the non-energetic nozzle is of low heating value. The sludge is pumped from the selected tank or container through a flow measuring device directly into the kiln through the nozzle. The material is atomized with air and/or steam.

Energetic sludges and glove box direct feed is fed into the kiln through two atomizing sludge nozzles that use steam and/or air as the atomizing medium. Twelve-inch diameter mounting pipes are located on the kiln faceplate to support the nozzles. A feed pump transports the energetic sludge from the tank farm to one of these nozzles. The energetic sludge that is fed through the atomizing nozzle is generally a higher Btu waste. The glove box waste feed system is arranged to feed liquid waste from drums and other containers and to minimize exposure to the contents.

Aqueous waste and process water is fed into the kiln through two 1½-inch diameter internal steam or air atomizing nozzles. A 6-inch diameter concentric mounting pipe surrounds each nozzle and channels air around the nozzles for cooling and combustion.

Process water can be fed into the kiln through one of the atomizing nozzles whenever sufficient aqueous waste is not available or as determined to be necessary for the proper operation of the incinerator.

The kiln primary burner is located on the faceplate near the center of the faceplate. This forced air burner is capable of releasing up to 40 million Btu/hr through a fossil fuel nozzle or through two atomized liquid nozzles in the burner box. Energetic liquid from the tank farm and kiln direct inject energetic liquids from tank trucks, totes and other containers are fed to the two burner nozzles. The burner has a turndown ratio of approximately 3 to 1. During incinerator startup, shutdown, or upset conditions, auxiliary fuel is burned in place of energetic liquid waste.

2.1.7 Air Pollution Control System

Removal of particulate matter and acid gases occur in the Air Pollution Control System (APCS). The APCS consists of the following equipment:

- Two parallel Acid Gas Absorbers;
- An Ionizing Wet Scrubber; and
- A Wet Electrostatic Precipitator.

These systems are discussed in detail in the following sections.

2.1.7.1 Acid Gas Absorbers

A fiberglass reinforced plastic (FRP) duct conveys the cooled flue gas from the quench tower to two absorbers arranged in parallel. The 11-foot outside diameter, corrosion-resistant FRP vessels are 25 feet tall and contain 10 feet of polypropylene Tellerette®, or equivalent, packing.

The plastic packing material provides increased surface area for greater contact between the gas and scrubbing solution and thus increases the gas to liquid mass transfer capacity. Four packed-bed, forced draft cooling towers are used to cool the recirculating absorber water.

The pH control system feeds caustic to the inlet of the absorber pumps and a second (trim) caustic feed is injected in front of the cooling tower pumps, which discharge to the absorbers. The pH is measured in the discharge line of the absorber pumps and adequate caustic is added in the suction of the absorber pumps to raise the pH to a minimum of 4.55. The pH is monitored in the absorber inlet and a trim stream of caustic is injected into the suction of the cooling tower pumps to maintain the pH at the absorber inlet at approximately 7.0.

2.1.7.2 Ionizing Wet Scrubber

Following the absorbers are two parallel four-stage ionizing wet scrubbers (IWS). The IWS utilizes high voltage ionization to electrostatically charge the particulate in the gas stream before the particles enter a packed section in each of the four stages arranged in series. The packing in each of the packed sections is similar to the packing that is used in the absorbers. The charged particles leaving the ionization section impinge on and/or are attracted to the surfaces of the packing. A circulating water stream continuously flushes the particles off the packing. The gas stream moves horizontally through the IWS while the scrubber liquid flows vertically downward. Process water is added to the IWS circulating water recycle loop and a blowdown from this loop is directed to the absorber-cooling tower loop and the quench.

High-voltage DC power for the ionizing section is provided by a high-voltage transformer/ rectifier for each stage. The shell and most internal parts of the IWS are constructed of FRP and corrosion resistant metals.

Periodically (approximately every two hours) the IWS goes through a cleaning cycle to rinse particulate matter from the ionization plates. The cleaning cycle occurs sequentially through the four stages of the IWS. The power to a stage is turned off as that stage is being cleaned.

2.1.7.3 Wet Electrostatic Precipitator

The wet electrostatic precipitator (WESP) is installed following the IWS. Process gas enters the WESP at the top of the unit and may be saturated with water sprays to create additional water droplets in the gas stream, as necessary. The gas stream then passes through a distribution system to evenly distribute the gas in the ionization and collection tubes of the vessel. Each tube has a wire electrode suspended through the center of the tube. The electrode wire generates a high voltage DC corona field that ionizes the particulate and water droplets in the gas stream with a negative charge as the gas passes through the tubes. The negatively charged particulate and water droplets are attracted to the positively grounded walls of the tubes. The condensed water droplets serve to clean the particulate from the tube walls and maintain clean tube walls to maximize the particulate collection efficiency. The condensed water flows down the tubes into a sump in the bottom of the vessel. Process water is used to spray into the inlet process gas stream to saturate the stream. Approximately 7.0 gpm (on average) of the condensed water will be blown down to the existing scrubber water treatment system and replaced with make-up water.

For seven minutes every 24 hours, the distributors and tubes of the WESP are washed to remove particulate matter. The water in the sump is used for this periodic washing. During the cleaning cycle, power to the WESP is turned off. According to procedures outlined in the CPT Plan, the WESP undergoes a representative portion of its wash cycle during testing of applicable parameters. During the sampling for particulate matter and metals the WESP is washed for approximately 30 seconds in each run of the sampling trains for particulate matter and metals.

2.1.7.4 Induced Draft Fan and Stack

From the WESP, the flue gases pass into the FRP induced draft fan. The fan moves the approximately 110°F flue gas at an average rate of approximately 39,000 dscfm and can achieve a flow above 50,000 dscfm. The fan is direct driven by a 250 hp variable speed motor that is controlled by a variable frequency drive controller. The fan is sized to maintain a negative pressure in the rotary kiln and SCC, as well as to move combustion gases through the emission control train and out the stack. The pressure measurement at the feed end of the rotary kiln is used to determine the fan speed during operation. The fan speed (rpm) is determined by the variable frequency drive controller and used as an indication of stack flow.

Flue gas is forced through an FRP stack that is 5.5 feet in inside diameter. The stack is supported by a steel frame tower. The discharge of the stack is 130-feet aboveground level. Ladders and platforms provide access for stack testing.

2.2 Test Objectives

The CPT/RCRA/Air Test Plan presents Veolia's plan for the subsequent CPT for the Final Replacement Standards of the HWC MACT. The test was designed to demonstrate compliance with the standards and establish OPLs required by the standards of the HWC MACT for existing incinerators at §63.1219, and also presents Veolia's plan for the periodic testing required by the RCRA and Air permits for the facility.

The test objectives for the subsequent CPT for the Final Replacement Standards of the HWC MACT were to:

- Demonstrate compliance with stack gas emissions less than or equal to the following limits, corrected to 7% O_2:
  - Carbon Monoxide: 100 ppmv, dry;
  - Total Hydrocarbons: 10 ppmv, dry;
  - Dioxins/Furans: 0.40 ng TEQ/dscm;
  - Particulate Matter (PM): 0.013 grains/dscf;
  - Mercury: 130 μg/dscm;
  - Semivolatile Metals (SVM) (Cd and Pb combined): 230 μg /dscm;
  - Low Volatile Metals (LVM) (As, Be and Cr combined): 92 μg /dscm; and
  - Hydrogen Chloride/Chlorine (HCl/Cl_2): 32 ppmv as Cl- equivalent, dry.
- Compliance with the DRE standard (99.99% DRE) is demonstrated using data in lieu of (DILO) from the 2006 CPT.
- Establish limits for operating parameters.
- Conduct a Continuous Monitoring System (CMS) performance evaluation test.
- Conduct a Relative Accuracy Test Audit (RATA) for the CO and O2 Continuous Emissions Monitoring Systems (CEMS).

The test objectives for the RCRA permit periodic test were to:

- Demonstrate waste feedrate limits in Table V.H.3.b. of the RCRA permit for:
  - Arsenic;
  - Beryllium;
  - Cadmium;
  - Total Chromium;
  - Antimony;
  - Barium;
  - Lead;
  - Mercury;
  - Nickel, Pumpable Mode;
  - Nickel, Solids Mode;
  - Selenium;
  - Silver;
  - Thallium; and
  - Total Chlorine.

- Demonstrate emission limits in Table V.H.4.b. of the RCRA permit for:
  - Arsenic;
  - Beryllium;
  - Cadmium;
  - Chromium, Hexavalent;
  - Chromium, Total;
  - Antimony;
  - Barium;
  - Lead;
  - Mercury;
  - Nickel:
  - Selenium:
  - Silver;
  - Thallium;
  - Hydrogen Chloride;
  - Free Chlorine; and
  - Particulate Matter.
- Demonstrate the RCRA incinerator performance standards at 40 CFR 264.343:
  - A minimum 99.9999% destruction and removal efficiency (DRE) of principal organic hazardous constituents (POHCs and D/Fs). Compliance with the DRE standard of 99.9999% DRE is demonstrated using data in lieu of (DILO) from the 2006 CPT;
  - Control of hydrogen chloride emissions to less than 4 lb/hr or 1.0 % of the HCl generated in the combustion process; and
  - Control of particulate emissions to less than 0.08 grain per dry standard cubic foot as corrected to 7% oxygen in the stack gas.

Emissions of the parameters specified in the Air Permit were tested to demonstrate compliance with emission limits for:

- Total Organic Carbon (i.e., VOCs);
- Oxides of Nitrogen (NO_x);
- Oxides of Sulfur (SO_x);
- Carbon Monoxide (CO);
- Particulate Matter less than 10 microns (PM_{10});
- Hydrogen Chloride (HCl);
- Elemental Chlorine (Cl_2)
- Hydrogen Fluoride (HF);
- Dioxins/Furans;
- Metals, including antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium;

- Chromium VI;
- Polychlorinated Biphenyls (PCBs); and
- POHCs.

The feedrate limits and emission limits of the RCRA and Air permits are shown in Table 1-1.

2.3 Test Responsible Parties

The project organization for the performance and reporting of the CPT/RCRA/Air Test of the incinerator at Veolia's Port Arthur, Texas facility is presented in Figure 2-1 in the QAPjP for the CPT/RCRA/Air Test. Key personnel and their responsibilities are presented in the following.

Don Icard is the Veolia Test Manager. He is responsible for the overall performance of the test effort, including the operation of the facility, the acquisition of materials and all other aspects of the program. Mr. Icard has primary authority for all decisions affecting the performance of the performance test.

AECOM served as the performance test coordinator and performed sampling and analysis for the test. AECOM's responsibilities included the collection and analysis of all samples and the coordination of incinerator operations with sampling activities. AECOM's responsibilities included coordination of incinerator operations and spiking of waste streams, the collection of stack gas and waste feed samples, shipment of the collected samples to the laboratory, and preparation of the test report.

Laura Faletto of AECOM served as the Project Manager. In this role, she had the overall responsibility for the success and quality and coordination of the AECOM efforts. Laura had primary authority for all decisions concerning sampling and analysis and coordinated incinerator operations and spiking of waste streams with sampling and analysis activities during the test program with field team lead, Rob Sava.

2.4 Test Chronology

Veolia began the subsequent CPT on August 31, 2022, with the performance of a RATA of the CO and O_2 CEMS on the stack of the incinerator. The CPT/RCRA/Air Test was conducted on October 13 and 14, 2022.

The times for the sampling conducted in the three runs of the CPT/RCRA/Air Test are shown in Table 4-4.

2.5 Continuous Monitoring Systems and Continuous Emission Monitoring Systems

The HWC MACT addresses the use of continuous monitoring systems (CMS) to demonstrate compliance with applicable operating parameters and emission standards. The CMS can be divided into two types: continuous emission monitoring systems (CEMS), which measure stack gas concentration (e.g., carbon monoxide, oxygen) and process parameters CMS, which measure process operating parameters from the combustor and the associated air pollution control system (e.g., thermocouples, flow meters, pH probes). The parameters monitored by the CMS are presented in Section 4.3 of the CPT/RCRA/Air Test Plan.

A CMS performance evaluation test plan (CMS PETP) is included in Appendix C of the CPT/RCRA/Air Test Plan which details each CMS for the variety of monitored parameters. The CMS PETP presented Veolia's plan to a CMS Performance Evaluation Test for the incinerator to assess the performance of the continuous monitoring systems in fulfillment of the requirements of 40 CFR 63.1207(e).

2.5.1 Process Parameter Continuous Monitoring Systems

The incinerator uses process instruments, which include thermocouples, flowmeters, pH meters, and pressure transmitters to document compliance with applicable operating parameters. The process instruments continuously monitor and record operating parameters of the incinerator. The process instruments used to monitor operating parameters required by the HWC MACT are listed in Table 3-1 of the CMS PETP that is in Appendix C of the CPT/RCRA/Air Test Plan. The results of the CMS PET are presented in Appendix 2-6 of this report.

2.5.2 Continuous Emission Monitoring Systems (CEMS)

Veolia operates two identical EcoChem MC3 multi-component gas analyzers (one for compliance and one for redundancy). The single multi-component instrument analyzes the stack gas for O_2, CO, CO_2, SO_2 and HCl.

The ranges of the CO CEMS are 0-200 ppmv, and 0-3,000 ppmv and 0-10,000 ppmv. The calibration range for the O_2 component is 0-25% and the calibration range for the HCl component is 0-250 ppmv. Although, Veolia is authorized in an AMA approved by EPA and TCEQ to have the third range of the CO CEMS 0 – 6,000 ppm, the third range of the CO CEMS is 0 – 10,000 ppm.

A RATA, Relative Accuracy Test Audit, was performed at the initiation of the CPT/RCRA/Air Test of the CO and O_2 CEMS. The report of this RATA is included as Appendix 2-1 to this report.

RATAs are conducted annually of the CEMS for O_2, CO, CO_2, SO_2 and HCl, and the stack gas flowrate monitoring system on June 28, 2022. The O2 and CO RATAs were most recently performed on August 31, 2022. The CEMS analyzers and the volumetric flowrate monitor met the relative accuracy (RA) requirements during that test.

3. Operating Parameter Data Summary

The following sections present operating conditions and data from the CPT/RCRA/Air Test.

3.1 Process Operating Data

This section presents selected process parameters that were monitored and recorded during the CPT/RCRA/Air Test by Veolia. Process data are continuously monitored, and one-minute averages (OMAs) are determined and recorded by Veolia. Hourly rolling averages (HRAs) are calculated from the OMAs using 60 sequential OMAs and recorded by the Distributed Control System (DCS) for monitored parameters. The raw data from Veolia's DCS is provided in Appendix 2-4.

In the CPT/RCRA/Air Test Report, process data were developed over the entire period of a test run, from the initiation to completion of sampling. Process data developed from the initiation to completion of stack sampling from each of the three runs of the test are presented in Table 3-1.

TCEQ requested that OPLs be developed using process and related data from the period of time of the stack sampling for the applicable parameter (i.e., the OPLs for hydrochloric acid and chlorine gas are developed from process and related data during the stack sampling for HCl/Cl_2). Particulate matter (PM) and HCl/Cl_2 were sampled in the same sampling train. The sampling times for metals were the same as for PM and HCl/Cl_2 in all three runs. So, the process data developed for particulate matter, hydrochloric acid and chlorine gas, and metals (i.e., the Low Volatility Metals arsenic, beryllium, and chromium, the SemiVolatile Metals cadmium and lead, and mercury) are over the same time periods. Process data developed for the HWC MACT standards for particulate matter, hydrochloric acid and chlorine gas, and metals for OPLs applicable to these standards are presented in Table 3-2.

Process data developed from the times of sampling for dioxins and furans by SW-846 Method 0023A from each of the three runs of the test are presented in Table 3-3.

3.2 Hazardous Waste Feedrates

Table ***3-4*** presents data summaries for waste feed rates, grouped according to requirements of the RCRA permit and the HWC MACT. The HWC MACT OPLs for waste feedrates are shown in Table ***3-4*** and are presented in Table 1-2 of this Test Report and in the NOC. Multiple waste streams are fed under each of the three waste feed categories of the HWC MACT, that are Maximum Total Hazardous Waste Feedrate to the Kiln, *Maximum Pumpable Hazardous Waste Feedrate to the Kiln, and Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC*. The OPLs for waste feedrate are established as the average of the maximum hourly rolling averages for each run. Since the maximum hourly average for the streams fed in each category may not occur at the same time, the OPLs for waste feedrate are determined by first summing the feedrates of the individual waste feed streams, determining the maximum HRA for the summed waste streams by run, and then averaging the maximum HRAs for each run. These calculations are shown in the appendix of the raw process data for each of the three runs.

Shown in Table 3-4 are the feedrates for Maximum Total Hazardous Waste Feedrate to the Kiln, Maximum Pumpable Hazardous Waste Feedrate to the Kiln, and Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC developed from the initiation to completion of stack sampling from each of the three runs. Feedrates of hazardous waste are OPLs required for the HWC MACT standard for dioxins and furans. The OPLs for hazardous waste feedrate are taken from these data.

Table 3-1. Process Data – Entire Test Runs

Parameter	Units	Averaging Period	Process Tag	Run 1 October 13, 2022			Run 2 October 14, 2022			Run 3 October 14, 2022			Average		
				Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Non-Energetic Sludge to Kiln	lb/hr	HRA	AY-061L4	0	0	0	0	0	0	0	0	0	0	0	0
	lb/hr	OMA	FIC-517	0	0	0	0	0	0	0	0	0	0	0	0
Energetic Sludge to Kiln	lb/hr	HRA	AY-061L3	0	0	0	0	0	0	0	0	0	0	0	0
	lb/hr	OMA	FIC-514	0	0	0	0	0	0	0	0	0	0	0	0
Aqueous Waste to Kiln	lb/hr	HRA	AY-060L3	16,548	16,908	17,299	16,274	16,508	16,916	17,330	17,701	18,454	16,717.28	17,039.14	17,556.03
	lb/hr	OMA	FIC-511	13,834	14,079	14,383	13,190	13,485	13,840	13,509	13,736	14,013	13,511	13,767	14,079
Energetic Liquid Waste to Kiln	lb/hr	HRA	AY-061L1	2,559	2,639	2,761	2,606	2,704	2,790	2,517	2,612	2,648	2,560	2,651	2,733
	lb/hr	OMA	FIC-5035	2,590	2,677	2,818	2,608	2,717	2,840	2,398	2,590	2,683	2,532	2,662	2,780
Kiln Direct Feed (Waste Feed Chlorine)	lb/hr	HRA	AY-051L1	3,379	3,685	3,858	4,151	4,463	4,902	4,431	4,774	4,914	3,987	4,307	4,558
	lb/hr	OMA	FIC-400	2,211	2,705	2,943	857	2,995	5,677	3,095	4,112	5,544	2,054	3,271	4,721
Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	22,485	23,232	23,918	23,031	23,675	24,608	24,278	25,086	26,015	23,265	23,998	24,847
Regular (Bulk) Solid Waste to Kiln	lb/hr	HRA	BULK-MAV	620	12,350	20,154	8,180	15,974	21,800	12,814	18,680	22,671	7,205	15,668	21,542
Low-Flash Solid Waste to Kiln	lb/hr	HRA	PUTZ-MAV	0	0	0	0	0	0	0	0	0	0	0	0
Containerized Solid Waste to Kiln	lb/hr	HRA	CONT-MAV	360	395	480	0	239	600	250	255	270	203	296	450
Non-Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	980	12,745	20,634	8,180	16,213	22,400	13,064	18,935	22,941	7,408	15,964	21,992
Aqueous Waste to SCC	lb/hr	HRA	SCC-DIR-MAV	1,209	1,421	1,654	1,870	2,172	2,459	507	1,953	2,319	1,195	1,848	2,144
	lb/hr	OMA	FIC-500	741	1,344	2,762	1,076	2,193	4,498	5	1,722	6,790	608	1,753	4,683
Energetic Liquid Waste to SCC	lb/hr	HRA	AY-061L2	2,100	2,134	2,150	2,150	2,150	2,150	2,200	2,231	2,487	2,150	2,172	2,263
	lb/hr	OMA	FIC-5040	2,065	2,144	2,209	2,141	2,150	2,166	2,197	2,290	2,614	2,134	2,195	2,330
BA Direct Feed to SCC	lb/hr	OMA	FIC-5024	2,740	2,909	3,123	2,756	3,029	3,530	2,916	3,260	3,931	2,804	3,066	3,528
Pumpable (Total) Hazardous Waste Feedrate to the SCC	lb/hr	HRA	SCC-TOT-WST	6,284	6,451	6,674	7,010	7,345	7,643	6,484	7,388	7,673	6,593	7,060	7,330
Kiln Exit Temperature	ºF	HRA	HRA-512	1,331	1,344	1,360	1,328	1,337	1,352	1,328	1,336	1,347	1,329	1,339	1,353
	ºF	OMA	KILN-EX-TEMP	1,324	1,349	1,383	1,296	1,339	1,394	1,304	1,335	1,382	1,308	1,341	1,386
SCC Exit Temperature	ºF	HRA	SCC-TEMP-AVG	1,937	1,953	1,964	1,940	1,956	1,964	1,920	1,935	1,947	1,932	1,948	1,958
	ºF	OMA	SCC-EX-TEMP	1,931	1,953	1,979	1,930	1,958	1,998	1,901	1,932	1,958	1,921	1,948	1,979
Stack Gas Flowrate	dscfm	HRA	HRA-576	38,919	39,240	39,679	39,203	39,486	39,970	39,010	39,067	39,165	39,044	39,264	39,605
	dscfm	OMA	FI-576INS	38,836	39,215	39,559	39,030	39,361	39,870	38,889	39,079	39,305	38,918	39,218	39,578
ID Fan Speed	RPM	OMA	RPM-576	456.11	456.36	456.36	456.18	456.36	456.55	456.24	456.36	456.36	456.18	456.36	456.42

Table 3-1. Process Data – Entire Test Runs (continued)

				Run 1 October 13, 2022			Run 2 October 14, 2022			Run 3 October 14, 2022			Average		
Parameter	Units	Averaging Period	Process Tag	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Liquid to Gas Ratio in the Absorbers	L/G	HRA	HRA-LOVG	0.107	0.108	0.109	0.106	0.107	0.108	0.108	0.108	0.109	0.107	0.108	0.108
	L/G	OMA	LOVG-INS	0.106	0.108	0.110	0.106	0.108	0.109	0.107	0.108	0.110	0.106	0.108	0.110
Absorber "LA" Flow	gpm	OMA	FIC-533	2,068.3	2,117.0	2,163.0	2,074.7	2,117.2	2,155.1	2,059.2	2,115.8	2,144.3	2,067.4	2,116.7	2,154.2
Absorber "LB" Flow	gpm	OMA	FIC-534	2,062.8	2,116.5	2,160.8	2,064.4	2,117.2	2,146.2	2,074.7	2,116.7	2,159.6	2,067.3	2,116.8	2,155.5
Cooling Tower Inlet pH	Unitless	HRA	HRA-571	3.79	4.12	5.88	3.44	3.49	3.54	3.41	3.49	3.55	3.55	3.70	4.32
		OMA	AI-571ANL	0.00	0.00	0.00	2.66	3.50	4.26	2.97	3.51	4.23	--	--	--
		OMA	AI-571BNL	3.52	3.90	4.29	0.00	0.00	0.00	0.00	0.00	0.00	1.17	1.30	1.43
Cooling Tower to Absorbers pH	Unitless	HRA	HRA-573	3.24	4.00	7.53	3.13	3.20	3.33	3.13	3.26	3.32	3.16	3.49	4.73
		OMA	AI-518ANL	8.21	9.17	9.64	8.92	9.48	10.41	9.20	9.73	10.26	8.77	9.46	10.10
		OMA	AI-518BNL	8.21	9.17	9.64	8.92	9.48	10.41	9.20	9.73	10.26	--	--	--
Quench Tower Sump pH	Unitless	OMA	AIC-502	0.93	3.84	8.11	0.36	0.84	1.43	0.00	0.54	0.98	0.43	1.74	3.51
IWS pH	Unitless	OMA	AIC-511	7.01	7.06	7.14	6.94	7.01	7.11	6.94	7.02	7.10	6.97	7.03	7.12
Blowdown to Deepwell	gpm	HRA	HRA12-616	81.9	90.6	95.3	91.9	93.2	94.0	92.3	93.1	95.0	88.7	92.3	94.7
	gpm	OMA	FIC-616	0.0	92.8	96.4	91.7	93.5	94.6	91.8	92.8	94.6	61.2	93.0	95.2
Conductivity of Blowdown to Deepwell	μmho	HRA	HRA-616C	16,815	42,743	73,615	32,960	49,198	71,796	118,671	129,748	142,010	56,149	73,896	95,807
	μmho	OMA	AI-616A	16,845	54,995	116,310	34,096	63,339	94,903	115,468	133,423	148,008	55,470	83,919	119,741
	μmho	OMA	AI-616B	19,161	48,128	87,950	33,563	55,825	78,148	96,312	106,904	117,473	49,679	70,286	94,524
WESP Power	kVA	HRA	HRA-KV577	16.2	16.5	16.7	16.3	16.6	16.8	16.2	16.6	16.8	16.2	16.6	16.7
WESP Sump Level	%	HRA	HRA12-LI577	39.5	43.0	44.0	40.2	43.2	44.0	40.3	43.5	45.4	40.0	43.2	44.5
Stack CO	ppmv, corrected to 7% O_2	HRA	STACK-CO-AVG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		OMA	STACK-CO-MV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stack O_2	%	OMA	STACK-O2-MV	6.8	7.2	8.1	6.0	6.9	7.4	6.3	6.9	7.4	6.4	7.0	7.6
Stack CO_2	%	OMA	STACK-CO2-MV	8.3	9.1	9.5	8.8	9.4	10.3	9.0	9.5	10.0	8.7	9.3	9.9
Stack HCl	ppmv	HRA	HRA-HCLPPMV	0.00	0.00	0.00	0.15	0.16	0.17	0.06	0.10	0.14	0.07	0.09	0.10
	ppmv	OMA	AI-527	0.00	0.12	1.33	0.00	0.19	1.54	0.00	0.15	1.34	0.00	0.15	1.40
	ppmv	OMA	AI-527B	3.12	3.43	4.67	2.52	3.20	3.65	2.83	3.28	3.59	2.82	3.30	3.97
Stack SO_2	ppmv	OMA	AI-SO2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3-1. Process Data – Entire Test Runs (continued)

Parameter	Units	Averaging Period	Process Tag	Run 1 October 13, 2022			Run 2 October 14, 2022			Run 3 October 14, 2022			Average		
				Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Kiln Pressure	inches W.C.	INSTAN	KILN-PR-CTRL	-0.87	-0.71	-0.55	-1.10	-0.72	-0.43	-1.06	-0.71	-0.35	-1.01	-0.71	-0.44
Kiln Rotational Speed	RPM	OMA	SI-505	0.33	0.33	0.33	0.30	0.32	0.33	0.33	0.33	0.33	0.32	0.32	0.33
Quench Exit Gas Temperature	oF	OMA	TY-520	189	192	194	192	194	196	195	197	198	192	194	196
Natural Gas to Kiln	lb/hr	OMA	FIC-810	2.2	82.8	99.8	73.4	116.6	146.8	50.7	70.7	88.4	42.1	90.0	111.6
Natural Gas to SCC (BA)	lb/hr	OMA	FIC-850-BA	39.6	95.0	128.7	0.0	23.7	77.1	0.0	48.3	102.5	13.2	55.7	102.8
Natural Gas to SCC (BE)	lb/hr	OMA	FIC-850-BE	1.6	20.0	90.2	3.1	27.4	89.8	1.3	11.1	55.9	2.0	19.5	78.6
Kiln Heat Release	MM Btu/hr	OMA	AY-062L2	52.49	61.07	66.72	51.11	55.29	61.62	52.99	53.71	54.41	52.20	56.69	60.92
SCC Heat Release	MM Btu/hr	OMA	AY-062L4	66.25	67.27	68.11	63.68	65.38	66.82	64.59	66.31	67.50	64.84	66.32	67.48
Incinerator Total Heat Release	MM Btu/hr	OMA	AY-063L2	119.33	128.36	134.21	115.85	120.67	126.52	118.29	119.99	121.40	117.82	123.01	127.38
IWS Unit 1 mA	mA	OMA	II-506A	0.00	48.46	122.85	0.00	37.08	92.39	0.00	23.34	60.65	0.00	36.30	91.96
IWS Unit 2 mA	mA	OMA	II-506B	0.06	38.92	103.09	0.03	34.62	98.31	0.03	24.00	48.35	0.04	32.52	83.25
IWS Unit 3 mA	mA	OMA	II-506C	-0.53	184.45	254.93	-0.65	160.84	255.93	-0.65	85.86	214.79	-0.61	143.72	241.88
IWS Unit 4 mA	mA	OMA	II-506D	0.33	166.70	270.55	0.33	154.50	268.25	0.26	83.79	218.53	0.31	135.00	252.45
IWS Unit 5 mA	mA	OMA	II-506E	0.00	222.46	250.75	0.00	227.27	252.31	0.00	207.25	252.47	0.00	218.99	251.84
IWS Unit 6 mA	mA	OMA	II-506F	0.00	220.42	243.02	0.00	230.91	242.97	0.00	221.35	242.68	0.00	224.23	242.89
IWS Unit 7 mA	mA	OMA	II-506G	0.00	230.64	249.81	0.00	242.51	249.35	0.00	238.82	249.70	0.00	237.32	249.62
IWS Unit 8 mA	mA	OMA	II-506H	0.00	225.93	246.30	0.00	240.61	246.88	0.00	235.04	247.14	0.00	233.86	246.77
IWS Unit 1 KV-DC	kV - DC	OMA	EI-502A	-0.93	19.35	24.59	-0.79	19.49	23.03	-0.45	20.98	23.69	-0.72	19.94	23.77
IWS Unit 2 KV-DC	kV - DC	OMA	EI-502B	0.40	20.56	24.10	0.96	20.85	23.90	1.65	22.95	25.73	1.00	21.45	24.58
IWS Unit 3 KV-DC	kV - DC	OMA	EI-502C	0.90	22.07	25.62	0.76	22.80	26.42	0.12	22.14	26.44	0.59	22.34	26.16
IWS Unit 4 KV-DC	kV - DC	OMA	EI-502D	1.21	22.30	26.03	1.40	22.46	26.43	2.01	22.76	26.88	1.54	22.51	26.45
IWS Unit 5 KV-DC	kV - DC	OMA	EI-502E	0.80	20.68	24.56	0.82	21.83	24.76	0.83	22.85	25.51	0.82	21.79	24.94
IWS Unit 6 KV-DC	kV - DC	OMA	EI-502F	-0.19	20.46	26.30	-0.08	21.11	25.99	0.12	22.74	27.29	-0.05	21.44	26.53
IWS Unit 7 KV-DC	kV - DC	OMA	EI-502G	-0.07	21.28	25.46	-0.08	21.99	24.40	-0.09	22.25	27.79	-0.08	21.84	25.89
IWS Unit 8 KV-DC	kV - DC	OMA	EI-502H	0.55	21.16	25.65	0.64	21.28	23.56	0.66	22.20	27.03	0.62	21.55	25.42
IWS Unit 1 Recycle Flow	gpm	OMA	FI-548	914.5	955.1	1,241.7	910.5	954.7	1,243.1	905.5	950.7	1,243.1	910.2	953.5	1,242.6
IWS Unit 2 Recycle Flow	gpm	OMA	FI-550	918.7	963.9	1,263.6	921.6	970.4	1,326.9	902.2	967.3	1,260.3	914.1	967.2	1,283.6
IWS Unit 3 Recycle Flow	gpm	OMA	FI-552	689.9	724.3	1,024.5	700.3	728.7	1,035.6	707.6	760.2	1,055.8	699.2	737.8	1,038.6
IWS Unit 4 Recycle Flow	gpm	OMA	FI-554	922.1	963.2	1,294.8	923.4	957.6	1,286.7	920.1	953.0	1,287.9	921.9	957.9	1,289.8

Table 3-2. Process Data – Particulate Matter, HCl and Cl_2, and Metals Test Runs

Parameter	Units	Averaging Period	Process Tag	Run 1 October 13, 2022			Run 2 October 14, 2022			Run 3 October 14, 2022			Average		
				Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Non-Energetic Sludge to Kiln	lb/hr	HRA	AY-061L4	0	0	0	0	0	0	0	0	0	0	0	0
Energetic Sludge to Kiln	lb/hr	HRA	AY-061L3	0	0	0	0	0	0	0	0	0	0	0	0
Aqueous Waste to Kiln	lb/hr	HRA	AY-060L3	16,569	16,920	17,301	16,274	16,526	16,916	17,330	17,711	18,454	16,724	17,052	17,557
Energetic Liquid Waste to Kiln	lb/hr	HRA	AY-061L1	2,559	2,638	2,759	2,606	2,703	2,790	2,517	2,609	2,648	2,560	2,650	2,732
Kiln Direct Feed (Waste Feed Chlorine)	lb/hr	HRA	AY-051L1	3,415	3,694	3,858	4,151	4,465	4,902	4,431	4,761	4,900	3,999	4,307	4,554
Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	22,542	23,252	23,918	23,031	23,694	24,608	24,278	25,081	26,002	23,284	24,009	24,843
Regular (Bulk) Solid Waste to Kiln	lb/hr	HRA	BULK-MAV	1,077	12,667	20,154	8,180	16,360	21,800	12,814	18,633	22,671	7,357	15,886	21,542
Low-Flash Solid Waste to Kiln	lb/hr	HRA	PUTZ-MAV	0	0	0	0	0	0	0	0	0	0	0	0
Containerized Solid Waste to Kiln	lb/hr	HRA	CONT-MAV	360	395	480	0	251	600	250	255	270	203	300	450
Non-Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	1,437	13,062	20,634	8,180	16,611	22,400	13,064	18,887	22,941	7,560	16,187	21,992
Aqueous Waste to SCC	lb/hr	HRA	SCC-DIR-MAV	1,241	1,426	1,654	1,870	2,155	2,459	507	1,923	2,319	1,206	1,835	2,144
Energetic Liquid Waste to SCC	lb/hr	HRA	AY-061L2	2,100	2,133	2,150	2,150	2,150	2,150	2,200	2,235	2,487	2,150	2,173	2,263
BA Direct Feed to SCC	lb/hr	OMA	FIC-5024	2,740	2,907	3,123	2,803	3,001	3,253	2,916	3,169	3,455	2,820	3,026	3,277
Pumpable (Total) Hazardous Waste Feedrate to the SCC	lb/hr	HRA	SCC-TOT-WST	6,284	6,480	6,674	7,010	7,339	7,643	7,284	7,538	7,673	6,860	7,119	7,330
Kiln Exit Temperature	oF	HRA	HRA-512	1,331	1,344	1,360	1,328	1,338	1,352	1,328	1,336	1,347	1,329	1,339	1,353
SCC Exit Temperature	oF	HRA	SCC-TEMP-AVG	1,937	1,952	1,964	1,940	1,955	1,964	1,920	1,934	1,947	1,932	1,947	1,958
Stack Gas Flowrate	dscfm	HRA	HRA-576	38,917	39,235	39,679	39,203	39,496	39,970	39,010	39,069	39,165	39,043	39,267	39,605

Table 3-3. Process Data – Dioxins and Furans Test Runs

				Run 1 October 13, 2022			Run 2 October 13, 2022			Run 3 October 13, 2022			Average		
Parameter	Units	Averaging Period	Process Tag	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Non-Energetic Sludge to Kiln	lb/hr	HRA	AY-061L4	0	0	0	0	0	0	0	0	0	0	0	0
Energetic Sludge to Kiln	lb/hr	HRA	AY-061L3	0	0	0	0	0	0	0	0	0	0	0	0
Aqueous Waste to Kiln	lb/hr	HRA	AY-060L3	16,569	16,920	17,301	16,274	16,526	16,916	17,330	17,711	18,454	16,724	17,052	17,557
Energetic Liquid Waste to Kiln	lb/hr	HRA	AY-061L1	2,559	2,638	2,759	2,606	2,703	2,790	2,517	2,609	2,648	2,560	2,650	2,732
Kiln Direct Feed (Waste Feed Chlorine)	lb/hr	HRA	AY-051L1	3,415	3,694	3,858	4,151	4,465	4,902	4,431	4,761	4,900	3,999	4,307	4,554
Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	22,542	23,252	23,918	23,031	23,694	24,608	24,278	25,081	26,002	23,284	24,009	24,843
Regular (Bulk) Solid Waste to Kiln	lb/hr	HRA	BULK-MAV	1,077	12,667	20,154	8,180	16,360	21,800	12,814	18,633	22,671	7,357	15,886	21,542
Low-Flash Solid Waste to Kiln	lb/hr	HRA	PUTZ-MAV	0	0	0	0	0	0	0	0	0	0	0	0
Containerized Solid Waste to Kiln	lb/hr	HRA	CONT-MAV	360	395	480	0	251	600	250	255	270	203	300	450
Non-Pumpable Hazardous Waste Feedrate to the Kiln	lb/hr	HRA	Calculated	1,437	13,062	20,634	8,180	16,611	22,400	13,064	18,887	22,941	7,560	16,187	21,992
Aqueous Waste to SCC	lb/hr	HRA	SCC-DIR-MAV	1,241	1,426	1,654	1,870	2,155	2,459	507	1,923	2,319	1,206	1,835	2,144
Energetic Liquid Waste to SCC	lb/hr	HRA	AY-061L2	2,100	2,133	2,150	2,150	2,150	2,150	2,200	2,235	2,487	2,150	2,173	2,263
Pumpable (Total) Hazardous Waste Feedrate to the SCC	lb/hr	HRA	SCC-TOT-WST	6,309	6,455	6,674	7,010	7,327	7,643	6,484	7,365	7,673	6,601	7,049	7,330
Kiln Exit Temperature	oF	HRA	HRA-512	1,331	1,344	1,360	1,328	1,338	1,352	1,328	1,336	1,347	1,329	1,339	1,353
SCC Exit Temperature	oF	HRA	SCC-TEMP-AVG	1,937	1,952	1,964	1,940	1,955	1,964	1,920	1,934	1,947	1,932	1,947	1,958
Stack Gas Flowrate	dscfm	HRA	HRA-576	38,917	39,235	39,679	39,203	39,496	39,970	39,010	39,069	39,165	39,043	39,267	39,605

Table 3-4. Waste Feed Stream Summary

		Average of the Test Runs		
	Regulatory Basis	Minimum	Average	Maximum
Total Hazardous Waste Feedrate to Kiln and SCC (lb/hr)	RCRA	34,018	43,982	51,246
Total Hazardous Waste Solids to Kiln	RCRA	7,408	15,964	21,992
Total Aqueous Waste Feedrate to Kiln and SCC (lb/hr)	RCRA	17,913	18,888	19,700
Aqueous Waste Feedrate to SCC (lb/hr)	RCRA	1,195	1,848	2,144
Non-Aqueous Waste Feedrate to SCC (lb/hr)	RCRA	2,150	2,172	2,263
Total Pumpable Hazardous Waste Feedrate to the Kiln (lb/hr)	RCRA	23,265	23,998	24,847
Total Pumpable Hazardous Waste Feedrate to the SCC (lb/hr)	RCRA	6,593	7,060	7,330
Total Hazardous Waste Feedrate to Kiln (lb/hr)[a]	HWC MACT	30,844	40,195	46,835
Total Pumpable Hazardous Waste Feedrate to the Kiln (lb/hr)[a]	HWC MACT	23,284	24,009	24,843
Total (Pumpable) Hazardous Waste Feedrate to the SCC (lb/hr)[a]	HWC MACT	6,601	7,049	7,330

[a]The HWC MACT OPLs for hazardous waste feedrates are developed from the sampling times for dioxins/furans of the three test runs.

3.3 Continuous Monitoring Systems

A CMS performance evaluation test plan (CMS PETP) is an appendix to the CPT/RCRA/Air Test Plan and details each CMS for the variety of monitored parameters. The CMS PETP presented Veolia's plan to conduct a CMS Performance Evaluation Test for the incinerator to assess the performance of the continuous monitoring systems prior to the CPT/RCRA/Air Test. The Continuous Monitoring System Performance Evaluation Test Report is included as Appendix 2-6.

Veolia operates redundant continuous emissions monitoring systems (CEMS) for CO, O_2, CO_2, SO_2 and HCl, and a continuous stack gas flowrate monitoring system. A RATA of the CO and O_2 CEMS was performed at the initiation of the CPT/RCRA/Air Test. The report of this RATA is included as Appendix 2-1 to this report. RATAs of all of the CEMS (CO, O_2, CO_2, SO_2 and HCl) on the incinerator stack are conducted annually. A RATA of the stack gas flowrate monitoring system is also performed annually. These annual RATAs were most recently performed on June 28, 2022 for all of the CEMS analyzers and met the relative accuracy (RA) requirements during that test. The RATA of the CO and O_2 CEMS and volumetric flowrate monitor performed at the initiation of the CPT/RCRA/Air Test conducted on August 31, 2022, met the applicable relative accuracy (RA) requirements.

3.4 Spiking of Waste Feedstreams

During the test, the incinerator was operated on typical waste feeds, and metals were spiked into the incinerator as solids and liquids. Spiking of the liquid metals, as solutions, was performed by Superior Spiking Industries (SSI). A detailed spiking report is presented in Appendix 2-2. The spiking data is summarized in Table 3-5.

Table 3-5. Spiking Rates

Spiking Constituent	Target	Run 1	Run 2	Run 3
Metals Spiking Rates Over the Entire Test				
Pumpable Metals Spiking Rates				
Arsenic spiking, solution (lb/hr)	0.25	0.2504	0.2509	0.2515
Chromium spiking, solution (lb/hr)	2	2.0538	2.0204	2.0058
Mercury spiking, solution (lb/hr)	0.1 – 0.5	0.0471	0.2002	0.1968
Solid Metals Spiking Rates				
Arsenic spiking, solid (lb/hr)	3	2.757	2.717	2.986
Chromium spiking, solid (lb/hr)	10	9.131	9.238	10.070
Lead spiking, solid (lb/hr)	50	51.29	44.11	48.74
Metals Spiking Rates During the Stack Sampling for Metals				
Pumpable Metals Spiking Rates				
Arsenic spiking, solution (lb/hr)	0.25	0.2487	0.2508	0.2517
Chromium spiking, solution (lb/hr)	2	1.9389	2.0364	2.0262
Mercury spiking, solution (lb/hr)	0.1 – 0.5	0.0512	0.2031	0.1943
Solid Metals Spiking Rates				
Arsenic spiking, solid (lb/hr)	3	2.9	3.1	3.1
Chromium spiking, solid (lb/hr)	10	10.1	10.4	10.1
Lead spiking, solid (lb/hr)	50	48.1	50.2	52.4

[1] Spiking rates from Spiking Report: 2022 Veolia CPT, Superior Spiking Industries. (See Appendix 2-2).

The metals arsenic (As), lead (Pb), chromium (Cr), and mercury (Hg) were spiked into to the incinerator to establish feed rate limits for semivolatile metals (SVM), low volatile metals (LVM), and mercury (Hg) under the HWC MACT, and to demonstrate feed rate limits under the RCRA permit. Arsenic, chromium, and lead were spiked as solid packets to the kiln with the containerized waste feed by Veolia personnel. Logs of the containers that were fed with solid packets and the calculation of the metals spiking rates with the containers are presented in Appendices 2-3 and 2-5. Arsenic and chromium were spiked into the SCC of the incinerator in liquid form. Mercury was spiked into the kiln in liquid form. The combined feed rates of the metals in spiking materials and waste feeds are used to establish the respective feed rate limits. The combined emissions of the respective metals are used to demonstrate compliance with the emission limits of the HWC MACT and for individual metals under the RCRA and Air permits.

The spiking rates provided are presented for the period of the entire of a test run, from the initiation to completion of sampling as well as for over the sampling times of the three runs for HCl and Cl_2.

3.5 Alternative Monitoring

The HWC MACT requires operating parameters be established as the average of the three runs during the applicable CPT, as appropriate per manufacturer specification, or by rule. An Alternative Monitoring Application was filed with the CPT Plan for the Interim Standards of the HWC MACT on March 1, 2004 and included four individual alternative monitoring procedures. The EPA and TCEQ approved all four of those alternative monitoring procedures. A second Alternative Monitoring Application (AMA) was filed on January 25, 2005, and TCEQ approved these three additional alternative monitoring procedures. These AMAs and the letters from the EPA and TCEQ approving these AMAs are presented in Appendix B of the CPT/RCRA/Air Test Plan.

The four approved alternative monitoring procedures of the AMA dated March 1, 2004 are:

1. Alternative measure to control combustion gas leaks (i.e., shrouds around seals of the RKI);
2. Alternative monitoring of scrubber systems solids content (i.e., Blowdown to Deepwell);
3. Monitoring HCL/Cl emissions using a CEM in lieu of a chlorine feed rate and minimum scrubber pH limit; and
4. Waiver to measure pressure drop across the wet scrubber.

The three approved alternative monitoring procedures of the AMA dated January 25, 2005 are:

1. Third range of the stack CO CEMs with a span of 6,000 ppmv;
2. Alternative monitoring of scrubber systems solids content (i.e., conductivity of *Blowdown to Deepwell*); and
3. Waiver of ash feedrate.

3.6 Data in Lieu

Per 40 CFR 63.1206(b)(7)(i)(A) compliance with the DRE standard is required to be demonstrated only one time and Veolia demonstrated DRE during the 2006 CPT. The HWC MACT requires that DRE only be demonstrated one time as long as “you do not feed hazardous waste at a location in the combustion system other than the normal flame zone” (§63.1207(c)(2)(iv)). Veolia did not re-demonstrate DRE for the incinerator in this subsequent CPT. DRE, and the associated OPLs, were demonstrated during the 2006 CPT, and operations of the incinerator have not significantly changed since that test. Data from the 2006 CPT DRE testing are provided in Appendix A to the CPT/RCRA/Air Test Plan, and in Appendix 2-1 to this report. Compliance with the DRE standard (99.99% DRE) is demonstrated using data in lieu of (DILO) from the 2006 CPT.

All of the OPLs applicable to DRE, except for operation of the waste firing system, are also applicable to dioxins/furans. One of the OPLs applicable to DRE is also applicable to other standards (i.e., flue gas flowrate). Since the CPT did not include a re-demonstration of DRE, each of the following OPLs are established based on either the 2006 CPT, or this subsequent CPT, whichever basis gives the more stringent limit:

- Minimum combustion chamber temperature: hourly rolling average, as the average of the test run averages (DRE, dioxins/furans, THC);
- Maximum flue gas flowrate, as the stack gas flowrate: hourly rolling average, as the average of the maximum hourly rolling averages for each run (DRE, dioxins/furans, THC, SVM, LVM, PM, and HCl/Cl2);
- Maximum total hazardous waste feedrate: hourly rolling average, as the average of the maximum hourly rolling averages for each run (DRE, dioxins/furans, THC);
- Maximum pumpable hazardous waste feedrate to the kiln: hourly rolling average, as the average of the maximum hourly rolling averages for each run (DRE, dioxins/furans, THC); and
- Maximum pumpable hazardous waste feedrate to the SCC: hourly rolling average, as the average of the maximum hourly rolling averages for each run (DRE, dioxins/furans, THC).

Table 3-6 presents the limits that were established from the 2006 CPT and are based on the maxima and minima demonstrated during that CPT. These OPLs are applicable to DRE and were considered in the development of OPLs following this subsequent CPT. The OPLs in association with dioxins/furans are the same as for DRE, and the OPL for maximum stack gas flowrate is also applicable to particulate matter, HCl/Cl_2, SVM, and LVM. For the OPLs for maximum total hazardous waste feedrates, minimum combustion chamber temperatures, and maximum stack gas flowrate, the most stringent, applicable value determined in the 2006 CPT and this subsequent CPT has been established as the OPL, as stated in §63.1209(i) of the HWC MACT. All of the applicable OPLs that considered OPLs established from the 2006 CPT, were established from the 2006 CPT.

Table 3-6. OPLs Established from the 2006 CPT in Association with the Standard for DRE

Parameter	OPL	Demonstration
Minimum Combustion Chamber Temperature in the Kiln	1,316° F	Average of the test run averages
Minimum Combustion Chamber Temperature in the SCC	1,906° F	Average of the test run averages
Maximum Flue Gas Flowrate	39,904 dscfm	Average of the maximum HRA for each run
Maximum Total Hazardous Waste Feedrate to the Kiln	55,281 lb/hr	Average of the maximum HRA for each run
Maximum Pumpable Hazardous Waste Feedrate to the Kiln	20,328 lb/hr	Average of the maximum HRA for each run
Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC	9,953 lb/hr	Average of the maximum HRA for each run

4. Sampling and Analysis Procedures

The CPT/RCRA/Air Test of the incinerator at Veolia's Port Arthur facility included one set of operating conditions, and three replicate test runs (or test periods) were performed. For each test period, samples were collected of the waste streams and of stack emissions. The streams sampled during the test were:

- Liquid Waste Feeds:
  - Energetic Liquid Waste to Kiln;
  - Waste Chlorine Direct Inject to Kiln;
  - Aqueous Waste to Kiln;
  - Aqueous Waste to SCC; and
  - Energetic Liquid Waste to SCC.
- Solid Waste Feeds:
  - Regular (Bulk) Solid Waste to Kiln
- Stack Gases

Containerized wastes were fed but were not sampled during the test. The containerized wastes do contribute to the amount of wastes fed to the incinerator and do contribute to the OPL established for *Total Hazardous Waste Feedrate to the Kiln*, however, since the containerized wastes were not sampled or analyzed as part of the test, containerized wastes do not contribute to OPLs established for constituent feedrates.

Samples were analyzed as necessary to demonstrate compliance with the emission limits of the HWC MACT; to develop feedrate limits under the HWC MACT, and to demonstrate compliance with applicable RCRA and Air permit limits. Table 4-1 summarizes the sampling frequency during the test.

4.1 Sampling and Analytical Methods

The sampling and analytical requirements for measurements during the test are discussed in the following sections. The QAPjP submitted with the CPT/RCRA/Air Test Plan provides detailed descriptions of the sampling and analytical methods. Table 4-2 summarizes the sampling methods. Table 4-3 summarizes the analytical methods. Table 4-4 summarizes the sampling times and parameters. Appendix 3-2 includes the waste feed sampling data sheets, the stack gas sampling data sheets, the isokinetic and flow rate calculations, and the sample logbook.

Table 4-1. Measurement Frequency

Stream/Parameters	Sample Frequency
Liquid Waste Feeds	
Ash	3
Chlorine	3
Moisture	3
Heating Value, Viscosity, Density	3
Metals	3[1]
Solid Waste Feeds	
Ash	3
Chlorine	3
Heating Value	3
Metals	3[1]
Spiking Materials[2]	
Mercury Spiking Solution	3
Lead Solid Spiking Material	3
Arsenic Spiking Solution	3
Chromium Spiking Solution	3
Arsenic Solid Spiking Material	3
Chromium Solid Spiking Material	3
Stack Gas	
Particulate Matter	3
$HCl/Cl_2/HF$	3
Metals	31
Chromium VI	3
Dioxins/Furans	3
PCBs	3
Total Organic Carbon, as VOCs	3
Total Hydrocarbons, CO, NO_x, CO_2, O_2	Continuous[3]
Moisture	Concurrent with isokinetic sampling
O_2, SO_2[4]	Continuous

[1]Analysis for As, Be, Cd, Cr, Sb, Ba, Pb, Hg, Ni, Se, Ag, and Tl
[2]Samples were archived
[3]Allowing for hourly calibration of the THC monitor
[4]Plant monitors

Table 4-2. Sampling Matrix

Stream	Sampling Method	Sampling Frequency	Compositing Approach	Analytical Parameters
Liquid Waste Feeds	Tap (Method S004)	Every 30 minutes	Composite all subsamples from each test period	Ash Chlorine Moisture Heating Value Density Viscosity Metals 1
Solid Waste Feeds	Scoop (Method S007)	Beginning and/or end of each test period	Average samples for each test period	Ash Chlorine Heating Value Metals[1]
Mercury, Arsenic, Chromium Spiking Solutions	Tap (Method S004)	One sample	None – Archive	Archive
Arsenic, Chromium, Lead Spiking Materials	Grab	One sample	None – Archive	Archive
Stack Gas	EPA Method 2	Concurrent with isokinetic sampling	NR	Flowrate
	EPA Method 3A	Concurrent with isokinetic sampling	NR	O_2, CO_2
	EPA Method 4	Concurrent with isokinetic sampling	NR	Moisture
	EPA Method 5 EPA Method 26A	2+ hour collected isokinetically	NR	PM HCl/Cl_2/HF
	EPA Method 29	2+ hour collected isokinetically	NR	Metals[1]
	SW-846 Method 0061	2+ hour collected isokinetically	NR	Cr (VI)
	SW-846 Method 0023A	3+ hour collected isokinetically	NR	Dioxins/Furans
	SW-846 Method 0023A	3+ hour collected isokinetically	NR	PCBs
	EPA Method 25A	Continuous	NR	THC Total Organic Carbon[2]
	EPA Method 7E	Continuous	NR	NOx
	Plant CEMS	Continuous	NR	CO, O_2, SO_2

[1]Analysis for As, Be, Cd, Cr, Sb, Ba, Pb, Hg, Ni, Se, Ag, and Tl
[2]A canister sample was collected and analyzed for methane and ethane, and the concentration of Total Organic Carbon, as VOCs, was to be determined by subtracting the methane and ethane concentrations from the concentration of THC
NR = Not Required

Table 4-3. Summary of Analytical Methods

Parameter	Stream	Analytical Method
Particulate Matter	Stack Gas	Gravimetric - EPA Method 5
$HCl/HF/Cl_2$	Stack Gas	IC - EPA Method 26A
Dioxins/Furans	Stack Gas	HRGC/MS – SW-846 Method 8290A
Metals [1]	Waste Feeds, Stack Gas	ICPES - SW-846 Method 6010B CVAAS - Hg, SW-846 Method 7470A or 7471A
PCBs	Stack Gas	EPA Method 1668A
Chromium VI	Stack Gas	SW-846 Method 7199
THC, Total Organic Carbon[2]	Stack Gas	EPA Method 25A
NOx	Stack Gas	EPA Method 7E
O_2, CO_2, N_2	Stack Gas	EPA Method 3A
Moisture	Stack Gas	EPA Method 4
Ash Chlorine Moisture Heating Value Density Viscosity	Waste Feeds	SW-846 and ASTM Standard Methods

[1]Analysis for As, Be, Cd, Cr, Sb, Ba, Pb, Hg, Ni, Se, Ag, and Tl
[2]A canister sample was collected and analyzed for methane and ethane, and the concentration of Total Organic Carbon, as VOCs, was determined by subtracting the methane and ethane concentrations from the concentration of THC

Table 4-4. Summary of Sample Collection Times

Run 1	Date	Time
Stack - Dioxins/Furans (Method 0023A)	October 13, 2022	0900 - 1030, 1644 - 1814
Stack - PCBs (Method 0023A)		0900 - 1030, 1644 – 1814
Stack - PM-HCl/Cl2 (Methods 5/26A)		0900 - 1000, 1020 - 1030, 1640 - 1730
Stack - Metals (Method 29)		0900 - 1000, 1020 - 1030, 1640 - 1730
Stack- Chromium VI (Method 0061)		0930 - 1030, 1644 - 1744
Liquid Wastes Aqueous Waste to Kiln - (AY060L3) Energetic Liquid Waste to Kiln (AY061L1) Kiln Direct Feed (Waste Feed Chlorine) (AY051L1) Energetic Liquid Waste to SCC (AY061L2)		0900 – 1815
Bulk Solid Waste (Regular Waste)		Collected at the Beginning and/or at the End of the Run
Run 2	Date	Time
Stack - Dioxins/Furans (Method 0023A)	October 14, 2022	0750 - 0920, 0937 - 0953, 0955 - 1109
Stack - PCBs (Method 0023A)		0750 - 0920, 0937 - 0953, 0955 - 1109
Stack - PM-HCl/Cl2 (Methods 5/26A)		0750 - 0850, 0905 - 1005
Stack - Metals (Method 29)		0750 - 0850, 0905 - 1005
Stack- Chromium VI (Method 0061)		0820 - 0920, 0937 - 0953, 0955 - 1039
Liquid Wastes Aqueous Waste to Kiln - (AY060L3) Energetic Liquid Waste to Kiln (AY061L1) Kiln Direct Feed (Waste Feed Chlorine) (AY051L1) Energetic Liquid Waste to SCC (AY061L2)		0750 – 1109
Bulk Solid Waste (Regular Waste)		Collected at the Beginning and/or at the End of the Run

Table 4-4. Summary of Sample Collection Times (continued)

Run 3	Date	Time
Stack - Dioxins/Furans (Method 0023A)	October 14, 2022	1325 - 1455, 1515 - 1645
Stack - PCBs (Method 0023A)		1325 - 1455, 1515 - 1645
Stack - PM-HCl/Cl2 (Methods 5/26A)		1325 - 1425, 1440 - 1540
Stack - Metals (Method 29)		1325 - 1425, 1440 - 1540
Stack- Chromium VI (Method 0061)		1355 - 1455, 1515 - 1615
Liquid Wastes Aqueous Waste to Kiln - (AY060L3) Energetic Liquid Waste to Kiln (AY061L1) Kiln Direct Feed (Waste Feed Chlorine) (AY051L1) Energetic Liquid Waste to SCC (AY061L2)		1325 – 1645
Bulk Solid Waste (Regular Waste)		Collected at the Beginning and/or at the End of the Run

4.2 Sampling Locations and Procedures

Samples were collected of liquid waste feeds, solid waste feeds, and stack gas during the test. This section describes the sampling methods that were employed. Since most of the methods are standard reference methods, only brief, summary type descriptions are presented. More detailed descriptions can be found in the indicated reference documents and in the QAPjP for the CPT/RCRA/Air Test.

4.2.1 Waste Feed Sampling Procedures

Samples of the liquid and solid waste feed streams were collected in amber glass bottles with Teflon™ cap liners. Spiking materials were sampled and archived. Pre-cleaned bottles were purchased and used to collect the samples.

Liquid waste feed samples were collected using the tap sampling procedure specified in U.S. EPA Method S004, *"Sampling and Analysis Methods for Hazardous Waste Combustion."* The sample tap was flushed each time (allowed to flow briefly) before the sample was collected to ensure that any stagnant accumulation of solids, or other contaminants that may be present in the tap, did not affect the sample integrity or its representation of the stream being sampled. For each liquid stream, at 30-minute intervals throughout each test period, a grab sample of approximately 100 milliliters was collected and added to a jar, creating a composite sample for the run. The composite samples for each stream for each run were analyzed.

Solid waste feed samples were collected using the scoop sampling procedure specified in U.S. EPA Method S007, *"Sampling and Analysis Methods for Hazardous Waste Combustion."* Samples of the bulk solid wastes (i.e., "regular wastes") fed to the kiln were collected by Veolia personnel for each of the three test runs. In the case where multiple samples of "regular wastes" were collected, the average analysis result for each test run were utilized.

4.2.2 Stack Gas Sampling Procedures

The stack gas emissions were sampled for determination of the parameters indicated in Table 4-2. Figure 4-1 presents a schematic of the stack sampling locations. Table 4-5 presents a summary of the sampling data for the isokinetic trains. The sampling methods used are described below.

For all of the stack gas emission parameters measured using sampling trains (i.e., Method 0023A for Dioxins/Furans, Method 29, Method 5/26A, Method 0061, and Method 0023A for PCBs) a field blank sample was collected by assembling the sampling train, taking it to the stack sampling location, and then performing a leak check. The field blank was then recovered and analyzed in the same manner as actual samples. The primary purpose of the field blank samples is to evaluate any bias to sample results due to contamination of the sampling system and/or sampling media.

4.2.2.1 Sample Port Location

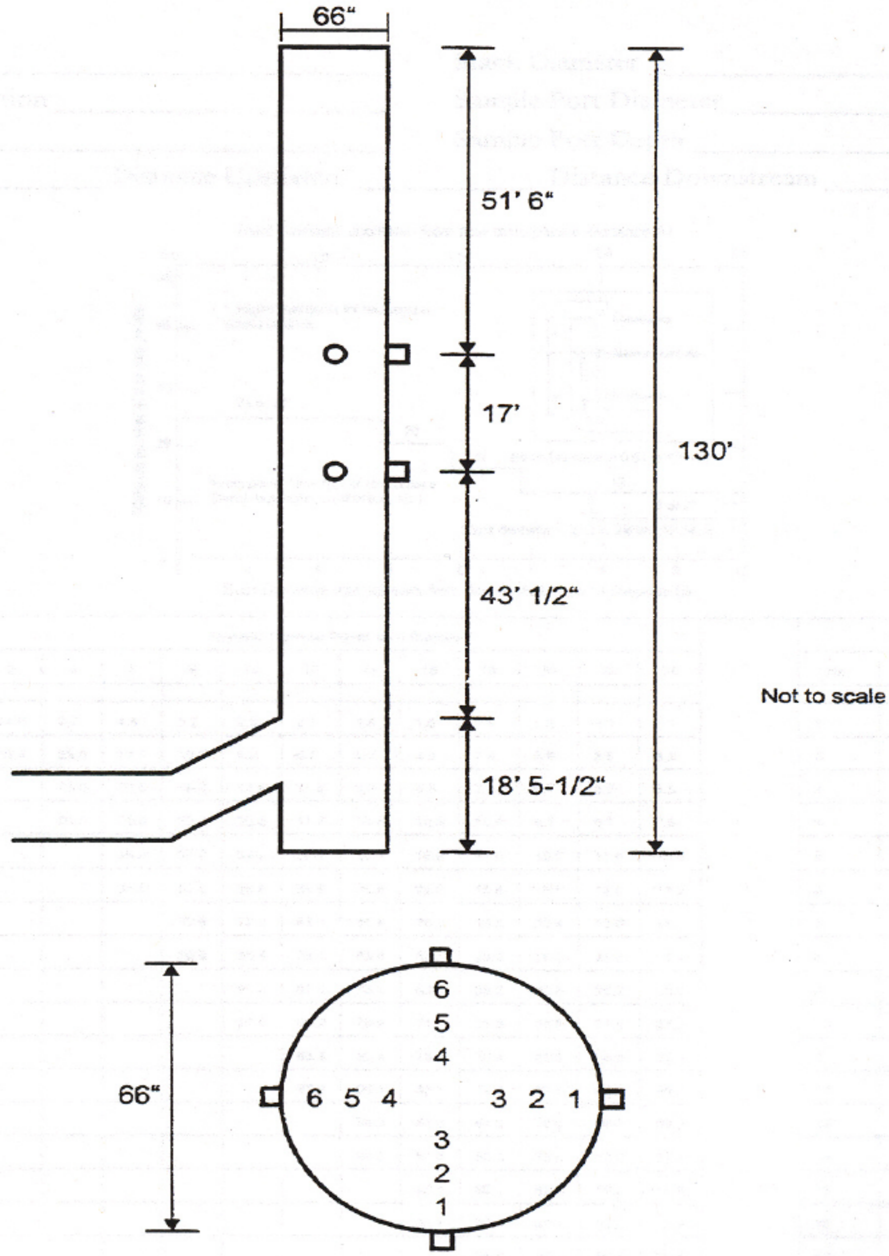
Stack gas samples were collected from ports located on the stack, which has an inner diameter of 5.5 feet (66 inches). There are two sets of two orthogonal ports located at two different levels. Level 1 is 43 feet ½ inch downstream of the closest upstream disturbance (i.e., 7.8 stack diameters) and 68 feet 6 inches upstream of the stack discharge point (i.e., almost 12 ½ stack diameters). Level 2 is 60 feet ½ inch downstream of the closest upstream disturbance, i.e., 10.9 stack diameters, and 51 feet 6 inches upstream of the stack discharge point (i.e., 9.4 stack diameters). Per EPA Method 1, isokinetic sampling must be performed at 12 traverse points at Level 1 and at 8 traverse points at Level 2. To be consistent, isokinetic sampling was conducted using the more conservative 12 traverse points at both stack sampling levels. The configuration of the stack sampling ports, and the locations of the 12 traverse points are shown in Figure 4-1.

The absence of cyclonic flow was verified by performing a cyclonic flow check of both stack traverse diameters on January 9, 2017. The Method 1 measurements, as well as documentation of cyclonic flow check, are included in Appendix 3-2.

Table 4-5. Summary of Isokinetic Sampling

Run	Analytical Parameter	Average Stack Temperature (°F)	Velocity (ft/sec)	Flue Gas Moisture (%)	O_2 (vol %)	CO_2 (vol %)	Average Flowrate (acfm)	Average Flowrate (dscfm)	Volume at Meter (dscf)	Isokinetic Sampling Rate (%)
1	EPA Method 5/26A - PM/HCl/Cl2/HF	100.2	31.03	6.15	7.49	9.37	44,238	39,144	81.777	101.75
	EPA Method 29 – Metals	97.0	32.25	5.80	7.49	9.37	45,966	41,119	90.210	100.14
	SW-846 Method 0023A - Dioxins/Furans	99.6	33.58	5.62	7.49	9.37	47,866	42,663	129.600	97.21
	SW-846 Method 0023A – PCBs	99.6	33.58	5.62	7.49	9.37	47,866	42,663	129.600	97.21
	SW-846 Method 0061 - Cr (VI)[1]	95.6	33.04	5.58	7.49	9.37	47,103	42,291	90.053	100.01
2	EPA Method 5/26A - PM/HCl/Cl_2/HF	99.0	28.52	5.92	7.07	9.76	40,654	36,143	74.293	100.12
	EPA Method 29 – Metals	96.4	31.81	5.70	7.07	9.76	45,347	40,621	89.416	100.48
	SW-846 Method 0023A - Dioxins/Furans	100.8	32.65	5.03	7.07	9.76	46,536	41,711	129.315	99.21
	SW-846 Method 0023A – PCBs	100.8	32.65	5.03	7.07	9.76	46,536	41,711	129.315	99.21
	SW-846 Method 0061 - Cr (VI)[1]	95.7	33.20	5.57	7.07	9.76	47,324	42,648	91.959	99.62
3	EPA Method 5/26A - PM/HCl/Cl_2/HF	101.5	29.78	6.07	7.10	9.82	42,457	37,548	78.781	102.19
	EPA Method 29 – Metals	98.0	31.39	5.40	7.10	9.82	44,751	40,180	88.572	100.62
	SW-846 Method 0023A - Dioxins/Furans	104.9	31.37	5.64	7.10	9.82	44,715	39,556	122.480	99.08
	SW-846 Method 0023A – PCBs	104.9	31.37	5.64	7.10	9.82	44,715	39,556	122.480	99.08
	SW-846 Method 0061 - Cr (VI)[1]	96.2	33.14	5.40	7.10	9.82	47,248	42,616	91.592	100.95

[1]Flue gas moisture was not determined in the Method 0061 sampling train. Flue gas moisture from the Run 1 Method 29 sampling train was used in calculations



Traverse Point No.	Percent of Diameter	Point Location from End of Port (in.)
1	4.4	2-7/8"
2	14.6	9-5/8"
3	29.6	19-1/2"
4	70.4	46-1/2"
5	85.4	56-3/8"
6	95.6	63-1/8"

Figure 4-1. Stack Schematic

4.2.2.2 EPA Methods 2 and 4 (Flowrate and Moisture)

Concurrent with the performance of isokinetic sampling trains, measurements are made to determine gas velocity by EPA Method 2, and moisture by EPA Method 4. Moisture was not measured with the sampling train for hexavalent chromium.

4.2.2.3 EPA Method 5 (PM) / EPA Method 26A (HCl/Cl2/HF)

Samples for the determination of HCl, Cl2, HF, and particulate matter (PM) in stack emissions were collected using a single sampling train meeting the requirements of both EPA Method 26A and EPA Method 5.

This sample train consists of the following components:

- Glass (quartz) nozzle;
- Heated, glass (quartz)-lined probe;
- Heated Teflon mat filter with a Teflon filter support;
- Optional knockout impinger, modified Greenburg-Smith, containing 50 mL of 0.1 N H2SO4;
- Greenburg-Smith impinger containing 100 mL of 0.1 N H2SO4;
- Greenburg-Smith impinger containing 100 mL of 0.1 N H2SO4;
- Modified Greenburg-Smith impinger containing 100 mL of 0.1 N NaOH;
- Modified Greenburg-Smith impinger containing 100 mL of 0.1 N NaOH; and
- Modified Greenburg-Smith impinger containing silica gel.

The procedures specified in EPA Method 5 protocol were used to determine particulate matter. These procedures require the isokinetic extraction of particulate matter on a filter maintained at a controlled temperature. In accordance with the requirements of EPA Method 26A, the filter and probe were kept at a temperature between 248°F and 273°F, and a Teflon-backed filter was used. A Teflon union was used to connect the quartz nozzle to the quartz probe liner. The particulate mass, which includes all material that condenses at or above the filtration temperature, was determined gravimetrically, after desiccation.

Chloride and fluoride analysis was performed on the impinger contents using ion chromatography according to Method 26A.

4.2.2.4 SW-846 Method 0023A (Dioxins/Furans)

Stack gas emissions samples were collected for dioxins/furans using SW-846 Method 0023A. The sampling train consists of a heated probe, heated filter, sorbent module, and pumping and metering unit. A gooseneck nozzle of proper size to allow isokinetic sample collection is attached to the probe. S-type pitot differential pressure is monitored to determine the isokinetic sampling rate.

From the heated filter, sample gas enters the sorbent module. The sorbent module consists of a water-cooled condenser followed by the XAD-2 resin trap. After the resin trap is a dry modified Greenburg-Smith impinger that collects the aqueous condensate. The stem of this impinger is short to reduce carryover of collected aqueous condensate. Following the condensate trap are two impingers containing 100 mL of DI water to collect any mist carryover from the condensate trap and a final impinger containing a desiccant to dry the sample gas before metering. A pump and dry gas meter are used to control and monitor the sample gas flowrate.

Sampling of the stack gases was conducted in accordance with published protocol. This involved collecting samples isokinetically across both diagonals of the stack at a sampling rate between 0.5 and 0.75 dry standard cubic feet per minute (dscfm). In accordance with 40 CFR 63.1208(b)(1)(ii), a minimum of 2.5 dscm (dry standard cubic meters) or 88.3 dry standard cubic feet was collected over a minimum sampling time of three hours (180 minutes).

4.2.2.5 SW-846 Method 0023A (PCBs)

Stack gas emissions samples were collected for PCBs using SW-846 Method 0023A. The sampling system consists of a heated probe, heated filter, sorbent module, and pumping and metering unit. A gooseneck nozzle of proper size to allow isokinetic sample collection is attached to the probe. S-type pitot differential pressure is monitored to determine the isokinetic sampling rate.

From the heated filter, sample gas enters the sorbent module. The sorbent module consists of a water-cooled condenser followed by the XAD-2 resin trap. After the resin trap is a dry modified Greenburg-Smith impinger which collects the aqueous condensate. The stem of this impinger is short to reduce carryover of collected aqueous condensate. Following the condensate trap are two impingers containing 100 mL of DI water followed by a dry impinger to collect any mist carryover from the condensate trap and a final impinger containing a desiccant to dry the sample gas before metering. A pump and dry gas meter are used to control and monitor the sample gas flowrate.

Sampling included collecting samples isokinetically across both diagonals of the stack at a sampling rate of no more than 0.75 dry standard cubic feet per minute. A minimum of 106 dry standard cubic feet was collected.

4.2.2.6 EPA Method 29 (Metals)

Samples of the stack gas emissions were collected isokinetically for the HWC MACT metals As (arsenic), Be (beryllium), Cd (cadmium), Cr (chromium), Pb (lead), and Hg (mercury); the metals in the RCRA permit As, Be, Cd, Cr, Sb (antimony), Ba (barium), Pb, Hg, Ni (nickel), Se (selenium), Ag (silver), Tl (thallium), and Zn (zinc); and the metals in the Air permit Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, and Tl using EPA Method 29.

This method is basically an EPA Method 5 sampling train with some very specific modifications:

- The nozzle and probe liner were glass or quartz. All connections were glass or Teflon;
- The filter was quartz or glass fiber, with a fritted glass or Teflon support;
- The first and second impingers contained a nitric acid/hydrogen peroxide solution;
- The third impinger was empty;
- The fourth and fifth impingers contained acidic potassium permanganate; and
- A Modified Greenburg-Smith impinger containing silica gel.

A brush containing no metal was used for the probe and nozzle rinse. The probe and nozzle were rinsed with 0.1 normal nitric acid.

Sampling involved collecting samples isokinetically across both diagonals of the stack at a sampling rate between 0.5 and 0.75 dry standard cubic feet per minute. A minimum of 45 dry standard cubic feet was collected over 120 minutes.

4.2.2.7 SW-846 Method 0061 (Chromium VI)

The stack gas was sampled for determination of hexavalent chromium (Chromium VI) using SW-846 Method 0061. The sampling train consisted of the following components:

- Glass nozzle;
- Heated, glass-lined probe;
- Teflon impinger containing 150 mL of 0.5 N KOH, and a pumping system capable of recirculating impinger solution through the probe;
- Teflon impinger containing 75 mL of 0.5 N KOH;
- Teflon impinger containing 75 mL of 0.5 N KOH;

- Dry Teflon impinger; and
- Modified Greenburg-Smith impinger containing silica gel.

4.2.2.8 Continuous Emissions Monitoring (THC, NOx, CO_2, O_2, CO and SO_2)

CEMs were used to monitor the concentrations of THC (total hydrocarbons), NO_x, CO_2, O_2, CO, and SO_2 in the stack gas.

Concentrations of SO_2 in the stack gas are reported from permanent installation CEMS of the incinerator facility. THC, CO, NO_x, CO_2, and O_2 were monitored by AECOM during the test using continuous monitors.

The concentrations of total hydrocarbons (THC), oxides of nitrogen (NOx), carbon dioxide (CO_2), oxygen (O_2), and Carbon Monoxide (CO) in the stack gas were determined by AECOM using EPA Methods 25A, 7E, 3A, and 10 respectively. CO_2 and O_2 were monitored using Method 3A to determine the stack gas composition (i.e., molecular weight) used to determine the flowrate of the stack gas. All of these methods utilize continuous monitors.

The Air permit includes an emission limit for Total Organic Carbon that was measured as Volatile Organic Compounds (VOCs). The concentration of THC was measured using EPA Method 25A. A canister sample was collected throughout each of the three runs of the test for analysis of methane and ethane. The concentration of VOCs was to be determined by subtracting the methane and ethane concentrations from the concentration of THC.

4.3 Analysis Procedures

Samples collected during the CPT/RCRA/Air Test were analyzed for the parameters specified in Table 4-3. This section describes the analytical methods that were used. Since most of the methods are standard reference methods, only brief summary type descriptions are presented. More detailed descriptions can be found in the indicated reference documents and in the QAPjP for the CPT/RCRA/Air Test.

4.3.1 Particulate Matter Analysis

The particulate matter concentration of the stack gas was determined following EPA Method 5 protocol. The wash from the nozzle, probe liner, and glassware prior to the filter on the sampling train were evaporated, and the mass determined on an analytical balance. The filter removed from the sampling train was desiccated and weighed to determine the mass of particulate matter on the filter. The combined mass from the filter and the evaporated wash are related to the total volume of gas sampled to determine the particulate matter loading.

4.3.2 HCl, Cl_2, and HF Analysis

The sulfuric acid and sodium hydroxide impinger catches from Method 5/26A sampling were analyzed for chloride and fluoride ion concentrations. Chloride and fluoride analysis was performed using EPA Method 26A, an IC technique.

4.3.3 Dioxins/Furans Analysis

Samples of the stack gas collected using SW-846 Method 0023A were analyzed for dioxins/furans using SW-846 Method 8290, a high-resolution gas chromatography (HRGC) with high resolution mass spectroscopy (HRMS). After sample cleanup and concentration procedures at the analytical laboratory, an aliquot of the front-half extracts (i.e., PNR and filter) were combined and analyzed for dioxins/furans separate from the back-half components (i.e., mid-train rinses, XAD sorbent). The analytical protocol includes quantitation of all dibenzodioxins and dibenzofurans including four or more chlorine atoms. The method provides congener class definition for each of the five congener groups (tetra-, penta-, hexa-, hepta-, and octa-). In addition, each individual isomer containing the 2,3,7,8-substitution pattern was individually quantified.

4.3.4 PCBs Analysis

Analysis of stack gas samples for polychlorinated biphenyls (PCBs) was performed using EPA Method 1668A. This method is a high-resolution GC/MS technique. The analysis for PCBs is performed for each of the 209 individual isomers. Results are added for each of the ten congener classes representing degree of chlorine substitution (i.e., mono- through deca-). Prior to analysis, appropriate sample extraction techniques are employed (SW-846 Method 3510 or 3520 for liquids and 3540 or 3550 for solids). The resulting extraction solvent is then exchanged to hexane and analyzed. If necessary, cleanup procedures (SW-846 Method 3620 or Method 3620, followed by Method 3660) were used to eliminate interferences in the analysis. The extracts of all components of the sampling train were combined prior to analysis. The results are quantitated as chlorinated biphenyl congeners.

4.3.5 Methane and Ethane Analysis

Samples of the stack gas were collected during each run and analyzed for methane and ethane using ASTM D-1946, a gas chromatography technique.

4.3.6 Metals Analysis

Waste feed samples were analyzed for metals using a trace level inductively coupled argon plasma emission spectroscopy (ICPES) and atomic absorption spectroscopy. Samples were prepared for analysis using SW-846 Method 3050B. The metals analyzed by ICPES (SW-846 Method 6010B) are Sb, As, Ba, Be, Cd, Cr, Pb, Ni, Se, Ag, and Tl. Mercury (Hg) was analyzed using Method 7470A of SW-846.

The Method 29 sampling train was used to collect samples of the stack gas for metals. The samples were analyzed using ICPES according to SW-846 Method 6010B, and mercury was analyzed using Method 7470A of SW-846. The metals analyzed by ICPES are Sb, As, Ba, Be, Cd, Cr, Pb, Ni, Se, Ag, and Tl.

4.3.7 Chromium VI Analysis

Stack gas samples collected for measurement of chromium VI using SW-846 Method 0061 were analyzed for chromium VI using Method 7199 of SW-846. The method uses ion chromatography for determination of chromium VI in the potassium hydroxide impinger solutions and associated rinses. The ion chromatograph is run with a post column reagent (PCR) mixing and delivery system.

4.3.8 Composition and Physical Parameters Analysis

Samples of liquid waste feeds were collected for determination of chemical and physical parameters, including:

- Ash;
- Total chlorine;
- Moisture;
- Heating value;
- Density; and
- Viscosity.

Samples of solid waste feeds were collected for determination of chemical and physical parameters, including:

- Ash;
- Total chlorine; and
- Heating value.

These analyses were performed using the following ASTM standard methods and SW-846 methods:

- Ash Content: ASTM D-482;
- Total Chlorine: SW-846 9056;
- Density: ASTM D-854 and ASTM D-1475;
- Gross Calorific Value: ASTM D-240 and ASTM D-5865;
- Kinematic Viscosity: ASTM D-445; and
- Percent Moisture: ASTM D-4017.

5. Results

This section presents the results of the CPT/RCRA/Air Test of Veolia Port Arthur's incinerator. The analytical results for the waste feed streams and stack gas are presented in Sections 5.1 and 5-2, respectively. The collection of samples and the methods used for sampling and analysis were specified in the CPT/RCRA/Air Test Plan and QAPjP and are discussed in Section 4.0. Calculations of constituent feedrates, stack gas concentrations, and emission rates are shown in the Excel file in Appendix 4-8.

5.1 Waste Feed Streams

Five liquid waste streams and one solid waste stream were sampled during the CPT/RCRA/Air test and were analyzed for parameters identified in previous sections of this report.

5.1.1 Analytical Results for Liquid Waste Streams

The liquid waste samples were analyzed for the following:

- Metals (Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, and Tl);
- Ash;
- Density;
- Calorific Value;
- Viscosity;
- Moisture; and
- Chlorine.

Analytical results for Aqueous Waste to Kiln are shown in Table 5-1.

Analytical results for Energetic Liquid Waste to Kiln are shown in Table 5-2.

Analytical results for Kiln Direct Feed (Waste Feed Chlorine) are shown in Table 5-3.

Analytical results for Aqueous Waste to SCC are shown in Table 5-4.

Analytical results for Energetic Liquid Waste to SCC are shown in Table 5-5.

The detailed analytical reports for analysis of the waste feeds are presented in Appendix 4-1.

Table 5-1. Analytical Results of Aqueous Waste to Kiln

		Run 1	Run 2	Run 3
Parameter	Units	VPA-AWK-11-Comp	VPA-AWK-12-Comp	VPA-AWK-13-Comp
Antimony	mg/kg	<0.331	<0.334	<0.342
Arsenic	mg/kg	<0.282	<0.285	<0.292
Barium	mg/kg	0.403	0.45	0.438
Beryllium	mg/kg	<0.0389	<0.0393	<0.0402
Cadmium	mg/kg	<0.0195	<0.0196	<0.0201
Chromium	mg/kg	<0.204	<0.206	<0.211
Lead	mg/kg	<0.214	<0.216	<0.221
Mercury	mg/kg	0.108	0.103	0.102
Nickel	mg/kg	<0.963	<0.972	<0.996
Selenium	mg/kg	<0.428	<0.432	<0.443
Silver	mg/kg	<0.0798	<0.0806	<0.0825
Thallium	mg/kg	<0.486	<0.491	<0.503
Ash Content	mg/kg	9,270	10,700	4,100
Density	g/cm3	1	0.999	0.997
Gross Calorific Value	Btu/lb	<353	<346	<349
Kinematic Viscosity	cSt	0.895	0.914	0.912
Percent Water	%	97.6	98.9	100
Total Chlorine	mg/kg	1,000	956	894
Antimony	mg/kg	<0.331	<0.334	<0.342

Table 5-2. Analytical Results of Energetic Liquid Waste to Kiln

		Run 1	Run 2	Run 3
Parameter	Units	VPA-ELK-11-COMP	VPA-ELK-11-COMP	VPA-ELK-11-COMP
Antimony	mg/kg	<0.337	<0.346	<0.343
Arsenic	mg/kg	<0.287	<0.295	<0.292
Barium	mg/kg	1.01	1.2	0.887
Beryllium	mg/kg	<0.0396	<0.0407	<0.0403
Cadmium	mg/kg	<0.0198	<0.0203	<0.0202
Chromium	mg/kg	0.269	0.529	0.456
Lead	mg/kg	<0.218	<0.224	<0.222
Mercury	mg/kg	0.0589	0.0495	0.0542
Nickel	mg/kg	<0.980	<1.01	<0.998
Selenium	mg/kg	<0.436	<0.447	<0.444
Silver	mg/kg	<0.0812	<0.0833	<0.0827
Thallium	mg/kg	<0.495	<0.508	<0.504
Ash Content	mg/kg	493	789	688
Density	g/cm3	0.835	0.841	0.841
Gross Calorific Value	Btu/lb	19,200	19,200	19,200
Kinematic Viscosity	cSt	3.42	3.39	3.39
Percent Water	%	0.195	0.230	0.225
Total Chlorine	mg/kg	343	382	339
Antimony	mg/kg	<0.337	<0.346	<0.343

Table 5-3. Analytical Results of Kiln Direct Feed (Waste Feed Chlorine)

		Run 1	Run 2	Run 3
Parameter	Units	VPA-LWF-11-Comp	VPA-LWF-12-Comp	VPA-LWF-13-Comp
Antimony	mg/kg	<0.339	<0.341	<0.335
Arsenic	mg/kg	<0.289	<0.291	<0.286
Barium	mg/kg	<0.389	<0.392	<0.385
Beryllium	mg/kg	<0.0399	<0.0402	<0.0394
Cadmium	mg/kg	<0.0200	<0.0201	<0.0197
Chromium	mg/kg	<0.210	<0.211	<0.207
Lead	mg/kg	<0.220	<0.221	<0.217
Mercury	mg/kg	<0.00993	<0.0102	0.0836
Nickel	mg/kg	<0.988	<0.994	<0.976
Selenium	mg/kg	<0.439	<0.442	<0.434
Silver	mg/kg	<0.0818	<0.0823	<0.0809
Thallium	mg/kg	<0.499	<0.502	<0.493
Ash Content	mg/kg	<94.6	<93.8	141
Density	g/cm3	1.30	1.29	1.31
Gross Calorific Value	Btu/lb	3,440	3,330	3,710
Kinematic Viscosity	cSt	0.317	0.316	0.316
Percent Water	%	0.155	<0.100	<0.100
Total Chlorine	mg/kg	772,000	768,000	815,000
Antimony	mg/kg	<0.339	<0.341	<0.335

Table 5-4. Analytical Results of Aqueous Waste to SCC

Parameter	Units	Run 1 VPA-AWS-11-Comp	Run 2 VPA-AWS-12-Comp	Run 3 VPA-AWS-13-Comp
Antimony	mg/kg	<0.340	<0.343	<0.342
Arsenic	mg/kg	<0.290	<0.293	<0.292
Barium	mg/kg	<0.390	<0.394	<0.392
Beryllium	mg/kg	<0.0400	<0.0404	<0.0402
Cadmium	mg/kg	<0.0200	<0.0202	<0.0201
Chromium	mg/kg	<0.210	<0.212	<0.211
Lead	mg/kg	<0.220	<0.222	<0.221
Mercury	mg/kg	0.0626	0.0985	0.0548
Nickel	mg/kg	<0.990	<1.00	<0.996
Selenium	mg/kg	<0.440	<0.444	<0.443
Silver	mg/kg	<0.0820	<0.0828	<0.0825
Thallium	mg/kg	<0.500	<0.505	<0.503
Ash Content	mg/kg	<93.5	132	193
Density	g/cm3	1.31	1.3	1.29
Gross Calorific Value	Btu/lb	4020	3170	3330
Kinematic Viscosity	cSt	0.366	0.318	0.329
Percent Water	%	<0.100	0.145	0.13
Total Chlorine	mg/kg	735000	801000	755000
Antimony	mg/kg	<0.340	<0.343	<0.342

Table 5-5. Analytical Results of Energetic Liquid Waste to SCC

		Run 1	Run 2	Run 3
Parameter	Units	VPA-ELS-11-Comp	VPA-ELS-12-Comp	VPA-ELS-13-Comp
Antimony	mg/kg	<0.337	<0.339	<0.341
Arsenic	mg/kg	<0.287	<0.289	<0.291
Barium	mg/kg	2.61	0.739	0.72
Beryllium	mg/kg	<0.0396	<0.0399	<0.0402
Cadmium	mg/kg	0.0386	<0.0200	<0.0201
Chromium	mg/kg	0.303	<0.210	<0.211
Lead	mg/kg	0.283	<0.220	<0.221
Mercury	mg/kg	0.0548	0.0475	0.0853
Nickel	mg/kg	<0.980	<0.988	<0.994
Selenium	mg/kg	<0.436	<0.439	<0.442
Silver	mg/kg	<0.0812	<0.0818	<0.0823
Thallium	mg/kg	<0.495	<0.499	<0.502
Ash Content	mg/kg	976	985	1,140
Density	g/cm3	0.838	0.839	0.84
Gross Calorific Value	Btu/lb	18,700	19,300	19,300
Kinematic Viscosity	cSt	3.66	3.61	3.6
Percent Water	%	0.81	0.715	0.455
Total Chlorine	mg/kg	495	456	348
Antimony	mg/kg	<0.337	<0.339	<0.341

5.1.2 Analytical Results for Solid Waste Streams

The liquid waste samples were analyzed for the following:

- Metals (Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, and Tl);
- Ash;
- Density;
- Calorific Value;
- Moisture; and
- Chlorine.

Analytical results for Regular (Bulk) Solids to the Kiln are shown in Table 5-6.

5.2 Constituent Feedrates

Feedrates have been calculated for selected constituents using waste stream analytical results, shown in Section 5.1 and waste feedrates monitored and recorded by the DCS and shown in Table 3-3 during the stack sampling for particulate matter, HCl/Cl_2, and metals, and the metals spiking rates shown in Table 3-5.

Constituent feedrates have been calculated for:

- Individual metals (Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, and Tl);
- Low Volatility Metals (As, Be, and Cr) of the HWC MACT – both total and pumpable;
- SemiVolatile Metals (Cd and Pb);
- Chlorine; and
- Ash to SCC.

Feedrates of the above constituents presented in this revised CPT/RCRA/Air Test Report are based on waste feedrates and spiking rates over the periods of time that sampling was performed for particulate matter, HCl and Cl_2, and metals in the three runs of the test. These waste feedrates are shown in Table 3-2.

5.2.1 Feedrates of Metals

The feedrates of individual metals determined during the CPT/RCRA/Air Test are presented in Table 5-7. Feedrates of metals are shown according to limits in Table V.H.3.b. of the RCRA permit.

Feedrates of metals for Run 1, Run 2, and Run 3 are presented in Tables 5-8, 5-9, and 5-10, respectively. These tables include the waste feedrates, waste stream concentrations, and spiking rates used to calculate metals feedrates.

5.2.2 Feedrates of LVM, SVM, and Mercury

Feedrates of metals grouped according to the categories of metals in the HWC MACT measured during the CPT/RCRA/Air Test are presented in Table 5-11.

Table 5-6. Analytical Results of Regular (Bulk) Solids to the Kiln

		Run 1	Run 2	Run 3
Parameter	Units	VPA-SM-11-MTLS	VPA-SM-12-MTLS	VPA-SM-13-MTLS
Antimony	mg/kg	<0.341	<0.341	<0.3365
Arsenic	mg/kg	1.87	1.96	2.145
Barium	mg/kg	22.2	22.55	19.75
Beryllium	mg/kg	0.202	0.224	0.215
Cadmium	mg/kg	<0.0200	<0.02005	<0.0198
Chromium	mg/kg	4.49	5.175	5.715
Lead	mg/kg	3.51	3.7	4.135
Nickel	mg/kg	1.76	2.32	1.965
Selenium	mg/kg	0.507	0.5345	0.509
Silver	mg/kg	<0.0822	<0.08225	<0.0812
Thallium	mg/kg	<0.501	<0.5015	<0.495
Ash Content	mg/kg	851,000	856,000	857,000
Gross Calorific Value	Btu/lb	<333	<334.5	<349
Total Chlorine	mg/kg	170	180.5	197

Table 5-7. Feedrates of Metals

	Metals Feedrate (lb/hr)			
Analyte	Run 1	Run 2	Run 3	Average
Antimony	0.0066	0.0074	0.0082	0.0074
Arsenic (Total)	3.3757	3.1860	3.3959	3.3192
Arsenic (Pumpable)	0.2525	0.2548	0.2560	0.2544
Barium (Total)	0.2907	0.3722	0.3809	0.3480
Barium (Pumpable)	0.0160	0.0135	0.0130	0.0142
Beryllium (Total)	0.0030	0.0041	0.0046	0.0039
Beryllium (Pumpable)	0.0005	0.0006	0.0006	0.0006
Cadmium	0.0004	0.0004	0.0005	0.0005
Chromium	12.0981	12.2228	12.5367	12.2858
Lead (Total)	52.4467	48.1619	50.2803	50.2963
Lead (Pumpable)	0.0033	0.0030	0.0032	0.0032
Mercury	0.0534	0.2053	0.1970	0.1519
Nickel (Total)	0.0348	0.0506	0.0512	0.0455
Nickel (Solids)	0.0218	0.0369	0.0366	0.0318
Nickel (Pumpable)	0.0130	0.0137	0.0146	0.0138
Selenium	0.0121	0.0146	0.0160	0.0142
Silver	0.0016	0.0018	0.0020	0.0018
Thallium	0.0097	0.0109	0.0120	0.0109

Table 5-8. Metals Feedrates – Run 1

	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Thallium
Arsenic spiking, solution (lb/hr)	--	0.2487	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solution (lb/hr)	--	--	--	--	--	1.9389	--	--	--	--	--	--
Mercury spiking, solution (lb/hr)	--	--	--	--	--	--	--	0.0512	--	--	--	--
Energetic Liquid Waste to SCC												
Feedrate (lb/hr)[1]						**2,130**						
Metal Concentration (mg/kg)	<0.337	<0.287	2.61	<0.0396	0.0386	0.303	0.283	0.0548	<0.980	<0.436	<0.0812	<0.495
Metal Feedrate (lb/hr)	0.00036	0.00031	0.00556	0.00004	0.00008	0.00065	0.00060	0.00012	0.00104	0.00046	0.00009	0.00053
Aqueous Waste to SCC - BE Direct Feed												
Feedrate (lb/hr)[1]						**1,460**						
Metal Concentration (mg/kg)	<0.340	<0.290	<0.390	<0.0400	<0.0200	<0.210	<0.220	0.0626	<0.990	<0.440	<0.0820	<0.500
Metal Feedrate (lb/hr)	0.00025	0.00021	0.00028	0.00003	0.00001	0.00015	0.00016	0.00009	0.00072	0.00032	0.00006	0.00037
Kiln Direct Feed (Waste Feed Chlorine)												
Feedrate (lb/hr)[1]						**3,728**						
Metal Concentration (mg/kg)	<0.339	<0.289	<0.389	<0.0399	<0.0200	<0.210	<0.220	<0.00993	<0.988	<0.439	<0.0818	<0.499
Metal Feedrate (lb/hr)	0.00063	0.00054	0.00073	0.00007	0.00004	0.00039	0.00041	0.00002	0.00184	0.00082	0.00015	0.00093
Energetic Liquid Waste to Kiln												
Feedrate (lb/hr)[1]						**2,612**						
Metal Concentration (mg/kg)	<0.337	<0.287	1.01	<0.0396	<0.0198	0.269	<0.218	0.0589	<0.980	<0.436	<0.0812	<0.495
Metal Feedrate (lb/hr)	0.00044	0.00037	0.00264	0.00005	0.00003	0.00070	0.00028	0.00015	0.00128	0.00057	0.00011	0.00065
Aqueous Waste to Kiln												
Feedrate (lb/hr)[1]						**16,908**						
Metal Concentration (mg/kg)	<0.331	<0.282	0.403	<0.0389	<0.0195	<0.204	<0.214	0.108	<0.963	<0.428	<0.0798	<0.486
Metal Feedrate (lb/hr)	0.00280	0.00238	0.00681	0.00033	0.00016	0.00172	0.00181	0.00183	0.00814	0.00362	0.00067	0.00411
Arsenic spiking, solid (lb/hr)	--	3.10	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solid (lb/hr)	--	--	--	--	--	10.10	--	--	--	--	--	--
Lead spiking, solid (lb/hr)	--	--	--	--	--	--	52.40	--	--	--	--	--
Regular (Bulk) Solids to the Kiln												
Feedrate (lb/hr)[1]						**12,373**						
Metal Concentration (mg/kg)	<0.341	1.87	22.2	0.202	<0.0200	4.49	3.51	0	1.76	0.507	<0.0822	<0.501
Metal Feedrate (lb/hr)	0.00211	0.02314	0.27468	0.00250	0.00012	0.05555	0.04343	0.00000	0.02178	0.00627	0.00051	0.00310
Total Metals Feedrate (lb/hr)	**0.0066**	**3.3757**	**0.2907**	**0.0030**	**0.0004**	**12.0981**	**52.4467**	**0.0534**	**0.0348**	**0.0121**	**0.0016**	**0.0097**

[1]Waste feedrates are the average HRA during stack sampling for metals for the run

Table 5-9. Metals Feedrates – Run 2

	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Thallium
Arsenic spiking, solution (lb/hr)	--	0.2508	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solution (lb/hr)	--	--	--	--	--	2.0364	--	--	--	--	--	--
Mercury spiking, solution (lb/hr)	--	--	--	--	--	--	--	0.2031	--	--	--	--
Energetic Liquid Waste to SCC												
Feedrate (lb/hr)[1]						**2,150**						
Metal Concentration (mg/kg)	<0.339	<0.289	0.739	<0.0399	<0.0200	<0.210	<0.220	0.0475	<0.988	<0.439	<0.0818	<0.499
Metal Feedrate (lb/hr)	0.00036	0.00031	0.00159	0.00004	0.00002	0.00023	0.00024	0.00010	0.00106	0.00047	0.00009	0.00054
Aqueous Waste to SCC - BE Direct Feed												
Feedrate (lb/hr)[1]						**2,165**						
Metal Concentration (mg/kg)	<0.343	<0.293	<0.394	<0.0404	<0.0202	<0.212	<0.222	0.0985	<1.00	<0.444	<0.0828	<0.505
Metal Feedrate (lb/hr)	0.00037	0.00032	0.00043	0.00004	0.00002	0.00023	0.00024	0.00021	0.00108	0.00048	0.00009	0.00055
Kiln Direct Feed (Waste Feed Chlorine)												
Feedrate (lb/hr)[1]						**4,382**						
Metal Concentration (mg/kg)	<0.341	<0.291	<0.392	<0.0402	<0.0201	<0.211	<0.221	<0.0102	<0.994	<0.442	<0.0823	<0.502
Metal Feedrate (lb/hr)	0.00075	0.00064	0.00086	0.00009	0.00004	0.00046	0.00048	0.00002	0.00218	0.00097	0.00018	0.00110
Energetic Liquid Waste to Kiln												
Feedrate (lb/hr)[1]						**2,673**						
Metal Concentration (mg/kg)	<0.346	<0.295	1.2	<0.0407	<0.0203	0.529	<0.224	0.0495	<1.01	<0.447	<0.0833	<0.508
Metal Feedrate (lb/hr)	0.00046	0.00039	0.00321	0.00005	0.00003	0.00141	0.00030	0.00013	0.00135	0.00060	0.00011	0.00068
Aqueous Waste to Kiln												
Feedrate (lb/hr)[1]						**16,528**						
Metal Concentration (mg/kg)	<0.334	<0.285	0.45	<0.0393	<0.0196	<0.206	<0.216	0.103	<0.972	<0.432	<0.0806	<0.491
Metal Feedrate (lb/hr)	0.00276	0.00236	0.00744	0.00032	0.00016	0.00170	0.00178	0.00170	0.00803	0.00357	0.00067	0.00406
Arsenic spiking, solid (lb/hr)	--	2.90	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solid (lb/hr)	--	--	--	--	--	10.10	--	--	--	--	--	--
Lead spiking, solid (lb/hr)	--	--	--	--	--	--	48.10	--	--	--	--	--
Regular (Bulk) Solids to the Kiln												
Feedrate (lb/hr)[1]						**15,908**						
Metal Concentration (mg/kg)	<0.341	1.96	22.55	0.224	<0.02005	5.175	3.7	0	2.32	0.5345	<0.08225	<0.5015
Metal Feedrate (lb/hr)	0.00271	0.03118	0.35872	0.00356	0.00016	0.08232	0.05886	0.00000	0.03691	0.00850	0.00065	0.00399
Total Metals Feedrate (lb/hr)	**0.0074**	**3.1860**	**0.3722**	**0.0041**	**0.0004**	**12.2228**	**48.1619**	**0.2053**	**0.0506**	**0.0146**	**0.0018**	**0.0109**

[1]Waste feedrates are the average HRA during stack sampling for metals for the run

Table 5-10. Metals Feedrates – Run 3

	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Thallium
Arsenic spiking, solution (lb/hr)	--	0.2517	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solution (lb/hr)	--	--	--	--	--	2.0262	--	--	--	--	--	--
Mercury spiking, solution (lb/hr)	--	--	--	--	--	--	--	0.1943	--	--	--	--
Energetic Liquid Waste to SCC												
Feedrate (lb/hr)[1]						**2,200**						
Metal Concentration (mg/kg)	<0.341	<0.291	0.72	<0.0402	<0.0201	<0.211	<0.221	0.0853	<0.994	<0.442	<0.0823	<0.502
Metal Feedrate (lb/hr)	0.00038	0.00032	0.00158	0.00004	0.00002	0.00023	0.00024	0.00019	0.00109	0.00049	0.00009	0.00055
Aqueous Waste to SCC - BE Direct Feed												
Feedrate (lb/hr)[1]						**2,154**						
Metal Concentration (mg/kg)	<0.342	<0.292	<0.392	<0.0402	<0.0201	<0.211	<0.221	0.0548	<0.996	<0.443	<0.0825	<0.503
Metal Feedrate (lb/hr)	0.00037	0.00031	0.00042	0.00004	0.00002	0.00023	0.00024	0.00012	0.00107	0.00048	0.00009	0.00054
Kiln Direct Feed (Waste Feed Chlorine)												
Feedrate (lb/hr)[1]						**4,816**						
Metal Concentration (mg/kg)	<0.335	<0.286	<0.385	<0.0394	<0.0197	<0.207	<0.217	0.0836	<0.976	<0.434	<0.0809	<0.493
Metal Feedrate (lb/hr)	0.00081	0.00069	0.00093	0.00009	0.00005	0.00050	0.00052	0.00040	0.00235	0.00105	0.00019	0.00119
Energetic Liquid Waste to Kiln												
Feedrate (lb/hr)[1]						**2,618**						
Metal Concentration (mg/kg)	<0.343	<0.292	0.887	<0.0403	<0.0202	0.456	<0.222	0.0542	<0.998	<0.444	<0.0827	<0.504
Metal Feedrate (lb/hr)	0.00045	0.00038	0.00232	0.00005	0.00003	0.00119	0.00029	0.00014	0.00131	0.00058	0.00011	0.00066
Aqueous Waste to Kiln												
Feedrate (lb/hr)[1]						**17,673**						
Metal Concentration (mg/kg)	<0.342	<0.292	0.438	<0.0402	<0.0201	<0.211	<0.221	0.102	<0.996	<0.443	<0.0825	<0.503
Metal Feedrate (lb/hr)	0.00302	0.00258	0.00774	0.00036	0.00018	0.00186	0.00195	0.00180	0.00880	0.00391	0.00073	0.00444
Arsenic spiking, solid (lb/hr)	--	3.10	--	--	--	--	--	--	--	--	--	--
Chromium spiking, solid (lb/hr)	--	--	--	--	--	10.40	--	--	--	--	--	--
Lead spiking, solid (lb/hr)	--	--	--	--	--	--	50.20	--	--	--	--	--
Regular (Bulk) Solids to the Kiln												
Feedrate (lb/hr)[1]						**18,630**						
Metal Concentration (mg/kg)	<0.3365	2.145	19.75	0.215	<0.0198	5.715	4.135	0	1.965	0.509	<0.0812	<0.495
Metal Feedrate (lb/hr)	0.00313	0.03996	0.36794	0.00401	0.00018	0.10647	0.07703	0.00000	0.03661	0.00948	0.00076	0.00461
Total Metals Feedrate (lb/hr)	**0.0082**	**3.3959**	**0.3809**	**0.0046**	**0.0005**	**12.5367**	**50.2803**	**0.1970**	**0.0512**	**0.0160**	**0.0020**	**0.0120**

[1]Waste feedrates are the average HRA during stack sampling for metals for the run

Table 5-11. Feedrates of HWC MACT Metals

	Metals Feedrate (lb/hr)			
Analyte	Run 1	Run 2	Run 3	Average
Arsenic (Total)	3.38	3.19	3.40	3.32
Beryllium (Total)	0.00	0.00	0.00	0.00
Chromium (Total)	12.10	12.22	12.54	12.29
Total LVM (Arsenic, Beryllium, Chromium)	15.48	15.41	15.94	15.61
Arsenic (Pumpable)	0.25	0.25	0.26	0.25
Beryllium (Pumpable)	0.00	0.00	0.00	0.00
Chromium (Pumpable)	1.94	2.04	2.03	2.00
Pumpable LVM (Arsenic, Beryllium, Chromium)	2.20	2.30	2.29	2.26
Cadmium	0.00	0.00	0.00	0.00
Lead	52.45	48.16	50.28	50.30
Total SVM (Cadmium, Lead)	52.45	48.16	50.28	50.30
Mercury	0.053	0.205	0.197	0.152

5.2.3 Feedrate of Chlorine

The feedrate of chlorine measured during the CPT/RCRA/Air Test is presented in Table 5-12. Waste feedrates used to calculate the feedrate of chlorine are from the periods of time that sampling was performed for HCl and Cl2 along with SVM and LMV.

Table 5-12. Feedrate of Chlorine

	Run 1	Run 2	Run 3
Energetic Liquid Waste to SCC			
Feedrate (lb/hr)[1]	***2,130***	***2,150***	***2,200***
Chlorine Concentration (mg/kg)	495	456	348
Chlorine Feedrate (lb/hr)	***1.1***	***1.0***	***0.8***
Aqueous Waste to SCC - BE Direct Feed			
Feedrate (lb/hr)[1]	***1,460***	***2,165***	***2,154***
Chlorine Concentration (mg/kg)	735,000	801,000	755,000
Chlorine Feedrate (lb/hr)	***1,073.2***	***1,734.5***	***1,626.6***
Kiln Direct Feed (Waste Feed Chlorine)			
Feedrate (lb/hr)[1]	***3,728***	***4,382***	***4,816***
Chlorine Concentration (mg/kg)	772,000	768,000	815,000
Chlorine Feedrate (lb/hr)	***2,877.9***	***3,365.5***	***3,924.9***
Energetic Liquid Waste to Kiln			
Feedrate (lb/hr)[1]	***2,612***	***2,673***	***2,618***
Chlorine Concentration (mg/kg)	343	382	339
Chlorine Feedrate (lb/hr)	***0.9***	***1.0***	***0.9***
Aqueous Waste to Kiln			
Feedrate (lb/hr)[1]	***16,908***	***16,528***	***17,673***
Chlorine Concentration (mg/kg)	1,000	956	894
Chlorine Feedrate (lb/hr)	***16.9080***	***15.8005***	***15.7993***
Regular (Bulk) Solids to the Kiln			
Feedrate (lb/hr)[1]	***12,373***	***15,908***	***18,630***
Chlorine Concentration (mg/kg)	170.0	180.5	197.0
Chlorine Feedrate (lb/hr)	***2.1***	***2.9***	***3.7***
Chlorine Feedrate (lb/hr)	***3972.1***	***5120.6***	***5572.6***
Average Chlorine Feedrate (lb/hr)		***4,888.4***	

[1]Waste feedrates are the average HRA during stack sampling for metals, HCl, and CL2 for the run

5.2.4 Feedrate of Ash to SCC

The RCRA permit has a limit for the feedrate of *Ash to Afterburner.* The limit for *Ash to Afterburner* is a legacy of previous permitting of the incinerator. Under the HWC MACT, there is no OPL for the feedrate of ash to the incinerator. An Alternative Monitoring Application (AMA) was approved by TCEQ on October 20, 2005 stating "Onyx (now Veolia) has provided sufficient documentation that neither the ash feedrate limit nor an alternative operating parameter limit is needed to ensure compliance with the emission standard for particulate matter". The feedrate of *Ash to Afterburner* (i.e., Ash to SCC) is presented in Table 5-13. Waste feedrates used to calculate the feedrate of ash to the afterburner are from the periods of time that sampling was performed for particulate matter.

Table 5-13. Feedrate of Ash to SCC

	Run 1	Run 2	Run 3
Energetic Liquid Waste to SCC			
Feedrate (lb/hr)[1]	***2,130***	***2,150***	***2,200***
Ash Concentration (mg/kg)	976	985	1,140
Ash Feedrate (lb/hr)	***2.1***	***2.1***	***2.5***
Aqueous Waste to SCC - BE Direct Feed			
Feedrate (lb/hr)[1]	***1,460***	***2,165***	***2,154***
Ash Concentration (mg/kg)	<93.5	132	193
Ash Feedrate (lb/hr)	***0.1***	***0.3***	***0.4***
Ash Feedrate to SCC (lb/hr)	***2.1***	***2.4***	***2.9***
Average Ash Feedrate to SCC (lb/hr)		***2.5***	

1 Waste feedrates are the average HRA for the run.

5.3 Stack Gas

Table 5-14 presents the HWC MACT standards for existing hazardous waste incinerators from §63.1219 applicable to the incinerator at Veolia's Port Arthur facility.

Samples of stack gas were collected for determination of the following parameters:

- Dioxins/Furans;
- Metals;
- HCl, Cl2, HF
- Particulate matter;
- Hexavalent chromium; and
- PCBs.

Compliance with the DRE standard is demonstrated using data in lieu of (DILO) from the 2006 CPT. See Section 3.6.

Table 5-14. Applicable HWC MACT Standards

HAP or HAP Surrogate	Final Replacement Standards
Destruction and Removal Efficiency	99.99%
Dioxins/Furans	0.40 ng TEQ/dscm if Temp. < 400 oF, at 7% O_2[1,2]
Particulate Matter	0.013 gr/dscf, at 7% O_2
Mercury	130 µg/dscm, at 7% O_2
SVM (Semivolatile metals, Cd, Pb)	230 µg/dscm, at 7% O_2
LVM (Low volatility Metals, As, Be, Cr)	92 µg/dscm, at 7% O_2
HCl/Cl_2	32 ppmv, dry, at 7% O_2, as chloride equivalents.
CO	100 ppmv, dry, at 7% O_2
Hydrocarbons	10 ppmv, dry, at 7% O_2

1 Toxicity Equivalents – relating the relative concentrations and toxicity of the dioxin and furan congeners and isomers to the toxicity of 2,3,7,8 tetrachlorodibenzodioxin.

2 For purposes of compliance, operation of the wet particulate control device meets the 400 oF or lower requirement.

5.3.1 Dioxins/Furans in Stack Gas

Stack gas samples for determination of dioxins/furans were collected using SW-846 Method 0023A and were analyzed using SW-846 Method 8290, high resolution gas chromatography (HRGC) with high resolution mass spectroscopy (HRMS) analytical technique. Components recovered from the train were combined as follows:

The sampling train was recovered to provide the following fractions:

- Combined probe and nozzle rinse with acetone, dichloromethane, and toluene (PNR);
- Filter (FILT);
- Condenser rinse with acetone, dichloromethane, and toluene (CR); and
- XAD sorbent (XAD).

After sample cleanup and concentration procedures at the analytical laboratory, an aliquot of the front-half extracts (i.e., PNR and filter) was combined and analyzed using SW-846 Method 8290 for dioxins/furans separate from the back-half components (i.e., condenser rinses, XAD sorbent).

The results of the measurement of dioxins/furans in the stack gas are presented in Table 5-15.

The detailed analytical results for the dioxins/furans analyses are included in Appendix 4-2. A field blank was collected and analyzed for dioxins/furans. The results for the field blank are discussed in Section 6.0.

While the HWC MACT standard for dioxins/furans is a concentration-based value, the Air permit for the Veolia Port Arthur facility has a limit for the mass emission rates of dioxins/ furans, individually. Tables 5-16 and 5-17 present mass emission rates (MERs) for dioxins/ furans, respectively.

5.3.2 Metals in Stack Gas

Metals were sampled in the stack gas using EPA Method 29. The samples were analyzed for 12 metals using ICPES according to Method 6010B of SW-846. Mercury analyses were performed by cold vapor atomic absorption spectroscopy according to Method 7470A of SW-846. Target analytes for Method 6010B are antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, and zinc.

The sampling trains were recovered to provide the following fractions:

- Probe and nozzle rinse with 0.1 N nitric acid (PNR);
- Filter (FILT);
- Content and rinse of the acidified peroxide impingers with 0.1 N nitric acid (NI);
- Contents and rinse of the empty impinger with 0.1 N nitric acid (EIR);
- Contents and rinse of the acidified permanganate impingers with deionized water, 0.1 N nitric acid, and permanganate solution (PERM); and
- Rinse of the permanganate impingers with hydrochloric acid (HCLRNS).

The analytical results for metals in the components of the Method 29 sampling trains are presented in Table 5-18. The detailed results for the metals analyses in stack gas are included in Appendix 4-3.

A field blank was collected and analyzed for metals and is discussed in Section 6.0.

Table 5-15. Results of Dioxins/Furans in Stack Gas

		Run 1			Run 2			Run 3		
Date Time		October 13, 2022 0900-1814			October 14, 2022 0750-1109			October 14, 2022 1325-1645		
Volume (dscf) Flow Rate (dscfm) Oxygen Concentration (%)		129.534 42,662 7.49			129.573 41,756 7.07			122.403 39,542 7.10		
Sample Fraction		PNR/Filter	XAD/Cond	Sum	PNR/Filter	XAD/Cond	Sum	PNR/Filter	XAD/Cond	Sum
Analyte	Toxicity Equivalent Factor [1]	Mass Found (pg) 2,3,4								
2,3,7,8-TCDD	1	<0.351	<0.775	<1.126	<0.176	<0.726	<0.902	<0.319	<0.948	<1.267
1,2,3,7,8-PeCDD	0.5	<0.0877	<0.228	<0.3157	<0.0557	<0.344	<0.3997	<0.0795	<0.233	<0.3125
1,2,3,4,7,8-HxCDD	0.1	<0.281	3.2	<3.481	<0.246	<0.398	<0.644	<0.457	4.22	<4.677
1,2,3,6,7,8-HxCDD	0.1	<0.287	1.49	<1.777	<0.252	1.61	<1.862	<0.466	2.05	<2.516
1,2,3,7,8,9-HxCDD	0.1	1.58	1.94	3.52	<0.248	2.28	<2.528	<0.459	2.8	<3.259
1,2,3,4,6,7,8-HpCDD	0.01	<0.161	<1.41	<1.571	<0.837	<2.52	<3.357	<2.63	<1.42	<4.05
OCDD	0.001	4.14	4.92	9.06	2.67	<0.526	<3.196	<0.553	<0.331	<0.884
2,3,7,8-TCDF	0.1	5.48	57.3	62.78	<0.279	61	<61.279	10.1	61.1	71.2
1,2,3,7,8-PeCDF	0.05	3.82	22	25.82	<0.218	22.8	<23.018	4.31	25.3	29.61
2,3,4,7,8-PeCDF	0.5	9.36	40.2	49.56	3.95	42.6	46.55	8.1	42.8	50.9
1,2,3,4,7,8-HxCDF	0.1	12.8	35.4	48.2	7.07	43	50.07	10.3	45.8	56.1
1,2,3,6,7,8-HxCDF	0.1	<0.425	12.6	<13.025	<0.381	13.7	<14.081	<0.594	14.8	<15.394
2,3,4,6,7,8-HxCDF	0.1	5.5	9.39	14.89	3.04	10.2	13.24	<0.649	10.4	<11.049
1,2,3,7,8,9-HxCDF	0.1	<0.504	<0.708	<1.212	<0.451	<0.743	<1.194	<0.704	<0.944	<1.648
1,2,3,4,6,7,8-HpCDF	0.01	11.2	14.8	26	6.13	19.8	25.93	10.1	19	29.1
1,2,3,4,7,8,9-HpCDF	0.01	<0.478	<0.527	<1.005	<0.489	<0.738	<1.227	<0.553	<0.393	<0.946
OCDF	0.001	4.95	6.24	11.19	<0.309	4.97	<5.279	5.22	4.86	10.08
	Total Toxicity Equivalents	7.5	33.5	41.0	3.0	35.8	38.9	6.4	37.0	43.4
	Concentration (ng TEQ/dscf)		0.000317			0.000300			0.000354	
	Concentration (ng TEQ/dscm)		0.0112			0.0106			0.0125	
	Concentration (ng TEQ/dscm @ 7% O_2)		0.0116			0.0106			0.0126	
	Average Concentration (ng TEQ/dscm @ 7% O_2)					**0.0116**				

1 Toxic Equivalency Factor (TEF) as developed in: ``Interim Procedure for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxin and -Dibenzofurans (CDDs and CDFs) and 1989 Update'', March 1989; Van den Berg, M., et al. ``Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife'' Environmental Health Perspectives, Volume 106, Number 12, December 1998., as directed by the Preamble to the HWC MACT.

2 Results followed by an "*" are Estimated Maximum Possible Concentrations (EMPCs).

3 In accordance with Section §1208(b)(1)(iii) of the HWC MACT, non-detects of dioxins/furans are assumed to be at zero concentrations.

4 In accordance with the USEPA Analytical Services Branch document National Functional Guidelines for Chlorinated Dibenzo–p–Dioxins and Chlorinated Dibenzofurans Data Review, EMPCs are not included in the calculation of TEFs.

Table 5-16. Mass Emission Rates of Dioxins

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1814**	**0750-1109**	**1325-1645**
Volume (dscf)	**129.534**	**129.573**	**122.403**
Flow Rate (dscfm)	**42,662**	**41,756**	**39,542**
Analyte		**Mass Found (pg)**	
2,3,7,8-TCDD	<1.126	<0.902	<1.267
1,2,3,7,8-PeCDD	<0.3157	<0.3997	<0.3125
1,2,3,4,7,8-HxCDD	<3.481	<0.644	<4.677
1,2,3,6,7,8-HxCDD	<1.777	<1.862	<2.516
1,2,3,7,8,9-HxCDD	3.52	<2.528	<3.259
1,2,3,4,6,7,8-HpCDD	<1.571	<3.357	<4.05
OCDD	9.06	<3.196	<0.884
Total Dioxins (pg)	<20.9	<12.9	<17.0
Total Dioxins Concentration (pg/dscf)	<0.161	<0.0995	<0.139
Total Dioxins Mass Emission Rate (lb/hr)	<9.08E-10	<5.49E-10	<7.25E-10
Average Total Dioxins Mass Emission Rate (lb/hr)		<7.28E-10	

Table 5-17. Mass Emission Rates of Furans

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1814**	**0750-1109**	**1325-1645**
Volume (dscf)	**129.534**	**129.573**	**122.403**
Flow Rate (dscfm)	**42,662**	**41,756**	**39,542**
Analyte		**Mass Found (pg)**	
2,3,7,8-TCDF	62.78	<61.279	71.2
1,2,3,7,8-PeCDF	25.82	<23.018	29.61
2,3,4,7,8-PeCDF	49.56	46.55	50.9
1,2,3,4,7,8-HxCDF	48.2	50.07	56.1
1,2,3,6,7,8-HxCDF	<13.025	<14.081	<15.394
2,3,4,6,7,8-HxCDF	14.89	13.24	<11.049
1,2,3,7,8,9-HxCDF	<1.212	<1.194	<1.648
1,2,3,4,6,7,8-HpCDF	26	25.93	29.1
1,2,3,4,7,8,9-HpCDF	<1.005	<1.227	<0.946
OCDF	11.19	<5.279	10.08
Total Dioxins (pg)	<254	<242	<276
Total Dioxins Concentration (pg/dscf)	<1.96	<1.87	<2.26
Total Dioxins Mass Emission Rate (lb/hr)	<1.11E-8	<1.03E-8	<1.18E-8
Average Total Dioxins Mass Emission Rate (lb/hr)		<1.11E-8	

Table 5-18. Analytical Results for Metals in Stack Gas

	PNR/ FILT (ug)	NI (ug)	EIR (ug)	Perm (ug)	HCIRns (ug)	Totals (ug)
Run 1						
Antimony	1.92	<0.84	--	--	--	<2.76
Arsenic	<2.67	<0.18	--	--	--	<2.85
Barium	4.25	1.57	--	--	--	5.82
Beryllium	<.016	<.047	--	--	--	<0.0630
Cadmium	<.28	<.018	--	--	--	<0.298
Chromium	4.8	0.734	--	--	--	5.53
Lead	<1.41	0.62	--	--	--	<2.03
Mercury	3.88	3.84	<0.12	0.587	55.6	<64.0
Nickel	3.48	<0.26	--	--	--	<3.74
Selenium	<1.98	<0.39	--	--	--	<2.37
Silver	<0.081	<0.11	--	--	--	<0.191
Thallium	<1.44	<0.34	--	--	--	<1.78
Run 2						
Antimony	1.9	<0.84	--	--	--	<2.74
Arsenic	<2.67	<0.18	--	--	--	<2.85
Barium	4	1.5	--	--	--	5.50
Beryllium	<0.016	<0.047	--	--	--	<0.0630
Cadmium	<0.28	<0.018	--	--	--	<0.298
Chromium	3.53	0.372	--	--	--	3.90
Lead	<1.41	<0.48	--	--	--	<1.89
Mercury	0.192	0.956	<0.12	0.0761	12	<13.3
Nickel	2.4	1.07	--	--	--	3.47
Selenium	<1.98	<0.39	--	--	--	<2.37
Silver	<0.081	<0.11	--	--	--	<0.191
Thallium	<1.44	<0.34	--	--	--	<1.78
Run 3						
Antimony	1.85	<0.84	--	--	--	<2.69
Arsenic	<2.67	<0.18	--	--	--	<2.85
Barium	4.32	1.86	--	--	--	6.18
Beryllium	<0.016	<0.047	--	--	--	<0.0630
Cadmium	<0.28	0.02	--	--	--	<0.300
Chromium	3.16	0.603	--	--	--	3.76
Lead	<1.41	0.594	--	--	--	<2.00
Mercury	0.606	0.674	<0.12	<0.0492	2.43	<3.88
Nickel	2.17	0.57	--	--	--	2.74
Selenium	<1.98	<0.39	--	--	--	<2.37
Silver	<0.081	<0.11	--	--	--	<0.191
Thallium	<1.44	<0.34	--	--	--	<1.78

Concentrations of metals in the stack gas are presented in Table 5-19. Table 5-19 presents the stack gas concentrations for the 12 individual metals measured during the CPT/RCRA/Air Test and for metals grouped according to the categories of the HWC MACT.

Emission limits for metals in the RCRA and Air permits are mass emission rates (i.e., lb/hr). Table 5-20 presents mass emission rates for the 13 metals measured during the CPT/RCRA/Air Test and for which there are limits in the RCRA and Air permits.

5.3.3 Hydrogen Chloride, Chlorine, and Hydrogen Fluoride in Stack Gas

Stack gas samples for determination of hydrogen chloride (HCl), chlorine, or free chlorine (Cl2), and hydrogen fluoride (HF) were collected according to EPA Method 26A in a sampling train combined with EPA Method 5. Samples were analyzed for chloride and fluoride using IC according to Method 26A. Each train was recovered into multiple components for analysis as follows:

- The two impingers of 0.1 N sulfuric acid; and
- The two impingers of 0.1 N sodium hydroxide.

HCl is determined in the acidic impingers, and Cl_2 is determined in the alkaline impingers. Both the acidic and alkaline impingers were analyzed for HF.

A field blank was collected and analyzed for chloride and fluoride and is discussed in Section 6.0. The detailed analytical results for the determination of HCl, Cl_2, and HF are included in Appendix 4-4.

Concentrations of HCl, Cl2, and HF in the stack gas are presented in Table 5-21. Table 5-20 also presents the HCl and Cl2 results in the units of the HWC MACT limit for HCl and Cl_2, ppmv as chloride equivalents (Cl-).

The RCRA and Air permits have limits for hydrogen Chloride (HCl) and free chlorine (Cl) as mass emission rates (i.e., lb/hr), and the Air permit has a limit for hydrogen fluoride (HF) as a mass emission rate (i.e., lb/hr). Table 5-21 presents mass emission rates for HCl, Cl_2, and HF.

Table 5-19. Results for Metals in Stack Gas

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1730**	**0750-1005**	**1325-1540**
Volume Collected (dscf)	**90.210**	**89.416**	**88.572**
Stack Gas Flowrate (dscfm)	**41,119**	**40,621**	**40,180**
Oxygen Concentration (%)	**7.49**	**7.07**	**7.10**
Analyte		**Mass Found (ug)**	
Antimony	<2.76	<2.74	<2.69
Arsenic	<2.85	<2.85	<2.85
Barium	5.82	5.50	6.18
Beryllium	<0.0630	<0.0630	<0.0630
Cadmium	<0.298	<0.298	<0.300
Chromium	5.53	3.90	3.76
Lead	<2.03	<1.89	<2.00
Mercury	<64.0	<13.3	<3.88
Nickel	<3.74	3.47	2.74
Selenium	<2.37	<2.37	<2.37
Silver	<0.191	<0.191	<0.191
Thallium	<1.78	<1.78	<1.78
Stack Gas Concentration (ug/dscf)			
Antimony	<0.031	<0.031	<0.030
Arsenic	<0.032	<0.032	<0.032
Barium	0.0645	0.0615	0.0698
Beryllium	<0.00070	<0.00070	<0.00071
Cadmium	<0.0033	<0.0033	<0.0034
Chromium	0.0613	0.0436	0.0425
Lead	<0.023	<0.021	<0.023
Mercury	<0.71	<0.15	<0.044
Nickel	<0.041	0.0388	0.0309
Selenium	<0.026	<0.027	<0.027
Silver	<0.0021	<0.0021	<0.0022
Thallium	<0.020	<0.020	<0.020
Stack Gas Concentration (ug/dscm, corrected to 7% O_2)			
Arsenic	<1.2	<1.1	<1.1
Beryllium	<0.026	<0.025	<0.025
Chromium	2.24	1.55	1.51
LVM (Arsenic, Beryllium, Chromium)	**<3.4**	**<2.7**	**<2.7**
Average LVM (Arsenic, Beryllium, Chromium)		**<2.9**	
Cadmium	<0.12	<0.12	<0.12
Lead	<0.82	<0.75	<0.80
SVM (Cadmium & Lead)	**<0.94**	**<0.87**	**<0.93**
Average SVM (Cadmium & Lead)		**<0.91**	
Mercury	<26	<5.3	<1.6
Average Mercury		**<11**	

Table 5-20. Mass Emission Rates of Metals

	Mass Emission Rate (lb/hr)			Average
Antimony	<0.00017	<0.00016	<0.00016	<0.00016
Arsenic	<0.00017	<0.00017	<0.00017	<0.00017
Barium	0.000351	0.000331	0.000371	0.000351
Beryllium	<0.0000038	<0.0000038	<0.0000038	<0.0000038
Cadmium	<0.000018	<0.000018	<0.000018	<0.000018
Chromium	0.000334	0.000234	0.000226	0.000265
Lead	<0.00012	<0.00011	<0.00012	<0.00012
Mercury	<0.0039	<0.00080	<0.00023	<0.0016
Nickel	<0.00023	0.000209	0.000164	0.000199
Selenium	<0.00014	<0.00014	<0.00014	<0.00014
Silver	<0.000012	<0.000011	<0.000011	<0.000011
Thallium	<0.00011	<0.00011	<0.00011	<0.00011

Table 5-21. Results for HCl, Cl_2, and HF in Stack Gas

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1730**	**0750-1005**	**1325-1540**
Volume (dscf)	**81.778**	**74.350**	**81.640**
Flow Rate (dscfm)	**39,144**	**36,144**	**37,548**
Oxygen (%)	**7.49**	**7.07**	**7.10**
Mass Found (ug)			
Hydrogen Chloride - Acid Imp	166	163	265
Chlorine – Caustic Imp	152	225	249
Hydrogen Fluoride	<47.5	<47.5	<43.9
Concentration (mg/dscf)			
Hydrogen Chloride	0.00203	0.00219	0.00325
Chlorine	0.00186	0.00303	0.00305
Hydrogen Fluoride	<0.00058	<0.00064	<0.00054
Concentration (chloride equivalents ppmvd)			
Hydrogen Chloride	0.0458	0.0495	0.0733
Chlorine	0.0444	0.0722	0.0728
Total	0.0902	0.122	0.146
Concentration (ppmvd, corrected to 7% O2)			
Chloride Equivalents	0.0935	0.122	0.147
Average Concentration (Chloride Equivalents, ppmvd, corrected to 7% O2)		**0.121**	
Mass Emission Rates (lb/hr)			
Hydrogen Chloride	0.0105	0.0105	0.0161
Average Emission Rate (Hydrogen Chloride, lb/hr)		**0.0124**	
Free Chlorine	0.00962	0.0145	0.0151
Average Emission Rate (Free Chlorine, lb/hr)		**0.0131**	
Hydrogen Fluoride	<0.0030	<0.0031	<0.0027
Average Emission Rate (Hydrogen Fluoride, lb/hr)		**<0.0029**	

5.3.4 Particulate Matter in Stack Gas

Stack gas samples for determination of particulate matter were collected in accordance with EPA Method 5 in a sampling train combined with EPA Method 26A. These samples were analyzed gravimetrically for particulate matter according to Method 5. The components of the sampling train recovered and analyzed for particulate matter were:

- An acetone rinse of the probe and nozzle (PNR); and
- Filter (FILT).

A field blank was collected and analyzed for dioxins/furans. The results for the field blank are discussed in Section 6.0. The detailed analytical results for the determination of particulate matter are included in Appendix 4-4.

Results for particulate matter in the stack gas are presented in Table 5-22. The Air permit has a limit as a mass emission rate for particulate matter. Table 5-22 also presents mass emission rates for particulate matter.

Table 5-22. Results for Particulate Matter in Stack Gas

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1730**	**0750-1005**	**1325-1540**
Volume Collected (dscf)	**81.778**	**74.350**	**81.640**
Flow Rate (dscfm)	**39,144**	**36,144**	**37,548**
Oxygen Concentration (%)	**7.49**	**7.07**	**7.10**
Mass Found (mg)			
PM - Filter	<0.5	<0.5	<0.5
PM - PNR	1.05	0.61	<0.5
Particulate Matter - Total	<1.55	<1.11	<1.00
Stack Gas Concentration (mg/dscf)			
Particulate Matter	<0.0190	<0.0149	<0.0122
Stack Gas Concentration (gr/dscf)			
Particulate Matter	<0.00029	<0.00023	<0.00019
Stack Gas Concentration (gr/dscf, 7% O_2)			
Particulate Matter	<0.00030	<0.00023	<0.00019
Average Particulate Matter		**<0.00024**	
Mass Emission Rate (lb/hr)			
Particulate Matter	<0.0981	<0.0711	<0.0608
Average Particulate Matter		**<0.077**	

5.3.5 Hexavalent Chromium in Stack Gas

Stack gas samples for determination of hexavalent chromium (Cr VI) were collected in a sampling train according to SW-846 Method 0061. These samples were analyzed for hexavalent chromium according to SW-846 Method 7199. Each sampling train was recovered into one fraction as follows:

- Complete train rinse with deionized water (from nozzle to last impinger), and
- Impinger contents (IMP/RNS).

The RCRA and Air permits have a limit as a mass emission rate for hexavalent chromium. The results for hexavalent chromium are presented in Table 5-23.

The detailed analytical results for the hexavalent chromium are included in Appendix 4-5. A field blank was collected and analyzed for hexavalent chromium. The results for the field blank are discussed in Section 6.0.

5.3.6 PCBs in Stack Gas

Stack gas samples for determination of polychlorinated biphenyls (PCBs) were collected using EPA Method 0023A, and analyzed by EPA Method 1668A, a high-resolution GC/MS technique. Individual components recovered from the train (probe and nozzle rinse, filter, condenser rinse, and XAD sorbent) were extracted individually and combined prior to analysis.

Results for PCBs results are presented in Table 5-24 by degree of chlorine substitution, or congener class. The detailed analytical results for the PCBs analyses are in Appendix 4-6.

A field blank was collected and analyzed for PCBs. The results for the field blank are discussed in Section 6.0.

Table 5-23. Results for Hexavalent Chromium in Stack Gas

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0930-1744**	**0820-1039**	**1355-1615**
Volume Collected (dscf)	**90.053**	**91.959**	**91.592**
Flow Rate (dscfm)	**42,291**	**42,648**	**42,616**
Mass Found (ug)			
Hexavalent Chromium	0.709	0.390	0.375
Stack Gas Concentration (ug/dscf)			
Hexavalent Chromium	0.00787	0.00424	0.00409
Average Hexavalent Chromium		**<0.0054**	
Mass Emission Rate (lb/hr)			
Hexavalent Chromium	0.0000440	0.0000239	0.0000231
Average Hexavalent Chromium		**0.000030**	

Table 5-24. Results for PCBs in Stack Gas

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1814**	**0750-1109**	**1325-1645**
Volume Collected (dscf)	**129.534**	**129.573**	**122.403**
Stack Gas Flowrate (dscfm)	**42,662**	**41,756**	**39,542**
Analyte		**Mass Found (ng) 1,2**	
Monochlorobiphenyl	0.0150 *	0.0376 *	0.0754 *
Dichlorobiphenyl	0.0393 *	0.0334 *	0.0795 *
Trichlorobiphenyl	0.0303 *	0.0264 *	0.0277 *
Tetrachlorobiphenyl	0.0247 *	0.0279 *	0.0200 *
Pentachlorobiphenyl	0.0271 *	0.0385 *	0.0246 *
Hexachlorobiphenyl	0.0148 *	0.0251 *	0.0132 *
Heptachlorobiphenyl	0.0041 *	0.0091 *	0.0070 *
Octachlorobiphenyl	<0.00740	<0.01000	<0.00790
Nonachlorobiphenyl	<0.03520	<0.08090	<0.07430
Decachlorobiphenyl	0.0068 *	<0.00440	0.0037 *
Analyte		**Concentration (ng/dscf)**	
Monochlorobiphenyl	0.00000	0.00000	0.00000
Dichlorobiphenyl	0.00000	0.00000	0.00000
Trichlorobiphenyl	0.00000	0.00000	0.00000
Tetrachlorobiphenyl	0.00000	0.00000	0.00000
Pentachlorobiphenyl	0.00000	0.00000	0.00000
Hexachlorobiphenyl	0.00000	0.00000	0.00000
Heptachlorobiphenyl	0.00000	0.00000	0.00000
Octachlorobiphenyl	0.00006	0.00008	0.00006
Nonachlorobiphenyl	0.00027	0.00062	0.00057
Decachlorobiphenyl	0.00000	0.00003	0.00000
Total PCB Concentration (ng/dscf)	<0.00033	<0.00074	<0.00063
Mass Emission Rate (lb/hr)	<0.0000000019	<0.0000000041	<0.0000000033

1 Results followed by an "*" are Estimated Maximum Possible Concentrations (EMPCs).
2 In accordance with the USEPA Analytical Services Branch document National Functional Guidelines for Chlorinated Dibenzo–p–Dioxins and Chlorinated Dibenzofurans Data Review, EMPCs are not included in the calculation of TEFs.

5.3.7 Carbon Monoxide and Oxygen in Stack Gas

Concentrations of carbon monoxide (CO) and oxygen (O_2) are monitored continuously by Veolia using certified continuous emission monitoring systems (CEMS). The instantaneously monitored results are used to calculate one-minute averages that are used to calculate hourly rolling averages. The CO results are corrected to 7% O_2. Results are presented in Table 3-1 - Process Data.

Table 5-25 presents the results of continuous monitoring for carbon monoxide, corrected to 7% O2. One-minute averages for CO and O2 are presented in Appendix 2-4.

The Air permit has a limit as a mass emission rate for CO that is also shown in Table 5-25.

Table 5-25. Results for CO in Stack Gas

	Run 1	Run 2	Run 3
Date **Time**	**October 13, 2022** **0900-1815**	**October 14, 2022** **0750-1109**	**October 14, 2022** **1325-1645**
Flowrate (dscfm) 1 **O_2 (%)**	**43,003** **7.49**	**41,931** **7.07**	**39,792** **7.10**
CO (ppmvd, at 7% O_2)	0.77	1.01	0.95
Average CO (ppmvd, at 7% O_2)		0.9	
CO (ppmvd)	0.75	1.01	0.94
CO (lb/hr)	0.14	0.18	0.16
Average CO (lb/hr)		0.16	

1 Stack gas flowrate is the average measured by the isokinetic sampling trains of each run. The stack gas flowrate measured by the Cr (VI) sampling train was not used in the calculation of the average stack gas flowrate of Run 1 because the sampling train was stopped early.

5.3.8 Oxides of Sulfur in Stack Gas

The concentration of oxides of sulfur are monitored continuously by Veolia as sulfur dioxide (SO2) using a certified continuous emission monitoring system (CEMS). Results are presented in Table 3-1 - Process Data.

Table 5-26 presents the results of continuous monitoring for SO2 as the stack gas concentration and as lb/hr. The Air permit has a mass emission rate limit for SO2. The monitoring data for SO2 are presented in Appendix 2-4.

Table 5-26. Results for Oxides of Sulfur in Stack Gas

	Run 1	Run 2	Run 3
Date **Time**	**October 13, 2022** **0900-1815**	**October 14, 2022** **0750-1109**	**October 14, 2022** **1325-1645**
Flowrate (dscfm) 1 **O2 (%)**	**43,003** **7.49**	**41,931** **7.07**	**39,792** **7.10**
SO_2 (ppmvd)	0.00	0.00	0.00
SO_2 (lb/hr)	0.00	0.00	0.00
Average SO_2 (lb/hr)		**0.00**	

1 Stack gas flowrate is the average measured by the isokinetic sampling trains of each run. The stack gas flowrate measured by the Cr (VI) sampling train was not used in the calculation of the average stack gas flowrate of Run 1 because the sampling train was stopped early.

5.3.9 Total Hydrocarbons and Volatile Organic Compounds in Stack Gas

Total Hydrocarbons were monitored by AECOM using EPA Method 25A to demonstrate compliance with the THC limit of the HWC MACT.

The Air permit has a limit, as a mass emission rate, for emissions of Total Organic Carbon, monitored as Volatile Organic Compounds (VOCs). To determine VOCs, a canister sample of the stack gas was collected in each run for analyses of methane and ethane by ASTM Method D-1945. To determine VOCs, concentrations of methane and ethane were to be subtracted from the concentration of THC monitored by Method 25A. However, the canisters were analyzed by ASTM D-1946 instead of D-1945, and the analytical detection limits for methane and ethane were higher than the concentrations of THC measured by Method 25A. For this reason, the concentration of THC monitored by Method 25A was used to calculate a mass emission rate of VOCs. The resulting value demonstrates compliance with the mass emission rate for VOCs in the Air permit.

Results for THC are presented in Table 5-27. Results for VOCs are presented in Table 5-28. Raw monitoring data for THC by Method 25A is presented in Appendix 3-3, and the analytical results for methane and ethane are presented in Appendix 4-7.

Table 5-27. Results for Total Hydrocarbons in Stack Gas

	Run 1	Run 2	Run 3
Date Time	**October 13, 2022 0900-1815**	**October 14, 2022 0750-1109**	**October 14, 2022 1325-1645**
THC (ppmv, actual)[1]	0.57	0.47	0.29
Moisture (%)	5.63	5.03	5.65
THC (ppmvd)[1]	0.60	0.50	0.31
O2 (%)	7.49	7.07	7.10
THC (ppmvd, at 7% O_2)[1]	0.62	0.50	0.31
Average THC (ppmvd, at 7% O_2)[1]		**0.48**	

[1]as Propane

Table 5-28. Results for Volatile Organic Compounds in Stack Gas

	Run 1	Run 2	Run 3
Date Time	**October 13, 2022 0900-1815**	**October 14, 2022 0750-1109**	**October 14, 2022 1325-1645**
THC (ppmv, actual)[1]	0.57	0.47	0.29
Moisture (%)	7.49	5.03	5.65
VOCs, as THC (ppmvd)[1]	0.61	0.50	0.31
Flowrate (dscfm)[2]	43,003	41,931	39,792
VOCs (lb/hr)[3]	0.18	0.14	0.08
Average VOCs (lb/hr)		0.14	

1 as Propane
2 Stack gas flowrate is the average measured by the isokinetic sampling trains of each run. The stack gas flowrate measured by the Cr (VI) sampling train was not used in the calculation of the average stack gas flowrate of Run 1 because the sampling train was stopped early.
3 Samples for analysis of methane and ethane were collected in canisters in each of the three runs. The canisters were analyzed by ASTM Method D1946, a method for fixed gases. Neither methane nor ethane were detected in any of the samples. Concentrations of methane and ethane were not subtracted from THC.

5.3.10 Oxides of Nitrogen in Stack Gas

Stack gas concentrations of oxides of nitrogen were monitored by AECOM using EPA Method 7E. The Air permit has a limit, as a mass emission rate, for emissions of Oxides of Nitrogen (NOx). Results for oxides of nitrogen are presented in Table 5-29. Raw monitoring data for NOx by Method 7E is presented in Appendix 3-3.

Table 5-29. Results for Oxides of Nitrogen

	Run 1	Run 2	Run 3
Date	**October 13, 2022**	**October 14, 2022**	**October 14, 2022**
Time	**0900-1815**	**0750-1109**	**1325-1645**
Flowrate (dscfm)[1]	**43,003**	**41,931**	**39,792**
O_2 (%)	**7.49**	**7.07**	**7.10**
NO_x (ppmvd)	80.2	71.4	89.1
NO_x (lb/hr)[2]	24.8	21.5	25.5
Average NO_x (lb/hr)		**23.9**	

1 Stack gas flowrate is the average measured by the isokinetic sampling trains of each run.
2 The more conservative molecular weight of nitrogen dioxide was used in the calculation of the mass emission rate of NOx.

5.3.11 Oxygen and Carbon Dioxide in Stack Gas

Oxygen and carbon dioxide were monitored by AECOM using continuous analyzers in accordance with EPA Method 3A. Raw monitoring data for O2 and CO2 monitored by AECOM by Method 3A is presented in Appendix 3-3.

The results for oxygen and carbon dioxide monitored by AECOM are presented in Table 4-5.

5.4 System Removal Efficiency for Metals

System removal efficiency (SRE) was determined for the HWC MACT metals As, Pb, Cr, and Hg, the metals that were spiked during the test. The feedrates of metals includes the spiking rates and the feedrates of these metals in the waste feeds to the incinerator. The feedrates for these metals are presented in Table 5-7. Metals emission rates are presented in Table 5-20. SREs for the four metals are presented in Table 5-30.

Table 5-30. System Removal Efficiency (SRE) for Metals

	Run 1			Run 2			Run 3			
Analyte	Feedrate (lb/hr)	Emission rate (lb/hr)	System Removal Efficiency (%)	Feedrate (lb/hr)	Emission rate (lb/hr)	System Removal Efficiency (%)	Feedrate (lb/hr)	Emission rate (lb/hr)	System Removal Efficiency (%)	Average System Removal Efficiency (%)
Arsenic	3.38	<0.00017	>99.9950	3.19	<0.00017	>99.9947	3.40	<0.00017	>99.9950	>99.9949
Chromium	12.10	0.000334	99.9972	12.22	0.000234	99.9981	12.54	0.000226	99.9982	99.9978
Lead	52.45	<0.00012	>99.9998	48.16	<0.00011	>99.9998	50.28	<0.00012	>99.9998	>99.9998
Mercury	0.053	<0.0039	>92.6975	0.205	<0.00080	>99.6103	0.197	<0.00023	>99.8832	>97.3970

5.5 Extrapolation of Metals Feed Rates

Extrapolated feed rates were calculated for the following:

- Pumpable LVM Feedrate (Arsenic, Beryllium, Chromium, lb/hr);
- Total SVM Feedrate (Cadmium, Lead, lb/hr); and
- Mercury Feedrate (lb/hr).

The extrapolated values are calculated by ratioing 80% of the emission limits to the measured emission results during the CPT testing for each parameter and multiplying this ratio by the feed rates measured during the CPT testing. The results of this calculation are presented in Table 5-31. Also displayed are the feed rates at three times that measured during the CPT testing, as this may be a more conservative extrapolated value.

Table 5-31. Extrapolation of Feedrates

	Run 1	Run 2	Run 3	Average
Total LVM Feedrate (Arsenic, Beryllium, Chromium, lb/hr)	**15.48**	**15.41**	**15.94**	**15.61**
LVM Emission Limit (ug/dscm, at 7% O_2)	92	92	92	92
80% of LVM Emission Limit (ug/dscm, at 7% O_2)	73.6	73.6	73.6	73.6
LVM Concentration (ug/dscm, at 7% O_2)	<3.4	<2.7	<2.7	<2.9
LVM Feedrate Extrapolated to 80% MACT Standard	**>335.0**	**>420.1**	**>434.4**	**>396.5**
LVM Feedrate Extrapolated to 3 Times Measured Feedrate	**46.43**	**46.24**	**47.81**	**46.83**
Pumpable LVM Feedrate (Arsenic, Beryllium, Chromium, lb/hr)	**2.20**	**2.30**	**2.29**	**2.26**
LVM Emission Limit (ug/dscm, at 7% O2)	92	92	92	92
80% of LVM Emission Limit (ug/dscm, at 7% O2)	73.6	73.6	73.6	73.6
LVM Concentration (ug/dscm, at 7% O2)	<3.4	<2.7	<2.7	<2.9
LVM Feedrate Extrapolated to 80% MACT Standard	**>47.5**	**>62.6**	**>62.3**	**>57.5**
LVM Feedrate Extrapolated to 3 Times Measured Feedrate	**6.59**	**6.89**	**6.86**	**6.78**
Total SVM Feedrate (Cadmium, Lead, lb/hr)	**52.45**	**48.16**	**50.28**	**50.30**
SVM Emission Limit (ug/dscm, at 7% O2)	230	230	230	230
80% of SVM Emission Limit (ug/dscm, at 7% O2)	184	184	184	184
SVM Concentration (ug/dscm, at 7% O2)	<0.94	<0.87	<0.93	<0.91
SVM Feedrate Extrapolated to 80% MACT Standard	**>10,266**	**>10,186**	**>9,948**	**>10,133**
SVM Feedrate Extrapolated to 3 Times Measured Feedrate	**157.34**	**144.49**	**150.84**	**150.89**
Mercury Feedrate (lb/hr)	**0.053**	**0.205**	**0.197**	**0.152**
Hg Emission Limit (ug/dscm, at 7% O2)	130	130	130	130
80% of Hg Emission Limit (ug/dscm, at 7% O2)	104	104	104	104
Hg Concentration (ug/dscm, at 7% O2)	<26	<5.3	<1.6	<11
Hg Feedrate Extrapolated to 80% MACT Standard (lb/hr)	**>0.2**	**>4.0**	**>12.8**	**>5.7**
Hg Feedrate Extrapolated to 3 Times Measured Feedrate	**0.160**	**0.616**	**0.591**	**0.456**
RATIO OF PROPRIETARY CONTROL TO Hg FEEDRATE	**29.4**	**4.9**	**5.1**	**13.1**

6. Quality Assurance/Quality Control

As part of the CPT/RCRA/Air Test, a project-specific quality assurance/quality control (QA/QC) effort was developed and implemented. This QA/QC effort was documented in the QAPjP and was tailored to meet the specific needs of this test effort.

The results of the QA/QC activities demonstrate that the quality of project measurement data is well documented, and that the data are reliable, defensible, and meet project objectives.

The primary objectives of the QA/QC effort were to control, assess, and document data quality. To accomplish these objectives, the QA/QC approach consisted of the following key elements:

- Definition of data quality objectives that reflect the overall technical objectives of the measurement program;
- Design of a sampling, analytical, QA/QC and data analysis system to meet those objectives;
- Evaluation of the performance of the measurement system; and
- Initiation of corrective action when measurement system performance does not meet the specifications

These QA procedures include sampling and analytical procedures, along with specified calibration requirements, QC checks, data reduction and validation procedures, and sample tracking. A review of analysis results for QA/QC samples and assessment of overall data quality is presented in this section.

The sections below present discussions of the QA/QC activities associated with sampling and analysis, as well as with data quality assessment. Although several minor issues are identified and discussed in the following sections, it should be recognized that the overall conclusion of the QA/QC assessment is that the results of the CPT/RCRA/Air Test are of high quality and are appropriate for their intended use.

6.1 Analysis of Waste Feeds

6.1.1 Analysis of Waste Feeds for Metals

Samples of waste feed materials were analyzed for mercury using CVAA, according to SW-846 Method 7471B. These same samples were analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, and zinc using ICPES, according to SW-846 Method 6010C. These samples were prepared for analysis using appropriate extraction or dilution techniques. Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Preparation and analysis of laboratory control samples;
- Preparation and analysis of samples collected in duplicate; and
- Preparation and analysis of matrix spike and matrix spike duplicate samples.

Review of these QA/QC activities indicates that these data are supportable and useable. See the detailed data quality assessment in Appendix 4-1. The following issue was identified during the course of the QA/QC assessment:

- Matrix spike/matrix spike duplicates for mercury in one liquid waste and antimony and lead in one solid waste were outside of QAPjP specifications. The RPD for barium in one solid waste was outside of the QAPjP specifications, as well. These outliers are not systematic and are likely associated with the non-homogeneity of these waste materials. Further, the results for metals in the waste streams are negligible relative to the amounts spiked. No data are qualified or invalidated based on matrix spike results.

6.1.2 Analysis of Waste Feeds for Physical and Chemical Parameters

Samples of liquid and solid waste feed materials were analyzed for ash content, density, total chlorine, gross calorific value, kinematic viscosity, and moisture, using the following methods:

- Ash Content: ASTM D-482;
- Total Chlorine: SW-846 9056;
- Density: ASTM D-854 and ASTM D-1475;
- Gross Calorific Value: ASTM D-240 and ASTM D-5865;
- Kinematic Viscosity: ASTM D-445; and
- Percent Moisture: ASTM D-4017.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Preparation and analysis of laboratory control samples;
- Preparation and analysis of matrix spike and matrix spike duplicate samples; and
- Preparation and analysis of selected samples in duplicate.

Review of these QA/QC activities indicates that data are supportable and usable for the purpose of demonstrating regulatory compliance. See the detailed data quality assessment in Appendix 4-1. The following issues were identified during the course of the QA/QC assessment:

- The QAPjP specified the use of ASTM D-1963, and the laboratory references ASTM D-1475 and D-854. D-1963 was replaced by ASTM D-1475 in 2004. ASTM D-854 is specific for solids and is more applicable to those streams.
- The QAPjP specified the use of ASTM E-203 and ASTM D-5142, and the laboratory references the use of ASTM D-4017. TestAmerica's procedure references E-203, D-4017, and D-3792. D-5142 is primarily for coal and is not applicable to these matrices.
- Matrix spike/matrix spike duplicates were performed for analysis of chlorine. For one liquid waste stream, the MS and MSD were outside of QAPjP specifications. The outlier is associated with a single sample of material which is very high (>75%) in chlorine. The laboratory noted that this error may be associated with the high level of chlorine, a low relative spike, and with the high volatility of the matrix. From process knowledge, this material is known to be a recycled solvent, dichloromethane, with a theoretical chlorine content between 83 and 84%. The analytical results for the four samples of this material ranged from 75-82%, agreeing fairly well with the theoretical level. As such, the MS results indicate increased uncertainty, but do not invalidate the results. The analytical results are used in reporting calculations.

6.2 Stack Gas

6.2.1 Isokinetic Sample Collection

The following isokinetic sampling trains were used for the collection of air emission compliance samples:

- Particulate matter, hydrogen chloride, hydrogen fluoride, and chlorine using a single train meeting the requirements of both EPA Method 5 and EPA Method 26A;
- Hexavalent chromium according to SW-846 Method 0061;
- Polychlorinated dibenzodioxins and polychlorinated dibenzofurans according to SW-846 Method 0023A;
- Polychlorinated biphenyls according to SW-846 Method 0023A; and
- Metals according to EPA Method 29.

Quality assurance and quality control activities associated with the collection of these samples included:

- Collection of the specified volumes of stack gas over the specified duration;
- Collection of stack gas within 90-110 percent of isokinetic;
- Maintaining the probe, filter, and heated transfer line at the specified temperatures, as applicable;
- Maintaining the impinger exit and the condenser exit at the specified temperature, as applicable;
- Performing sampling train leak checks before sample collection, at port changes, and after sample collection;
- Performing pitot tube leak checks before and after sample collection; and
- Recording all data on pre-printed data sheets.

Review of these QA/QC activities indicates that sampling was performed according to the methods and the QAPjP. See the detailed data quality assessment in Appendix 5-1. Sampling data sheets are presented in Appendix 3-2. Calibration documentation for all field equipment is presented in Appendix 5-3. The following issues were identified during the data quality assessment:

- Run 1 for the Method 0061 sampling train was stopped short due to process issues. QAPjP specifications for minimum sample volume and sample duration were not met. The single shortened run for hexavalent chromium was due to process issues. The results for this shortened run are consistent with the other runs, and well below the regulatory standard. No data are invalidated based on sample volume and duration.
- Run 1 for the Method 5/26A sampling train had several probe temperature points that fell below the 248°F QAPjP specification. No data are qualified or invalidated based on the few probe temperature excursions.

6.2.2 Analysis of Stack Gas Samples for Determination of Particulate Matter

Samples of stack gas for determination of particulate matter were collected in a sampling train meeting the requirements of both EPA Method 5 and EPA Method 26A.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;

- Collection and analysis of field blanks;
- Repeatability of sequential weighings; and
- Daily balance calibration.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-4. The following issue was identified during the data quality assessment:

- The field blank result for probe and nozzle rinse is similar in magnitude to the field samples. This suggests that the emissions results may have a positive bias, or possibly be false positive results. As no results are corrected for blank results, and that any estimates of emissions have a positive (conservative) bias, no data are qualified or invalidated based on the blank results.

6.2.3 Analysis of Stack Gas Samples for Determination of Hydrogen Chloride, Hydrogen Fluoride, and Chlorine

Samples of stack gas for determination of hydrogen chloride, hydrogen fluoride, and chlorine were collected in a sampling train meeting the requirements of both EPA Method 5 and EPA Method 26A. Samples recovered from this sampling train were analyzed for hydrogen chloride, hydrogen fluoride, and chlorine using ion chromatography, according to EPA Method 26A.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of laboratory control samples;
- Preparation and analysis of matrix spike and matrix spike duplicate samples; and
- Preparation and analysis of all samples in duplicate.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-4. The following issue was identified as part of the data quality assessment:

- A trace amount of chlorine was detected in the field blank. The field blank results are below the sample-based detection limit for the field samples. As the results are very low, and the blank result is well below the values assigned to the field results, this has no impact on the interpretation of the data. No data are qualified or invalidated based on blank results.

6.2.4 Analysis of Stack Gas Samples for Determination of Metals

Samples for determination of metals in stack gas were collected according to EPA Method 29. The filters, impinger solutions, and rinses were analyzed for mercury by CVAA according to SW-846 Method 7470A and for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, and zinc by ICPES, according to SW-846 Method 6010C.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;

- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of media check samples;
- Preparation and analysis of laboratory control samples and laboratory check sample duplicates; and
- Preparation and analysis of matrix spike and matrix spike duplicate samples.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-3. The following issue was identified as part of the data quality assessment:

- Antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, and zinc were all found in either the laboratory blank or the field blank or the media check sample. For every target analyte, the levels found in the blank are similar to the levels measured in the field samples. This suggests that the field results may have a positive bias, or even be false positive results. As the field results are not corrected for the blank results, the field results may be biased high, which is conservative. The conclusions of the report are unaffected by this bias. No data are qualified or invalidated based on blank results.

6.2.5 Analysis of Stack Gas Samples for Determination of PCBs

Samples for determination of the polychlorinated biphenyls (PCBs) were collected according to the methodology described in SW-846 Method 0023A. The filters, sorbent tubes, rinses, and condensate from these samples were prepared for analysis according to SW-846 Method 0023A, and the resulting extracts analyzed for PCBs by high-resolution GCMS, according to EPA Method 1668A.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of media check samples;
- Preparation and analysis of laboratory control samples and laboratory check sample duplicates; and
- Addition of surrogate compounds to each sample.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-6. The following issues were identified as part of the data quality assessment:

- Levels of several PCB congener classes and specific compounds were observed in the field blank, media check, and laboratory blank. These levels are significantly lower than those observed in the field samples. This has no impact on the results for the field samples. No data are qualified or invalidated based on blank results.
- Four surrogates did not meet the QAPjP specifications for surrogate recovery. The high recovery of surrogates indicates a potential positive bias. These results are very low, and a positive bias would be conservative. No data are qualified or invalidated based on surrogate recoveries.

6.2.6 Analysis of Stack Gas Samples for Determination of Dioxins/Furans

Samples for determination of the polychlorinated dibenzodioxins and dibenzofurans (dioxins/furans) were collected according to the methodology described in SW-846 Method 0023A. The filters, sorbent traps, and rinses from these samples were prepared for analysis according to SW-846 Method 0023A, and the resulting extracts analyzed for dioxins/furans by high-resolution GCMS, according to SW-846 Method 8290.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of media check samples;
- Preparation and analysis of laboratory control samples and laboratory check sample duplicates; and
- Addition of surrogate compounds to each sample.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-2. The following issues were identified as part of the data quality assessment:

- OCDD and OCDF were both detected in the method blank. These blank results have no impact on the data, as the compounds detected in the blank were not detected in the field samples. No data are qualified or invalidated based on blank results.
- Recovery of one laboratory check sample (LCS) for 1,2,3,7,8,9-HxCDF was outside of QAPjP specifications. This single outlier for LCS recovery is considered negligible. There is no indication of a systematic issue, and since all sample results are below detection limit, this has no impact. No data are qualified or invalidated based on LCS/LCSD recovery.
- Recovery of one pre-sampling surrogate for 13C-1,2,3,4,7,8-HxCDF in the Run 3 PNR/Filter sample was outside of QAPjP specifications. This single outlier for surrogate recovery is considered negligible. There is no indication of a systematic issue, and since all results are below detection limit, this has no impact. No data are qualified or invalidated based on surrogate recovery.

6.2.7 Analysis of Stack Gas Samples for Hexavalent Chromium

Samples for determination of the hexavalent chromium were collected according to SW-846 Method 0061. The combined solution and rinses from these samples were analyzed for hexavalent chromium by ion chromatography, according to SW-846 Methods 7199.

Quality assurance and quality control activities associated with these analyses included:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of laboratory control samples and laboratory check sample duplicates;
- Preparation and analysis of matrix spikes and matrix spike duplicates; and
- Analysis of each sample in duplicate.

Review of these QA/QC activities indicates that these data are supportable, and useable. See the detailed data quality assessment in Appendix 4-5. The following issue was identified as part of the data quality assessment:

- A low level of hexavalent chromium was observed in the field blank, on the same order as the sample results. This indicates a possible positive bias. The sample results are not corrected for the blank result, which is a conservative approach. No data are qualified or invalidated based on blank results.

6.2.8 Monitoring of Stack Gas for Oxygen, Carbon Dioxide, Oxides of Nitrogen, and Total Hydrocarbon

The stack gas was monitored for oxygen (O_2), carbon dioxide (CO_2), oxides of nitrogen (NO_x), and total hydrocarbon (THC) according to EPA Methods 3A (O_2 and CO_2), 7E (NO_x), and 25A (THC).

Quality assurance and quality control activities associated with continuous emission monitoring include:

- Use of calibration gas standards of known and acceptable quality;
- Use of calibration gas standards in the specified ranges;
- Performance of calibration error tests;
- Performance of system bias checks;
- Performance of zero and span drift checks; and
- Performance of a NOx analyzer converter efficiency check.

Review of these QA/QC activities indicates that these data are supportable and usable. See the data quality assessment in Appendix 5-1. Copies of certifications of calibration gas standards; the NO_x analyzer converter efficiency check; and the raw data for continuous emission monitors is presented in Appendix 3-3. The following issues were identified as part of the data quality assessment:

- The high-range calibration gas was used for system bias and calibration drift check for NO_x determination, rather than the mid-range gas, as specified in the method.
- The NO_x sample results exceeded the span range of the calibration.
- After Run 1, the system bias check and drift check for NO_x were outside of method specification.

Each of these indicates an issue which increases the uncertainty in the NOx results. These data are used only to demonstrate that the emissions are within the specification of the air permit. This was demonstrated by a wide margin; calculated emissions are less than half the permit limit. As such, these data are qualified as having increased uncertainty for method irregularities, but are acceptable for the intended purpose above, and are not invalidated.

6.2.9 Analysis of Stack Gas Samples for Methane and Ethane

Stack gas samples collected in evacuated cylinders were analyzed for methane and ethane according to ASTM Method D-1946.

Quality assurance and quality control activities associated with continuous emission monitoring include:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;

- Collection and analysis of field blanks; and
- Preparation and analysis of laboratory control samples and laboratory check sample duplicates.

The canister samples were analyzed for methane and ethane using ASTM D-1946 instead of ASTM D-1945 specified in the QAPjP. ASTM D-1946 provides considerably higher detection limits than D-1945. Results for methane and ethane were reported at the detection limit that was above the measured concentration of THC, rendering the methane and ethane data of no value. While review of QA/QC activities indicates that these data are supportable, because of the level of the reported detection limits, the data are of no value. See the data quality assessment in Appendix 6-14. No issues were identified as part of the data quality assessment.

6.3 Process Data

In accordance with the HWC MACT requirements, all process instrumentation was calibrated. A *Continuous Monitoring System Performance Evaluation Test Plan* (CMSPETP) was prepared and defines the calibration procedures and acceptance criteria. The testing specified in the CMSPETP was performed prior to the CPT/RCRA/Air Test.

6.4 Spiking

As detailed in Section 3.4 and Appendices 2-2 and 2-3, and 2-5, during the CPT/RCRA/Air Test, liquids and solids were spiked into the incinerator feed. QA/QC activities associated with the spiking included:

- Use of spiking materials of known and acceptable quality;
- Collection of data on either pre-printed data sheets and appropriate data acquisition systems;
- Calibration of pumps; and
- Documentation of preparation of spiking packets.

Review of these QA/QC activities indicates that the spiking data are supportable and useable. The spiking report is presented in Appendix 2-2.

6.5 Audit Samples

Audit Samples were not required for this CPT.

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Notification of Compliance with the Final Replacement Standards of the National Emission Standards for Hazardous Air Pollutants for Hazardous Waste Combustors (40 CFR 63, Subpart EEE)

Veolia ES Technical Solutions, L.L.C.
Port Arthur, Texas

January 20, 2023

Delivering a better world

Quality information

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1. Certification Statement

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for known violations.

Signature: ______________________ Date: 1-20-23

Skyler Kerby
General Manager
Veolia ES Technical Solutions, L.L.C.

2. Introduction

Veolia ES Technical Solutions, L.L.C. (Veolia) operates a hazardous waste incinerator at its facility in Port Arthur, Texas. The incinerator treats hazardous wastes under the Resource Conservation and Recovery Act (RCRA) Permit HW-50212 and Air Permit 42450 issued by the Texas Commission on Environmental Quality (TCEQ) as well as a Toxic Substances Control Act (TSCA) permit issued by the United States Environmental Protection Agency (US EPA). While the incinerator is operated in accordance with the requirements of the RCRA, Air, and TSCA permits, the incinerator is also regulated under the *National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Hazardous Waste Combustors* (Title 40 of the Code of Federal Regulations, Part 63 [40 CFR Part 63], Subpart EEE) commonly referred to as the Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT) standard.

The current Notification of Compliance (NOC) for the Final Replacement Standards of the HWC MACT is dated July 7, 2017. Veolia operates the incinerator in compliance with the NOC. The NOC was prepared using "*data in lieu of*" (DILO) from the Comprehensive Performance Test (CPT) for the Interim Standards of the HWC MACT that was performed in 2006 as well as the CPT that was performed in 2017.

The previous Comprehensive Performance Test (CPT) of the Port Arthur incinerator began on February 2, 2017. A Notice of Deficiency (NOD) on Notification of Compliance (NOC) was issued by TCEQ on April 27, 2018, which determined that additional information was necessary to make a Finding of Compliance (FOC) acknowledging that the CPT Report and NOC demonstrated compliance with the HWC MACT. Subsequently, a FOC stating that the CPT Report and NOC demonstrated compliance with the HWC MACT was issued by TCEQ on March 14, 2019.

The HWC MACT, at §63.1207(d)(1) Comprehensive *performance testing* states, "you must commence testing no later than 61 months after the date of commencing the previous comprehensive performance test". The subsequent CPT of the Port Arthur incinerator had to begin by March 2, 2022. On December 22, 2021, Veolia requested an extension of the required start date of the CPT. An extension was granted on January 18, 2022, and the CPT was required to commence on or before September 7, 2022. Veolia began the subsequent CPT on August 31, 2022, with the performance of a RATA of the CO and O_2 CEMS on the stack of the incinerator. The test was completed on October 14, 2022, within 60 days of commencement as required by §63.1207(d)(3). The test also included the periodic testing requirements for the RCRA and Air permits of the facility. A site-specific test plan, the *Comprehensive Performance Test Plan and Test Plan for RCRA Permit Periodic Testing and Test Plan for Air Permit Periodic Testing* (i.e., the CPT/RCRA/Air Test Plan) and a Quality Assurance Project Plan (QAPjP) were initially submitted to TCEQ on December 21, 2020 and revised on February 10, 2021. The CPT/RCRA/Air Test Plan and QAPjP were approved by TCEQ on March 22, 2021.

The approved test plan presented Veolia's plan for the subsequent CPT for the Final Replacement Standards of the HWC MACT and was designed to demonstrate compliance with the standards and associated OPLs of the HWC MACT for existing incinerators at §63.1219. Table 2-1 presents the Final Replacement Standards for existing hazardous waste incinerators under the HWC MACT applicable to the incinerator at Veolia's Port Arthur facility.

Table 2-1. HWC MACT Standards

HAP or HAP Surrogate	Final Replacement Standards
Destruction and Removal Efficiency	99.99%
Dioxins/Furans	0.40 ng TEQ/dscm if Temp. < 400°F, at 7% O_2 [a,b]
Particulate Matter	0.013 gr/dscf, at 7% O_2
Mercury	130 µg/dscm, at 7% O_2
SVM (Semivolatile metals, Cd, Pb)	230 µg/dscm, at 7% O_2
LVM (Low volatility Metals, As, Be, Cr)	92 µg/dscm, at 7% O_2
HCl/Cl_2	32 ppmv, dry, at 7% O_2, as chloride equivalents.
CO	100 ppmv, dry, at 7% O_2
Hydrocarbons	10 ppmv, dry, at 7% O_2

a. Toxicity Equivalents – relating the relative concentrations and toxicity of the dioxin and furan congeners and isomers to the toxicity of 2,3,7,8 tetrachloro-dibenzo-dioxin.

b. For purposes of compliance, operation of the wet particulate control device meets the 400°F or lower requirement.

Prior to the commencement of the CPT/RCRA/Air Test, the Continuous Monitoring System (CMS) process monitors associated with the Veolia incinerator were validated according to the CMS Performance Evaluation Test Plan (CMSPETP), which was submitted as Appendix C to the CPT/RCRA/Air Test Plan. Results of this validation are presented in the Continuous Monitoring System Performance Evaluation Test Report (CMSPETR), submitted as Appendix 2-6 to the document entitled *Report of the Comprehensive Performance Test and RCRA Permit Periodic Test and Air Permit Periodic Test of the Rotary Kiln Incinerator.*

40 CFR Part 63.1207(c)(2) allows for previous emissions test data to serve as the documentation of conformance with the standards of the HWC MACT. Compliance with the DRE standard (99.99% DRE) is demonstrated using "*data in lieu of*" (DILO) from the 2006 CPT, which was submitted as Appendix A to the CPT/RCRA/Air Test Plan. This document is the Notification of Compliance (NOC) for the Final Replacement Standards of the HWC MACT. Data contained in this document has also been presented in the document entitled *Report of the Comprehensive Performance Test and RCRA Permit Periodic Test and Air Permit Periodic Test of the Rotary Kiln Incinerator, dated January 20, 2023*, and submitted by reference with this NOC.

The OPLs in this Notification of Compliance were established from the 2022 CPT based on process and related data from throughout each of the three test runs, determined by the initiation and completion of stack testing. This Notification of Compliance and the CPT/RCRA/Air Test Report have been revised to address a request from TCEQ following the 2017 CPT to develop OPLs using process and related data from the specific periods of time of the stack sampling for each individual parameter (i.e., the OPLs for hydrochloric acid and chlorine gas are developed from process and related data correlating to the same time period as the stack sampling for HCl/Cl_2).

3. Unit Description

A detailed description of the incinerator at Veolia's Port Arthur facility is given in Section 2.0 of the main text of the CPT/RCRA/Air Test Plan; therefore, only a brief description is provided as part of the NOC.

3.1 Description of the Combustion System

The incinerator consists of waste receiving and waste feeding equipment, a rotary kiln, an ash/slag removal system, a secondary combustion chamber (SCC), a quench tower, two acid gas absorbers, a four-stage ionizing wet scrubber, a wet electrostatic precipitator, an induced draft fan, and an exhaust stack.

The kiln is a refractory-lined unit 60 feet long with an effective inside diameter of approximately 14 feet. It can operate in a temperature range of up to 2,300°F. The kiln is driven by a centrally mounted girth gear powered by a variable speed, 100-hp motor. The nominal rotation speed is one rpm with an average solids-residence-time of approximately one hour.

The kiln primary burner is located near the center of the faceplate. This forced air burner can release up to 40 million British thermal units per hour (MMBtu/hr) through a liquid fossil fuel nozzle or through two atomized liquid waste nozzles in the burner box. During incinerator startup, shutdown, or upset conditions, auxiliary liquid fossil fuel is burned in place of energetic liquid waste.

The discharge end of the kiln connects to a refractory-lined disengaging chamber, where ash drops into the ash removal system. The ash is conveyed into roll-off boxes for transport and disposal.

The combustion gases, after leaving the disengaging chamber, pass into the secondary combustion chamber or afterburner, a refractory-lined vertical cylinder with overall inside dimensions of approximately 80 feet high by 16 feet in diameter. Eight burners are mounted around the circumference of the afterburner. The burners, which fire tangentially, are rated at 15 MMBtu/hr each. The burners are dual fuel burners and have the capability to fire waste liquid and/or liquid fossil fuel. Solids from the afterburner (slag) drop into a water bath and are cooled prior to being conveyed to a roll-off box for transport and disposal. Flue gases exit from the SCC through a refractory-lined duct.

3.2 Waste Feed System

Veolia's Port Arthur incinerator can burn pumpable liquids (including sludges), solids, and injected containerized gases. The suitability of a waste for incineration is determined in the pre-acceptance stage of Veolia's waste control practices as currently outlined in the HWC MACT Feedstream Analysis Plan and the RCRA Waste Analysis Plan. The commercial incineration facility receives and manages nearly every type of hazardous waste identified in 40 CFR Part 261.

During the 2022 CPT, combinations of waste feeds that represent "worst-case" conditions were fed to the incinerator in order to demonstrate the performance capability. The wastes incinerated during the test demonstrations were actual hazardous waste mixes available at the time of the testing. Additionally, a high chlorine containing stream was fed to the incinerator, as well as multiple metals spiking streams to ensure worst-case conditions were met. The waste feed streams from waste categories such as energetic liquids, energetic and non-energetic sludges, aqueous liquids, and solid wastes fed as bulk, drums, and from the Putzmeister were used during the testing. The wastes fed to the kiln include both pumpable and nonpumpable waste. The feed mechanisms for the kiln include atomizing and non-atomizing burners and nozzles, container feed, ram, and bulk solids feed chute. Pumpable waste only is fed to the SCC, through atomizing burners.

Pumpable wastes are charged to the rotary kiln through various mechanisms located on the kiln faceplate. The method by which a waste is injected depends upon its physical state and caloric value. Direct feeding to the kiln from tanker trucks, drums, and tote bins is performed for materials that are not suitable for placing into tankage.

The incinerator train also receives bulk solids such as contaminated soil, solid, and sludge process waste and plant trash. Containerized waste is also fed into the kiln through the kiln container ram feeder. These bulk and containerized solids are currently charged to the kiln through systems which feed through the faceplate.

All suitable wastes authorized for receipt at the Port Arthur facility may be processed within the Bulk Material Handling Building. The resultant waste blends are then fed to the incinerator.

3.3 Air Pollution Control System

Cooling of the combustion gases and removal of particulate matter and acid gases occur in the quench tower and air pollution control system (APCS). The APCS consists of two parallel acid gas absorbers, an ionizing wet scrubber, and a wet electrostatic precipitator.

Flue gases exit from the SCC through a refractory-lined duct and enter the top center of a quench tower. Three rows of water spray nozzles are arranged around the circumference of the tower and spray water directly into the hot combustion gas. As the gas flows downward, it is cooled to an adiabatic saturation temperature of about 185^{o}F.

A fiberglass reinforced plastic (FRP) duct conveys the cooled flue gas from the quench tower to two absorbers arranged in parallel. The pH is measured in the discharge line of the absorber pumps and adequate caustic is added in the discharge of the absorber pumps to raise the pH to a minimum of 4.55.

Following the absorbers are two parallel four-stage ionizing wet scrubbers (IWS). The IWS utilizes high voltage ionization to electrostatically charge the particulate in the gas stream before the particles enter a packed section in each of the four stages arranged in series. The packing in each of the packed sections is similar to the packing that is used in the absorbers. The charged particles leaving the ionization section impinge on and/or are attracted to the surfaces of the packing material.

Process gas then enters the wet electrostatic precipitator (WESP) at the top of the unit. The process gas may be saturated with water sprays to create additional water droplets in the gas stream, as necessary. The gas stream passes through a distribution system to evenly distribute the gas in the ionization and collection tubes of the vessel.

From the WESP, the flue gases pass into the induced draft fan. The fan moves the approximately 110^{o}F flue gas at an average rate of approximately 39,000 dscfm and can achieve a flow above 50,000 dscfm. Final discharge to atmosphere occurs through a 5.5-foot inside diameter by 130-foot high FRP stack. The stack is equipped with sampling ports to conduct the required sampling.

4. Results of the Comprehensive Performance Test

For the execution of a Comprehensive Performance Test (CPT), §63.1207(d) requires that the date of commencement of the previous CPT is the basis for establishing the deadline to commence the next CPT. The deadline for commencing subsequent comprehensive performance testing is no later than 61 months after the date of commencing the previous CPT. The most recent previous CPT was initiated on February 2, 2017. The subsequent CPT of the Port Arthur incinerator had to begin by March 2, 2022. On December 22, 2021, Veolia requested an extension of the required start date of the CPT. An extension was granted on January 18, 2022, and the CPT was required to commence on or before September 7, 2022. Veolia began the subsequent CPT on August 31, 2022, with the performance of a RATA of the CO and O_2 CEMS on the stack of the incinerator. The test was completed on October 14, 2022, within 60 days of commencement as required by §63.1207(d)(3).

The HWC MACT, at §63.1207(e)(1)(i) states that a site-specific test plan (i.e., CPT Plan) be submitted at least one year before the CPT is scheduled to begin. A site-specific test plan, the *Comprehensive Performance Test and Test Plan for RCRA Permit Periodic Testing and Test Plan for Air Permit Periodic Testing* (i.e., the CPT/RCRA/Air Test Plan) and a Quality Assurance Project Plan (QAPjP) were initially submitted to TCEQ on December 21, 2020 and revised on February 10, 2021, and were approved by TCEQ on March 22, 2021. This plan described testing for all of the HWC MACT parameters, with the exception of DRE. Compliance with the HWC MACT standard for DRE was demonstrated with the submittal of *"data in lieu of*" testing, with the data from the CPT conducted in 2006.

Table 4-1 presents the results of the emissions testing from the subsequent CPT of the Veolia incinerator that demonstrations compliance with the Final Replacement Standards of the HWC MACT.

Table 4-1. Compliance Summary

HAP or HAP Surrogate	Final Replacement Standards	Results [a]
Destruction and Removal Efficiency [b]	99.99%	>99.9999897 [c]
Dioxins/Furans	0.40 ng TEQ/dscm if Temp. < 400°F, at 7% O_2 [d,e]	0.0116
Particulate Matter	0.013 gr/dscf, at 7% O_2	<0.00024
HCl/Cl_2	32 ppmv, dry, at 7% O_2, as chloride equivalents.	0.121
SVM (Semivolatile Metals, Cd, Pb)	230 µg/dscm, at 7% O_2	<0.91
LVM (Low Volatility Metals, As, Be, Cr)	92 µg/dscm, at 7% O_2	<2.9
Mercury	130 µg/dscm, at 7% O_2	<11
CO	100 ppmv, dry, at 7% O_2	0.91
Total Hydrocarbons	10 ppmv, dry, at 7% O_2	0.48

a Average of three runs of the 2022 CPT.

b Measured during the 2006 CPT and submitted as *"data in lieu of"* testing as Appendix A to the CPT/RCRA/Air Test Plan.

c Lowest DRE measured during the 2006 CPT for 1,2-Dichlorobenzene, in Class 1 of the Thermal Stability Index.

d Toxicity Equivalents – relating the relative concentrations and toxicity of the dioxin and furan congeners and isomers to the toxicity of 2,3,7,8 tetrachloro-dibenzo-dioxin.

e For purposes of compliance, operation of the wet particulate control device meets the 400°F or lower requirement.

As stated in 40 CFR 63.1203(d), emission levels are calculated to at least two significant figures to document compliance. The incinerator at Veolia's Port Arthur facility demonstrated compliance with the Final Replacement Standards of the HWC MACT. As presented in Section 2, the incinerator was operated at the 'extreme range of normal', and applicable operating parameter limits were established from the test. The CPT was performed in accordance with the CPT/RCRA/Air Test Plan and QAPjP approved by TCEQ.

5. Operating Parameter Limits

Table 5-1 presents the operating parameter limits (OPLs) established for the incinerator at the Veolia facility in Port Arthur, Texas in compliance with the Final Replacement Standards of the HWC MACT. As prescribed in the CPT Plan, unit operations were at the 'extreme range of normal' during the 2022 CPT. OPLs to comply with the Final Replacement Standards were developed based on the data collected during the 2022 CPT, and *"data in lieu of"* DRE from the 2006 CPT.

A number of Alternative Monitoring Applications (AMAs) have been previously approved by EPA. Those EPA-approved AMAs, and their impact on the development or implementation of OPLs are described below.

- The OPL for "pressure drop across a low-energy wet scrubber" (i.e., the absorbers) was waived by approval of the AMA dated March 1, 2004.
- The OPL for "ash feedrate" was waived by approval of the AMA dated January 25, 2005.
- The OPL for "blowdown rate from a wet scrubber" (i.e., the air pollution control system) is established as a single blowdown stream, *"Blowdown to Deepwell"*, by approval of the AMA dated March 1, 2004 or by the conductivity of the Blowdown to Deepwell by approval of the AMA dated January 25, 2005.
- The OPL for "scrubber tank volume or level" applies only to the WESP by approval of the AMA dated March 1, 2004.
- Demonstration of compliance with the HCl/Cl_2 emission limit is achieved by an HCl Continuous Emissions Monitor, or by the OPLs to demonstrate compliance with the HCl/Cl_2 emission limit by approval of the AMA dated March 1, 2004.
- Control of fugitive emissions is demonstrated by operation of a fan that evacuates shrouds around both ends of the rotary kiln, and by maintaining a negative pressure in the rotary kiln by approval of the AMA dated March 1, 2004.

Table 5-2 presents the bases for development of the OPLs shown in Table 5-1. The data used to develop the OPLs are presented in Table 5-2 for each of the Final Replacement Standards of the HWC MACT. As stated in 40 CFR 63.1209(i), if an operating parameter is applicable to multiple standards, then the most stringent limit applies. Table 5-1 presents the OPLs for the Port Arthur incinerator selecting, where necessary, the more stringent OPL if that OPL is applicable to more than one standard.

Table 5-1. HWC MACT Operating Parameter Limits for the Final Replacement Standards for the Incinerator at Veolia ES Technical Solutions, L.L.C.'s Port Arthur Facility

Operating Parameter	Permitting Units	Process Tag	Source of Data to Establish OPL	Operating Parameter Limit
Maximum Feedrate of Total Mercury	12-Hour Rolling Average	HRA12-056L3	2022 CPT	0.456 lb/hr [h]
Maximum Total Feedrate of SVM (Pb, Cd)	12-Hour Rolling Average	HRA12-056L5	2022 CPT	150.9 lb/hr [e]
Maximum Total Feedrate of LVM (As, Be, Cr)	12-Hour Rolling Average	HRA12-056L6	2022 CPT	46.8 lb/hr [e]
Maximum Pumpable Feedrate of LVM (As, Be, Cr)	12-Hour Rolling Average	HRA12-P056L6	2022 CPT	6.78 lb/hr [e]
Maximum Feedrate of Total Chlorine/Chloride	12-Hour Rolling Average	HRA12-051L1	2022 CPT	4,888 lb/hr
Minimum Combustion Chamber Temperature in the Kiln	HRA	HRA-512	2022 CPT	1,339°F
Minimum Combustion Chamber Temperature in the SCC	HRA	SCC-TEMP-AVG	2022 CPT	1,948°F
Maximum Flue Gas Flowrate	HRA	HRA-576	2022 CPT	39,605 dscfm
Maximum Total Hazardous Waste Feedrate to the Kiln	HRA	KILN-TOT-WST	2022 CPT	46,839 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the Kiln	HRA	KILN-LIQUID	2022 CPT	24,847 lb/hr
Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC	HRA	SCC-TOT-WASTE	2022 CPT	7,330 lb/hr
Operation of Waste Firing System -Minimum Burner Atomization Pressure (Air or Steam) [a]	Instantaneous		MS [b]	20 psig
Maximum Emission Concentration of HCl (continuously monitored, as a surrogate for HCl/Cl_2)	HRA	HRA-HCLPPMV	AMA [c]	32 ppmv
Minimum Liquid-to-Gas Ratio in the Absorbers	HRA	HRA-LOVG	2022 CPT	0.107
Minimum Liquid Feed Pressure to the Absorbers	HRA	HRA-PI573	MS [b]	7 psig
Minimum pH at Cooling Tower Inlet	HRA	HRA-571	2022 CPT	3.55
Minimum Scrubber Blowdown Rate (Blowdown to Deepwell) —OR— Maximum Conductivity of Scrubber Water	HRA	HRA 12-616 —OR— HRA-616C	2022 CPT	88.7 gpm —OR— 95,807 µmho
Voltage to the IWS	2 minutes	XA-IWS-HV	MS [b]	10 kV
Minimum Power to the WESP	HRA	HRA-KV577	2022 CPT	16.2 kVA
Minimum Tank Level in the WESP	HRA	HRA12-LI577	2022 CPT	40.0 %
Maximum Pumpable Arsenic Feedrate	HRA	HRA-PO56L4	2022 CPT	0.25 lb/hr

Operating Parameter	Permitting Units	Process Tag	Source of Data to Establish OPL	Operating Parameter Limit
Control of Fugitive Emission -Operation of Shroud System —OR— -Pressure at Kiln Faceplate	Fan On —OR— Fan Off/ Instantaneous	Fan On/Off —OR— XA-544F	AMA [c]	Fan On, and greater than 0 psig for greater than 10 seconds —OR— Fan Off, greater than 0 psig on an instantaneous basis
Emission Limit for Carbon Monoxide	HRA	STACK-CO-AVG	ES [d]	100 ppmv corrected to 7% O_2

a Waste feed is automatically cut-off only to the burner that has low atomizing pressure.

b Limit set by manufacturer's specification/good engineering practice.

c Approved by the Alternative Monitoring Application dated March 1, 2004.

d HWC MACT emission standard.

e OPL is extrapolated to three times the feedrate measured during the 2022 CPT

h The mercury feed rate limit was developed using the mercury feedrate measured during the CPT extrapolated to three times the measured feed rate.

Table 5-2. Development of HWC MACT Operating Limits

Operating Parameter	Averaging Period	Regulatory Basis	Process Tag	HWC MACT Limit	Measured Values and Emission Rates		How Limit is Established	Operating Parameter Limit
					2006 CPT	2022 CPT		
Destruction and Removal Efficiency				**99.99%**	**99.9999897%** [a]			
Minimum Combustion Chamber Temperature in the Kiln	HRA	Average of the Test Run Averages [40 CFR 63.1209(j)(1)(ii)]	HRA-512		1,316ºF		2006 CPT	1,316ºF
Minimum Combustion Chamber Temperature in the SCC	HRA	Average of the Test Run Averages [40 CFR 63.1209(j)(1)(ii)]	SCC-TEMP-AVG		1,906ºF		2006 CPT	1,906ºF
Maximum Flue Gas Flowrate	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(2)(I)]	HRA-576		39,904 dscfm		2006 CPT	39,904 dscfm
Maximum Total Hazardous Waste Feedrate to the Kiln	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	KILN-TOT-WST		55,281lb/hr		2006 CPT	55,281 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the Kiln	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	KILN-LIQUID		20,328 lb/hr		2006 CPT	20,328 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the SCC	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	SCC-TOT-WASTE		9,953 lb/hr		2006 CPT	9,953 lb/hr
Operation of Waste Firing System [c] • Minimum Burner Atomization Pressure (Air or Steam)	Instantaneous	[40 CFR 63.1209(j)(4)]	NA		NA		MS [d]	20 psig
Dioxins/Furans [b]				**0.40 ng/dscm TEQs corrected to 7% O_2**		**0.0116**		
Minimum Combustion Chamber Temperature in the Kiln	HRA	Average of the Test Run Averages [40 CFR 63.1209(k)(2)(ii)]	HRA-512		1,316ºF	1,339ºF	2022 CPT	1,339ºF
Minimum Combustion Chamber Temperature in the SCC	HRA	Average of the Test Run Averages [40 CFR 63.1209(j)(1)(ii)]	SCC-TEMP-AVG		1,906ºF	1,948ºF	2022 CPT	1,948ºF

Operating Parameter	Averaging Period	Regulatory Basis	Process Tag	HWC MACT Limit	Measured Values and Emission Rates		How Limit is Established	Operating Parameter Limit
					2006 CPT	2022 CPT		
Maximum Flue Gas Flowrate	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(k)(3)(i)]	HRA-576		39,904 dscfm	39,605 dscfm	2022 CPT	39,605 dscfm
Maximum Total Hazardous Waste Feedrate to the Kiln	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	KILN-TOT-WST		55,281lb/hr	46,839 lb/hr	2022 CPT	46,839 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the Kiln	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	KILN-LIQUID		20,328 lb/hr	24,847 lb/hr	2022 CPT	24,847 lb/hr
Maximum Pumpable Hazardous Waste Feedrate to the SCC	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(j)(3)(ii)]	SCC-TOT-WASTE		9,953 lb/hr	4,407 lb/hr	2022 CPT	7,330 lb/hr
Mercury [b]				**130 µg/dscm corrected to 7% O_2**		**<11**		
Feedrate of Total Mercury	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(l)(1)]	HRA12-056L3			0.152 lb/hr	2022 CPT	0.456 lb/hr [h]
Minimum Liquid-to-Gas Ratio in the Absorbers	HRA	Average of the Test Run Averages [40 CFR 63.1209(l)(2) and 40 CFR 63 1209(o)(3)(v)]	HRA-LOVG			0.107	2022 CPT	0.107
Minimum Liquid Feed Pressure to the Absorbers	HRA	Based on Manufacturer's Specification [40 CFR 63.1209(l)(2) and 40 CFR 63 1209(o)(3)(iii)]	HRA-PI573			NA	MS [d]	7 psig
Maximum Pumpable Arsenic Feedrate	HRA	Average of the Test Run Averages [40 CFR 63.1209(g)(2)]	HRA-PO56L4			0.25 lb/hr	2022 CPT	0.25 lb/hr
Particulate Matter [b]				**0.013 grains/dscf corrected to 7% O_2**		**<0.00024**		
Maximum Flue Gas Flowrate	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(m)(2)]	HRA-576		39,904 dscfm	39,605 dscfm	2022 CPT	39,605 dscfm

Operating Parameter	Averaging Period	Regulatory Basis	Process Tag	HWC MACT Limit	Measured Values and Emission Rates		How Limit is Established	Operating Parameter Limit
					2006 CPT	2022 CPT		
Minimum Scrubber Blowdown Rate (Blowdown to Deepwell) —OR— Maximum Conductivity of Scrubber Water	HRA	Average of the Test Run Averages [40 CFR 63.1209(m)(1)(B)(ii)]	HRA12-616 —OR— HRA-616C			88.7 gpm —OR— 95,807 µmho	2022 CPT	88.7 gpm —OR— 95,807 µmho
Minimum Voltage to the IWS	2 minutes	Based on Manufacturer's Specification [40 CFR 63.1209(g)(2)]	XA-IWS-HV			NA	MS [d]	10 kV
Minimum Power to the WESP	HRA	Average of the Test Run Averages [40 CFR 63.1209(g)(2)]	HRA-KV577			16.2 kVA	2022 CPT	16.2 kVA
Minimum Tank Level in the WESP	HRA	Average of the Test Run Averages [40 CFR 63.1209(m)(1)(B)(ii)]	HRA12-LI577			40.0%	2022 CPT	40.0%
Semivolatile Metals - SVM (Pb, Cd) [b]				**230 µg/dscm corrected to 7% O_2**		**<0.91**		
Low Volatile Metals - LVM (As, Be, Cr) [b]				**92 µg/dscm corrected to 7% O_2**		**<2.9**		
Maximum Total Feedrate of SVM (Pb, Cd) [g]	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(n)(2)(i)(A)]	HRA12-056L5			150.89 lb/hr	2022 CPT	150.89 lb/hr [e]
Maximum Total Feedrate of LVM (As, Be, Cr) [h]	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(n)(2)(i)(B)]	HRA12-056L6			46.83 lb/hr	2022 CPT	46.83 lb/hr [f]
Maximum Pumpable Feedrate of LVM (As, Be, Cr) [i]	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(n)(2)(i)(B)]	HRA12-P056L6			6.78 lb/hr	2022 CPT	6.78 lb/hr [h]
Maximum Flue Gas Flowrate	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(n)(5)]	HRA-576		39,904 dscfm	39,605 dscfm	2022 CPT	39,605 dscfm
Maximum Feedrate of Total Chlorine/Chloride	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(n)(4)]	HRA12-051L1			4,888 lb/hr	2022 CPT	4,888 lb/hr

Operating Parameter	Averaging Period	Regulatory Basis	Process Tag	HWC MACT Limit	Measured Values and Emission Rates		How Limit is Established	Operating Parameter Limit
					2006 CPT	2022 CPT		
Minimum Scrubber Blowdown Rate (Blowdown to Deepwell) —OR— Maximum Conductivity of Scrubber Water	HRA	Average of the Test Run Averages [40 CFR 63.1209(n)(3) and 40 CFR 63.1209(m)(1)(B)(ii)]	HRA12-616 —OR— HRA-616C			88.7 gpm —OR— 95,807 µmho	2022 CPT	88.7 gpm —OR— 95,807 µmho
Minimum Voltage to the IWS	2 minutes	Based on Manufacturer's Specification [40 CFR 63.1209(g)(2)]	XA-IWS-HV			NA	MS d	10 kV
Minimum Power to the WESP	HRA	Average of the Test Run Averages [40 CFR 63.1209(g)(2)]	HRA-KV577			16.2 kVA	2022 CPT	16.2 kVA
Minimum Tank Level in the WESP	HRA	Average of the Test Run Averages [40 CFR 63.1209(n)(3) and 40 CFR 63.1209(m)(1)(B)(ii)]	HRA12-LI577			40.0%	2022 CPT	40.0%
Hydrochloric Acid and Chlorine Gas (HCl/Cl_2) b				**32 ppmv combined as Cl- equivalents, corrected to 7% O_2**		**0.121**		
Maximum Emission Concentration of HCl (continuously monitored, as a surrogate for HCl/Cl_2)	HRA		HCL-PPMV			0.121 ppmv		32 ppmv
Maximum Feedrate of Total Chlorine/Chloride	12-Hour Rolling Average	Average of the Test Run Averages [40 CFR 63.1209(o)(1)]	HRA12-051L1			4,888 lb/hr	2022 CPT	4,888 lb/hr
Maximum Flue Gas Flow	HRA	Average of the Test Run Maximum HRAs [40 CFR 63.1209(o)(2)(i)]	HRA-576		39,904 dscfm	39,605 dscfm	2022 CPT	39,605 dscfm
Minimum Liquid-to-Gas Ratio in the Absorbers	HRA	Average of the Test Run Averages [40 CFR 63 1209(o)(3)(v)]	HRA-LOVG			0.107	2022 CPT	0.107
Minimum Liquid Feed Pressure to the Absorbers	HRA	Based on Manufacturer's Specification [40 CFR 63 1209(o)(3)(iii)]	HRA-PI573			NA	MS d	7 psig

Operating Parameter	Averaging Period	Regulatory Basis	Process Tag	HWC MACT Limit	Measured Values and Emission Rates 2006 CPT	Measured Values and Emission Rates 2022 CPT	How Limit is Established	Operating Parameter Limit
Minimum pH at Cooling Tower Inlet	HRA	Average of the Test Run Averages [40 CFR 63.1209(o)(3)(iv)]	HRA-571			3.55	2022 CPT	3.55
Carbon Monoxide (CO)				**100 ppmv corrected to 7% O_2**				
Maximum Emission Concentration of Carbon Monoxide	HRA	Average of the Test Run Average HRAs [40 CFR 63.1209(a)(1)]	STACK-CO-AVG			0.91 ppmv [b]		100 ppmv corrected to 7% O_2

a Lowest value measured. DRE measured for 1,2-Dichlorobenzene, in Class 1 of the Thermal Stability Index.

b Average value.

c Waste feed is automatically cut-off only to the burner that has low atomizing pressure.

d Limit set by manufacturer's specification/good engineering practice.

e The SVM feedrate was developed using the SVM feedrate measured during the CPT extrapolated to three times the measured feedrate.

f The total LVM feedrate was developed using the total LVM feedrate measured during the CPT extrapolated to three times the measured feedrate.

g The pumpable LVM feedrate was developed by using the pumpable LVM feedrate measured during the CPT extrapolated to three times the measured feedrate.

h The mercury feed rate limit was developed using the mercury feedrate measured during the CPT extrapolated to three times the measured feed rate.

6. Bases for Establishment of OPLs

The HWC MACT has standards for eight emission limits and for destruction and removal efficiency (DRE). In association with each of these standards, the HWC MACT requires that feedrate limits and/or operating parameter limits (OPLs) be established for the combustion systems and/or for air pollution control equipment. The operation of the unit within the feedrate limits and OPLs will ensure that the standards of the HWC MACT are being continuously achieved. Listed below are the HWC MACT limits and the feedrate and OPLs required for each standard. For each feedrate limit or OPL, an explanation is provided for the establishment of the feedrate limit or OPL. As stated in 40 CFR 63.1209(i), if an operating parameter is applicable to multiple standards, then the most stringent limit applies.

- **DRE – 40 CFR 63.1209(j)**

  Compliance with the standard for destruction and removal efficiency (DRE) was demonstrated via *"data in lieu of"* submitted as Appendix A to the CPT/RCRA/Air Test Plan. Applicable feedrates and OPLs associated with this standard are established using *"data in lieu of"*, submitted with the CPT/RCRA/Air Test Plan, and collected during the 2006 CPT.

  Minimum Combustion Chamber Temperature in the Kiln - 40 CFR 63.1209(j)(1)
  Minimum combustion chamber temperature in the kiln was established during the 2006 CPT.

  Minimum Combustion Chamber Temperature in the SCC - 40 CFR 63.1209(j)(1)
  Minimum combustion chamber temperature in the SCC was established during the 2006 CPT.

  Maximum Flue Gas Flowrate or Production Rate - 40 CFR 63.1209(j)(2)
  Flue gas flowrate, as stack gas flowrate, is monitored using a correlation between ID fan amps and measured stack gas flowrate, as dscfm (dry standard cubic feet per minute).

  The OPL for maximum flue gas flowrate is established during the 2006 CPT when maximum hazardous waste feedrates were achieved.

  Maximum Hazardous Waste Feedrate to the Kiln - 40 CFR 63.1209(j)(3)
  The incinerator at Veolia's plant in Port Arthur burns both pumpable and nonpumpable hazardous wastes. Nonpumpable wastes are burned in the rotary kiln, and pumpable wastes are burned in the rotary kiln and SCC.

  The OPL for maximum hazardous waste feedrate to the kiln is based on the combined measured nonpumpable and pumpable waste feedrates to the kiln during the 2006 CPT. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

  Maximum Pumpable Hazardous Waste Feedrate to the Kiln - 40 CFR 63.1209(j)(3)
  The incinerator at Veolia's plant in Port Arthur burns pumpable hazardous wastes in the rotary kiln and in the SCC.

  The OPL for maximum pumpable hazardous waste feedrate to the kiln is based on the combined measured pumpable waste feedrates to the kiln during the 2006 CPT. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

  Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC - 40 CFR 63.1209(j)(3)
  The incinerator at Veolia's plant in Port Arthur burns pumpable hazardous wastes in the rotary kiln and in the SCC.

The OPL for maximum pumpable hazardous waste feedrate to the SCC is based on the combined measured pumpable waste feedrates to the SCC during the 2006 CPT. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

Operation of the Waste Firing System - 40 CFR 63.1209(j)(4)
An OPL must be established to ensure good operation of the hazardous waste firing system. An OPL has been established for Minimum Atomizing Steam Pressure, based on Manufacturer's Specifications.

- **Dioxins and Furans – 40 CFR 63.1209(k)**

Compliance with the standard for dioxins and furans was demonstrated during the 2022 CPT. Applicable feedrates and OPLs associated with this standard are established from the 2022 CPT.

Gas Temperature at the Inlet to a Dry Particulate Matter Control Device – 40 CFR 63.1209(k)(1)
Not applicable. There is no dry particulate matter control device on the Port Arthur incinerator.

Minimum Combustion Chamber Temperature in the Kiln - 40 CFR 63.1209(j)(1)
Minimum combustion chamber temperature in the kiln was established during the 2022 CPT determined during stack sampling for dioxins and furans.

Minimum Combustion Chamber Temperature in the SCC - 40 CFR 63.1209(j)(1)
Minimum combustion chamber temperature in the SCC was established during the 2022 CPT determined during stack sampling for dioxins and furans.

Maximum Flue Gas Flowrate or Production Rate - 40 CFR 63.1209(j)(2)
Flue gas flowrate, as stack gas flowrate, is monitored using a correlation between ID fan amps and measured stack gas flowrate, as dscfm (dry standard cubic feet per minute).

The OPL for maximum flue gas flowrate is established from the 2022 CPT determined during stack sampling for dioxins and furans when maximum hazardous waste feedrates were achieved.

Maximum Hazardous Waste Feedrate to the Kiln - 40 CFR 63.1209(j)(3)
The incinerator at Veolia's plant in Port Arthur burns both pumpable and nonpumpable hazardous wastes. Nonpumpable wastes are burned in the rotary kiln, and pumpable wastes are burned in the rotary kiln and SCC.

The OPL for maximum hazardous waste feedrate to the kiln is based on the combined measured nonpumpable and pumpable waste feedrates to the kiln during the 2022 CPT determined during stack sampling for dioxins and furans. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

Maximum Pumpable Hazardous Waste Feedrate to the Kiln - 40 CFR 63.1209(j)(3)
The incinerator at Veolia's plant in Port Arthur burns pumpable hazardous wastes in the rotary kiln and in the SCC.

The OPL for maximum pumpable hazardous waste feedrate to the kiln is based on the combined measured pumpable waste feedrates to the kiln during the 2022 CPT determined during stack sampling for dioxins and furans. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

Maximum Total (Pumpable) Hazardous Waste Feedrate to the SCC - 40 CFR 63.1209(j)(3)

The incinerator at Veolia's plant in Port Arthur burns pumpable hazardous wastes in the in the SCC.

The OPL for maximum pumpable hazardous waste feedrate to the SCC is based on the combined measured pumpable waste feedrates to the SCC during the 2022 CPT determined during stack sampling for dioxins and furans. OPLs for hazardous waste feedrates developed from multiple streams were established by first summing the feedrates of individual waste streams, determining the maximum HRA for the summed waste streams by run, and averaging the maximum HRAs from the three runs.

Particulate Matter Operating Limit - 40 CFR 63.1209(k)(5)

Not applicable. This OPL is only applicable if the incinerator is equipped with an activated carbon injection system.

Activated Carbon Injection Parameter Limits - 40 CFR 63.1209(k)(6)

Not applicable. There is no carbon injection system on the Port Arthur incinerator.

Carbon Bed Parameter Limits - 40 CFR 63.1209(k)(7)

Not applicable. There is no carbon bed on the Port Arthur incinerator.

Catalytic Oxidizer Parameter Limits - 40 CFR 63.1209(k)(8)

Not applicable. There is no catalytic oxidizer on the Port Arthur incinerator.

- **Mercury – 40 CFR 63.1209(l)**

Compliance with the standard for mercury was demonstrated during the 2022 CPT. Applicable feedrates and OPLs associated with this standard are established from the 2022 CPT.

Feedrate of Total Mercury – 40 CFR 63.1209(l)(1)

The total feedrate of mercury is established using the results of the 2022 CPT determined during stack sampling for mercury.

Wet Scrubber - 40 CFR 63.1209(l)(2)

The HWC MACT prescribes that operating parameter limits for wet scrubbers be established under the standard for mercury as required for the hydrochloric acid and chlorine gas standard found in 40 CFR 63.1206(o)(3). 40 CFR 63.1206(o)(3)(iv) (i.e., minimum pH) is not required.

The wet scrubbers on the Port Arthur incinerator for which OPLs are established for control of mercury are the two parallel absorbers. The absorbers are low energy scrubbers. The absorbers affect control of emissions of mercury and hydrochloric acid and chlorine gas (HCl/Cl_2). The results of the 2022 CPT determined during stack sampling for mercury are used to document compliance with the mercury standard and establish associated OPLs.

Minimum Pressure Drop Across a High Energy Scrubber - 40 CFR 63.1209(l)(2) and 40 CFR 63.1209(0)(3)(i)

Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Pressure Drop for Low Energy Scrubber - 40 CFR 63.1209(l)(2) and 40 CFR 63.1209(o)(3)(ii)

The OPL for minimum pressure drop across the wet scrubber is not required through approval of the Alternative Monitoring Application submitted March 1, 2004.

Minimum Liquid Feed Pressure for Low Energy Scrubber - 40 CFR 63.1209(l)(2) and 40 CFR 63.1209(o)(3)(iii)

Minimum liquid feed pressure for the absorbers is established based on "manufacturer's specifications" as prescribed by the HWC MACT.

Minimum Liquid to Gas Ratio - 40 CFR 63.1209(l)(2) and 40 CFR 63.1209(o)(3)(v)
The liquid to gas ratio of the absorbers is established from the results of the 2022 CPT.

Activated Carbon Injection - 40 CFR 63.1209(l)(3)
Not applicable. There is no carbon injection system on the Port Arthur incinerator.

Activated Carbon Bed - 40 CFR 63.1209(l)(4)
Not applicable. There is no carbon injection system on the Port Arthur incinerator.

Maximum Pumpable Arsenic Feedrate - 40 CFR 63.1209(g)(2)
Maximum pumpable arsenic feedrate is established as an additional requirement for control of mercury and was established during the 2022 CPT determined during stack sampling for mercury.

- **Particulate Matter – 40 CFR 63.1209(m)**

Compliance with the standard for particulate matter was demonstrated during the 2022 CPT. Applicable feedrates and OPLs associated with this standard are established from the 2022 CPT.

Control Device Operating Parameter Limits – 40 CFR 63.1209(m)(1)
The HWC MACT prescribes OPLs for high energy scrubbers and wet scrubbers used to control particulate matter (and metals). There is no high energy scrubber on the incinerator at Port Arthur. The control devices on the Port Arthur incinerator that are designed and operated to control particulate matter (and metals) are the ionizing wet scrubber and the wet electrostatic precipitator (WESP).

Minimum Pressure Drop Across a High Energy Scrubber – 40 CFR 63.1209(m)(1)(i)(A)
Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Liquid to Gas Ratio or Minimum Scrubber Flowrate and Maximum Flue Gas Flowrate for a High Energy Scrubber – 40 CFR 63.1209(m)(1)(i)(C)
Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Blowdown Rate and Minimum Scrubber Tank Volume or Level– OR – Maximum Conductivity of Scrubber Water – 40 CFR 63.1209(m)(1)(B)(1)
Veolia received approval of an AMA dated March 1, 2004 to monitor the blowdown rate from the water treatment system, termed Blowdown to the Deepwell, as an OPL. This AMA also waived the limit for tank level in the IWS sumps.

An additional Alternative Monitoring Application submitted on January 25, 2005 was approved and authorizes use of either minimum blowdown rate to the Deepwell, or maximum conductivity of the blowdown to the Deepwell as the OPL to control the solids content of the scrubber water.

The blowdown to the Deepwell and conductivity OPLs are established from the results of the 2022 CPT determined during stack sampling for particulate matter in association with the demonstration of compliance with the PM standard.

Minimum Tank Level in the WESP – 40 CFR 63.1209(m)(1)(B)(ii)
The OPL for minimum tank level in the WESP is established from the 2022 CPT determined during stack sampling for particulate matter.

Maximum Flue Gas Flowrate or Production Rate - 40 CFR 63.1209(m)(2)
Flue gas flowrate, as stack gas flowrate, is monitored using a correlation between ID fan amps and measured stack gas flowrate, as dscfm (dry standard cubic feet per minute).

The OPL for maximum flue gas flowrate is established from the 2022 CPT determined during stack sampling for particulate matter.

Maximum Ash Feedrate – 40 CFR 63.1209(m)(3)

The OPL for maximum ash feedrate is not required through approval of the Alternative Monitoring Application submitted January 25, 2005.

Voltage to the IWS – 40 CFR 63.1209(g)(2)

For each IWS unit, voltage across the resistor in the alarm circuit is monitored. The voltage will vary from zero to a maximum value in direct response to the IWS control logic. If for any reason the maximum voltage of 10 kV is not achieved during any two-minute period, the undervoltage alarm will occur (for instance during a cleaning cycle). In the event that four units are in undervoltage alarm at the same time an Automatic Waste Feed Cutoff (AWFCO) will occur.

With the addition of the Wet Electrostatic Precipitator (WESP), the IWS unit acts as a prefilter for the WESP, and the system has sufficient excess metal and particulate removal capacity to perform with 3 units offline, as demonstrated in the 2017 CPT. Further the WESP OPL for DC Power of 16.2 kVA demonstrated in the 2022 CPT while the WESP was “de-tuned” (i.e., functioning at 85% of normal power) will ensure acceptable metal and particulate removal efficiencies are achieved when only five of the IWS units are operating because if excessive particles pass the IWS it will cause corona suppression in the WESP and lower the DC power below the limit demonstrated in the CPT, causing an AWFCO.

Voltage to the IWS is established based on “manufacturer’s specifications” as an additional requirement.

An IWS wash cycle was included in each run of the 2022 CPT, as described in the CPT plan.

Minimum Power to WESP – 40 CFR 63.1209(g)(2)

The OPL for minimum power to the WESP is established from the 2022 CPT determined during stack sampling for particulate matter.

A representative portion of a WESP wash cycle was included in each run of the 2022 CPT.

- **Semivolatile Metals and Low Volatility Metals – 40 CRF 63.1209(n)**

Compliance with the standard for semivolatile metals and low volatility metals was demonstrated during the 2022 CPT. Applicable feedrates and OPLs associated with this standard are established from the 2022 CPT.

Maximum Inlet Temperature to Dry Particulate Matter Air Pollution Control Device – 40 CFR 63.1209(n)(1)

Not applicable. There is no dry particulate matter control device on the Port Arthur incinerator.

Maximum Feedrate of Semivolatile and Low Volatile Metals - 40 CFR 63.1209(n)(2)

The feedrates of the semivolatile metals (SVMs) lead (Pb) and cadmium (Cd), and the low volatility metals (LVMs) arsenic (As), beryllium (Be), and chromium (Cr) were demonstrated during the 2022 CPT primarily due to the spiking of the SVM metal Pb, and the LVM metals As and Cr. As and Cr were both spiked as soluble metals in pumpable wastes to the SCC. Nonpumpable forms of As, Cr, and Pb were spiked into the kiln. The total feedrates of the SVMs and LVMs include the spiking rates and the contribution of these metals supplied with the waste streams – both pumpable and nonpumpable.

The OPL for maximum feedrate of Semivolatile Metals (SVM) is established from the 2022 CPT determined during stack sampling for metals, and is extrapolated to three times the feedrate measured during the CPT.

The OPL for maximum total feedrate of Low Volatility Metals (LVM) is established from the 2022 CPT determined during stack sampling for metals, and is extrapolated to three times the feedrate measured during the CPT.

The OPL for maximum feedrate of pumpable Low Volatility Metals (LVM) is established from the 2022 CPT determined during stack sampling for metals, and is extrapolated to three times the feedrate measured during the CPT.

Control Device Operating Parameter Limits - 40 CFR 63.1209(n)(3)

These OPLs are identical to the OPLs for the Particulate Matter standard. 40 CFR 63.1209(n)(3) references 40 CFR 63.1209(m)(1). The OPLs established for the SVM and LVM standards and the Particulate Matter standard are the same, and are established from results of the 2022 CPT.

Minimum Pressure Drop Across a High Energy Scrubber

Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Liquid to Gas Ratio or Minimum Scrubber Flowrate and Maximum Flue Gas Flowrate for a High Energy Scrubber

Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Blowdown Rate and Minimum Scrubber Tank Volume or Level– OR – Maximum Conductivity of Scrubber Water

Veolia has received approval of an AMA dated March 1, 2004 to monitor the blowdown rate from the water treatment system, termed Blowdown to the Deepwell, as an OPL. This AMA also waived the limit for tank level in the IWS sumps.

An additional Alternative Monitoring Application submitted on January 25, 2005 was approved and authorizes use of either minimum blowdown rate to the Deepwell, or maximum conductivity of the blowdown to the Deepwell as the OPL to control the solids content of the scrubber water.

The blowdown to the Deepwell and conductivity OPLs are established from the results of the 2022 CPT in association with the demonstration of mercury, SVM, and LVM compliance.

Maximum Total Chlorine and Chloride Feedrate - 40 CFR 63.1209(n)(4)

The HWC MACT prescribes the establishment of the feedrate of total chlorine and chloride in association with both the Semivolatile Metals and Low Volatility Metals and the Hydrochloric Acid and Chlorine Gas (HCl/Cl2) standards. The emission limits for SVM, LVM, and HCl/Cl2 and the feedrate of total chlorine/chloride were demonstrated in the 2022 CPT. OPLs for all of these standards were established from the results of the 2022 CPT.

The feedrate of total chlorine/chloride during the 2022 CPT was determined during stack sampling for metals using the concentrations of chlorine/chloride in each of the waste streams burned in the incinerator (solid wastes and liquid wastes) and the feedrates of those streams.

Minimum Tank Level in the WESP – 40 CFR 63.1209(n)(3) and 40 CFR 63.1209(m)(1)(B)(ii)

The OPL for minimum tank level in the WESP is established from the 2022 CPT determined during stack sampling for metals.

Maximum Flue Gas Flowrate or Production Rate - 40 CFR 63.1209(n)(5)

Flue gas flowrate, as stack gas flowrate, is monitored using a correlation between ID fan amps and measured stack gas flowrate, as dscfm (dry standard cubic feet per minute).

The OPL for maximum flue gas flowrate is established from the 2022 CPT determined during stack sampling for metals.

Voltage to the IWS – 40 CFR 63.1209(g)(2)

For each IWS unit, voltage across the resistor in the alarm circuit is monitored. The voltage will vary from zero to a maximum value in direct response to the IWS control logic. If for any reason the maximum voltage of 10 kV is not achieved during any two-minute period, the undervoltage alarm will occur (for instance during a cleaning cycle). In the event that four units are in undervoltage alarm at the same time an Automatic Waste Feed Cutoff (AWFCO) will occur.

With the addition of the Wet Electrostatic Precipitator (WESP), the IWS unit acts as a prefilter for the WESP, and the system has sufficient excess metal and particulate removal capacity to perform with 3 units offline, as demonstrated in the 2017 CPT. Further the WESP OPL for DC Power of 16.2 kVA demonstrated in the 2022 CPT while the WESP was “de-tuned” (i.e., functioning at 85% of normal power) will ensure acceptable metal and particulate removal efficiencies are achieved when only five of the IWS units are operating because if excessive particles pass the IWS it will cause corona suppression in the WESP and lower the DC power below the limit demonstrated in the CPT, causing an AWFCO.

Voltage to the IWS is established based on “manufacturer’s specifications” as an additional requirement.

An IWS wash cycle was included in each run of the CPT, as described in the CPT plan.

Minimum Power to WESP – 40 CFR 63.1209(g)(2)

The OPL for minimum power to the WESP is established from the 2022 CPT determined during stack sampling for metals.

A representative portion of a WESP wash cycle was included in each run of the 2022 CPT.

- **Hydrochloric Acid and Chlorine Gas - 40 CFR 63.1209(o)**

Compliance with the standard for hydrochloric acid and chlorine gas was demonstrated during the 2022 CPT. Applicable feedrates and OPLs associated with this standard are established from the 2022 CPT.

The primary means of documenting compliance with the HCl/Cl_2 standard is by a continuous emission monitor for HCl. This approach was authorized by approval of the AMA submitted March 1, 2004. The value of the HCl CEMs is doubled by the DCS and compared to the standard for hydrochloric acid and chlorine gas. Under the Final Replacement Standards of the HWC MACT, the applicable standard is 32 ppmv, dry basis, combined emissions of HCl and Cl_2, expressed as a chloride (Cl^-) equivalent.

In the event that the HCl CEMs is not operating, the following OPLs are in effect to document compliance with the HCl/Cl_2 standard.

Maximum Total Chlorine and Chloride Feedrate - 40 CFR 63.1209(o)(1)

The HWC MACT prescribes the establishment of the feedrate of total chlorine and chloride in association with both the Semivolatile Metals and Low Volatility Metals and the Hydrochloric Acid and Chlorine Gas (HCl/Cl_2) standards. The emission limits for SVM, LVM, and HCl/Cl_2 and the feedrate of total chlorine/chloride were demonstrated in the 2022 CPT. OPLs for all of these standards were established from the results of the 2022 CPT.

The feedrate of total chlorine/chloride during the 2022 CPT was determined during stack sampling for HCl and Cl_2 using the concentrations of chlorine/chloride in each of the waste streams burned in the incinerator (solid wastes and liquid wastes) and the feedrates of those streams.

Maximum Flue Gas Flowrate or Production Rate - 40 CFR 63.1209(o)(2)

Flue gas flowrate, as stack gas flowrate, is monitored using a correlation between ID fan amps and measured stack gas flowrate, as dscfm (dry standard cubic feet per minute).

The OPL for maximum flue gas flowrate is established from the 2022 CPT determined during stack sampling for HCl and Cl_2.

Wet Scrubber - 40 CFR 63.1209(o)(3)

The HWC MACT prescribes that operating parameter limits for wet scrubbers be established under the hydrochloric acid and chlorine gas standard found in 40 CFR 63.1206(o)(3).

The wet scrubbers on the Port Arthur incinerator for which OPLs are established for control of hydrochloric acid and chlorine are the two parallel absorbers. The absorbers are low energy scrubbers. The results of the 2022 CPT are used to document compliance with the hydrochloric acid and chlorine standards and establish associated OPLs.

Minimum Pressure Drop Across a High Energy Scrubber - 40 CFR 63.1209(o)(3)(i)

Not applicable. There is no high energy scrubber on the Port Arthur incinerator.

Minimum Pressure Drop for Low Energy Scrubber - 40 CFR 63.1209(o)(3)(ii)

The OPL for minimum pressure drop across the wet scrubber is not required through approval of the Alternative Monitoring Application submitted March 1, 2004.

Minimum Liquid Feed Pressure for Low Energy Scrubber - 40 CFR 63.1209(o)(3)(iii)

Minimum liquid feed pressure for the absorbers is established based on “manufacturer’s specifications” as prescribed by the HWC MACT.

Minimum pH - 40 CFR 63.1209(o)(3)(iv)

The OPL for minimum pH of the air pollution control system of the Port Arthur incinerator is established as the pH of the scrubber water at the inlet of the cooling towers.

The OPL for minimum pH is established from the results of the 2022 CPT determined during stack sampling for HCl and Cl_2.

Minimum Liquid to Gas Ratio - 40 CFR 63.1209(o)(3)(v)

The liquid to gas ratio of the absorbers is established from the results of the 2022 CPT determined during stack sampling for HCl and Cl_2.

Dry Scrubber - 40 CFR 63.1209(o)(4)

Not applicable. There is no dry scrubber on the Port Arthur incinerator.

- **Carbon Monoxide - 40 CFR 63.1203(a)(1)(i)**

  Compliance with the standard for carbon monoxide was demonstrated at all times during the 2022 CPT.

- **Maximum Combustion Chamber Pressure - 40 CFR 63.1206(c)(5) and 40 CFR 63.1209(p)**

  The requirement to control combustion system leaks is demonstrated by operation of a fan that evacuates shrouds around both ends of the rotary kiln by approval of the AMA dated March 1, 2004. When the fan of the shroud system is not operating, pressure lower than ambient pressure (i.e., a negative pressure) will be maintained at the front-face of the kiln and monitored instantaneously.

- **Hazardous Waste Residence Time - 40 CFR 63.1206(b)(11)**

  A determination of the hazardous waste residence time is to be included in the CPT Plan and in the NOC. The incinerator burns solids, liquids, containerized gases, and vent streams. The hazardous waste residence time is in effect the residence time of the solids through the kiln because the residence time for solids is substantially greater than liquids and vent streams. The residence time of solids in the kiln is calculated using the following formula:

$$T = \frac{0.19 * kl}{rpm * id * sl}$$

Where:

T = residence time, minutes
kl = kiln length, feet (60 feet)
rpm = kiln rotational speed, rpm (normally varies between 0.3 and 1.0 rpm)
id = kiln inside diameter, feet (14 feet)
sl = slope, feet/feet (0.0175)

Using this formula and the physical dimensions of the kiln, the formula calculates a residence time between 155 minutes and 46.5 minutes depending upon the kiln rotational speed (between 0.3 and 1.0 rpm) as follows:

$$T = \frac{0.19 * 60}{0.3 * 14 * 0.0175}$$ = 155 minutes @ 0.3 rpm

$$T = \frac{0.19 * 60}{1.0 * 14 * 0.0175}$$ = 46.5 minutes @ 1.0 rpm

The average kiln rotational speed was 0.33, 0.32, and 0.33 rpm determined from the initiation to completion of sampling of Runs 1, 2, and 3, respectively, of the 2022 CPT. The formula calculates residence times between 142 and 146 minutes for the 2022 CPT as follows:

$$T = \frac{0.19 * 60}{0.33 * 14 * 0.0175}$$ = 142 minutes @ 0.33 rpm – Run 1

$$T = \frac{0.19 * 60}{0.32 * 14 * 0.0175}$$ = 146 minutes @ 0.32 rpm – Run 2

$$T = \frac{0.19 * 60}{0.33 * 14 * 0.0175}$$ = 142 minutes @ 0.33 rpm – Run 3

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